UNITED STATES TARIFF COMMISSION

SUMMARIES OF TRADE AND TARIFF INFORMATION

Prepared in Terms of the Tariff Schedules of the United States (TSUS)

Schedule 4
Chemicals and Related Products
(In 12 volumes)

Volume 8

Flavoring Extracts and Essential Oils

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SUMMARIES OF TRADE AND TARIFF INFORMATION
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FOREWORD

In an address delivered in Boston on May 18, 1917, Frank W. Taussig, distinguished first chairman of the Tariff Commission, delineated the responsibility of the newly established Commission to operate as a source of objective, factual information on tariffs and trade. He stated that the Commission was already preparing a catalog of tariff information--

> designed to have on hand, in compact and simple form, all available data on the growth, development and location of industries affected by the tariff, on the extent of domestic production, on the extent of imports, on the conditions of competition between domestic and foreign products.

The first such report was issued in 1920. Subsequently three series of summaries of tariff information on commodities were published--in 1921, 1929, and 1948-50. The current series, entitled Summaries of Trade and Tariff Information, presents the information in terms of the tariff items provided for in the eight tariff schedules of the Tariff Schedules of the United States (abbreviated to TSUS in these volumes), which on August 31, 1963, replaced the 16 schedules of the Tariff Act of 1930.

Through its professional staff of commodity specialists, economists, lawyers, statisticians, and accountants, the Commission follows the movement of thousands of articles in international commodity trade, and during the years of its existence, has built up a reservoir of knowledge and understanding, not only with respect to imports but also regarding products and their uses, techniques of manufacturing and processing, commercial practices, and markets. Accordingly, the Commission believes that, when completed, the current series of summaries will be the most comprehensive publication of its kind and will present benchmark information that will serve many interests. This project, although encyclopedic, attempts to conform with Chairman Taussig's admonition to be "exhaustive in inquiry, and at the same time brief and discriminating in statement."

This series is being published in 62 volumes of summaries, each volume to be issued as soon as completed. Although the order of publication may not follow the numerical sequence of the items in the TSUS, all items are to be covered. As far as practicable, each volume reflects the most recent developments affecting U.S. foreign trade in the commodities included.

SUMMARIES OF TRADE AND TARIFF INFORMATION

SCHEDULE 4

Volume 8

C O N T E N T S

Numerical List of TSUS Items in This Volume

This volume (identified as volume 4:8) is the eighth in a series of 12 volumes of summaries on the chemicals and related products classified under schedule 4 of the TSUS. Schedule 4 is divided into 13 parts; this volume consists wholly of summaries covering items in part 5. Part 5 is subdivided into subpart A covering flavoring extracts of vegetable origin, and fruit flavors, essences, esters, and oils (except distilled or essential), both natural and synthetic and whether or not they contain ethyl alcohol, and subpart B, which consists wholly of essential or distilled oils. The list of products covered by summaries in this volume is shown in appendix A to this volume, which reproduces both the pertinent segments of the Tariff Schedules of the United States Annotated (TSUSA-1970) relating to the products included in part 5, and the general headnotes to the TSUS.

The value of aggregate U.S. consumption of the chemical products covered in the summaries contained in this volume approximated $1 billion in 1968. The value of U.S. consumption of products covered in subpart A, flavors and extracts, which is exceeded substantially by the value of U.S. production of those products constituted about 93 percent of the total value of consumption of all products in part 5.

The value of total exports in 1968 of the products covered in the summaries included in this volume was estimated at $71 million. Of this amount, about $41 million was accounted for by flavors and extracts, and the remainder by essential oils. Exports of all these products had wide distribution, including countries in South and Central America, Europe, Southeast and Eastern Asia, and Africa.

In 1968 the total value of U.S. imports for consumption of the products covered in the summaries included in this volume amounted to about $41 million. The essential oils covered in subpart B accounted for approximately $37 million, or 90 percent of the total value.

The summaries and tables generally include data only through 1968; however, appendix B to this volume provides data on the value of U.S. imports in 1969 of the TSUS items included in the individual summaries. Also shown are percentage changes in imports from 1968 to 1969 and the three principal countries which supplied imports in 1969.

Commodity	TSUS item
Flavoring extracts and fruit flavors:	
Not containing alcohol:	
In ampoules and similar forms	450.10
Other	450.20
Containing alcohol	450.30, -.40, -.50

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. consumption of the flavors and flavoring extracts covered by this summary, estimated to exceed $900 million a year, is predominantly supplied by U.S. production. Exports are much larger than imports.

Description and uses

Flavors covered by this summary are materials--including extracts, fruit flavors, essences, esters, and oils--used to impart a gratifying taste to such products as soft drinks, candies, baked goods, gelatin desserts, cake mixes, ice cream and other dairy products, pharmaceuticals, and chewing gum. They have little or no food value, and are used to give character to the flavored articles and to make them more agreeable to the taste.

Natural flavoring materials generally consist of extracts of certain plant products, such as lemons and other fruit, nuts, barks, and vanilla and other beans. Such extracts are usually in the form of alcoholic infusions or tinctures. Natural flavorings other than extracts include a great variety of fruit and berry juice concentrates. These are prepared by vacuum concentration or distillation. Some flavorings are formulations of the essential oils obtained from plant products (items 452.02 to 452.80). The largest group of flavoring materials are formulations of synthetic chemicals. Advances in technology have enabled scientists to simulate a natural flavor very closely, and to reproduce it by the use of synthetic ingredients. Such flavors are a complex mixture of as many as 100 constituents.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1970) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Flavoring extracts and fruit flavors:		
	Not containing alcohol:		
450.10	In ampoules and similar forms.	12.5% ad val.	6% ad val.
450.20	Other---------	7.5% ad val.	6% ad val. 1/
	Containing alcohol, by weight:		
450.30	Not over 20 percent.	6¢ per lb. + 6% ad val.	3¢ per lb. + 3% ad val.
450.40	20 to 50 percent--	12¢ per lb. + 7% ad val.	6¢ per lb. + 3% ad val.
450.50	Over 50 percent---	24¢ per lb. + 7% ad val.	12¢ per lb. + 3% ad val.

1/ This rate became effective in the second stage (calendar year 1969) of the Kennedy round staged rate reductions. Further reductions scheduled for this item have not become effective; see footnote 1 to Staged Rates and Historical Notes to part 5 of schedule 4 of the TSUSA-1970, as shown in appendix A to this volume.

The rates effective January 1, 1972, represent the final stage of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1970, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, had remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through 1967.

U.S. consumption

The value of annual U.S. consumption of the materials covered by this summary exceeds $900 million (table 1). Imports supply less than 1 percent of this consumption.

U.S. producers and shipments

In 1963 there were 520 U.S. establishments, operated by 492 firms, primarily engaged in manufacturing flavoring sirups and other flavoring materials. Total shipments of flavoring products by these establishments and by others not primarily engaged in the manufacture of such products amounted to $745 million in 1963, $925 million in 1966, and $998 million in 1967, the latest year for which shipments data are available (table 1).

U.S. exports and imports

The value of U.S. exports of flavoring extracts and related materials increased from $18.1 million in 1962 to $40.8 million in 1968 (table 1). Natural flavoring materials constituted 75 to 79 percent of these exports in the years 1961-64; export statistics for later years do not distinguish between natural and synthetic materials. Aggregate U.S. imports of the flavors and extracts covered by this summary were higher in value in 1968 than in 1962, but not in quantity. In each of those years they amounted to 1.5 million pounds; however, they were valued at $4.1 million in 1968, compared with $1.5 million in 1962.

U.S. imports of flavoring extracts and related materials not containing alcohol, in ampoules, capsules, tablets, and similar forms, amounted to $17,000 in 1966 but have been nil or negligible in all the other years since August 31, 1963 (the effective date of the TSUS), when separate statistics first became available. U.S. imports of flavoring extracts and related materials not containing alcohol and not in ampoules, capsules, tablets, or similar forms increased in value from $1.4 million in 1962 to $4.0 million in 1968. They declined in quantity, however, from 1.4 million pounds in 1962 to 954,000 pounds in 1968 (table 2). U.S. imports of flavoring extracts and related materials containing not over 20 percent, by weight, of alcohol increased irregularly from 6,000 pounds, valued at $6,000, in 1962 to 273,000 pounds, valued at $185,000, in 1968 (table 3). U.S. imports of flavoring extracts and related materials containing over 20 percent but not over 50 percent, by weight, of alcohol increased, likewise irregularly, from 42,000 pounds, valued at $30,000, in 1962 to 60,000 pounds, valued at $51,000, in 1968 (table 4). U.S. imports of flavoring extracts and related materials containing over 50 percent, by weight, of alcohol, increased from 79,000 pounds, valued at $41,000, in 1962 to 216,000 pounds, valued at $187,000, in 1968 (table 5).

Table 1.--Flavors and extracts: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-68

Year	Producers' shipments	Imports		Exports 1/	Apparent consumption
		Quantity	Value		
	1,000 dollars	1,000 pounds	1,000 dollars	1,000 dollars	1,000 dollars
1962	642,000	1,535	1,492	18,062	625,430
1963	745,000	1,621	1,527	18,707	727,820
1964	824,000	1,080	2,291	22,255	804,036
1965	836,000	1,025	2,245	19,954	818,291
1966	925,000	1,181	3,310	23,874	903,476
1967	998,000	1,612	4,176	27,782	974,394
1968	2/	1,503	4,114	40,836	2/

1/ Data for 1962-64 are not statistically comparable with those for 1965-68.

2/ Not available.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--Statistics on quantity of exports are reported in several classes having different reporting units.

Table 2.--Flavoring extracts and related materials not containing alcohol and not in ampoules or similar forms: U.S. imports for consumption, by principal sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
Spain	116	113	119	114	246	356	283
Switzerland	35	37	44	47	59	67	116
Morocco	-	-	1	1	35	43	107
Canada	107	102	107	113	196	250	209
United Kingdom	442	656	81	19	32	41	24
Netherlands	32	39	58	49	49	51	59
All other	676	452	89	64	69	186	156
Total	1,408	1,399	499	407	686	994	954
	Value (1,000 dollars)						
Spain	194	416	668	556	935	1,224	1,689
Switzerland	232	212	295	372	446	472	553
Morocco	-	-	13	12	124	179	494
Canada	291	240	250	243	509	523	484
United Kingdom	117	152	113	72	296	405	267
Netherlands	96	114	408	419	480	491	159
All other	485	260	212	181	198	353	345
Total	1,415	1,394	1,959	1,855	2,988	3,647	3,991

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Flavoring extracts and related materials containing not over 20 percent, by weight, of alcohol: U.S. imports for consumption, by principal sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
West Germany	-	1/	-	1/	15	225	171
Brazil	-	-	-	-	-	8	58
Switzerland	2	2	29	60	69	31	18
All other	4	71	284	346	204	93	26
Total	6	73	313	406	288	357	273
	Value (1,000 dollars)						
West Germany	-	2/	-	1	12	180	144
Brazil	-	-	-	-	-	1	11
Switzerland	2/	1	13	26	36	15	7
All other	6	35	141	205	101	58	23
Total	6	36	154	232	149	254	185

1/ Less than 500 pounds.
2/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 4.--Flavoring extracts and related materials containing over 20 percent but not over 50 percent, by weight, of alcohol: U.S. imports for consumption, by principal sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
Italy	29	18	78	20	16	28	48
West Germany	3	2	1	5	1	6	3
United Kingdom	9	2	3	6	6	6	7
All other	1	2	6	1	1	3	2
Total	42	24	88	32	24	43	60
	Value (1,000 dollars)						
Italy	12	11	30	8	8	16	26
West Germany	8	7	5	13	16	19	12
United Kingdom	8	4	8	15	14	15	10
All other	2	4	8	2	7	5	3
Total	30	26	51	38	31	55	51

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 5.--Flavoring extracts and related materials, containing over 50 percent, by weight, of alcohol: U.S. imports for consumption, by principal sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
United Kingdom	79	121	128	126	139	149	142
Spain	-	-	-	1/	-	1	42
France	-	1	46	49	38	65	26
All other	1/	3	6	5	6	3	6
Total	79	125	180	180	183	218	216
	Value (1,000 dollars)						
United kingdom	40	64	69	66	73	80	75
Spain	-	-	-	2/	-	1	62
France	-	1	46	45	49	134	41
All other	1	6	12	8	3	5	9
Total	41	71	127	119	125	220	187

1/ Less than 500 pounds.
2/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

The essential oils, which are characterized by a particular or individual odor and a tendency to evaporate readily, are obtained from various parts of numerous plants of diverse types which grow worldwide--both in the warm, less-developed regions and in the temperate-zoned industrialized countries. The bulk of the more than 100 essential oils of commercial significance covered in this volume are obtained by steam distillation; however, some, particularly the citrus oils, are derived principally by mechanical expression. Some essential oils from flowers or other plant parts are extracted by absorption in cold fat (enfleurage), by absorption in hot fat (maceration), or by volatile solvents, those in the last category being termed concretes (in solid form) which can be transformed into absolutes (in liquid form); these various substances are covered under TSUS item 460.05 in volume 4:9 of this series.

Technical standards and specifications for various of the essential oils are published not only in compendia such as the United States Pharmacopoeia and other similar publications which are referred to in the individual summaries, but also in a series published by the Essential Oil Association, an organization which comprises a number of essential oil concerns.

Relatively few of the essential oils covered herein are produced domestically. However, in 1967, the value of U.S. producers' shipments of essential oils, including pine oil, as published in the Census of Manufacturers of the U.S. Department of Commerce, amounted to $67.2 million, having increased from $42.7 million in 1963; domestically produced oils accounted for more than half the total value of consumption of all oils in 1967. The total value of production in 1968 was estimated at $60 million. Essential oils produced in the United States include clove bud, the citrus oils--grapefruit, lemon, lime, and orange--pine, peppermint, spearmint, cedarleaf, cedarwood, and several other miscellaneous oils.

The value of total exports in 1968 of essential oils amounted to about $30 million, and had virtually world-wide distribution. Of these oils, exports of peppermint, pine, spearmint, orange, and lemon oil predominated.

In 1968 the total volume of U.S. imports for consumption of essential oils amounted to $37 million. The most important essential oils

represented in the imports for that year were as follows:

Essential oil	Value of imports (Million dollars)
Lime	7.0
Lavender and spike lavender	3.7
Lemon	2.5
Geranium	2.4
Sandalwood	2.2
Vetiver	2.2
Bergamot	2.1
Rose	1.7
Clove	1.6
Citronella	1.3

The principal sources of imports were as follows: France ($7.0 million), Mexico ($5.7 million), Italy ($3.6 million), Malagasy ($3.4 million), and Haiti ($2.6 million).

The following part of this volume covering the essential oils is arranged into groupings by general types or most frequent use, and thus TSUS items are not necessarily found in numerical order. The groupings are in sequence and cover items as follows: Food and pharmaceutical oils (bitter almond, anise, caraway, cassia, cinnamon, clove, eucalyptus, and origanum oils), perfumery oils (bergamot, citronella, geranium, lavender and spike lavender, lemongrass, linaloe and bois de rose, neroli, orris, palmarosa, patchouli, petitgrain, rose, sandalwood, vetiver, and ylang-ylang and cananga oils), the mint oils (cornmint and peppermint oils), the citrus oils (grapefruit, lemon, lime, and orange oils), and other miscellaneous oils (camphor, cedar leaf, pine needle, rosemary, thyme, and other oils not specifically enumerated). It is to be noted that a specific oil could be included in a category other than that in which it is placed here; the groupings are by no means all inclusive. For example, certain citrus-derived oils, such as bergamot, and neroli are included under the perfume oils, and the category for the oils used in foods and pharmaceuticals is not presumed to be an exhaustive compilation.

Commodity	TSUS item
Bitter almond oil----------	452.02

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970)(pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements of bitter almond oil, which amounted to 43,000 pounds in 1968 and constituted the principal portion of French and thereby, world, production.

Comment

Bitter almond oil is a volatile oil obtained by steam distillation of the finely powdered kernels of the fruit of the amara variety of the almond tree, Prunus amygdalus, and from other kernels containing the glycoside amygdalin, such as those from the apricot tree, Prunus armeniaca, or from certain varieties of the peach tree, Prunus persica. These trees are cultivated in southern France, Spain, southern Italy, Sicily, Israel, Morocco, Algeria, California, and elsewhere.

The dulcis variety of Prunus amygdalus (the other of the two commercially important varieties of the almond tree) bears sweet almonds, and the oil expressed therefrom is provided for in item 176.58. Sweet almonds, however, do not contain the glycoside amygdalin in the kernel.

The bulk of the bitter almond oil currently entering commerce is believed to be produced in France from apricot kernels.

Bitter almond oil is composed chiefly of benzaldehyde and a small quantity of hydrocyanic acid, both of which are produced by hydrolysis of amygdalin during the distillation process. The use of bitter almond oil in medicine, particularly for the treatment of skin disorders, derives from the presence of these two chemicals in the oil. However, bitter almond oil is used principally as a flavoring agent in cough medicines, baked goods and confections, and an ingredient in toilet preparations. For use in these products, the bitter almond oil must be that from which the hydrocyanic (prussic) acid has been removed, and such oil is then designated as "FFPA" (free from prussic acid). Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences-National Research Council. Synthetic benzaldehyde is frequently substituted for bitter almond oil in many of its uses.

U.S. imports of bitter almond oil are entered free of duty under TSUS item 452.02. The duty-free status was provided for in the original Tariff Act of 1930 under paragraph 1731 and in the TSUS, which became effective August 31, 1963; it has been bound since January 1, 1948, as a concession granted by the United States under the General Agreement on Tariffs and Trade.

No bitter almond oil is believed to be produced in the United States, and domestic needs are supplied entirely by imports. Annual U.S. imports of bitter almond oil have generally been small; in 1962-68 they averaged less than 30,000 pounds, valued at about $38,000 (see accompanying table). Most of this oil came from France, and nearly all of the remainder (approximately 18 percent in 1968) came from the Netherlands. It is believed that the U.S. imports from the Netherlands were produced from raw material of French, Spanish, or other origin. With only minor exceptions, U.S. imports are of the FFPA grade.

Bitter almond oil is a relatively unimportant item in international commerce. No statistics on foreign production or exports are available; however, annual world production of bitter almond oil at present probably does not exceed 55,000 pounds. It is estimated that U.S. purchases (imports) account for about 75 percent of French production.

Bitter almond oil: U.S. imports for consumption, by principal sources, 1962-68

Year	Total		France		Netherlands		Other	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	1,000 pounds	1,000 dollars	1,000 pounds	1,000 dollars	1,000 pounds	1,000 dollars	1,000 pounds	1,000 dollars
1962	23	30	15	22	7	7	1	1
1963	22	29	14	20	9	9	-	-
1964	31	37	23	30	5	5	2	2
1965	23	28	19	25	3	3	1/	2/
1966	26	38	21	32	4	4	1	2
1967	39	44	36	40	3	3	-	-
1968	43	61	34	51	8	8	1	2

1/ Less than 500 pounds.
2/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Anise oil	452.04

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports nearly all of its requirements of anise oil. The value of annual U.S. consumption of such oil was less than $10,000 in 1964-68. Anise oil has become unimportant in the U.S. market because of substantial substitution of synthetic anethole for the natural essential oil.

Comment

Anise oil is a colorless or pale yellow volatile oil obtained by steam distillation from the dried ripe fruit (commercially called seed) of anise, the annual herb Pimpinella anisum, or from the dried ripe fruit of the evergreen tree, Illicium verum. The type derived from Pimpinella anisum, known commercially as Russian anise oil, has a finer and more delicate flavor and is generally priced higher than the oil from Illicium verum, known as Chinese star anise oil. Anethole, the most important constituent, makes up about 80 to 90 percent of both types of anise oil, and is responsible for the characteristic odor and taste of the oil.

Anise oil is used as a flavoring agent in medicinals, mouthwashes, toothpastes, foods such as baked goods and confections, and feeds. In medicine it is used for its carminative properties. During the past two decades there has been substantial substitution of synthetic anethole, which is much lower in price, by former consumers of natural anise oil.

The herb from which Russian anise oil is obtained is cultivated in the U.S.S.R., Bulgaria, Poland, Spain, France, and other European countries, as well as in South America. The U.S.S.R., Poland, Bulgaria, and Spain are among the largest producers. Chinese star anise oil is known to be produced in southeastern mainland China and North Viet-Nam. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences-National Research Council.

U.S. imports of anise oil are entered free of duty under TSUS item 452.04. The duty-free treatment was provided for in the original Tariff Act of 1930 under paragraph 1731, and in the TSUS, which became effective August 31, 1963; it was bound from January 1, 1948, as a concession granted by the United States under the General Agreement on Tariffs and Trade (GATT). The binding was discontinued effective December 11, 1950, by Presidential Proclamation 2908, which terminated the agreement with the Republic of China. A new binding, effective January 1, 1968, was granted as a concession in the sixth (Kennedy) round of trade negotiations under the GATT.

The small U.S. consumption of natural anise oil is supplied by imports and by an undetermined but probably minor quantity domestically produced from imported anise seeds (item 161.01); 369,000 pounds of anise seeds was imported (mostly from Spain) in 1968. No Chinese star anise oil is available on the U.S. market.

There were no U.S. imports of anise oil in 1962 and 1963. Imports in 1964-68, as reported in official statistics of the U.S. Department of Commerce, were as follows:

Year	Quantity (pounds)	Value
1964	5,000	$5,649
1965	2,600	4,519
1966	220	543
1967	220	1/ 3,217
1968	220	480

1/ An analysis of official import documents reveals this figure to be erroneous, and it is believed that it should approximate the value figure for 1966.

Although the average annual unit value of imports of anise oil more than doubled in 1964-66, the increase in unit value was not reflected in prices quoted for domestic sales during that period; prices rose only slightly.

West Germany was the sole source of U.S. imports of anise oil in 1964, and the United Kingdom supplied either all or almost all such imports during the years 1965-67; in 1968 France was the sole supplier. United States Foreign Assets Control Regulations require that certificates of origin be issued by the government of a source country for U.S. imports of anise oil, pursuant to an agreement between the government of the source country and the Office of Foreign Assets Control of the U.S. Treasury Department.

No data on world production of anise oil are available. It has been reported that mainland China annually produces and exports star anise oil in amounts estimated at 1,000 tons.

Commodity	TSUS item
Caraway oil	452.10

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all, or virtually all, of its requirements of caraway oil, which averaged 28,000 pounds, valued at $112,000, a year in 1962-68.

Comment

Caraway oil, a colorless to pale yellow liquid with the characteristic odor and taste of caraway, is obtained by steam distillation from the dried ripe fruits (commercially called seeds) of the biennial herb Carum carvi. Its chief constituent (50 to 60 percent) is the ketone carvone, which is primarily responsible for the characteristic flavor of the oil. Most of the remainder of the oil consists of the terpene d-limonene, which contributes little to the flavor. Indigenous to both Europe and Asia, the plant is widely cultivated in Europe, particularly in the Netherlands, the western Ukraine, and Poland. The Netherlands produces the greatest part of the world supply of caraway oil of superior quality. Little or no caraway oil is produced in the United States, although substantial amounts of caraway seeds (item 161.09) are imported and used as a food flavor. Caraway oil is used in pharmaceuticals both as a flavor and for its effect in countering the nauseating side effects of some medicinals. It is used as a flavor in foods, including bakery products and candies, and in liqueurs. The use of caraway oil as a source of carvone is no longer important since this ketone is now entirely produced synthetically. Caraway oil is marketed in the United States in two grades, one of which, though termed "crude," nevertheless conforms to the specifications of the National Formulary XII, and the other, a more costly redistilled or "rectified" grade, is produced from the crude. Specifications for the oil for use as a falvoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences - National Research Council. Today caraway oil is a relatively unimportant item in commerce, although in the 1930's it was one of the most widely used essential oils.

U.S. imports of caraway oil are entered free of duty under TSUS item 452.10. The duty-free treatment was provided for in the original

Tariff Act of 1930 under paragraph 1731 and in the TSUS, which became effective August 31, 1963; it has been bound since January 1, 1948, as a concession granted by the United States under the General Agreement on Tariffs and Trade.

During 1962-68 the volume of annual U.S. imports of caraway oil varied somewhat from year to year, averaging 28,000 pounds. U.S. import data for that period, compiled from official statistics of the U.S. Department of Commerce, are as follows:

Year	Quantity (1,000 pounds)	Value (1,000 dollars)
1962	26	84
1963	31	101
1964	25	103
1965	32	134
1966	14	74
1967	31	135
1968	36	155

Most of the imports came from the Netherlands; Poland consistently supplied relatively small amounts (averaging 4,000 pounds a year) to the United States. The imports are usually of a quality which conforms to the specifications of the National Formulary XII. Processing of imported caraway oil in the United States is limited to examination, removal of excess water if necessary, and for some of it, redistillation. There are no U.S. exports of caraway oil.

No statistics on world production are available, nor are exports of this oil from the Netherlands separately classified in that country's official statistics. However, it is believed that production in the Netherlands has declined from levels of the previous decade, and that production in the U.S.S.R. (where the entire output is probably used domestically) has declined during the last 4 or 5 years. Annual world demand for caraway oil probably does not exceed 50,000 pounds.

Commodity	TSUS item
Cassia oil	452.12

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements (which are minor) of natural cassia oil, which in 1968 were valued at less than $7,000.

Comment

Cassia oil is obtained by steam distillation from the leaves and twigs of the Chinese cinnamon tree, Cinnamomum cassia. It is produced chiefly in the Kwangsi and Kwantung Provinces of southeastern China and also in Viet-Nam and India. The chief constituent (80 to 95 percent) of cassia oil is cinnamic aldehyde.

Cassia oil has medicinal uses as an antiseptic, a stimulant, and a carminative; it is also used in soaps and as a flavoring agent in candy, chewing gum, cola types of soft drinks, and bakery goods. Synthetic cinnamic aldehyde has now generally replaced the natural cassia oil in virtually all of its uses, particularly in the United States, where the Chinese product is not available.

Cassia oil is referred to as cinnamon oil in the United States Pharmacopoeia (U.S.P. XVII) and is sometimes called Chinese cinnamon oil by the trade; however, true cinnamon oil (see separate summary, item 452.16) is derived from the related species Cinnamomum zeylanicum, rather than from C. cassia.

U.S. imports of cassia oil are entered free of duty under TSUS item 452.12. The duty-free treatment of cassia oil was provided for in the original Tariff Act of 1930 under paragraph 1731, and in the TSUS, which became effective August 31, 1963; it was bound as of January 1, 1948, as a concession granted by the United States under the General Agreement on Tariffs and Trade (GATT). This binding was discontinued effective December 11, 1950, by Presidential Proclamation 2908, which terminated the agreement with the Republic of China; a new binding became effective January 1, 1968, as a concession in the sixth (Kennedy) round of trade negotiations under the GATT.

Although U.S. imports in the immediate post-World War II years were sizable (e.g., 175,000 pounds, valued at $343,000, was imported from China in 1947), there have been virtually no imports in recent years. A negligible amount (3 pounds) was imported from France in 1962 and in 1964; none was imported in 1963, 1965, or 1966. In 1967, 440 pounds, valued at $2,006, was supplied to the United States from France. Official statistics for 1967--which reported imports of 2,656 pounds, valued at $10,262--are in error. In 1968 France again supplied the total U.S. imports, which amounted to 1,543 pounds, valued at $6,599. It is believed that the small imports reported as coming from France actually originated in South Viet-Nam. United States Foreign Assets Control Regulations require that certificates of origin be issued by the government of the country of source for U.S. imports of cassia oil. At present the United States has agreements with the Governments of the United Kingdom and South Viet-Nam for issuing certificates of origin for imports of cassia oil into the United States.

Production of cassia oil in the Kwangsi Province (the chief producing area) is much less now than it was prior to 1949, the year in which the United States discontinued importing such oil from mainland China. The United States at one time imported a third to a half of total Chinese production of cassia oil. It is believed that production in mainland China now amounts to about 200 metric tons a year (all of which is exported to Europe and Canada) and greatly exceeds the production in other areas of Southeast Asia.

Commodity	TSUS item
Cinnamon oil----------	452.16

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Except for small amounts produced domestically from imported raw materials, the United States imports all of its requirements of cinnamon oil. Annual imports have not exceeded $156,000 in the last 6 years.

Description and uses

The term "Cinnamon oil" refers to the oil obtained by steam distillation from the inner bark of the evergreen Cinnamomum zeylanicum, or Ceylon cinnamon, as well as to the oil obtained from its leaves. Oil from C. cassia, although designated as "cinnamon oil" by the United States Pharmacopoeia, is more properly termed "cassia oil" (see separate summary on item 452.12). C. zeylanicum is cultivated principally in Ceylon, where it is indigenous, but is also grown in the Seychelles, the Malagasy Republic, Indonesia, Laos, Viet-Nam, Burma and other areas.

A distinction is made by the trade between cinnamon bark oil and cinnamon leaf oil. Oil obtained from the bark is high in cinnamic aldehyde (up to 75 percent) and low in eugenol (approximately 15 or 20 percent); oil from the leaf may contain more than 90 percent of eugenol and only a very little cinnamic aldehyde. Cinnamon bark oil is considered far superior in delicacy of odor and flavor to cinnamon leaf oil (and to cassia oil), and is generally priced higher; cinnamon leaf oil is further differentiated in commerce, according to the area of origin, as either Ceylon oil or Seychelles oil. Both cinnamon bark oil and cinnamon leaf oil are used as flavoring in pharmaceutical and toilet products (e.g., toothpastes and mouthwashes, etc.) and in foods, such as bakery goods, soft drinks, and chewing gums; and, to a lesser extent, as an additive in the manufacture of perfume. The leaf oil is also used to a large extent for the isolation of the phenol eugenol, which, in turn, is used in perfumes and for the synthesis of vanillin. Specifications for the oil for use as a flavoring agent in foods are published in The Food Chemicals Codex 1966, of The National Academy of Sciences--National Research Council.

Synthetic cinnamic aldehyde competes with cinnamon leaf oil as a flavoring agent in food products. Lignin, a byproduct of the wood-pulp industry, competes as a raw material for the manufacture of synthetic vanillin.

U.S. tariff treatment

U.S. imports of cinnamon oil are entered free of duty under TSUS item 452.16. The duty-free status was provided for in the original Tariff Act of 1930 under paragraph 1731, and in the TSUS, which became effective August 31, 1963; it has been bound since January 1, 1948, as a concession granted by the United States under the General Agreement on Tariffs and Trade.

U.S. production, consumption, and exports

Although no statistics on U.S. production of cinnamon oil are available, a small amount of oil is known to be produced from imported cinnamon bard (item 161.17); it is believed that the quantity produced exceeds the quantity of cinnamon bark oil imported. There is no U.S. production of cinnamon leaf oil, the type that supplies the great bulk of U.S. consumption. Small quantities of cinnamon bark oil are probably exported.

U.S. consumption of cinnamon oil, therefore, consists of a small quantity of domestically produced bark oil plus a much larger quantity of imported oil, most of which is cinnamon leaf oil; the quantity of cinnamon oil consumed domestically closely approximates the imports.

U.S. imports

Annual U.S. imports of cinnamon oils varied somewhat during 1962-66 and averaged 72,000 pounds, valued at $136,000 (see accompanying table); they declined sharply in 1967, then rose to 49,000 pounds, valued at $107,000 in 1968. The bulk of these imports in 1962-68 were supplied by Ceylon and the Seychelles Islands. The statistics for 1966 erroneously include 20,000 pounds, valued at $16,900, from Guatemala, which was misclassified.

United States Foreign Assets Control Regulations require that certificates of origin be issued by the government of the source country for U.S. imports of cinnamon oil from sources other than Ceylon and the Seychelles.

The quantities and values shown in the accompanying table are

the aggregates for cinnamon leaf and cinnamon bark oil. Since the price of the bark oil (which comes only from Ceylon) greatly exceeds the price of the leaf oil, a meaningful average unit value cannot be calculated for reported total imports or for imports from Ceylon.

Foreign production and trade

Cinnamon leaf and cinnamon bark oils are produced in Ceylon on a rather primitive level as a byproduct of cinnamon bark (see items 161.17 and 161.19). Cinnamon trees are cultivated on approximately 25,000 acres along the western seacoast. Although tea, rubber, and coconuts are the major cash crops of Ceylon, cinnamon is one of its more consequential minor crops.

No statistics on the production of cinnamon oil in Ceylon are available; production is believed to approximate exports, which amounted to 45,017 pounds in 1967. Of these exports, 43,527 pounds were cinnamon leaf oil, and 1,490 pounds were cinnamon bark oil. Total exports of cinnamon oil were valued at $150,000 in 1967; because of the great difference in price between the leaf- and the bark-derived oil, the total value of leaf oil exports and that of bark oil exports were approximately equal. In 1967 the largest market for Ceylon cinnamon oil, in terms of value, was the United States, followed by France, Italy, the United Kingdom, and Japan. The total value of cinnamon oil exports was 50 percent of the total value of exports of all essential oils from Ceylon in that year. (Nearly all of the remainder was citronella oil, item 452.18.)

Cinnamon of the variety similar to that grown in Ceylon grows semiwild on an estimated 20,000 acres on four of the Granite Islands of the Seychelles, of which Mahe is the largest producer. In addition to cinnamon leaf oil, the Seychelles also export cinnamon bark which is used for extracting cinnamon bark oil and producing cinnamon quills. Oil from this bark, however, has a slightly lower cinnamic aldehyde content than Ceylon oil, and is priced lower. In 1964 the Seychelles exported about 169,000 pounds (approximately their total production) of cinnamon leaf oil, valued at about $131,000. Almost half of this (by value) went to the United Kingdom and the remainder went to the United States and France. Unlike Ceylon, the Seychelles did not produce or export the higher priced bark oil. Exports of cinnamon leaf oil and cinnamon bark each comprised almost 10 percent of the total value of all exports from the Seychelles in 1964. The chief markets for the bark--some of which is believed to be used in the production of cinnamon bark oil--were the United States, the United Kingdom, and West Germany.

Cinnamon oil: U.S. imports for consumption, by principal sources, 1962-68

Year	Source			
	Ceylon	Seychelles	Other	Total
	Quantity (1,000 pounds)			
1962	36	40	5	81
1963	29	49	-	78
1964	20	43	1	64
1965	34	21	2	57
1966 1/	29	31	21	81
1967	25	1	3	29
1968	41	5	3	49
	Value (1,000 dollars)			
1962	70	40	6	116
1963	84	48	-	132
1964	64	43	2	109
1965	124	24	8	156
1966 1/	116	32	21	169
1967	75	3	8	86
1968	86	11	10	107

1/ Official statistics for this year erroneously include imports of 20,000 pounds, valued at $16,900, from Guatemala.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Clove oil	452.20

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports about 80 percent of its domestic consumption of clove oil, which approximates 1.2 million pounds a year. Annual U.S. production is about 250,000 pounds, and annual exports about 4,000 pounds.

Description and uses

Clove oil, a pale yellow liquid with a strong odor and a pungent taste, is obtained by steam distillation from the dried flower buds of the tropical tree Eugenia caryophyllata. The leaves of the tree and the stems upon which the buds grow also yield oils, called, in the trade, clove-leaf oil and clove-stem oil; clove-bud oil, however, has an odor and flavor generally considered superior. The quality of clove oil is a function of its content of phenolic substances, principally eugenol, which may be as high as 95 percent; for medicinal use, the United States Pharmacopeia (U.S.P. XVII) specifies a content of not less than 85 percent. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences National Research Council.

Clove-bud oil is used medicinally as a germicide and local anesthetic in pharmaceuticals and similar preparations, such as mough washes and toothache drops; it is also widely used for flavoring food; and in soaps and perfumes. Leaf oil, stem oil, and some bud oil are used for the isolation of eugenol, a raw material for the production of vanillin (item 408.80).

U.S. tariff treatment

A free rate of duty applies to U.S. imports of clove oil under column 1 of TSUS item 452.20 (See general headnote 3 in the TSUSA-1970.) The duty-free status which became effective on January 1, 1968 represents a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General

Agreement on Tariff or Trade. The rate prior to January 1, 1968 was 6.25% ad valorem and had remained unchanged from August 31, 1963, the effective date of the TSUS, through 1967.

U.S. consumption

During 1963-68, annual U.S. consumption of clove oil of all types averaged 1.2 million pounds, about 80 percent of which was supplied by imported leaf and stem oils used largly as a source of eugenol by the soap and detergent manufacturers. The remainder of the supply came from domestic production of high-grade clove-bud oil.

U.S. producers and production

Clove oil is one of the few essential oils produced in the United States. Only the bud oil is produced, and it is distilled from imported clove buds which come chiefly from the Malagasy Republic. The oil is produced by about four U.S. firms, all in the metropolitan New York area. These firms also produce other essential oils and various other aromatic chemicals. Imported clove buds (item 161.21) are also used, either whole or ground, as a spice.

Industry sources estimate the average annual U.S. production of clove-bud oil at about 250,000 pounds. The volume of domestic production of clove-bud oil has been relatively stable in recent years. Production has risen only 25 percent since 1952.

U.S. exports and imports

According to industry estimates, U.S. exports at present amount to a small part of domestic production, not exceeding 4,000 pounds annually. Most of the markets are in Europe, where U.S. clove oil competes with the lower priced European and Malagasy oils.

Annual U.S. imports averaged 1.0 million pounds in 1963-68 (see accompanying table). Imports in 1968 consisted predominantly of clove-leaf and clove-stem oils, chiefly from the Malagasy Republic and Tanzania. Smaller amounts from France and the United Kingdom consisted of the clove-bud oil produced from imported cloves. Indonesia and Israel first entered the U.S. market in 1967, as Brazil had done in 1965. These last three countries probably supplied leaf and stem oils.

Foreign production and trade

The largest world source of clove oil is the Malagasy Republic, which has a predominantly agricultural economy. (About 90 percent of the population is dependent on agriculture.) In that country, it is principally the clove leaves that are used for oil production. Clove-leaf oil is produced on the east coast of the Malagasy Republic in hundreds of small simple iron stills by agricultural workers who also harvest the coffee or vanilla crops (Malagasy's chief export earners). The clove-leaf oil is collected by Chinese merchants who sell it to the exporters or shippers. No statistics on production are available; however, it is believed that virtually all production is exported. In 1966 the Malagasy Republic exported about 1.9 million pounds of clove oil, valued at more than $1.5 million. Its largest market was the United States, which, according to statistics of the Malagasy Republic, absorbed more than 44 percent (by volume) of its exports. 1/ France took about a fifth of the total (both in quantity and in value).

Tanzania (particularly the islands of Zanzibar and Pemba) is the chief producer of cloves, supplying about two-thirds of the cloves that enter world trade. It is, however, the second largest world producer of clove oil. Tanzania produces oil from clove stems and from low-quality clove buds, but the Government prohibits the export of such oil in order to maintain the high quality of cloves for export. There is one well-equipped distillery of clove oil in Zanzibar which has been in existence since the mid-1930's. In 1960, the latest year for which complete data are available, about 339,000 pounds of clove-bud and clove-stem oils was exported from Zanzibar, in comparison with about 304,000 pounds in 1959. No separate statistics for markets of clove-stem-oil exports are available; however, it is known that a substantial part of Tanzania's exports have come to the United States in recent years.

1/ Differences in official statistics on exports from the Malagasy Republics to the United States and those on U.S. imports from the Malagasy Republic may be accounted for by differences in counting year-end shipments.

Clove oil: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)					
Malagasy Republic	811	697	978	728	731	873
Tanzania	1/ 172	127	205	108	200	217
Turkey	-	22	-	11	-	45
Indonesia	-	-	-	-	15	51
All other	4	37	25	7	58	28
Total	987	883	1,208	854	1,004	1,214
	Value (1,000 dollars)					
Malagasy Republic	682	564	723	616	747	1,150
Tanzania	1/ 231	174	287	147	288	307
Turkey	-	17	-	10	-	59
Indonesia	-	-	-	-	10	30
All other	6	41	28	15	45	31
Total	919	796	1,038	788	1,090	1,577

1/ Reported for British East Africa, including Kenya and Uganda.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Eucalyptus oil	452.24

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. imports--which amounted to $247,000 in 1968 and came chiefly from Spain, Australia, and Portugal--supply U.S. requirements of eucalyptus oil; there is no domestic production.

Description and uses

Eucalyptus oil, a nearly colorless oil with an aromatic odor and a spicy taste, is obtained by steam distillation from the leaves and terminal branches of the evergreen Eucalyptus globulus and various allied species, including E. australiana, E. citriodora, E. dives, E. leucoxylon, E. polybractea, E. smithii and others. These species are indigenous to Australia and are also grown in Spain, Portugal, South Africa, and parts of South America. Two grades of eucalyptus oil are marketed in the United States: one contains 70 to 75 percent and the other, 80 to 85 percent cineole (eucalyptol). The National Formulary specifies that the oil for medicinal use must contain at least 70 percent cineole. The oil ordinarily also contains pinene and other terpenes, piperitone, and various aldehydes.

Eucalyptus oil is used in medicine as an antiseptic or as an expectorant in pharmaceutical preparations, as an ingredient of cough drops and other remedies for the common cold, as a germicide and perfumery agent in soap, as a flavoring agent, and--to a limited extent--in mineral flotation processes and as a spot and stain remover. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences--National Research Council. The oil is also used as a commercial source of cineole and other of its main constituents, some of which are used for synthesis of other chemicals.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general

headnote 3 in the TSUSA-1970) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1969
452.24	Eucalyptus oil--------	4% ad val.	3.5% ad val.

The rate became effective in the first stage (calendar year 1968) and remained so in the second stage (calendar year 1969) of staged rate reductions of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. A further reduction scheduled for this item has not become effective; see footnote 1 to Staged Rates and Historical Notes to part 5 of schedule 4 of the TSUSA-1970, as shown in appendix A to this volume. The column 1 rate shown above as existing prior to January 1, 1968, was in effect under the TSUS from January 1, 1964, through 1967; the rate of 5 percent ad valorem was in effect from August 31, 1963 (the effective date of the TSUS), through December 31, 1963 (see general headnote 3 in the TSUSA-1970).

U.S. consumption, production, and imports

Although some eucalyptus trees have been planted in California as a windbreak for orchards, there is no known commercial production of eucalyptus oil in the United States. Since exports, if any, are probably negligible, consumption in the United States approximates imports. In 1963-68, annual U.S. imports averaged 465,000 pounds, valued at $364,000 (see accompanying table). They have fluctuated somewhat with no apparent trend during recent years, and have come principally from Spain, Australia, and Portugal, with smaller amounts from Brazil and Peru. Prior to 1954, U.S. imports were supplied chiefly by Australia. From then until about 1962, however, imports from Spain and Portugal increased rapidly, and those from Australia declined correspondingly. The high prices of Australian oil and the easier availability of the Spanish and Portuguese oils partially accounted for the shift in source.

Foreign production and trade

Although the eucalyptus tree was originally Australian, the bulk of the world's supply of eucalyptus oil is produced in southern Spain, Portugal, Brazil, and South Africa; varieties of the trees are also grown--and the oil distilled--in Algeria, India, New Zealand, Argentina, the Republic of the Congo, mainland China, and the U.S.S.R. The decline after World War II in Australia's importance as a supplier of eucalyptus oil was caused partly by higher labor costs and partly by the increased use for wheat production of land formerly

occupied by eucalyptus trees.

No statistics on world production of eucalyptus oil are available; however, such production has been estimated at more than 1,000 metric tons, or 2.2 million pounds a year. Spain is at present an important world source of the E. globulus type of eucalyptus oil (with a high eucalyptol content), for which the United States is the chief market. Production of this commodity has been a relatively small part of Spain's chemical industry, and such oil constitutes a small part of exports of essential oils.

Eucalyptus oil: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)					
Spain	307	324	277	297	276	265
Australia	71	72	73	60	110	64
Portugal	24	89	118	54	27	70
Brazil	14	10	18	12	11	9
All other	24	5	20	39	39	11
Total	440	500	506	462	463	419
	Value (1,000 dollars)					
Spain	245	264	215	219	181	158
Australia	55	70	90	82	161	39
Portugal	16	66	81	37	14	37
Brazil	18	6	6	8	8	6
All other	17	8	18	29	22	7
Total	351	414	410	375	386	247

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Origanum oil----------	452.46

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements of origanum oil; the maximum value of annual imports during recent years was less than $11,000.

Comment

Origanum oil refers to any of several essential oils yielding a high concentration of the phenol carvacrol, which are obtained by steam distillation from various related species of perennial flowering herbs that grow wild in the Mediterranean regions. Chief among these is Thymus capitatus, the source of the so-called Spanish type of oil (also produced in the Middle East); sources of the type of oil produced in North Africa--the Moroccan type--are Origanum elongatum, O. virens, and several other Origanum species. Origanum oil is produced principally in Spain, where the distillation is carried out in field stills; it is also produced in Israel, Syria, and Morocco. Origanum oils usually contain 60 to 75 percent, by volume, of phenols. Origanum oil is sometimes marketed as a variety of thyme oil, but it differs substantially from true thyme oil (item 452.66). Origanum oil as initially obtained is dark yellowish red to brownish red in color. When this oil is rectified (i.e., redistilled for the purpose of purification), it yields a light yellow ("white") oil which has a slightly higher phenol content than the unrefined oil. The oil may darken again, however, after it has been stored for a long time in metal containers.

Origanum oil is used as an antiseptic in dental preparations and mouth washes; as a food flavor in condiments, sausages, and liqueurs; and to a large extent in soap perfumery. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences--National Research Council.

U.S. imports of origanum oil are entered free of duty under TSUS item 452.46. The duty-free status was provided for in the original Tariff Act of 1930 under paragraph 1731 and in the TSUS, which became

effective August 31, 1963; the rate has been bound since January 1, 1948, as a concession granted by the United States under the General Agreement on Tariffs and Trade.

There is no known U.S. production or exportation of origanum oil, and domestic requirements are supplied entirely by imports. During 1963-68, annual U.S. imports, which in recent years have comprised only an insignificant part of total U.S. imports of essential oils, remained at less than 4,000 pounds, valued at less than $11,000 (see accompanying table). Imports came principally from Spain.

Origanum oil: U.S. imports for consumption, from Spain and from all other countries, 1963-68

Year	Total	Spain	All other
	Quantity (pounds)		
1963	2,755	2,645	110
1964	2,733	2,645	88
1965	3,075	1,764	1/ 1,311
1966	2,205	2,205	-
1967	551	441	110
1968	3,546	3,546	-
	Value		
1963	$ 4,552	$ 4,347	$ 205
1964	5,874	5,621	253
1965	8,030	4,673	1/ 3,357
1966	6,488	6,488	-
1967	1,500	1,245	255
1968	10,741	10,471	-

1/ Includes 1,190 pounds, valued at $3,076, from Lebanon.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Bergamot oil----------	452.06

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

There is no U.S. production of bergamot oil. U.S. consumption is supplied entirely by imports, which were valued at $2 million in 1967 and were entered mostly from Italy and France.

Description and uses

Bergamot oil is one of the more important essential oils used in perfumery; it is obtained by expression from the peel of the bergamot orange, which is the fruit of a tree sometimes classified botanically as the subspecies bergamia of Citrus aurantium and sometimes as a distinct species, Citrus bergamia. The leaves and twigs of this tree yield petitgrain bergamot oil (see summary on petitgrain oil, item 452.56).

Expression of the oil is usually carried out by rasping the fruit, thereby puncturing the oil reservoirs of the peel. The principal constituents of the oil are linalyl acetate (about 40 percent), its parent alcohol linalool (about 25 percent), and the terpene limonene. Virtually all of the commercial cultivation of the tree is in southern coastal areas of the Italian peninsula.

Bergamot oil is used as an ingredient in quality perfumes and eau de cologne, to both of which it imports stability as well as fragrance. It is also used to scent lotions, creams, and soap. As a flavoring material, the oil is used in hard candies and (in Europe) in pipe tobacco.

Synthetic substitutes for bergamot oil have been developed, but the natural oil is still preferred for the more expensive end products, particularly those which have an established market.

Neroli, petitgrain, and bitter orange oils (items 452.42, 452.44, and 452.56), although derived from the closely related subspecies amara of Citrus aurantium (the bitter orange), are considerably different in composition from bergamot oil.

U.S. tariff treatment

U.S. imports of bergamot oil are entered free of duty under TSUS item 452.06. The duty-free status was provided for in the original Tariff Act of 1930 and in the TSUS, which became effective August 31, 1963; it has been bound since May 30, 1950, as a concession granted by the United States under the General Agreement on Tariffs and Trade.

U.S. consumption

During 1963-68, annual U.S. consumption of bergamot oil, supplied entirely by imports, averaged 151,000 pounds. In recent years, lower priced imitations or substitutes produced synthetically by several domestic firms have claimed a part of the market formerly held by natural bergamot oil in such uses as the manufacture of soaps and similar low-cost products; the substitutes are also used as extenders of the natural oil. In recent years competition from the synthetic product--in addition to the effect of the high prices (about $30 a pound) and occasional supply irregularities of the natural oil--has undoubtedly reduced domestic consumption of the natural bergamot oil.

U.S. imports

In recent years U.S. imports of bergamot oil have generally fluctuated from year to year (see accompanying table). During 1963-68, Italy was the principal supplier of such imports, followed by France, Switzerland, and West Germany; it is believed that material from the countries other than Italy was processed material originally produced in Italy. U.S. imports of bergamot oil ranked third in value among U.S. imports of essential oils in 1967, and seventh in 1968.

Foreign production and trade

Bergamot oil is produced in the southern part of Italy, along a narrow coastal strip centering in the Province of Reggio Calabria. This area has a virtual world monopoly on the commodity, since attempts to grow the bergamot tree in other parts of the world have generally been unsuccessful. About 7,500 acreas are planted to bergamot oranges in this area. Most of the cultivation of the trees is carried on by numerous growers on small plots of five acres or less. The growers are required to deliver their oil to a syndicate, Consorzio del Bergamotto, in Reggio Calabria. The syndicate analyzes the oil chemically and sets a price based on results of the laboratory testing and on subjective judgments of odor and quality made by

the authorities of its experimental station. The syndicate sells oil on Italy's domestic market and also exports the oil, both directly and through normal trade channels. The Consorzio guarantees that oil marketed in containers bearing its stamp is unadulterated.

It is reliably reported that Italy's annual production of bergamot oil in recent years has averaged about 407,000 pounds. Almost all of the oil is exported. Exports of bergamot oil from Italy amounted to 396,000 pounds, valued at $5.3 million, in 1964, and to 270,000 pounds, valued at $6.1 million, in 1966. The principal markets were France, the United States, Switzerland, West Germany, and the United Kingdom.

In addition to the high-quality bergamot oil expressed from the peel of fresh, sound fruit, Italy produces oil from windfallen and damaged fruit and, along with citric acid, from fruit that has already been initially processed for oil. Byproducts such as pectin (item 455.04) and animal feeds are also obtained from the processed fruit.

Bergamot oil: U.S. imports for consumption, by principal markets, 1963-68

Market	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)					
Italy	131	143	137	100	110	122
France	20	14	26	25	18	23
Switzerland	1/	1/	1	10	6	15
West Germany	-	-	-	-	4	1
All other	1/	-	1/	-	1/	-
Total	151	157	164	134	139	161
	Value (1,000 dollars)					
Italy	1,525	1,679	1,951	2,248	1,691	1,596
France	201	153	388	563	279	293
Switzerland	10	6	8	264	92	208
West Germany	-	-	-	-	52	2
All other	4	-	10	-	4	-
Total	1,740	1,838	2,357	3,075	2,119	2,099

1/ Less than 500 pounds.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Citronella oil	452.18

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

No citronella oil is produced in the United States; domestic requirements are supplied entirely by imports from less developed countries; these totaled 2 million pounds, valued at $1.3 million, in 1968.

Description and uses

Citronella oil is one of the most important of the essential oils. It is distilled from either of two related species of fragrant grass, Cymbopogon nardus and C. winterianus. The former species yields the Ceylon grade of oil, and such oil is produced almost entirely in Ceylon. The latter species yields the Java grade of oil, which is produced not only in Indonesia but also in mainland China, Taiwan, and South America (particularly in Quatemala). Although commercial production of citronella oil first began in Ceylon, the greater part of the present-day output is of the Java type, which is the more useful and valuable grade.

Citronella oil is light yellow and has a pungent, citruslike odor. Its principal constituents are its isolates geraniol and citronellal, the combined content of which is usually more than 85 percent in Java oil and between 50 and 60 percent in Ceylon oil. In both types, about a fourth to a half of the oil consists of geraniol.

Citronella oil is used to scent soaps, disinfectants, and other similar household preparations. The Ceylon type is used when price is the primary consideration. In addition to its use as a scenting agent, the Java type is used extensively for the extraction of its aromatic isolates (see summary in vol. 4:9 on aromatic and odoriferour substances and mixtures, items 460.15 through 460.90).

Because of fluctuations in supply and prices of citronella oil (caused by varying climatic conditions), some U.S. chemical producers have developed substitutes for the citronella oil isolates--such as synthetic citronellal and geraniol, which are manufactured from beta-pinene, a low-priced raw material.

U.S. tariff treatment

U.S. imports of citronella oil are entered free of duty under TSUS item 452.18. The duty-free status was provided for in the original Tariff Act of 1930 under paragraph 1731, and in the TSUS, which became effective August 31, 1963; it has been bound since January 1, 1948, as a concession granted by the United States under the General Agreement on Tariffs and Trade.

U.S. consumption

U.S. consumption, which is supplied entirely by imports, fluctuated during 1963-68, with an annual average of 2.9 million pounds, valued at $2.4 million. Decreases in consumption coincided with increases in the prices at which the Java type (comprising the bulk of the imports) was offered on the U.S. market. 1/ During periods of higher prices and curtailed supply, the users of citronella oil appear to have turned to synthetic substitutes for its isolates.

U.S. imports

Citronella oil is imported into the United States in greater volume than is any other essential oil. In 1968 the volume of imports of the Java type of citronella oil amounted to 94 percent of the total volume of citronella oil imports. Of the total quantity, Taiwan's share of the U.S. market was 64 percent; that of Indonesia was 16 percent; and that of Guatemala was 14 percent. Ceylon, which supplied the lower quality oil, was the source of 3 percent of the total. Except in 1967, Taiwan was the largest U.S. supplier in each year of 1963-68 (see accompanying table). Unit values of the U.S. imports have fluctuated widely, reflecting the fluctuations in the world market. In 1963 the high unit values of U.S. imports were the result of a supply shortage caused by adverse weather conditions in Taiwan. Since 1964 the lower unit values of U.S. imports reflect at least in part the higher levels of production in Taiwan, which resulted in lowered world prices. There have been recent attempts, by Taiwan and Guatemala to stabilize the prices of this commodity.

Foreign production and trade

Taiwan, Guatemala, Java, and mainland China are the major world suppliers of citronella oil; the first two countries furnish most of the world's supply of this oil. In these two countries, large

1/ As reported in the Oil, Paint and Drug Reporter.

numbers of individual farmers cultivate the grass from which the oil is obtained and distill out the oil on their farms. Although citronella is a major farm crop in Taiwan, other crops, such as rice, sugar, pineapple, and sweet potatoes, far exceed the output of citronella oil in quantity and value. The producing area is concentrated around Taichung in the western part of the island, and near Taitung in southeastern Taiwan, a much less developed area than the north or west of the island. Production in 1967 was estimated at 2.4 million pounds. In 1967, according to the Taiwan Citronella Oil Association, 685 metric tons (about 1.5 million pounds) was exported. Japan, which absorbed more than three-fourths of this Taiwan citronella oil, utilized it in the production of synthetic menthol.

Annual production of citronella oil in Guatemala, the output of about 30 producers, is estimated at 2 million pounds. In 1965, the last year for which official statistics are available, Guatemala exported approximately 1,153,000 pounds, valued at $791,000, the greater part of which went to the United States; most of the remainder was marketed in Spain. Annual consumption of citronella oil in Guatemala is less than 3 percent of the country's total production.

No information on citronella oil production in Indonesia, particularly Java, is available. It is believed that substantial amounts of citronella oil are produced on the island of Hainan, a part of mainland China; the entire production is shipped to the U.S.S.R., Eastern and Western Europe, and countries of the British Commonwealth. Citronella oil originating in mainland China is prohibited by Foreign Assests and Control Regulations from being imported into the United States.

Citronella oil: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)					
Taiwan	1,772	2,221	4,161	2,853	256	1,310
Guatemala	472	656	713	520	556	290
Indonesia	4	8	56	73	293	340
Ceylon	109	161	146	82	74	66
France	1/	1	-	-	-	40
All other	45	3	-	45	39	2
Total	2,402	3,050	5,076	3,573	1,218	2,048
	Value (1,000 dollars)					
Taiwan	2,582	1,660	2,587	1,773	159	872
Guatemala	657	621	555	412	384	205
Indonesia	5	5	31	33	139	200
Ceylon	136	182	670	47	42	44
France	2/	2	-	-	-	24
All other	60	3	-	28	22	1
Total	3,440	2,473	3,843	2,293	746	1,346

1/ Less than 500 pounds.
2/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Geranium oil----------	452.26

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements of geranium oil; in 1968 such imports were valued at $2.4 million. There is no U.S. production of geranium oil, and exports are insignificant or nil.

Description and uses

Geranium oil is obtained commercially by steam distillation from the leaves and branches of several species of Pelargonium, a large genus of showy-flowered herbs cultivated under the name "geranium." These plants are cultivated for the production of the oil principally on the island of Réunion in the Indian Ocean but also in Algeria, Morocco, southern France, Spain, Italy, the U.S.S.R., and various other countries. Recently, the cultivation of geraniums for the production of oil has been initiated in Japan and Brazil on an experimental basis. Two types of the oil, geranium oil Bourbon and geranium oil Algerian, are marketed in the United States; the former is considered by the trade to be of better quality.

Geranium oil is an important raw material consistently in demand for perfumes and soaps. It is considered by the perfumery industry to be an almost perfect perfume in itself. It is also an important raw material for the production of rhodinol, a mixture of terpene alcohols used in formulating perfumes of a rose character. Moreover, limited amounts of geranium oil are used in flavors. With geranium oil, as with many other natural products, curtailment of supply and concomitant high prices frequently result from adverse weather conditions. Several synthetic replacements and extenders for geranium oil have appeared on the market to compete with the natural product. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences--National Research Council.

The terms "East Indian geranium oil" and "Turkish geranium oil" are misnomers for palmarosa oil (item 452.50).

U.S. tariff treatment

U.S. imports of geranium oil are entered free of duty under TSUS item 452.26. The duty-free status was provided for in the original Tariff Act of 1930 under paragraph 1731 and in the TSUS, which became effective August 31, 1963; it has been bound since January 1, 1948, as a concession granted by the United States under the General Agreement on Tariffs and Trade.

U.S. consumption and imports

U.S. consumption is approximately equal in volume to imports; there is no U.S. production, and exports are probably insignificant. Except for a decline in 1966, the volume of imports generally rose in the years 1963-68 and amounted to 215,000 pounds, valued at $2,425,000 in 1968 (table 1). U.S. imports of geranium oil from Réunion are included in the statistics on such imports from the Malagasy Republic; in 1968, U.S. imports of geranium oil from the Malagasy Republic amounted to about 51 percent of the total of such imports from all sources. In most of the recent years, the proportion originating in Réunion has been the largest. In 1968 France supplied about 37 percent of the total volume of imports. Algeria and Morocco (the latter included in the "All other" category) have also supplied the United States with significant amounts of geranium oil.

Foreign production and trade

Geranium oil Bourbon, the most important type, is produced in, and exported from, both the island of Réunion and France. In Réunion the oil is produced mostly in numerous small stills.

Since 1963 a farmers' cooperative in essential oils, backed by the government, has been in operation in Réunion to stabilize prices and production; in cooperation with an organization representing exporters, this cooperative has fixed a maximum production of 70 tons a year. In addition, the cooperative maintains and controls a reserve supply to be made available when crop damage is incurred owing to weather conditions. No export statistics are available, but it is believed that the bulk of the production in Réunion is exported.

In 1967 France exported about 288,000 pounds of geranium oil Bourbon (table 2). The largest market for this product was the

United States, which absorbed 53,000 pounds in 1967. 1/ Other member States of the European Economic Community together constituted the second largest market for the French exports of geranium oil.

1/ As reported in official statistics, French exports of geranium oil to the United States exceed U.S. imports from France. French export statistics probably include transshipments; U.S. import statistics do not.

Table 1.--Geranium oil: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)					
Malagasy 1/	41	63	64	41	82	110
France	30	46	72	66	45	80
Algeria	10	19	14	6	13	14
All other	7	17	19	11	17	11
Total	88	145	169	124	157	215
	Value (1,000 dollars)					
Malagasy 1/	518	715	736	479	943	1,265
France	345	463	762	731	495	838
Algeria	93	168	140	80	174	190
All other	68	169	156	105	166	132
Total	1,024	1,515	1,794	1,395	1,778	2,425

1/ Imports from Malagasy include those originating in the Reunion Islands.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Geranium oil Bourbon: French exports, by principal markets, 1967

Market	Quantity 1/	Value 2/
	1,000 pounds	1,000 dollars
United States	53	594
Japan	37	382
West Germany	29	333
United Kingdom	33	322
Spain	20	227
Switzerland	13	161
Netherlands	9	100
India	13	99
Italy	9	95
All other	72	760
Total	288	3,073

1/ Converted from metric tons.

2/ Converted from francs at the rate of 4.908 francs per U.S. dollar.

Source: Compiled from official statistics of the French Government.

Commodity	TSUS item
Lavender and spike lavender oils	452.32

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

At present the United States imports its entire requirements of lavender and spike lavender oils. Imports amounted to 1.1 million pounds, valued at $3.7 million, in 1968; exports are believed to be negigible or nil.

Description and uses

Lavender oil and spike lavender oil are volatile oils obtained by steam distillation from the flowering tops of Lavandula officinalis and L. latifolia, respectively. A hybrid of these two species, termed "L. hybrida," yields lavandin oil which is classifiable under TSUS item 452.80. The chief constituents of the lavender oils are the aliphatic alcohol linalool and its ester, linalyl acetate. The quality of the oil to a large extent depends on its ester content.

The ester is the most important constituent of lavender oil and may account for nearly half of the volume of the best quality oil. On the other hand the ester content of spike lavender oil is very low; its principal constituent is linalool. Lavender oil is marketed in the United States in two grades, based on ester content--a 35-to-37-percent grade and a higher priced 40-to-42-percent grade. The United States Pharmacopeoia (U.S.P. XII) specifies for lavender oil a minimum ester content of 35 percent, calculated as linalyl acetate.

Lavender oil is used principally in perfumery and also in cosmetics, toilet preparations, and soap; in addition, it is used in medicinals as a flavoring and perfuming agent. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences-National Research Council. Spike lavender oil is used mainly in soap but is also used to some extent in cosmetics

Other essential oils--particularly lavandin, bois de rose, petitgrain, and rosemary oils (items 452.80, 452.40, 452.56, and 452.62)--compete with lavender and spike lavender oils in their use

as soap perfumes. In addition, synthetic replacements or extenders for these oils have recently been developed.

U.S. tariff treatment

Imports of lavender and spike lavender oils are entered free of duty under TSUS item 452.32. The duty-free status was provided for in the original Tariff Act of 1930 under paragraph 1731, and in the TSUS, which became effective August 31, 1963; it has been bound under the General Agreement on Tariffs and Trade since January 1, 1948.

U.S. consumption and imports

Present U.S. consumption of the lavender oils is estimated to approximate U.S. imports, since there is no known domestic production or reexportation. Before World War II, however, there was some production of lavender oil in the Puget Sound region of the State of Washington.

Annual U.S. consumption of the lavender oils, as measured by imports, fluctuated somewhat during 1962-68 but generally amounted to about 1 million pounds. In 1968, imports amounted to 1.1 million pounds, valued at $3.7 million (see accompanying table). In 1962-65, there was a steep rise in the average unit value of imports, which resulted in a two fold increase in their aggregate value. The increase in average unit value was probably due in part to uncertainties caused by fluctuations in the supply available. After 1965 the average unit value of imports declined somewhat, as shown in the following tabulation:

Year	Unit value (per pound)
1962	$1.68
1963	2.23
1964	4.07
1965	5.14
1966	4.29
1967	2.92
1968	3.31

France has been the source of more than 80 percent of U.S. imports of the lavender oils, and Spain has been the only other major source. Lavender oil came largely from France, whereas spike lavender oil came from Spain. In 1968, U.S. imports of lavender oil and spike lavender oil exceeded in value the imports of any other essential oil except lime oil.

Foreign production and trade

France supplies the bulk of the world's supply of lavender oil and the related lavandin oil (included in item 452.80). The flowers which produce these oils grow best in mountainous areas which are otherwise unsuitable for cultivation and have calcareous soil that is poor and generally not irrigated. Lavender and lavandin are generally only supplementary crops, and production varies in response to market price fluctuations. The land devoted to lavender when prices are high is planted to other crops when lavender prices are low.

Lavender and spike lavender oils: U.S. imports for consumption, by principal sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
France	735	756	1,109	756	678	841	940
Spain	156	146	110	196	101	141	165
Italy	14	5	24	1	1	12	1/
All other	2	15	5	5	6	10	8
Total	917	932	1,278	958	786	1,004	1,113
	Value (1,000 dollars)						
France	1,233	1,734	4,565	3,793	2,901	2,548	3,215
Spain	259	260	400	1,093	452	389	431
Italy	25	15	108	7	7	43	1
All other	24	46	128	36	11	43	39
Total	1,541	2,055	5,201	4,929	3,371	2,933	3,686

1/ Less than 500 pounds.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Lemongrass oil----------	452.36

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements of lemongrass oil. The imports amounted to 366,000 pounds, valued at $566,000, in 1968. There is no U.S. production and consequently there are no exports.

Comment

Lemongrass oil (sometimes called verbena oil) is one of the 10 most important essential oils with respect to annual volume of production. It is obtained by steam (or water-and-steam) distillation from two species of Cymbopogon grasses, C. flexuosus and C. citratus, which are indigenous to India. The former is now extensively cultivated, principally in Travancore, for the production of oil and is the source of the so-called East Indian type. The latter species is cultivated in widely distributed areas throughout the world; oil from this species is called West Indian lemongrass oil and is produced in Central America (particularly Guatemala), South America, Africa, and Southeast Asia, as well as in India and the West Indies.

Although the two basic types of lemongrass oil--East Indian and West Indian--are similar in many respects, there are marked differences between the two. Both are yellow to reddish-brown in color; however, the East Indian type is generally lighter. Both have a lemonlike odor, but the East Indian smells sweeter and fresher. Citral is the principal constituent (75 to 85 percent) of both types; geraniol, myrcene, and methylheptanone are other constituents. West Indian oil contains significant amounts of myrcene, whereas the East Indian type contains little or none.

Although lemongrass oil is important to the perfume and flavor industries, very little of the oil, as such, is used as a scenting agent, and virtually none is used as a flavor. Lemongrass oil is used principally as a source of citral which, in turn, is used as a flavoring agent or in perfumes, cosmetics, and soaps; citral is also processed into ionones, a series of aromatics having a strong violet odor. Beta-ionone is further processed commercially into vitamin A.

In recent years, oil from Litsea cubeba, a small tree of the laurel family growing principally in Southeast Asia, has offered increasing competition to lemongrass oil in world markets. Both oils have approximately the same citral content.

U.S. imports of lemongrass oil are entered free of duty under TSUS item 452.36. The duty-free status was provided for in the original Tariff Act of 1930 under paragraph 1731, and in the TSUS, which became effective August 31, 1963; it was bound for the first time as a concession granted by the United States under the General Agreement on Tariffs and Trade effective January 1, 1950 (Haiti), and was thereafter bound effective July 1, 1962 (India).

In recent years, U.S. consumption of lemongrass oil has approximated imports, since there has been no U.S. production. 1/

U.S. imports of lemongrass oil dropped sharply from 1.2 million pounds, valued at $2.3 million, in 1962 to only 500,000 pounds, valued at $797,000, in 1963 (see accompanying table). Since 1963, imports have generally continued to decline, and in 1968 amounted to 366,000 pounds, valued at $566,000. The decline in U.S. imports of lemongrass oil is attributed to the expansion of domestic production of synthetic citral, which production has more than tripled since 1961. Although India is the chief world supplier of lemongrass oil, Guatemala is the principal U.S. source.

Foreign production and trade

In terms of value, lemongrass oil is the second most important essential oil exported from India, which produces approximately 80 percent of the total world output, principally in Travancore. Since late 1955, the Government of India has required that all lemongrass oil intended for export be graded at a Government control and grading laboratory located in Cochin (the main terminal market). This grading requirement has brought about an improvement in the quality of oil consigned for export. The Government of India has also been active in recent years in price stabilization actions, such as imposition of floor and ceiling prices and purchases for storage, in the face of overproduction and competition by synthetic materials.

No statistics relating to acreage in India of lemongrass for oil production are available. The holdings are widely scattered, and plantings increase and decrease in response to price and prevailing demand in the export market. Acreage devoted to lemongrass for oil has recently been estimated at about 73,000 acres. Of the more than

1/ During World War II and for several years thereafter, lemongrass oil was produced in Texas along the gulf coast, and small quantities were exported.

12 essential oils exported by India in 1964--which had an aggregate value of about $6,080,000--lemongrass oil ranked second to sandalwood oil in value of exports (about $2,580,000). India's largest markets for lemongrass oil in 1964 were the United Kingdom and France, which in that year abosrbed lemongrass oil valued at about $761,000 and $596,000, respectively.

Lemongrass oil is one of the two essential oils (the more important being citronella oil, item 452.18) produced in Guatemala and exported in significant quantities. No separate production and export statistics for Guatemalan lemongrass oil are available for periods later than crop year 1958 (May through April). In that year, production of the oil amounted to 202,262 pounds, and exports amounted to 189,000 pounds. Since Guatemala consumes little or no lemongrass oil domestically, production fluctuates in response to export demands. Since 1964 the Government of Guatemala has promoted research and technical studies relating to utilization of the oil, and in late 1965 it established an export fee of 3 cents per pound to finance such programs.

Lemongrass oil: U.S. imports for consumption, by principal sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
Guatemala	825	427	371	323	238	307	314
India	324	66	74	264	144	69	46
All other	4	7	9	5	1/ 53	23	6
Total	1,153	500	454	592	435	399	366
	Value (1,000 dollars)						
Guatemala	1,568	664	490	419	312	408	454
India	730	118	89	254	204	100	99
All other	11	15	9	4	1/ 69	39	3
Total	2,309	797	588	677	586	547	566

1/ Includes 20 thousand pounds, valued at 23 thousand dollars, from Argentina and 12 thousand pounds, valued at 20 thousand dollars, from Paraguay.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Lignaloe or bois de rose oil--------	452.40

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements of bois de rose and lignaloe oil; imports of these oils amounted to 461,000 pounds, valued at about $975,000, in 1968 and consisted principally of bois de rose oil. The U.S. market has been the largest for the world's chief producers, Brazil and Peru.

Description and uses

In commerce the terms "lignaloe oil" and "bois de rose oil", which are the terms used in the tariff schedules, actually refer to two distinct essential oils derived from totally unrelated species of trees. Linalool is the principal constituent of both oils, which are somewhat similar in physical properties.

Lignaloe oil (or linaloe oil, as it is known in commerce and is referred to hereafter in this summary) is steam distilled from several species of Bursera known as linaloe trees. The wood of these trees furnishes virtually all of such oil produced in Mexico, the country to which the producing species are indigenous. In the province of Mysore in India, where linaloe trees were introduced about 60 years ago, oil is produced principally from the seed (berry) and from the husk of the fruit.

When it is pure, linaloe wood oil is a pale yellow or almost colorless liquid with a pleasant floral odor; however, impurities often cause it to be amber or orange in color. It was once a valuable flavoring agent and perfumer's raw material, as well as an important source of the perfume material linalool, but its popularity is declining. Linaloe seed oil and linaloe husk oil, which are inferior in quality to linaloe wood oil, are produced almost entirely in India, where nearly all of the output is consumed locally. They are used to some extent for scenting inexpensive soaps and cosmetics, but their principal use is as a source of the perfume material linalyl acetate. Linaloe seed oil is sometimes called Indian lavender oil.

Bois de rose oil (rosewood oil) is obtained by steam distillation from evergreen trees of the species Aniba rosaeodora (infrequently called the Brazilian linaloe tree). Two types of this oil are recognized commercially: Cayenne, obtained from the typical species, and Brazilian and Peruvian, obtained from the variety amazonica. The earliest production of bois de rose oil consisted entirely of the Cayenne type; its name is derived from that of the French Guiana port from which it is shipped, and it was obtained from trees of the jungle forests. Current production consists almost entirely of the Brazilian or Peruvian type, obtained from trees found in the Amazon basin. Bois de rose oil is a pale yellow liquid with a sweet, woody, refreshing odor. It is composed chiefly of alcohols, mostly linalool (more than 70 percent), the isolation of which is principally responsible for the commercial demand for the oil. It is also used, however, as a perfume and flavoring agent.

Specifications for linaloe wood oil and bois de rose oil for use as flavoring agents are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences - National Research Council.

Ho leaf oil (item 452.80) which is produced in Japan also contains a high percentage of linalool and is the principal natural competitor of both linaloe oil and bois de rose oil. Spike lavender oil (item 452.32) and petitgrain oil (item 452.56) also offer substantial competition as source materials for the isolation of linalool. The large-scale production of synthetic linalool has caused a further decline in the demand for both linaloe and bois de rose oils.

U.S. tariff treatment

Imports of linaloe and bois de rose oils are entered free of duty under TSUS item 452.40. The duty-free treatment was provided for in the original Tariff Act of 1930 and was bound effective on January 1, 1948, as a concession granted to Brazil by the United States under the General Agreement on Tariffs and Trade (GATT). As a result of renegotiations with Brazil, the tariff concession rights previously granted on linaloe oil under the GATT to that country were withdrawn by the United States. The duty-free treatment was subsequently bound, effective July 1, 1962, as a GATT concession to Peru.

U.S. consumption and trade

The United States does not produce or export either linaloe or bois de rose oil. Its requirements of these essential oils are entirely supplied by imports. In 1963-68, combined annual U.S. imports of the two oils averaged 407,000 pounds, valued at $863,000. Brazil and Peru supplied virtually all U.S. imports during this period,

although Surinam and Mexico entered minor amounts (table 1). In this period the quantity of U.S. imports from Brazil rose from about 51 percent to 82 percent of the total, whereas that of imports from Peru declined from 44 to 18 percent. The only imports of linaloe oil were those from Mexico and India (in table 1 those from India are included in "All other"); the bulk of the imports were of bois de rose oil. The average foreign unit value of imports originating in Brazil was consistently higher than that of those from Peru; the higher value was probably accounted for by an export tax on oil shipped from Manaus, Brazil, but not on shipments from Iquitos, Peru.

Foreign production and trade

The bulk of the world supply of bois de rose oil comes from Manaus, the capital of the Brazilian State of Amazonas, and Iquitos, Peru (both of which are in the Amazon River basin. It is brought to these cities from distilling plants situated 100 to 200 miles away deep in the jungles. Only minor amounts of this oil are produced in other countries. According to an industry estimate, annual production in Amazonas ranges between 650,000 and 700,000 pounds. It is believed that exports of bois de rose oil from Peru in 1966, which totaled 225,000 pounds, represented virtually all of the Peruvian production in that year. In both Brazil and Peru, an association of producers, with Government support, regulates the production and marketing of bois de rose oil to some extent. Moreover, production varies in response to the prices offered, as well as being affected by variable weather conditions which govern the transportation of the bois de rose logs on rafts down the Amazon River from the jungle areas to the distillation plants.

Official Brazilian statistics report that in 1966 the United States took 38 percent of Brazil's total exports of bois de rose oil; the United Kingdom, the U.S.S.R., the Netherlands, and France were also substantial markets. According to official statistics of Peru, the United States absorbed 58 percent of the volume of like exports from that country in 1966, with France and the Netherlands the next most important markets (table 2).

Table 1.--Linaloe and bois de rose oils: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (pounds)					
Brazil	247,870	246,963	220,197	184,264	245,196	377,119
Peru	210,507	223,038	152,596	95,794	82,237	83,847
Surinam	19,171	996	37,818	-	400	-
Mexico	1,247	1,550	1,042	385	-	405
Netherlands Antilles	2,808	-	-	-	-	-
France	397	-	-	397	-	-
All other	397	25	1/ 2,210	386	-	-
Total	482,397	472,572	413,863	281,226	327,853	461,371
	Value					
Brazil	$597,139	$521,258	$423,771	$390,020	$600,573	$802,327
Peru	443,521	418,127	276,360	184,591	195,522	171,025
Surinam	51,895	2,305	74,124	-	909	-
Mexico	3,049	2,969	2,673	922	-	1,211
Netherlands Antilles	5,673	-	-	-	-	-
France	2,021	-	-	1,794	-	-
All other	1,794	131	1/ 4,257	805	-	-
Total	1,105,092	944,790	781,185	578,132	796,995	974,563

1/ Includes 2,000 pounds, valued at $3,675, from India.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Bois de rose oil: Exports from Brazil and Peru, by countries of destination, 1966

(In pounds) 1/

Country of destination	Brazil	Peru
United States	172,245	130,569
United Kingdom	73,414	2,663
Union of Soviet Socialist Republics	69,445	-
Netherlands	40,873	34,760
France	38,492	38,644
Argentina	28,219	897
West Germany	13,095	-
Japan	5,942	13,814
Belgium and Luxembourg	3,968	3,106
Italy	1,190	-
Chile	33	-
Total	450,896	224,454

1/ Converted from kilograms at the rate of 2.2046 pounds per kilogram.

Source: Compiled from official statistics of the Governments of Brazil and Peru.

Note.--Differences in U.S. official import statistics and statistics on shipments to the United States recorded by the Governments of Brazil and Peru are probably accounted for by differences in counting yearend shipments.

Commodity	TSUS item
Neroli or orange flower oil-------	452.42

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements of natural neroli oil, which amounted to 805 pounds, valued at $210,923 (see table), in 1968, the bulk of which comes from France and represents a substantial part of world production.

Description and uses

Neroli (or orange flower) oil, also called neroli bigarade oil, is commercially obtained mainly from the freshly picked blossoms of the bitter orange tree. This tree, classified botanically as the subspecies amara of Citrus aurantium, is also known as the bigarade or Seville orange tree. The leaves of this tree yield petitgrain bigarade oil (item 452.56), and the peel of its fruit yields bitter orange oil (item 452.44). So-called Portugal neroli oil is obtained from the blossoms of the sweet orange tree, C. sinensis, but is not a regular article of commerce.

Neroli oil is a pale yellow, fluorescent liquid that turns reddish brown on exposure to light and has a fragrant floral type of odor.

Most neroli oil is obtained from the flowers by a process known as water distillation, which differs from steam distillation in that the oil is carried over from the still to the condensation chamber by a relatively large quantity of distillation water. Although most of the neroli oil floats on top of the aqueous distillate, from which it is separated mechanically, about a third of the total volatile oil contained in the blossoms remains in solution. This solution of oil in water is termed orange flower water (see summary on floral waters, item 461.20) and is an article of commerce. Orange flower water, however, is a bulky product to ship, containing as it does only about a third of 1 percent of essential oil, and a solvent extraction method for isolating the odoriferous principle has been developed to produce the so-called absolute of orange flower water. This absolute does not compete commercially with neroli oil, since it is reconstituted to the floral water after shipment to consumption points.

However, so-called absolute of orange flowers, which is obtained from the blossoms of the bitter orange by solvent extraction, does compete directly with neroli oil (see summary on floral essences, item 460.05).

Neroli or orange flower oil has long been used as a valuable and prestigious raw material in colognes and perfumes and as a flavoring agent. Synthetic replacements for neroli oil (included in part 1, schedule 4 of the TSUSA-1969) are used extensively as substitutes for or as extenders of the higher priced natural oil. Natural neroli oil is a relatively small item in commerce.

U.S. tariff treatment

U.S. imports of neroli or orange flower oil are entered free of duty under TSUS item 452.42. The duty-free treatment was provided for in the original Tariff Act of 1930 under paragraph 1731 and in the TSUS, which became effective August 31, 1963; it was bound, effective January 1, 1948, as a concession to France granted by the United States under the General Agreements on Tariffs and Trade.

U.S. consumption and trade

Although small quantities of neroli oil were produced in California during the 1940's, there is at present no commercial production in the United States; hence U.S. consumption of natural neroli oil is supplied entirely by imports.

Annual U.S. imports averaged 1,500 pounds, valued at about $223,200, during 1963-68. The bulk of these imports (generally more than 90 percent by volume) were supplied by France; Italy supplied much of the remainder (see accompanying table). Tunisia, Algeria, and Lebanon have occasionally supplied minor amounts of neroli oil. In recent years the average unit value of imports from France and Italy has fluctuated from $100 to more than $300, and the imports have been of the high quality used by perfumers and other industrial consumers.

Foreign production and trade

Annual world output of neroli oil approximates 2,500 pounds, of which France produces about 2,000 pounds, and Italy produces most of the remainder. Other Mediterranean nations (including Spain, Tunisia, and Algeria) contribute minor amounts to the world supply.

In France the bitter orange tree is grown--and the oil is distilled from the blossoms--in the southern part of the country.

In Italy the trees are cultivated and the oil is distilled in Calabria, on the southern tip of the peninsula, and in Sicily. Much of the Italian output is shipped to France. Seville is the center of bitter orange production in Spain. Tunisia, Algeria, and Morocco produce only small amounts of neroli oil, mostly for local consumption.

Neroli or orange flower oil: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (pounds)					
France	605	598	930	2,108	1,187	762
Italy	58	55	59	41	99	22
All other	40	1/ 2,382	-	25	10	21
Total	703	1/ 3,035	989	2,174	1,296	805
	Value					
France	$187,570	$173,828	$277,020	$210,639	$173,008	$200,379
Italy	15,437	14,415	15,609	10,067	23,418	4,650
All other	14,162	1/ 5,408	-	5,985	1,722	5,894
Total	217,169	1/ 193,651	292,629	226,691	198,148	210,923

1/ Believed to erroneously include 2,381 pounds, valued at $5,230.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Orris oil	452.48

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all of its requirements of orris oil from France. U.S. imports were valued at $18,400 in 1967 and at only $3,297 in 1968. Orris oil is insignificant in commerce.

Comment

Orris oil is a light-to-brownish-yellow, semisolid, aromatic substance obtained by steam distillation from the rhizomes of the perennials Iris germanica (commonly known as fleur-de-lis), I. pallida, and I. florentina. The I. florentina species is sometimes classified botanically as a variety of I. germanica. All three species are cultivated commercially in Italy.

Before being processed for the oil, the rhizomes are peeled, dried, aged for 3 years, and then powdered. Orris oil is produced mainly in Italy and France. Oil obtained from I. germanica and I. pallida is known in the trade as Verona oil; that from I. florentina is Florentine oil.

The largest component of orris oil (constituting 83 to 96 percent by volume) is myristic acid, which gives the oil a semisolid consistency that has led to the designation "orris concrete" for the product. (The term "concrete" properly refers to a natural flower oil obtained by solvent extraction.) However, the presence of the ketone irone--which gives the oil a fragrance resembling that of violets--is responsible for the commercial use of orris oil. A very high-priced product called orris absolute is obtained by removing the myristic acid from orris oil; what remains is a highly valued raw material for perfume. This absolute is included under TSUS item 460.05.

Specifications for orris oil are given in the Food Chemicals Codex, 1966, of the National Academy of Sciences--National Research Council.

Orris oil is used as a perfuming agent for cosmetics and soaps, as a component in violet types of floral perfume extracts, and as a flavoring agent for dentifrices, soft drinks, candies, and gelatin desserts. In soap preparations, less expensive orris resinoids obtained from the rhizomes by solvent extraction are often used in place of orris oil.

Because of the extensive production of synthetic ionone, which can be substituted for the higher priced orris oil in many of its uses, orris oil is an insignificant article of commerce.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1970) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1969
452.48	Orris oil----------	4% ad val.	3% ad val.

The rate became effective in the second stage (calendar year 1969) of staged rate reductions of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. (The first stage of the reduction became operative January 1, 1968.) Further reductions scheduled for this item have not become effective. See footnote 1 to Staged Rates and Historical Notes to part 5 of schedule 4 of the TSUSA-1970 as shown in appendix A to this volume. The rate shown above as existing prior to January 1, 1968, had remained unchanged from August 31, 1963 (the effective date of the TSUS), through 1967.

There is believed to be no U.S. production or exports of orris oil, and U.S. consumption is supplied wholly by imports. No separate statistics on U.S. imports of orris oil were available before 1964. During 1964-68, imports ranged from 1,196 pounds in 1965 to 31 pounds in 1968 (see accompanying table). All of these imports came from France. The great variation in unit value indicates that imports may have consisted of varying proportions of high-priced orris absolute, which more properly should have been included elsewhere, and ordinary orris oil (orris concrete).

No data on production of orris oil in France and Italy are available, but it is assumed that production is geared to meet the limited demand.

Orris oil: U.S. imports for consumption, 1964-68

Year	Quantity	Value	Unit value
	Pounds		Per pound
1964	608	$11,961	$19.67
1965 1/	1,196	32,749	27.37
1966	95	304	3.20
1967	88	18,400	209.09
1968	31	3,297	106.35

1/ Data exclude 10,000 pounds, valued at $6,950, from Taiwan, erroneously included in official statistics.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--All imports were from France.

Commodity	TSUS item
Palmarosa oil	452.50

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements of palmarosa oil, mainly from India and Brazil; imports were valued at about $171,000 in 1968. This oil is a relatively minor item of commerce.

Comment

Palmarosa oil is obtained by steam distillation of the motia variety of Cymbopogon martini, a grass which grows wild in central and eastern India. This grass is also cultivated in Indonesia (Java) and Brazil. The most important constituent of palmarosa oil is geraniol, which occurs in concentrations ranging from 85 to 94 percent. Other constituents, present in minor amounts, include dipentene and d-limonene. The oil has a roselike or geraniumlike character. The sofia variety of C. martini yeilds gingergrass oil (a related essential oil included in item 452.80); however, palmarosa is a more important and more highly regarded oil. Palmarosa oil is also known variously as East Indian geranium oil, Turkish geranium oil, Indian grass oil, and Rusa oil.

Palmarosa oil is used for scenting cosmetics, as a component of fine perfumes, and as a flavoring agent. Geraniol of a high quality is isolated from oil of palmarosa and is widely used for various floral perfume compositions. The Food Chemicals Codex, 1966 (of the National Academy of Sciences--National Research Council) lists among its specifications for palmarosa oil as a flavoring agent the requirement that the oil contain "not less than 88 percent and not more than 94 percent of total alcohols, calculated as geraniol" and "not less than 4 percent and not more than 18 percent of esters, calculated as geranyl acetate." Geraniol either derived from lower priced citronella oil (item 452.18) or prepared synthetically competes with palmarosa oil in some uses.

U.S. imports of palmarosa oil are entered free of duty under TSUS item 452.50. The duty-free status was provided for in the original Tariff Act of 1930 under paragraph 1731, and in the TSUS, which became effective August 31, 1963. It was bound effective

January 1, 1968, as a concession in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade.

The United States does not produce or export palmarosa oil; U.S. consumption of this item is supplied wholly by imports. Annual U.S. imports of palmarosa oil in 1963-68 averaged 21,208 pounds, valued at $176,330. More than three-fourths of the volume of U.S. imports was supplied by India during that period (see accompanying table). In 1968, significant quantities came from Brazil. Minor amounts came from Réunion in the Malagasy Republic. The unit value of imports in 1968 ranged from approximately $8.70 to $10 a pound. This variation probably does not reflect qualitative differences but rather varying local conditions of production affecting cost, such as those of weather and availability of labor.

Other essential oils of India, particularly sandalwood (item 452.64) and lemongrass (item 452.36), assume far greater importance among India's exports to the United States than does palmarosa oil.

Annual world production of palmarosa oil is estimated at 60,000 pounds.

Palmarosa oil: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (pounds)					
India	18,462	11,953	20,142	14,487	20,845	13,677
Brazil	3,967	2,380	2,381	1,843	6,326	2,381
Malagasy Republic	362	-	-	617	243	658
Guatemala	-	122	-	937	-	564
France	44	-	-	205	-	342
All other	-	-	1/ 917	1/ 2,372	2/ 918	-
Total	22,835	14,555	23,440	20,461	28,332	17,622
	Value					
India	$159,345	$93,339	$149,090	$123,294	$191,786	$135,716
Brazil	26,941	15,358	13,284	17,720	30,688	21,387
Malagasy Republic	2,177	-	-	5,304	2,080	5,951
Guatemala	-	844	-	7,970	-	4,918
France	388	-	-	2,228	-	3,094
All other	-	-	1/ 9,325	1/31,058	2/ 4,701	-
Total	188,851	109,541	171,690	187,574	229,255	171,066

1/ All from Indonesia.
2/ All from Leeward and Windward Islands.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Patchouli oil	452.52

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Imports, which were valued at $918,000 in 1968, supply all U.S. requirements for patchouli oil.

Description and uses

Patchouli oil is distilled from dried leaves of the Pogostemon patchouli plant and those of other species of the Labiate family, which are cultivated chiefly in Indonesia, in Malaysia, and to a small extent in the Seychelles Islands, Japan, the Malagasy Republic, and several other countries. Patchouli oil has a strong woody scent and is an important primary perfume material used widely in perfumes, soaps, cosmetics, and incense; in recent years, it has had an increased use in men's toiletries. Competing with natural patchouli oil, particularly when it is high priced, are several less costly and more stable synthetic chemicals which are used as extenders of or replacements for the natural products.

U.S. tariff treatment

A free rate of duty applies to U.S. imports of patchouli oil under column 1 of TSUS item 452.52 (see general headnote 3 in the TSUSA-1970). The duty-free status which became effective on January 1, 1968 represents a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The rate prior to January 1, 1968 was 6.25 percent ad valorem and had remained unchanged from August 31, 1963, the effective date of the TSUS, through 1967.

U.S. consumption, production, and trade

The U.S. demand for patchouli oil is met entirely by imports. Patchouli oil was last distilled domestically about 1950, when small amounts were produced from imported leaves.

During 1963-68, U.S. imports fluctuated both in quantity and value, reaching a volume of 411,000 pounds in 1968 (see accompanying table). In this period the average annual unit value of imports ranged from $2.16 a pound in 1963 to $6.27 a pound in 1965. Indonesia, consistently the principal supplier to the U.S. market, accounted for 97 percent of the total volume of imports in 1968. The Malagasy Republic entered the U.S. market in 1967, as Japan had done in 1966. (Both countries are included in the "All other" category of the table.) France distilled its patchouli oil from leaves imported from the Seychelles Islands and North Sumatra. In 1968, U.S. imports of patchouli oil from Singapore probably represented material which originated in Indonesia.

Foreign production and trade

Indonesia is the world's principal supplier of patchouli oil. Substantial increases in price in recent years have been caused by inflation and poor patchouli crops. The bulk of the patchouli plants are grown by a large number of farmers on relatively small parcels of land. The owners of the larger estates generally also own the oil distilleries located in the growing areas. Distribution is initiated by Indonesian merchants, who buy the oil in bulk from distillers and sell in drum quantities to representatives of traders and exporters, the traders and exporters generally being responsible for the quality of the oil. An industry representative has observed an acceleration in exports from Indonesia since 1965 (a move reflected in part by increased U.S. imports from that country) for the purpose of averting confiscation of exporters' inventories rather than as a result of increased production there. France is the Seychelles Islands' largest market for the raw material for patchouli oil. Although the Seychelles supply only a very small part of the world market (exporting only 670 pounds of patchouli oil in 1964), patchouli leaves and oil are of considerable economic importance to the islands, second only to vanilla, which is the chief export crop. The main markets for Seychelles patchouli oil are the United Kingdom, the United States, and Europe.

Patchouli oil: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)					
Indonesia	241	95	164	138	305	398
Singapore	-	-	-	-	2	5
France	2	3	18	10	2	3
India	-	-	1	-	-	1
Malaysia	8	13	6	1	8	3
All other	1	3	6	5	20	1
Total	252	114	195	154	337	411
	Value (1,000 dollars)					
Indonesia	510	217	984	1,634	1,149	872
Singapore	-	-	-	-	22	16
France	8	22	158	143	30	12
India	-	-	2	-	-	10
Malaysia	24	39	49	28	31	7
All other	3	10	31	40	23	1
Total	545	288	1,224	1,845	1,255	918

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Pettigrain oil	452.56

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports its requirements of petitgrain oil, which amounted to about 299,000 pounds, valued at $615,000, in 1968. The bulk of the imports came from Paraguay, the world's leading producer, which ships more than a third of its production to the United States.

Comment

"Petitgrain"--as the word is usually spelled in commerce and as it is used in the text and tables of this summary--designates the oils obtained from the leaves and twigs of several species of Citrus. More commonly, it refers to the oil derived by steam distillation from leaves and twigs of the bitter orange tree (the subspecies amara of C. aurantium) or from those of one of its mutations or hybrids; such oil is more specifically identified as "petitgrain bigarade oil" or as "petitgrain Paraguay oil". 1/ A related subspecies, bergamia, yields petitgrain bergamot oil (see summary on bergamot oil, item 452.06); and C. limonum yields petitgrain lemon oil (see also summary on lemon oil, item 452.34). Both of the latter petitgrain oils are included in this summary.

Petitgrain oil obtained from the bitter orange tree is a pale-to-light-yellow liquid with a refreshing odor and somewhat bitter flavor. The most important constituents are linalyl acetate--which ranges from about 50 percent in Paraguayan oil to more than 70 percent in French, Italian, and Haitian oil--and linalool (linalyl alcohol). Although Paraguayan oil is the most widely used type, French and Italian oils, which are frequently redistilled oils, are generally of superior quality and consequently higher priced. A terpeneless grade is prepared from Italian or French petitgrain oil.

1/ Neroli oil (item 452.42) is obtained from the blossoms of the bitter orange tree, and bitter orange oil (item 452.44), from the fruit peel.

Paraguayan petitgrain oil is used extensively in the scenting of soap, since it is comparatively inexpensive, blends well with other scents, has good stability, and does not discolor. European and Haitian oils are used in colognes, toilet waters, cosmetics, lotions, and other toilet preparations. Terpeneless petitgrain oil is used in fine perfume extracts, eaux de cologne, and cosmetics which require a more delicate scent. European petitgrain oil is sometimes blended with citrus and other oils to make the so-called synthetic neroli oil, which is used in fine perfumery. Specifications for the oil for use as a flavoring agent in foods, are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences--National Research Council.

Imports of pettigrain (petitgrain) oil are entered free of duty under TSUS item 452.56. The duty-free treatment was provided for in the original Tariff Act of 1930 under paragraph 1731, and in the TSUS, which became effective August 31, 1963. It was bound effective January 1, 1968, as a concession granted in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade.

U.S. consumption of petitgrain oil, which is used principally by the soap and perfume industries, is supplied entirely by imports. Annual U.S. imports averaged about 276,000 pounds, valued at $534,000, in 1963-68. Paraguay supplied at least 93 percent of the volume of the imports in each year. The proportion of the total value of imports accounted for by Paraguay was smaller than its proportion of the total quantity (table 1) because the average unit value of imports originating in the other supplying countries, mainly France and Italy, was several times as large as that of imports from Paraguay. This higher unit value reflected the qualitative superiority of European oil, which includes terpeneless oil and oil of generally higher ester (linalyl-acetate) content.

Total world production of petitgrain oil is estimated at 400,000 kilos, or 880,000 pounds; the Paraguayan type predominates quantitatively. Although the volume of output in Paraguay--which has for many years been the leading world producer--varies yearly (to some extent depending on world demand and on wages paid to labor for other crops), production has been more stable for the last two decades than it was earlier. No data on production in Paraguay are available; however, since very little petitgrain oil is consumed within the country, exports probably approximate output. In 1963 Paraguay exported 299 metric tons (approximately 660,000 pounds) (table 2), of which about 38 percent was shipped to the United States. In Paraguay, exporters' agents purchase the oil from a large number of small distillers (possibly 2,000 to 3,000) throughout the country, and clean, test, and bulk the oil in Asunción before exporting it. Distillation is accomplished during the Paraguay summer, that is, from September to January.

Data on production of petitgrain oil in France are likewise unavailable; however, France is known to consume a considerable part of its production and to import some petitgrain oil. In 1967 France exported 60 metric tons (approximately 132,000 pounds) to world markets. Cuba and Italy were the largest markets for the French oil in that year, absorbing 15 and 12 metric tons (33,000 and 26,400 pounds), respectively.

No statistics on Italy's output and exports of petitgrain oil are available; however, a substantial part of the Sicilian and Calabrian production--which is of high quality and is estimated at 400 kilos a year--is believed to be shipped to France.

Table 1.--Petitgrain oil: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (pounds)					
Paraguay	250,460	274,153	254,143	227,446	307,129	293,404
France	1,026	816	1,561	518	1,588	2,568
Italy	267	143	2,683	627	972	187
Argentina	4,535	-	-	-	4,123	-
Uruguay	4,486	-	-	4,947	-	-
All other	1/ 8,075	33	110	2/ 9,411	-	3/ 3,300
Total	268,849	275,145	258,497	242,949	313,812	299,459
	Value					
Paraguay	$494,003	$496,882	$430,866	$427,804	$588,768	$558,378
France	13,374	8,834	17,408	5,075	12,727	21,078
Italy	2,000	1,356	6,596	4,192	10,204	2,047
Argentina	9,602	-	-	-	8,006	-
Uruguay	8,690	-	-	8,467	-	-
All other	1/18,857	114	1,438	2/ 15,054	-	3/ 33,237
Total	546,526	507,186	456,308	460,592	619,705	614,740

1/ Includes 7,496 pounds, valued at $15,272, from Brazil.

2/ Includes 4,947 pounds, valued at $8,467, from Pakistan, which is believed to have been other merchandise, and 4,409 pounds, valued at $5,922, from Spain.

3/ All from the United Kingdom.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Petitgrain oil: Exports from Paraguay, by principal markets, 1963

Market	Quantity 1/	Value 1/ 2/
	Kilograms	Guaranies
United States	115,247	54,863,804
England	30,353	14,733,969
Netherlands	42,143	21,468,256
France	27,411	13,268,868
Argentina	25,617	12,870,733
Germany	18,025	8,924,587
Brazil	14,415	7,252,743
Sweden	13,268	6,495,220
Japan	3,934	2,030,878
Australia	3,240	1,634,763
Switzerland	3,280	1,621,632
Italy	1,272	631,062
Mexico	910	449,904
Colombia	180	88,992
Chile	70	34,600
Total	299,365	146,370,011

1/ All figures are as reported in source material.
2/ May be converted at the rate of 126.0 guaranies per U.S. dollar.

Source: Compiled from official statistics of the Government of Paraguay.

Commodity	TSUS item
Rose oil	452.60

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements of rose oil; imports in 1968 were valued at about $1.7 million. Bulgaria is the world's chief producer of rose oil.

Description and uses

One of the oldest, as well as one of the costliest, scents used in perfumery is that of the rose. It is obtained commercially from four types of roses: Rosa damascena (the pink damask rose), R. centifolia (the light pink cabbage rose or rose de mai), R. alba (the white cottage rose), and R. gallica. The first two species are by far the most important sources of the oil. Rose oil, also called otto of rose or attar of roses, is produced from the flower petals by water or steam-and-water distillation. It is a clear yellow or yellow-green liquid comprised principally of geraniol, citronellol, and phenylethyl alcohol. R. damascena, which is cultivated in Bulgaria and to a lesser extent in Turkey, yields a high proportion of oil of superior quality. R. centifolia is planted principally in the Grasse region of southern France and in Morocco; in these countries only small quantities of the odoriferous principle are extracted in the form of essential oil, which is derived by steam distillation; the principle is generally extracted with volatile solvents (usually petroleum ether) to produce rose concrete; the concrete may be further treated to obtain rose absolute. Floral concretes and absolutes are covered elsewhere (item 460.05). In southern France and, to a smaller extent, in Bulgaria, the essential oil is obtained in the form of a pomade by maceration. Rosewater, which is obtained as a coproduct during the distillation process, is covered elsewhere (item 461.20).

Three thousand to four thousand pounds of flower petals are required to produce one pound of oil, and consequently, rose oil is one of the most expensive essential oils. In the United States the wholesale price per pound has ranged in recent years from $364 to $1,090, depending upon the grade.

Rose oil is used widely, albeit in small amounts, in high-grade perfumes. Because of its high unit cost, the oil is often combined with geranium or palmarosa oils, other sources of geraniol, and synthetic perfume materials. A substantial quantity of Bulgarian rose oil has long been used as a flavor for snuff tobacco. Limited amounts are employed in the flavoring of foods, particularly soft drinks, and liqueurs. Synthetic replacements compete with this product.

Specifications for rose oil as a perfuming agent are listed in the National Formulary (N.F. XII), published by the American Pharmaceutical Association. The Food Chemicals Codex 1966 of the National Academy of Sciences--National Research Council publishes specifications for rose oil used as a flavoring agent. Rose oil is marketed in the United States in several grades; the grade conforming to the National Formulary and of Bulgarian origin is the finest and highest priced.

U.S. tariff treatment

Imports of rose oil are entered free of duty under TSUS item 452.60. The duty-free treatment was provided for in the original Tariff Act of 1930 under paragraph 1731, and in the TSUS, which became effective August 31, 1963; it was bound effective January 1, 1968, as a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade.

U.S. consumption and imports

The United States does not produce or export rose oil and domestic consumption of this product is supplied by imports. During 1963-67, imports averaged $752,000 a year and rose to $1,735,000 in 1968 (see accompanying table). These figures are similar to those for most of the preceding 20 years. Of the principal suppliers in 1968, France exported to the United States material of lower average unit value ($16.60 an ounce) than did Bulgaria or Turkey, unit values of the exports from these two countries averaging $20.60 and $20.10, respectively. It is believed that the lower average unit values of imports from France represented totals which included concretes and absolutes having lower unit values than those of the distilled essential oil; imports of the concretes and absolutes are provided for elsewhere (item 460.05).

In 1965 and 1966 relatively large quantities of material having extremely low unit values ($0.12 per ounce) were imported from Peru and reported under this item in official statistics. It is believed

that these imports, if rose oil at all, were unlike rose oil of the type produced in Bulgaria or Turkey.

Foreign production and trade

The value of annual world production of rose oil has been estimated at $3 million to $4 million.

Bulgaria produces about 80 percent of the world supply of rose oil in modern efficient installations. No statistics on production and exports of rose oil from Bulgaria are available; however, present production is estimated at 2,000 to 2,500 kilograms a year.

Production of rose oil in Turkey is centered in three factories in the Aegean region, but considerable amounts are also processed by the peasants of that district. In 1959 and 1960, 350 kilograms of rose oil and 450 kilograms of rose oil "cream or paste" respectively (probably concrete) were produced. Production in more recent years has probably varied little from these amounts. Virtually all of Turkey's production of rose oil is exported, with France and Switzerland the chief customers. Smaller quantities are exported to the United States. In 1960 Turkish prices for export for factory-produced rose oil were higher ($1,050 per kilogram) than those for peasant-produced oil ($750 per kilogram).

In 1967 France exported rose oil valued at approximately $900,000. The United States and Japan were the largest markets, followed by Switzerland, the United Kingdom, and Spain. France uses a substantial part of her production of rose oil domestically.

Other producers of rose oil include the U.S.S.R., mainland China, India, and Syria.

Rose oil: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (1,000 ounces)					
France	12	17	18	23	15	44
Bulgaria	7	8	8	10	9	24
Turkey	1	1	3	5	4	9
Belgium	-	-	-	-	1/	3
Switzerland	1/	1	1/	4	-	4
All other	6	5	2/ 78	3/ 103	5	8
Total	26	32	107	145	33	92
	Value (1,000 dollars)					
France	263	211	256	359	321	730
Bulgaria	242	279	272	369	383	495
Turkey	26	20	76	143	130	181
Belgium	-	-	-	-	7	100
Switzerland	2	21	1	33	-	90
All other	57	46	2/ 126	3/ 72	48	139
Total	590	577	731	976	889	1,735

1/ Less than 500 ounces.

2/ Includes 70 thousand ounces, valued at $8 thousand, from Peru which are believed to have been erroneously included in the statistics.

3/ Includes 99 thousand ounces, valued at $12 thousand, from Peru, which are believed to have been erroneously included in the statistics.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sandalwood oil	452.64

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Most of the U.S. consumption of sandalwood oil is supplied by imports, which in 1968 amounted to 144,000 pounds. The small production of this commodity in the United States, all marketed domestically, was discontinued at the beginning of 1968; exports are nil or negligible.

Description and uses

Trees of several different plant families are called sandalwood, and many of these are commercial sources of so-called sandalwood oils. The most important source, and the species which furnishes the highest quality oil, is the evergreen Santalum album. The S. album tree grows wild in the highlands of southern India, as well as in several Indonesian islands. The oil is obtained commercially mostly from trees grown in India in the State of Mysore and its immediate neighbors. Such oil is frequently designated by the trade as "East Indian sandalwood oil" to distinguish it from oil produced in other geographical areas and also called sandalwood oil.

Australian sandalwood oil is obtained from the small tree Eucarya spicata, which was once called Santalum spicatum. An oil sometimes called sandalwood is also occasionally obtained in Australia from Eremophila mitchelli. West Indian sandalwood oil, generally called amyris oil, is obtained from several varieties of Amyris balsamifera, a wild tree of Haiti. This oil is discussed in the summary on miscellaneous essential oils (item 452.80).

East Indian sandalwood oil is one of the most important igredients of the oriental types of perfume. It is also used as a fixative in scents for soaps and cosmetics. In the less developed countries of Asia, considerable amounts are used in the self-treatment of certain diseases. West Indian oil (amyris oil), as well as Australian sandalwood oil, is used instead of the East Indian oil as a perfume fixative in soaps and in the lower priced perfumes and cosmetics. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy

of Sciences - National Research Council.

U.S. tariff treatment

A free rate of duty applies to sandalwood oil under column 1 of TSUS item 452.64. (See general headnote 3 in the TSUSA-1970.) The duty-free status, which became effective on January 1, 1968, represents a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The rate prior to January 1, 1968, was 8 percent ad valorem and had remained unchanged from August 31, 1963, the effective date of the TSUS, through 1967.

U.S. consumption

The United States consumed between 75,000 and 144,000 pounds of sandalwood oil a year during 1963-68. About 15 or 20 percent of consumption is estimated to have been produced domestically, until 1968, from sandalwood imported from India. Since the average unit value of imported oil varies widely from year to year, the value of annual consumption of sandalwood oil fluctuates more than the quantity. In recent years, the value of annual consumption has been more than $1.5 million, and in 1968 it exceeded $2 million.

Imported and domestic sandalwood oils had been comparable in quality since the raw material for the greatest part of imports and for all domestic production was sandalwood produced in India, particularly the State of Mysore. The government of Mysore controls not only the production of oil but also the exportation of the wood itself.

U.S. production

From 10,000 to 20,000 pounds of sandalwood oil is estimated to have been produced domestically each year between 1963 and 1967 from imported sandalwood logs by several New York concerns. The value of this production amounted to several hundred thousand dollars a year. One of these concerns, which had produced the bulk of this oil from raw materials imported from Mysore, discontinued production early in 1968.

U.S. imports

U.S. imports of sandalwood oil averaged 64,000 pounds a year during 1963-67 and rose to 144,000 pounds in 1968 (see accompanying table). In 1968 India supplied 83 percent of the total volume

imported; France, Singapore, and Australia supplied most of the remainder. Imports from Singapore, which entered the U.S. market for the first time in 1968, probably consisted of material which originated in Australia.

Foreign production and trade

The principal source of the world's supply of sandalwood oil is the Indian State of Mysore. The sandalwood tree is Mysore's most important source of revenue, and the growth, production, and handling of both the tree and the wood are strictly regulated by the government of the State. In addition, a continuing supply of trees is assured by a reforestation program. The cutting of the trees is also regulated in the neighboring producing areas, but less stringently than in Mysore. About 90 percent of the cut wood is processed for oil.

In recent years two factories in Mysore have produced most of India's distilled sandalwood oil, estimated at 175,000 pounds a year. France is an important producer of sandalwood oil, but its production is entirely from wood imported from India, as is probably true for the production in several other countries, including the Netherlands and the United Kingdom.

Sandalwood oil: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)					
India	48	53	70	70	68	119
France	7	12	6	1	2	9
Singapore	-	-	-	-	-	5
Australia	1/	-	3	8	3	4
All other	3	1	3	5	8	7
Total	58	66	82	84	81	144
	Value (1,000 dollars)					
India	632	750	1,040	980	1,099	1,836
France	88	150	73	19	37	132
Singapore	-	-	-	-	-	65
Australia	2/	-	38	118	32	46
All other	43	16	45	42	78	93
Total	763	916	1,196	1,159	1,246	2,172

1/ Less than 500 pounds.
2/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Vetiver oil	452.68

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements of vetiver oil, which were valued at $2.2 million in 1968. There is no U.S. production or exportation of this oil.

Description and uses

Vetivert oil--or vetiver oil, as it is customarily known and as it will be referred to in this summary--is an essential oil obtained by steam distillation from the roots of the tall grass Vetiveria zizanioides. A native plant growing wild in India, Ceylon, and Malaysia, it was introduced many years ago into numerous tropical and subtropical countries. Commercial oil is obtained almost entirely from cultivated plant material, principally in the Island of Réunion, Haiti, and India.

The oil is a viscous liquid which ranges in color from amber to dark brown and has a woody-earthy odor. It is used principally in perfumes, cosmetics, and soaps, where it not only acts as a fixative (agent to insure lasting aroma) but also contributes to woody types of odors. It may be acetylated to give the so-called vetiver acetate of commerce, which is also used in perfumery. Vacuum distillation of vertiver oil yields a product with a flavor resembling that of asparagus, for use in reinforcing the flavor of the canned vegetable. Isolated from the oil are vetiverone, used in perfumery, and vetiverol, used to produce the ester vetiveryl acetate.

Geographical origin is the basis for grading vetiver oil. Generally, the higher priced Réunion oil (or Bourbon oil, from the former name of Réunion Island) is used in perfumery, while the less expensive oils from other countries are used in soap.

U.S. tariff treatment

A free rate of duty applies to vetivert (vetiver) oil under column 1 of TSUS item 452.68. (See general headnote 3 in the

TSUSA-1970.) The duty-free status, which became effective on January 1, 1968, represents a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement of Tariffs and Trade. The rate prior to January 1, 1968, was 3 percent ad valorem and had remained unchanged from August 31, 1963, the effective date of the TSUS, through 1967.

U.S. production, consumption, and exports

No vetiver oil is produced in the United States, and consumption is supplied entirely by imports. During 1962-67, annual imports fluctuated between 77,000 pounds and 128,000 pounds (see accompanying table), and averaged slightly more than 100,000 pounds, valued at about $1.1 million. In 1968, however, imports increased sharply to 222,000 pounds, valued at $2.2 million. Although the table shows the Malagasy Republic as a significant source of imports of vetiver oil, such imports are probably all from Réunion; official U.S. statistics combine exports from the two areas. France and Indonesia are minor suppliers.

World production and trade

Annual world output of vetiver oil has been estimated at 100 to 150 metric tons. About three-fourths of the output is produced in Réunion and Haiti, with production in Réunion being the larger. India is the only other major producing country. Small amounts (less than 10 tons each) are produced in other Asian countries, Africa, the West Indies, and Argentina and Brazil. France also produces vetiver oil, possibly from imported Java root.

Vetiver oil is reported to be produced in Réunion by six distilleries, which export virtually all of their output. Haiti is the only other major exporter. Most of India's production is consumed domestically.

Vetiver oil: U.S. imports for consumption, by principal sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
Haiti	66	51	80	71	58	72	172
Malagasy Republic	14	14	18	28	24	15	29
France	3	3	7	11	9	4	10
Indonesia	2	8	22	14	10	7	6
All other	3	1	1	4	3	2	5
Total	88	77	128	128	104	100	222
	Value (1,000 dollars)						
Haiti	601	453	776	663	577	737	1,495
Malagasy Republic	182	161	205	347	350	213	417
France	49	36	85	142	87	58	138
Indonesia	24	53	128	89	133	60	48
All other	19	9	8	43	37	22	53
Total	875	712	1,202	1,284	1,184	1,090	2,151

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Ylang-ylang (Cananga) oil	452.70

Note.--For the statutory description, see the Tariff Schedules of the United Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements of ylang-ylang and cananga oils, which amounted in 1968 to 110,000 pounds, valued at $1.2 million.

Description and uses

Although ylang-ylang oil and cananga oil are both essential oils derived from the flowers of the same species of tree, Cananga odorata, they are readily distinguishable from each other with respect to odor and other physiological properties. Ylang ylang oil, which is considered superior, is obtained from the botanical form genuina of the producing species; this form of the tree is lower growing and has smaller leaves than the for macrophylla, which produces cananga oil.

C. odorata is indigenous to the Moluccas, where ylang-ylang oil was first produced commercially. Later, Réunion (an island about 400 miles east of Madagascar) became the center of production. Currently, more than 80 percent of the world supply is obtaines from plantations on the Comoro Islands and on Nossi-Bé (an island off the northwest coast of Madagascar)--principally the latter. Cananga oil is a product of Java, where the macrophylla form of the producing tree grows semiwild.

Ylang-ylang oil is a pale yellow liquid with a very sweet floral odor. It is obtained from the flowers by steam or water-and-steam distillation. Its major components are linalool, geraniol and its esters, and pinene. Ylang-ylang oil is classified as extra, first, second, and third grades according to the boiling range of the distillate. Specifications for the grades are highly arbitrary, however, and only the designations extra and third have any substantial commercial application. The extra grade is used almost entirely in choice perfumes, and the third grade is used primarily in soaps. Ylang-ylang oil is also used as a food flavor.

Cananga oil is produced by water distillation from the flowers of the macrophylla form of C. odorate. Like ylang-ylang oil, it has

a sweet floral odor, but it also has a woody-leathery note. Its color ranges from orange yellow to greenish yellow. Unlike ylang-ylang oil, true cananga oil is a "complete" oil rather than a fractionated oil. Cananga oil is marketed in regular (native) and rectified grades, as well as in a grade conforming to specifications of the Food Chemicals Codex. 1/ It is used in soaps, in men's fragrances to import a leathery odor, and as a food flavor. Although cananga oil is sometimes described as a replacement for third-grade ylang-ylang oil, the two oils are not completely interchangeable.

Synthetic substitutes consisting of blends of some of the chemical substances found in ylang-ylang oil have been developed and are used to some extent in soaps.

Ylang-ylang absolute is a product obtained by washing with alcohol the concrete obtained by solvent extraction of the flowers. (The absolute and the concrete are covered in item 460.05.) Most of the commercial supply of both is produced in France and other European countries from imported oil.

U.S. tariff treatment

U.S. imports of ylang-ylang or cananga oils are entered free of duty under TSUS item 452.70. The duty-free status was provided for in the original Tariff Act of 1930 under paragraph 1731, and in the TSUS, which became effective August 31, 1963; that status was bound effective January 1, 1948, as a concession granted by the United States in the General Agreement on Tariffs and Trade.

U.S. production, consumption, and trade

The United States does not produce either ylang-ylang or cananga oil. Thus, there is no exportation of these oils, and domestic consumption, as measured by imports (see accompanying table), increased fairly steadily from 57,000 pounds, valued at $567,000, in 1962 to 110,000 pounds, valued at $1.2 million, in 1968. France and the Malagasy Republic have been the principal suppliers. Indonesia has usually been the third most important suppliers, but was supplanted (in terms of value) by Switzerland in 1968.

An analysis of the average annual unit value of imports indicates that imports from Indonesia were all cananga oil, and that

1/ Published in 1966 by the National Academy of Sciences--National Research Council.

imports from the Malagasy Republic (originating in the Comoro and Nossi-Bé Islands) were mostly ylang-ylang oil. Imports from France were slightly higher in unit value than those from the Malagasy Republic. Since France is not a primary producer of the oil, imports thereform were probably largely ylang-ylang oil imported from producing countries and upgraded; although a part of the imports shown as coming from France may possibly have been ylang-ylang absolute. The very high unit values of imports from Switzerland and other European countries indicate that imports from Europe may have been the absolute rather than the oil.

Foreign production and trade

As stated above, more than 80 percent of the world's output of ylang-ylang oil is distilled in the Comoro Islands and, Nossi-Bé, where it is the principal essential oil produced and exported. Java is the only significant producer of cananga oil. Oil from Cananga odorata is also produced in the Philippine Islands, Zanzibar, Haiti and other West Indian islands, Reunion, and some of the French possessions in the South Pacific. In some of the countries producing ylang-ylang oil, distilleries market only the low-boiling fractions as "ylang-ylang" and the remainder, the high-boiling fractions, as cananga oil.

No official statistics on foreign production of either ylang-ylang oil or cananga oil are available. Trade information, however, indicates that the 1966 production of ylang-ylang oil on the Comoro Islands, by grade, was as follows:

Grade	Pounds
Extra	42,180
First	8,694
Second	8,974
Third	60,220
Total	120,068

The world output of cananga oil is estimated to be between 20 and 30 short tons a year. Since the amount available on world markets is considerably higher, it is believed some oil marketed commercially as cananga is not a "complete" oil, but rather a mixture of less desirable high-boiling fractions obtained during the distillation of ylang-ylang oil.

Ylang-Ylang and cananga oils: U.S. imports for consumption, by principal sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
France	18	26	41	43	51	30	49
Malagasy Republic	26	24	17	26	19	28	44
Switzerland	1	3	7	1	1/	1/	2
Indonesia	11	9	11	14	14	20	13
All other	1	1	4	1	2	1	2
Total	57	63	80	85	86	79	110
	Value (1,000 dollars)						
France	215	299	489	503	599	401	581
Malagasy Republic	289	240	167	291	220	287	469
Switzerland	8	18	37	8	1	1	69
Indonesia	37	31	38	58	72	49	31
All other	18	6	23	4	22	9	37
Total	567	594	754	864	914	747	1,187

1/ Less than 500 pounds.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Cornmint oil, including "peppermint" derived from Mentha arvensis--------	452.22

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. consumption of cornmint oil, supplied entirely from imports, has been increasing in recent years but has not exceeded 380,000 pounds a year; cornmint oil is frequently substituted for the more expensive peppermint oil.

Description and uses

Cornmint (fieldmint) oil is an essential oil that is steam distilled from the leaves of the perennial herb Mentha arvensis variety piperascens (and possibly the variety glabrata), which is cultivated principally in Brazil, Japan, and Taiwan. It appears in commerce both as the natural (crude) oil and as dementholized oil, though most commonly in the latter form. The natural oil is golden to dark yellow in color and generally contains from 70 to 95 percent of menthol. The so-called dementholized oil still contains more than 50 percent of menthol. It is pale yellow or nearly colorless and has an odor reminiscent of that of peppermint oil (item 452.54) but somewhat harsher. Dementholized cornmint oil is also called simply mint oil or Japanese mint oil, depending on its origin; in many parts of the world outside the United States, it is commonly called peppermint oil.

Natural cornmint oil is an important source material for the production of menthol (item 437.64). The dementholized oil is used as a flavoring agent for chewing gum, candy, toothpaste, jellies, liqueurs, and flavoring extracts, both alone and as an ingredient of artificial peppermint oils. Artificial peppermint oils are made by blending relatively small amounts of true peppermint oil with selected fractions of cornmint oil. In the United States, cornmint oil and blends containing it are used as flavors where price considerations induce its use rather than that of the more expensive U.S.-made peppermint oil, particularly in products for export.

U.S. tariff treatment

A free rate of duty applies to U.S. imports of cornmint oil under column 1 of TSUS item 452.22. (See general headnote 3 in the TSUSA-1970.) The duty-free status, which became effective on January 1, 1968, represents a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The rate prior to January 1, 1968, was 6.25 percent ad valorem and had remained unchanged from August 31, 1963, the effective date of the TSUS, through 1967.

U.S. consumption, production, and exports

Estimated U.S. consumption of cornmint oil in 1968 amounted to more than 251,000 pounds, valued at about $277,000. This volume was more than 15 times the volume in 1958. Some of the consumption increase in 1958-68 can probably be accounted for by the substitution of cornmint oil for U.S. peppermint oil in some uses. Consumption is believed to be supplied completely by imports. There is no known U.S. production or exportation.

U.S. imports

In 1967 and 1968 the average unit values of imported cornmint oil were $1.15 and $1.04 per pound, respectively; the price of peppermint oil (U.S.) ranged from $4.65 to $8.30 per pound during 1967. The presumed increased use of the less expensive cornmint oil in place of U.S. peppermint oil in some flavoring agents has eliminated or curtailed certain markets for the U.S. oil (see summary on item 452.54).

Brazil, has supplied almost all the U.S. imports of the oil of Mentha arvensis, in recent years (see accompanying table). Taiwan, Switzerland, France, the Korean Republic, and the Malagasy Republic have supplied small amounts to U.S. markets.

Foreign production and trade

The total world production of cornmint oil probably exceeds 6 million pounds a year. Brazil now produces the bulk of the world's supply; Japan was the largest producer before World War II. According to data published by the Brazilian Office of Economic and Financial Statistics, Brazil's total exports of cornmint oil increased from about 804,000 pounds in 1960 to more than 3 million pounds in 1967, generally reflecting an upward trend of exports to each of its chief markets. In 1967 the approximately 317,000 pounds imported by the United States represented about 10 percent of Brazil's exports.

In that year the largest markets for Brazilian cornmint oil were Taiwan (597,000 pounds), West Germany (569,000 pounds), France (493,000 pounds), and the United Kingdom (375,000 pounds). In 1968 the United Kingdom, France, and West Germany were also among the chief markets for exports of U.S. peppermint oil, with which cornmint oil competes with respect to price (see summary on item 452.54).

In 1965 Japan produced an estimated 65 metric tons, or 143,000 pounds, of oil of Mentha arvensis, most of which was used for the extraction of menthol. In 1967, exports of such oil from Japan amounted to about 58,000 pounds, valued at about $113,000. The European Economic Community, Thailand, and India were Japan's largest markets.

Cornmint oil: U.S. imports for consumption by sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
Brazil	154	246	225	290	375	317	250
Taiwan	-	-	-	-	1	-	1
All other	1	1/	7	10	2	2/ 43	-
Total	155	246	232	300	378	360	251
	Value (1,000 dollars)						
Brazil	223	248	177	336	640	356	275
Taiwan	-	-	-	-	2	-	2
All other	1	3/	20	13	21	2/ 59	-
Total	224	248	197	349	663	415	277

1/ Less than 500 pounds.
2/ Includes 30 thousand pounds, valued at about 41 thousand dollars, from Tanzania.
3/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Peppermint oil derived from Mentha piperita---------	452.54

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the largest supplier of peppermint oil to the world market. Exports amounted to 46 percent of U.S. production in 1968, whereas imports have consistently been negligible. Consumption in 1968 amounted to 2.2 million pounds and was valued at almost $10 million.

Description and uses

In the United States, peppermint oil is obtained from the dried perennial herb Mentha piperita (the true peppermint) which is believed to be hybrid resulting from three different Mentha species. In this country the plants cultivated for oils probably descend from black mint, the vulgaris variety of M. piperita, which originated in the Mitcham district of the United Kingdom, where it was first exploited about 200 years ago. White mint, the variety officianalis, is also a source, although a minor one, of peppermint oil of a very fine quality.

Outside the United States, the term "peppermint oil" includes the oil obtained from the species Mentha arvensis; in the United States, however, oil from this species is designated as "cornmint oil" (item 452.22) in accordance with a regulation of the U.S. Department of Agriculture.

Peppermint oil is one of the most important of the essential oils. In volume of production in the United States, it is surpassed only by turpentine oil (spirits of turpentine, item 188.50) and pine oil (included in item 452.80).

Natural peppermint oil, the unprocessed oil obtained by steam distillation from the herb, is a pale yellow or pale olive liquid. Its principal constituent is menthol, which ranges in quantity from 45 to 90 percent. Other constituents are pinene, limonene, and eucalyptol. Natural peppermint oil is used exclusively as a flavor; none is used as a source material for the production of menthol (item 437.64), as cornmint oil is. For use as a flavor, peppermint oil is generally rectified (or redistilled); the rectified oil is almost

colorless and less harsh. It is used in the manufacture of chewing gum, candy, toothpaste, pharmaceuticals, jellies, liqueurs, and flavoring extracts; more than half of the total domestic production is used in chewing gum. In mint-flavored cordials, where stability and solubility in alcohol are required, terpeneless oil (oil from which the terpenes have been removed) is used. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences - National Research Council.

Spearmint oil (item 452.80), obtained from M. spicata, and cornmint oil (item 452.22), are used as flavors in much the same products as peppermint oil. There is, however, a greater world demand for peppermint oil than for spearmint oil. The choice between these two oils depends upon the specific flavor desired by the consumer. Cornmint oil and artificial mint flavorings are sometimes used as cheaper substitutes for peppermint or spearmint oil.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1970) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
452.54	Peppermint oil derived from Mentha piperita	25% ad val.	12.5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The first and five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1970, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, had remained unchanged from August 31, 1963 (the effective date of the TSUS), through 1967.

U.S. consumption

U.S. consumption of peppermint oil, almost all of which is supplied by domestic production, rose irregularly during 1962-67 from 1.2 million pounds to 3.1 million pounds, then declined to 2.2 million pounds in 1968 (table 1).

U.S. producers

U.S. production of peppermint oil is concentrated in Indiana, Michigan, Wisconsin, Idaho, Washington, and Oregon. In 1968, nearly half of the total was produced in Oregon, and slightly less, in Washington.

Production of the oil is carried on by approximately 1,000 growers of mint, most of whom distill the oil on their farms or at nearby locations using equipment owned singly or by cooperatives. Cooperative operations are frequently necessary because 3 to 4 tons of mint plants are required to distill 40 pounds of oil.

Mint growers usually devote very rich and valuable muck soils to their mint crops, the returns from which typically comprise a major portion of their total incomes.

U.S. production

The United States is the world's principal source of peppermint oil derived from Mentha piperita. U.S. climatic conditions, including long periods of sunshine, and rich organic soils in certain midwestern and northwestern areas provide high yields of quality oil. Production rose from 2.3 million pounds in 1962 to 4.6 million pounds in 1967 and then declined to 4.1 million pounds in 1968 (table 1). In the last few years, Washington State has produced the highest yield of oil per acre of mint grown.

The marketing of peppermint oil is accomplished through intermediary buyers who contract for most of the peppermint oil from the growers. The bulk of the oil is handled by about four large concerns which usually provide additional services, such as supplying containers and transportation, and maintain laboratories for analysis and blending of the oil in accordance with the specifications of the ultimate users -- the producers of foods, confections, and pharmaceuticals.

The general price level for peppermint oil is dependent upon the size of the current crop, the carryover from the previous crop, and the demand for peppermint oil by the ultimate users. The price received by the individual grower is influenced by such factors as soil and climatic conditions in his area, variations in constituents, (such as content of menthofuran, which affects taste), and the marketing services undertaken by the firms to which he sells. Hence, average prices may differ from region to region. As an example, the average price received by Indiana farmers in 1968 was $7.80 per pound of peppermint oil, whereas Washington State farmers averaged only $4.40 per pound of oil.

U.S. exports

During 1963-68, the volume of U.S. exports increased steadily (except for a slight drop in 1966) (table 2). In 1968 about 1.9 million pounds, valued at a little more than $11 million, was exported. During that year, Japan, the United Kingdom, France, Mexico, and West Germany were the principal markets for U.S. peppermint oil.

U.S. exports represented a substantial percentage of domestic production during 1963-68, and amounted to 46 percent, by volume, in 1968.

U.S. imports

U.S. imports of peppermint oil are relatively small. The ratio of imports to consumption based on volume ranged from 0.4 percent to 1.7 percent in the years 1962 through 1968. In 1968, as in the immediately preceding years, Italy supplied the greater part of the small volume of imports; in that year the United Kingdom supplied the remainder (table 3).

World production and trade

World production of peppermint oil is estimated at 6.5 million pounds; the world supply comes predominantly from the United States, but also from several European countries, including Italy, the United Kingdom, and France.

At present, the Mentha piperita crop in the United Kingdom is largely used in the form of the leaf itself rather than for the distillation of its essential oil.

The annual output in Italy in recent years is estimated at upwards of 200,000 pounds. Italy's production usually meets most of her requirements for this product, and imports have been negligible.

It is estimated that in recent years France has produced 70,000 pounds of the 200,000 pounds used in that country each year by toothpaste, candy, and other producers. France is thus a net importer of this commodity. It is believed that the principal processors of peppermint oil in Europe blend peppermint oils produced in Italy and France with the higher quality peppermint oil from the United States.

Table 1.--Peppermint oil: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-68

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Production	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
			Quantity		
1962	2,340	1	1,186	1,155	0.8
1963	2,312	7	1,046	1,273	.5
1964	2,472	20	1,350	1,142	1.7
1965	2,590	16	1,474	1,132	1.4
1966	3,283	31	1,384	1,930	1.6
1967	4,571	14	1,505	3,080	.4
1968	4,068	10	1,878	2,200	.4
			Value		
1962	11,800	4	5,708	6,096	0.1
1963	10,967	63	5,612	5,418	1.1
1964	11,508	208	7,145	4,571	4.6
1965	14,084	151	7,916	6,319	2.4
1966	18,236	196	8,179	10,253	1.9
1967	25,289	166	9,357	16,098	1.0
1968	20,855	126	11,036	9,945	1.3

Source: Imports and exports, compiled from official statistics of the U.S. Department of Commerce; production, compiled from official statistics of the U.S. Department of Agriculture.

Table 2.--Peppermint oil: U.S. exports of domestic merchandise, by principal markets, 1963-68

Market	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)					
Japan	100	148	178	252	332	397
United Kingdom	295	366	378	295	340	436
France	114	207	217	165	204	278
Mexico	34	55	73	77	69	120
West Germany	124	168	192	123	87	107
Canada	55	61	61	70	69	81
Australia	57	60	45	48	51	69
Republic of S. Africa	28	29	31	27	31	47
Netherlands	49	46	45	52	52	50
All other	190	210	255	275	270	293
Total	1,046	1,350	1,475	1,384	1,505	1,878
	Value (1,000 dollars)					
Japan	559	902	1,062	1,457	2,155	2,487
United Kingdom	1,489	776	1,915	1,605	2,099	2,428
France	519	881	1,000	1,031	1,174	1,429
Mexico	202	384	504	537	503	782
West Germany	695	902	1,041	756	564	636
Canada	338	394	327	450	507	598
Australia	355	372	271	343	377	499
Republic of S. Africa	176	172	201	212	240	338
Netherlands	264	228	256	340	320	283
All other	1,015	2,134	1,339	1,448	1,418	1,556
Total	5,612	7,145	7,916	8,179	9,357	11,036

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Peppermint oil: U.S. imports for consumption, by principal sources, 1964-68

Source	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)				
Italy	13	10	10	13	10
United Kingdom	6	4	7	1	1/
All other	1	2	14	1/	-
Total	20	16	31	14	10
	Value (1,000 dollars)				
Italy	136	101	103	151	124
United Kingdom	63	38	75	15	2
All other	1	12	17	2/	-
Total	200	151	196	166	126

1/ Less than 500 pounds
2/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Grapefruit oil----------	452.28

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the chief world producer and consumer of grapefruit oil. Both U.S. production and imports, which approximated 400,000 pounds and 93,000 pounds, respectively, in 1967, have been increasing. U.S. exports of grapefruit oil are relatively small.

Description and uses

Grapefruit oil is obtained by expression from the peel of the fruit of Citrus paradisi, a tree which possibly originated in the West Indies as a hybrid of the pummelo (shaddock) and the sweet orange. Oil can also be obtained from the leaves and blossoms of the same tree, but such oil is seldom an article of commerce. Grapefruit oil is light to orange yellow in color, has a characteristic odor, and contains about 90 percent of limonene. A ton of fruit yields 1 to 2 pounds of oil. Grapefruit oil is used primarily as a flavoring agent in soft drinks and frozen drink concentrates, for which purpose sales have expanded greatly in recent years, particularly since 1966. It is also used to a minor extent in perfumery.

Although grapefruit oil has been available commercially since about 1930, its development as a flavoring agent is much more recent than that of other citrus oils; only during the last 6 or 7 years have beverages containing this flavor gained widespread acceptance. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences - National Research Council.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general

headnote 3 in the TSUSA-1970) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
1/ 452.28	Grapefruit oil----	12.5% ad val.	6% ad val.

1/ Grapefruit oil imported from Cuba was provided for in item 452.29 prior to Jan. 1, 1969, when the provision for such oil was deleted.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1970, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, had remained unchanged from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

U.S. consumption, production, and producers

From 1961 to 1965 apparent annual U.S. consumption of grapefruit oil increased from 230,000 pounds to 330,000 pounds (table 1). Although complete data are not available for 1966 and 1968, it is believed that the rate of increase in annual consumption has been much greater since 1965, and that consumption is now well in excess of 500,000 pounds a year.

Until 1965, domestically produced grapefruit oil supplied all but a small percentage of domestic requirements. In 1966, 1967, and 1968, however, the U.S. producers' share of the domestic market may have been no more than 80 percent. Nevertheless, because of the greatly expanded demand for grapefruit oil, domestic production in each of those years was probably much higher than in any preceding year.

Grapefruit oil is produced in the United States by some 15 or 16 fruit-processing concerns with plants in Florida, California, Arizona, and Texas. Florida is by far the largest producing State. In 1965, industry sources estimated that about 250,000 pounds was produced in Florida, and about 70,000 pounds was produced in all the other producing States combined. The oil is obtained as a byproduct of the production of grapefruit juice and canned grapefruit segments. Some of the oil is used captively by the producers in the preparation of frozen drink concentrates, but the market with the greatest potential is that of the recently developed bottled carbonated beverages.

U.S. imports and exports

During 1963-65, U.S. imports of grapefruit oil were small, ranging from about 3,000 to about 10,000 pounds a year (table 2). Jamaica was the principal source of these imports. Imports increased to 107,000 pounds in 1966, dropped to 93,000 pounds in 1967, and then rose slightly to 94,000 pounds in 1968. Israel was the most important source of imports in 1966-68; Israeli grapefruit oil was considered to be comparable in quality to that produced in California.

Exports of grapefruit oil are not separately classified in official U.S. statistics. Industry sources indicate that they have been limited in quantity, often being an adjunct to shipments of grapefruit juice concentrate.

Foreign production and trade

The extraction of oil from grapefruit peel is much more difficult than extraction from other citrus fruit peel, and the yield of oil is relatively small. Thus, to be economically feasible, the extraction process must be highly efficient. Since the United States not only has a capability for the design of highly efficient industrial processes, but also is the world's largest grower of grapefruit, the production of grapefruit oil has been largely a U.S. industry. In Israel, production of the oil is also efficiently mechanized, developed along with the established production of citrus fruit, the exports of which are one of the main sources of foreign currency for Israel. Israel has expanded its exports of grapefruit oil to the United States since the beginning of 1966; on the whole, however, its existing substantial markets in Europe have not changed appreciably.

Table 1.--Grapefruit oil: U.S. production, imports for consumption, and apparent consumption, 1961-68

Year	Production	Imports	Apparent consumption	Ratio of imports to consumption
	Pounds	Pounds	Pounds	Percent
1961	228,000	2,039	230,039	0.9
1962	253,000	4,182	257,182	1.7
1963	1/	3,156	1/	1/
1964	250,000	2,565	252,565	1.0
1965	320,000	10,469	330,469	3.1
1966	1/	107,134	1/	1/
1967	400,000	92,687	492,687	18.8
1968	1/	93,953	1/	1/

1/ Not available.

Source: U.S production estimated by the trade; imports compiled from official statistics of the U.S. Department of Commerce.

Note.--No statistics on exports are available, but exports are believed to be small.

Table 2.--Grapefruit oil: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (pounds)					
Israel	-	-	4,478	100,734	88,703	83,169
Jamaica	1,600	1,375	4,800	4,400	1,600	4,075
Brazil	-	-	-	-	-	2,447
Republic of S. Africa	1,556	-	389	2,000	-	-
All other	-	1/ 1,190	2/ 800	-	3/ 2,384	4/ 4,262
Total	3,156	2,565	10,467	107,134	92,687	93,963
	Value					
Israel	-	-	$3,632	$57,032	$68,398	$97,034
Jamaica	$2,073	$1,055	4,461	4,173	2,132	9,801
Brazil	-	-	-	-	-	4,672
Republic of S. Africa	1,611	-	288	1,524	-	-
All other	-	1/ 7,619	2/ 608	-	3/ 2,962	4/ 6,617
Total	3,684	8,674	8,989	62,729	73,492	118,124

1/ All from Haiti.
2/ All from Mozambique.
3/ Principally from Japan.
4/ Principally from Algeria and Spain.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Lemon oil	452.34

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

In most recent years U.S. consumption of lemon oil--valued at an estimated $10.9 million in 1967--has been supplied primarily from domestic sources as a byproduct of the commercial production of lemon juice and concentrate. In 1968, exports were valued at $2.3 million, and imports, at $2.5 million.

Description and uses

Lemon oil, a yellow liquid with a sweet and pleasant aroma, is obtained from fruit of Citrus limon. It is a byproduct of the manufacture of lemon juice and concentrate, and is generally obtained by expression (cold pressing) from the peel. Relatively small amounts are also obtained by steam distillation; this process, however, yields a poorer quality oil. Very small quantities of oil are also produced from the leaves and twigs of the lemon tree; such oil is designated as "petitgrain lemon oil" (item 452.56). Lemon oil is a mixture of terpenes, aldehydes, esters, alcohols, and sesquiterpenes. The terpene d-limonene comprises approximately 85 percent of the natural oil. The chief aldehyde, citral, is present in concentrations that vary with the source of the fruit.

Most lemon oil is produced in the United States--in two areas, Southern California and Arizona--and in Sicily (Messina). Smaller amounts are produced in Florida, Greece, Israel, and Spain. Oils produced in different areas generally exhibit individual flavor characteristics unique to the specific area of production. Oils from lemons from idfferent growing areas in the United States are sometimes blended to obtain consistent flavor in successive output.

Lemon oil is marketed in several grades, depending upon whether it has been obtained by expression or distillation, and upon locale of origin (e.g., California, Arizona, Italy). In addition, oils from the various locales may be designated as "U.S.P." 1/ Terpeneless oil is

1/ United States Pharmacopoeia XVII.

also commercially available for specific uses; it is generally higher priced because of the additional processing required.

Lemon oil is most often sold directly by the processor to the manufacturer of the products in which it has its end use, though it is sometimes distributed through concerns in the flavor and fragrance fields. Next to orange oil, lemon oil has long been the most important citrus oil, used extensively as a flavor and perfume ingredient.

During periods of high prices or shortages of natural lemon oil, substitutes come into increasing use, particularly for certain products, such as candy. Some of these substitutes may actually have certain advantages, such as improved solubility, heat resistance, and special taste characteristics. Citral derived from lemongrass oil (item 452.36) has long been used instead of natural lemon oil. For several years, synthetic lemon oils composed of chemicals similar to those found in the natural oil have been available. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences - National Research Council.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1970) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
452.34	Lemon Oil----------	17.5% ad val.	8.5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1970, as excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, had remained unchanged from August 31, 1963 (the effective date of the TSUS), through 1967.

U.S. consumption

Annual apparent U.S. consumption, which amounted to approximately 1.3 million pounds in 1958, rose to about 2.1 million pounds in 1963 (table 1). The figure for 1963 reflects a relatively low volume of U.S. production in that year which led to high prices and apparently

induced stockpiling by industrial users against the incipient shortage. Domestic consumers displaced foreign buyers, causing a sharp drop in exports, and the price increased sufficiently to make otherwise very high-priced imports competitive. Apparent U.S. consumption in 1967 approximated 2.5 million pounds and reflected relatively stable import and export patterns and an increased U.S. production.

Most of the lemon oil consumed is of the natural expressed (cold-pressed) type. Terpeneless oils account for less than 1 percent of the volume.

An estimated three-fifths of the total consumption of lemon oil is used in beverages. Baked goods and candies account for almost a third of the consumption; the remainder is used in flavoring extracts, perfumes for soaps and cosmetics (terpeneless oils), and in pharmaceutical flavoring.

U.S. producers

The total number of U.S. producers of lemon oil is not known; however, according to industry sources about six concerns in California now produce the bulk of the U.S. output. The largest of these concerns, a long-established citrus-marketing cooperative representing an estimated 10,000 growers, accounts for most of the production of lemon oil in one of its two California citrus-processing plants. Another large firm consumes its production of the oil. The remaining firms are smaller independent concerns which produce citrus products, including lemon oil, for sale.

There are several essential oil firms in the metropolitan New York area which produce the terpeneless grade of lemon oil; this production comprises a small part of the total operations of these firms.

U.S. production

Total U.S. shipments of lemon oil in 1958 and in 1963 amounted to approximately 1.6 million pounds. The value of these shipments rose from about $5.9 million in 1958 to $8.2 million in 1963. The accompanying rise in the average unit value from about $3.67 per pound to about $5.20 per pound reflected the relatively high market price in the latter year because of a shortage in the supply of lemons resulting from adverse weather during the growing season. The value of U.S. shipments in 1967 amounted to $10.9 million. The bulk of U.S. production was of the natural expressed USP grade. Annual production of the terpeneless grade was estimated at about 5,000 pounds.

Since lemon oil is a byproduct of the manufacture of lemon juice and concentrated juice, its annual production is dependent on the size of the lemon crop and the portion sold for processing. Market prices of domestic lemon oil have fluctuated considerably in response to fluctuations of supply.

U.S. exports

During 1962-68, U.S. exports fluctuated from 184,000 pounds in 1963 to 622,000 pounds in 1968 (table 2). The largest markets throughout this period were the United Kingdom, Canada, France, and Japan. U.S. lemon oil enjoys a reputation for quality in these countries. Competition comes principally from Italian (including Sicilian) lemon oil. The latter enjoys prestige on the world market and is generally higher priced than the U.S. oil.

During 1962-68, U.S. exports generally exceeded imports in both volume and aggregate value, although unit values of imports were higher than unit values of exports.

U.S. imports

U.S. imports of lemon oil rose from 57,000 pounds, valued at $301,000, in 1958 to an annual average of 356,000 pounds, valued at $1,674,000, for the period 1962-68, excluding 1963, a year in which the quantities and values of imports virtually doubled (table 3). Generally, imports have supplemented the domestic supply (especially during 1963, when substantially less fruit was processed in the United States). Moreover, imports provide unique flavor qualities preferred by some soft drink and candy manufacturers and not found in the domestic product.

Italy, consistently the largest supplier of U.S. imports of lemon oil, in 1962-68 exported 284,000 pounds, valued at $1.7 million, to the United States in 1968. Greece entered the U.S. market in 1965 with oil of relatively high unit values and supplied 76,000 pounds in 1968, when it ranked next to Italy. Other major suppliers were the United Kingdom, Switzerland, and Israel. Switzerland provided the relatively high-priced terpeneless oil, which is used primarily in perfumes.

Foreign production and trade

No statistics on world production of lemon oil are available; however, such production probably ranges from 2.5 to 3.0 million pounds a year. The United States (primarily California) and Italy

(including Sicily) supply the bulk of the world output. Spain, Israel, Cyprus, and Greece are other significant suppliers.

In recent years, Italy's annual production has been about 1.2 million pounds. This amount is exceeded only by the U.S. output. Most of Italy's output has been exported. Of the million pounds Italy exported in 1967, the largest part went to the United Kingdom, and the next largest, to the United States; lesser amounts were sold to France, West Germany, the Netherlands, Switzerland, and Spain. In recent years the United Kingdom has imported somewhat more lemon oil from Italy than from the United States.

In foreign countries, as in the United States, the amount of oil produced depends upon the fruit available for processing, which, in turn, depends both on the size of the crop and the sales. The citrus industry in these countries has been mechanized in response to the heightened demand for citrus products in Europe. The old method of handpressing lemons in Sicily has been largely discontinued in favor of various types of Italian machines which yield high-quality oil.

Israel's output of lemon oil has enjoyed a consistent market in the European Economic Community. Israel's citrus industry factories are equipped with machinery of either Israeli or American design. Exports of lemon oil from Israel were reported at 13,200 pounds in 1962, and have probably risen considerably since then.

For Spain, the export of fresh fruit is reported to be a far greater source of income than the export of fruit products. Spain's citrus oils are used mainly by the country's soft drink and confectionery industries. Total annual production of lemon oil varies greatly, depending upon weather conditions; after a frost, the fruit unfit for export is salvaged by conversion into byproducts. Annual production of lemon oil in Spain has been estimated at 24,000 to 30,000 pounds.

Table 1.--Lemon oil: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1958 and 1962-68

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Producers' shipments	Imports	Exports	Apparent consumption	Ratio (percent) of: imports to consumption	Ratio (percent) of: exports to consumption
			Quantity			
1958	1/ 1,601	57	348	1,319	4	27
1962	2/	325	609	2/	2/	2/
1963	1/ 1,583	723	184	2,122	34	9
1964	2/	294	504	2/	2/	2/
1965	2/	378	415	2/	2/	2/
1966	2/	271	445	2/	2/	2/
1967	2,600	380	488	2,492	16	20
1968	2/	489	622	2/	2/	2/
			Value			
1958	1/ 5,884	301	1,310	4,874	6	27
1962	2/	1,041	1,612	2/	2/	2/
1963	1/ 8,228	3,246	1,005	10,469	31	10
1964	2/	1,686	2,284	2/	2/	2/
1965	2/	1,481	1,860	2/	2/	2/
1966	2/	1,272	1,663	2/	2/	2/
1967	10,900	2,055	2,013	10,942	19	18
1968	2/	2,510	2,349	2/	2/	2/

1/ Shipments including interplant transfers.
2/ Not available.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Lemon oil: U.S. exports of domestic merchandise, by principal markets, 1962-68

Markets	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
United Kingdom	188	32	60	113	79	158	118
Canada	56	37	204	67	88	44	79
France	67	16	77	54	38	67	120
Japan	46	31	39	51	49	67	52
Philippines	14	6	5	5	6	9	12
Spain	29	6	5	9	7	32	75
West Germany	66	17	39	30	9	15	26
Cyprus	-	-	-	-	1/	3	14
Belgium	3	3	13	14	5	8	21
Mexico	51	10	19	13	32	12	17
Switzerland	11	8	1	1	2	8	13
Netherlands	8	3	2	3	60	9	10
Denmark	1	1	2	2	2	3	4
All other	69	14	38	53	68	53	61
Total	609	184	504	415	445	488	622
	Value (1,000 dollars)						
United Kingdom	483	137	286	453	252	674	402
Canada	171	218	1,035	385	341	261	383
France	161	79	156	169	107	149	325
Japan	120	182	227	244	276	281	245
Philippines	39	74	128	145	156	109	208
Spain	66	20	12	32	19	98	118
West Germany	122	99	92	74	36	63	106
Cyprus	-	-	-	-	2	14	72
Belgium	10	17	61	51	18	21	64
Mexico	174	52	104	85	144	68	64
Switzerland	26	39	7	5	10	31	38
Netherlands	15	19	10	13	60	67	36
Denmark	4	8	8	9	7	24	35
All other	221	61	158	194	235	153	253
Total	1,612	1,005	2,284	1,860	1,663	2,013	2,349

1/ Less than 500 pounds.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Lemon oil: U.S. imports for consumption, by principal sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
Italy	294	597	275	229	208	212	284
Greece	-	-	-	42	9	65	76
United Kingdom	2	26	-	-	-	30	20
Switzerland	1/	6	6	13	9	13	12
Israel	1	21	7	19	3	23	14
West Germany	1/	3	1/	1/	2	6	27
France	1	3	3	2	1/	1	2
Argentina	-	-	-	1	-	9	18
Canada	26	20	1	68	32	9	17
All other	1	2/ 47	2	4	8	12	19
Total	325	723	294	378	271	380	489
	Value (1,000 dollars)						
Italy	997	2,814	1,528	962	1,034	1,232	1,657
Greece	-	-	-	185	47	352	457
United Kingdom	3	67	-	-	-	174	119
Switzerland	17	64	78	143	101	128	112
Israel	1	73	30	80	13	108	54
West Germany	1	28	3/	1	8	20	43
France	2	31	31	28	3	5	18
Argentina	-	-	-	10	-	6	18
Canada	11	20	6	58	36	17	17
All other	8	2/ 149	13	14	30	13	15
Total	1,040	3,246	1,686	1,481	1,272	2,055	2,510

1/ Less than 500 pounds.

2/ Includes 28 thousand pounds, valued at 58 thousand dollars, from Bermuda and 5 thousand pounds, valued at 35 thousand dollars, from Mexico.

3/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Lime oil	452.38

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. consumption of lime oil has been supplied mostly by imports, which totaled 932,000 pounds, valued at $7 million, in 1968. There is a slowly growing domestic output, which is still small compared with U.S. imports. Exports are estimated to be small.

Description and uses

Lime oil is an essential oil obtained either by expression or by steam distillation from the peel or pulp of the fruit of trees of the species Citrus aurantifolia. Although native to Indonesia, this species has been introduced into the Western Hemisphere, where it is extensively cultivated, particularly in Florida, Mexico, and the West Indies. It also grows wild in some parts of South and Central America.

Nearly all limes are of varieties known as acid or sour limes, which are further subdivided into a group variously called Mexican, West Indian, or Key limes, and a group called Tahitian, Persian, or seedless limes. Oils obtained from both of these groups of acid limes are roughly similar in odor and other physical properties. Citral is an important constituent of both types. The sweet lime, however, differs markedly from the acid lime, and is considered a hybrid rather than a true lime; the oil obtained from it is quite unlike that obtained from acid limes. Sweet lime oil has only occasionally been produced commercially, and then it has not generally been marketed as lime oil but rather under some such designation as "Mexican bergamot oil."

Although lime oil, together with lime juice, is generally considered a byproduct, since it is processed from surplus limes which cannot be marketed as edible fruit, both the oil and the juice are commodities of considerable importance to growers. Most of the lime oil of commerce is produced by steam distillation of the juice of the crushed fruit; the relationship between the demand for juice and the demand for oil guides the manufacturer in determining the proportion of juice to be subjected to the distillation process. Lime oil is

also obtained from the peel of the fruit by expression; such oil is somewhat superior in quality to distilled oil.

The principal uses of lime oil are as a flavoring agent in bottled soft drinks--including ginger ale and the various cola types of beverages--and in candies, and as a scent in cosmetics and perfumery, particularly men's toiletries. In perfumery the more expensive expressed oil is preferred. Imitation lime oils are frequently substituted for the distilled oil; these are frequently combinations of some of the chemical constituents, either derived from natural sources or synthesized, that are found in the natural lime oil. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences - National Research Council.

U.S. tariff treatment

U.S. imports of lime oil are entered free of duty under TSUS item 452.38. The duty-free status was provided for in the original Tariff Act of 1930 under paragraph 1731 and in the TSUS, which became effective August 31, 1963; it has been bound since January 1, 1948, as a concession granted by the United States under the General Agreement on Tariffs and Trade.

U.S. consumption

In terms of quantity, annual U.S. consumption of lime oil was about three times as large in 1968 as in 1960; it is estimated to have increased in 1960-68 from slightly more than 300,000 pounds to nearly 1 million pounds. The value of the oil consumed annually increased fourfold during the same period. From 1962 to 1968, however, this increase amounted to only about 126 percent, since the growth was more rapid during the early part of the decade. Imports supplied more than 90 percent of the oil consumed domestically.

U.S. production and producers

No statistics on U.S. production of lime oil are available. Industry sources, however, estimate production in the 1960's at about 30,000 pounds a year. Lime oil is produced in the United States by four or five citrus fruit processors in Florida that obtain oil from Persian varieties of limes. One large growing and processing concern accounts for most of the production.

U.S. imports and exports

Except for a sharp decline in 1964, U.S. imports of lime oil increased steadily from 283,000 pounds, valued at $1.4 million, in 1960 to 942,000 pounds, valued at $7.1 million, in 1967, then dropped slightly in 1968 (see accompanying table). Mexico supplied the bulk of these imports--between 80 and 85 percent--and Haiti supplied most of the remainder. Lime oil from Mexico is of the distilled type, whereas that from Haiti and other West Indian sources is of both distilled and expressed types. In 1968 the value of imports of lime oil into the United States exceeded that of imports of any other essential oil.

No official statistics on exports of lime oil from the United States are available. Industry sources indicate that exports are relatively small.

Foreign production and trade

Mexico produces most of the world's supply of lime oil. Most of the Mexican output is distilled oil, although small quantities of cold-pressed oil are also produced. The oil is marketed through a cooperative regulated by the Mexican Government, which has encouraged exports through a reduction the export tax. The United States is Mexico's largest market for lime oil.

Haiti is the world's second largest producer of lime oil, and possibly the largest producer of expressed oil. Like Mexico, it ships the major share of its exports to the United States.

Many other West Indian countries, as well as Guatemala, also have commercial plantings of limes and produce lime oil for export. Limes are also grown, and lime oil is produced, in a few African countries.

Lime oil: U.S. imports for consumption, by principal sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
Mexico	543	543	213	570	587	767	744
Haiti	82	85	74	90	104	139	139
Guatemala	-	-	-	-	1/	10	18
Dominican Republic	8	9	8	13	12	18	16
Jamaica	6	4	5	-	16	-	5
Guyana	-	-	1/	1	2	2	2
All other	2/ 13	6	7	4	2	6	8
Total	652	647	307	678	723	942	932
	Value (1,000 dollars)						
Mexico	2,659	2,933	1,337	3,788	4,018	5,806	5,681
Haiti	396	454	395	564	729	992	979
Guatemala	-	-	-	-	3	70	132
Dominican Republic	36	44	45	76	72	114	116
Jamaica	28	20	28	3	137	-	41
Guyana	-	-	1	6	18	26	16
All other	2/ 74	41	65	16	20	55	38
Total	3,193	3,492	1,871	4,453	4,997	7,063	7,003

1/ Less than 500 pounds.

2/ Includes 12 thousand pounds, valued at 67 thousand dollars, from Bermuda.

Source: Compiled from official statistics of the U.S. Department of Commerce.

	TSUS item
Orange oil----------	452.44

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

In 1958, 1963, and 1967 more than half of U.S. production of orange oil was exported. In recent years, imports, consisting mostly of higher priced specialty oil varieties, have accounted for 3 to 8 percent of U.S. apparent consumption, which totaled more than 4 million pounds in 1967.

Description and uses

The term "orange oil" 1/ ordinarily refers to the oil derived from the peel of the sweet orange, the fruit of various varieties of Citrus sinensis. Bitter orange oil, which is obtained from the peel of the fruit of a related species, C. aurantium (subspecies amara 2/), is also included here. In the United States, commerce in bitter orange oil is small compared with that in sweet orange oil. The blossoms of the sweet orange tree also yield oil, known as Portugal neroli oil, and its leaves and twigs yield Portugal petitgrain oil; these oils, however, are insignificant and are not regular articles of commerce (see summaries on neroli oil, item 452.42, and petitgrain oil, item 452.56).

Orange oil derived from the peel of the sweet orange is a yellowish or orange liquid with a characteristic, fresh, sweet flavor and odor. It is a byproduct of the production of orange juice and orange juice concentrate, recovered by expression through the use of screw presses, or by steam distillation. It contains more than 90 percent of limonene; the content of other chemical constituents, as well as the color and other physical characteristics of the oil, vary with the variety of orange used (e.g., Valencia, Jaffa, temple, navel), and the geographic area in which it is grown (e.g. California, Florida, Italy). Methods of processing the peel also influence the quality of the oil. Commercial grade designations indicate whether the oil has been obtained by expression (cold-pressing) or distillation, whether

1/ Mandarin oil is obtained from the mandarin orange and is included under item 452.80.

2/ Bergamot oil, obtained from the fruit peel of a related species, is covered under item 452.06.

terpenes have been removed, or whether the oil has been concentrated, the geographical region from which the oil comes, and whether it meets the specifications of the United States Pharmacopoeia (U.S.P. XVII).

In terms of quantity, orange oil is the most important citrus essential oil.

Orange oil is widely used in the natural form to flavor foods, confectionery, nonalcoholic beverages, and liqueurs and, to a lesser extent, to mask objectionable odors in pharmaceutical preparations. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences - National Research Council. The terpeneless type, as well as some of the natural, is used to scent soaps, cosmetics, and lotions. Bitter orange oil is also used widely in liqueurs, various soft drinks, and colognes and perfumes.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1970) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
452.44	Orange oil------	12.5%ad val.	6% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1970, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, had remained unchanged from August 31, 1963 (the effective date of the TSUS), through 1967.

U.S. consumption

On the basis of statistics on total shipments and on foreign trade, annual U.S. consumption of orange oil is estimated to have been approximately 1.0 million pounds valued at $1.5 million in 1958 and approximately 2.5 million pounds valued at $1.1 million in 1963; it was estimated at about $4.3 million in 1967. The major part of this consumption was in soft drinks and other beverages. Relatively smaller quantities were used in the confection, baked goods, and pharmaceutical industries. These industries use mostly the domestic

natural expressed (cold-pressed) oil.

Imported natural and terpeneless cold-pressed oils, which at present supply only about 3 percent of consumption, are usually used in fragrances and cosmetics. Small amounts are used in beverages to supply certain specialized aromas obtainable only from varieties of fruits indigenous to specific foreign localities.

Consumption appears to be responsive to price changes. It fell sharply in 1957 and 1962, when freezing weather destroyed much of the domestic U.S. crop, resulting in diminished quantities of oranges processed into juice and concentrates and increased prices of orange oil. In contrast, low prices in 1959 and 1964 resulting from high domestic rates of production led to sharp increases in consumption.

U.S. producers

According to industry sources, the bulk of the orange oil produced in the United States is the output of about 30 citrus-processing concerns (many of small size), of which about 25 are in Florida, and the remainder, in California. Of the Florida processors, about 20 are cooperatives owned by groups of citrus growers. The oil is one of the byproducts of the production of juice and juice concentrates; other byproducts are pectin, flavanoids, citric acid, and dried citrus pulp (used for cow feed).

In Florida about three companies, including a large cooperative, are believed to account for more than half of the State's output and sales of orange oil. In California a large cooperative represents an estimated 70 percent of the output of orange oil.

In addition, terpeneless and concentrated orange oils are produced by six or eight essential-oil firms in the Metropolitan New York area. For these concerns, orange oil accounts for a small part of the value of their total operations.

U.S. production

In the last several years, between 80 and 90 percent of total U.S. production of oranges utilized for juice or concentrates have been grown in Florida, with most of the remainder grown in California and Arizona. It is presumed that production of the oil in those States was proportional to the quantities or oranges utilized there for juice or concentrates.

U.S. production of orange oil, as measured by total shipments, amounted to 3.1 million pounds, valued at $3.2 million, in 1958,

5.2 million pounds, valued at $3.0 million, in 1963, and valued at $6.6 million, in 1967 (table 1). The variations in unit value of production and thus in the price of orange oil are largely determined by variations in the available supply, in addition to certain qualitative differences. (Climatic factors frequently affect the quantities of fruit available for processing and thus, the supply of orange oil available.)

Statistics on annual U.S. production in recent years include an estimated 10,000 pounds of the higher priced terpeneless oil.

U.S. exports

U.S. exports of orange oil exceeded domestic consumption in 1958, 1963, and 1967, the only recent years for which consumption estimates can be made (table 1). Exports rose from 2.2 million pounds in 1958 to 6.0 pounds in 1967, then dropped to about 4 million pounds in 1968. The aggregate value increased and dropped correspondingly during 1958-68.

Orange oils originating in both of the major U.S. producing areas are exported, and exports include the natural, terpeneless, and concentrated types. In 1968 the largest markets were (in order of export value) Japan, the Netherlands, West Germany, and France (table 2). The average unit values of U.S. exports of orange oil to Japan in 1967 and 1968 were relatively higher than those of such exports to Europe. This higher average unit value of exports to Japan probably represents a higher preponderance of California oils and terpeneless grades sent to that market, since relatively lower priced Florida oils are marketed widely in Europe and the United Kingdom. Imports of orange oil into the European Economic Community (the largest market for U.S. orange oil) are dutiable at 12 percent ad valorem.

Annual U.S. exports during 1958-68 amounted to about 20 to more than 40 times the volume of imports (the latter in 1967).

U.S. imports

The ratio of U.S. imports of orange oil to apparent consumption was 7.7 percent in 1958, 5.4 percent in 1963, and 3.3 percent in 1967 (table 1). The volume of U.S. imports rose from 81,000 pounds in 1958 to 161,000 pounds in 1965; in 1966 and 1967 the volume declined, but rose to 271,000 pounds in 1968. U.S. imports are much smaller than either domestic production or exports.

The principal source of U.S. imports of orange oil, by value, in 1968 was Switzerland, which supplied 22,000 pounds, valued at

about $284,000 (table 3). The imports from Switzerland consisted predominantly of high-priced terpeneless oil. The Swiss oil is presumed to have been prepared from fruit grown in Spain or Sicily.

Imports are largely specialty oils, some high-priced, which have a distinctive aroma and flavor preferred by certain U.S. producers of long-established and pretige formulas for perfumes and beverages; the prices of these imports are usually higher than those of domestically produced orange oil.

Foreign production and trade

The orange tree is believed to be indigenous to southern Asia but has been introduced into countries in subtropical regions all around the world. Orange oil is produced in many of the countries in which the tree grows. Production processes vary from the primitive to the highly mechanized, depending on the industrial development of the country. Moreover, methods of collecting the oil, of transporting it to export centers, and of storing it prior to export, as well as quality control of export shipments, also vary considerably from country to country. All these factors influence the composition and quality of the oil, and the price realized by the producer. Data on world production are fragmentary; however, it is known that modern mechanization of the manufacture of juices in Sicily and Israel has benefited orange oil production in those countries. The exports from those two countries have gone predominantly to markets in Europe, particularly the countries of the Common Market. Israel's exports in 1966 were valued at $550,000, and those of Italy in 1967 at about $32,000.

Table 1.--Orange oil: U.S. producers' shipments, 1/ imports for consumption, exports of domestic merchandise, and apparent consumption, 1958 and 1963-68

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Producers' Shipments	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption	Ratio (percent) of exports to shipments
	Quantity					
1958	3,133	81	2,169	1,045	7.7	69.0
1963	5,198	133	2,850	2,481	5.4	55.0
1964	2/	132	3,335	2/	2/	2/
1965	2/	161	4,212	2/	2/	2/
1966	2/	152	4,532	2/	2/	2/
1967	2/	137	5,969	2/	2/	2/
1968	2/	271	3,997	2/	2/	2/
	Value					
1958	3,153	187	1,835	1,505	12.4	58.0
1963	3,021	346	2,298	1,069	32.3	76.0
1964	2/	349	2,331	2/	2/	2/
1965	2/	386	2,103	2/	2/	2/
1966	2/	495	3,045	2/	2/	2/
1967	6,600	505	2,765	4,340	1.2	41.9
1968	2/	554	2,560	2/	2/	2/

1/ Including interplant transfers.
2/ Not available.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Orange oil: U.S. exports of domestic merchandise, by principal markets, 1963-68

Market	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)					
Japan	569	504	520	803	749	769
Netherlands	247	307	416	441	502	502
West Germany	402	406	530	561	519	480
France	351	587	967	713	1,052	371
Switzerland	101	198	285	253	475	381
Mexico	-	-	-	-	-	134
United Kingdom	461	363	310	395	684	289
Chile	76	93	74	124	152	64
Denmark	-	-	-	-	-	136
Italy	1	73	166	69	554	99
Canada	51	133	238	208	136	76
All other	591	671	706	965	1,146	696
Total	2,850	3,335	4,212	4,532	5,969	3,997
	Value (1,000 dollars)					
Japan	625	532	444	661	620	654
Netherlands	159	164	161	256	177	226
West Germany	240	213	201	325	201	226
France	230	284	315	343	370	221
Switzerland	66	102	97	151	175	180
Mexico	-	-	-	-	-	131
United Kingdom	235	230	168	214	196	118
Chile	130	107	56	94	117	107
Denmark	-	-	-	-	-	91
Italy	1	33	66	62	149	88
Canada	69	130	106	163	113	63
All other	543	536	489	742	647	457
Total	2,298	2,331	2,103	3,045	2,765	2,560

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Orange oil: U.S. imports for consumption, by principal sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
Switzerland	3	5	7	8	17	22	22
Dominican Republic	12	14	16	21	26	22	15
France	4	14	10	2	4	2	4
West Germany	1/	1	1/	1/	1	1/	1
Italy	1/	7	13	9	11	13	15
Guinea	-	-	8	12	10	16	7
Brazil	-	-	2	1	4	-	93
Israel	-	-	-	6	12	-	59
French Guiana	-	-	6	14	2	4	8
British Honduras	-	20	13	-	15	17	22
Jamaica	53	41	44	51	39	21	15
All other	26	31	13	37	11	20	10
Total	98	133	132	161	152	137	271
	Value (1,000 dollars)						
Switzerland	57	103	111	120	243	277	284
Dominican Republic	20	28	39	69	83	79	53
France	19	52	39	10	24	22	31
West Germany	6	12	6	10	26	8	26
Italy	2/	25	42	27	18	21	24
Guinea	-	-	18	30	27	44	23
Brazil	-	-	4	6	2	-	22
Israel	-	-	-	2	4	-	22
French Guiana	-	-	14	38	6	10	20
British Honduras	-	16	10	-	11	12	17
Jamaica	17	34	36	34	37	13	12
All other	51	77	30	40	14	19	20
Total	170	347	349	386	495	505	554

1/ Less than 500 pounds.
2/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Camphor oil	452.08

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements of camphor oil. Japan, formerly the leading supplier, has not been a significant source since 1964. Imports in 1968, all from Taiwan, amounted to approximately 294,000 pounds, valued at about $114,000.

Description and uses

Camphor oil is an essential oil obtained from a variety of Cinnamomum camphora known as the Hon-Sho, or true camphor, tree. This tree grows in Japan and Taiwan. The crude oil is obtained by steam distillation of the shredded or chipped wood, roots, and branches of the tree, followed by filter-pressing to separate it from the camphor (items 493.20 and 493.21), which is sublimed at the same time. Vacuum distillation of the crude oil yields an additional 50 percent of camphor. The remaining camphor-free oil is separated into low-, medium-, and high-boiling fractions marketed as white camphor oil, brown camphor oil, and blue camphor oil, respectively.

White camphor oil, which comprises about 20 percent of the total camphor-free oil, is a nearly colorless liquid. Its principal component is cineole, but it also contains a large percentage of terpenes. It is used principally as a lacquer solvent, but also in antiseptic and disinfectant preparations and as an ingredient of artificial essential oils such as rosemary, thyme, and lavandin. Although not used itself in perfumes, it is a source of various isolates used therein.

Brown camphor oil, the most important fraction, also comprises about 20 percent of the decamphorized crude. Its principal constituent is safrole, and it contains terpineol in appreciable quantities; both are isolated and used to produce perfume materials. Safrole is used in the manufacture of heliotropin and vanillin, and directly in soap perfumes. Brown camphor oil is also the source of an artificial sassafras oil--camphor oil sassafrassy--which is used in insecticides and soaps. The brown camphor oil is also used directly as a soap perfume.

Blue camphor oil consists mainly of sesquiterpenes and sesquiterpene alcohols. Nearly all of it is used locally in the producing country, in lacquers and porcelain paints, and for scenting inexpensive soaps.

Botanical forms of C. camphora other than Hon-Sho also yield essential oils, but the trade does not consider such oils to be camphor oil. The Ho-Sho, or fragrant camphor, tree--like the true camphor tree--is widely cultivated in Japan and Formosa and grown to a limited extent in mainland China; it yields an oil marketed as Ho oil (or Shiu oil), which is included under item 452.80. This oil is further differentiated, according to the part of the tree from which it is derived, as Ho wood oil and Ho leaf oil. Like camphor oil, Japanese Ho wood oil is a fractionated oil; the Chinese product, however, is a complete oil containing camphor. The majority of the trees of the species C. camphora found in mainland China are of the botanical form known as the Yu-Sho, or camphor oil, tree. Oil distilled from the wood of this tree is marketed as apopin oil (included under item 452.80). Although containing camphor, it is not used for the isolation thereof.

Several other types of so-called camphor trees also yield essential oils somewhat similar to camphor oil, but none of the oil from these types is exported commercially.

U.S. tariff treatment

U.S. imports of camphor oil are entered free of duty under TSUS item 452.08. This duty-free status was provided for in the original Tariff Act of 1930 under paragraph 1731 and in the TSUS, which became effective August 31, 1963; it has been bound as a concession granted by the United States in the General Agreement on Tariffs and Trade. A concession was granted effective January 1, 1948, which was terminated, effective December 11, 1950; a subsequent concession was granted effective September 10, 1955.

U.S. production, consumption, and trade

U.S. consumption of camphor oil is supplied entirely by imports; there is no domestic production and consequently no exports. Annual U.S. imports averaged 354,642 pounds, valued at an average of $93,655, during 1963-68. Japan was formerly the principal source of imports, with Taiwan the only other major source. Beginning in 1964, imports from Japan declined sharply; there were no imports of camphor oil from that country in 1966 or 1968, and only insignificant imports from there in 1967 (table 1).. Imports of camphor oil into the United States are subject to U.S. Treasury Department Foreign Assets Control Regulation (31 CFR 500.204(a)(3)), which prohibits imports

of commodities which have been shipped from or through Hong Kong, Macao, or any country not in the authorized trade territory referred to in the regulation; the purpose of this regulation is to bar importation of goods originating in mainland China.

Foreign production and trade

Taiwan, the principal U.S. supplier, is also the principal world supplier of camphor oil. Production of the oil, along with that of camphor, was initiated by the Japanese many years ago when the island of Taiwan (then called Formosa) was a Japanese possession. The industry was controlled by a government monopoly which, in effect, controlled all international trade in camphor, camphor oil, and derivatives thereof. The Government of Taiwan now regulates the island's camphor industry. Taiwan's largest market for camphor oil is Japan; its second largest is the United States. France and other western European countries take most of the remainder of the exports. Statistics on exports from Taiwan in 1964-66 are given in table 2. The small discrepancy between Taiwan's exports to the United States and U.S. imports from Taiwan may be accounted for by differences in the two countries' accounting of yearend shipments.

The camphor oil industry in Japan was not developed until after the loss of Taiwan subsequent to World War II. Production is centered on Kyushu, the southernmost island. Price competition from synthetic camphor has resulted in a greatly diminished output of natural camphor and its co-product, camphor oil. According to a trade source, production of these products may be discontinued in Japan in the near future, and Taiwan will again become the sole supplier. Production of crude camphor oil in Japan is said to have declined from 841 metric tons in 1962 to 480 metric tons in 1966. The bulk of the Japanese output of camphor oil is believed to be used domestically in Japan's actively expanding toilet preparations and fragrances industries. Exports of camphor oil from Japan in 1964-67 are shown in table 3.

Table 1.--Camphor oil: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (pounds)					
Taiwan	121,532	334,462	559,396	278,377	196,730	294,493
Japan	253,725	64,000	11,250	-	2,315	-
All other	-	1/ 8,953	-	-	2/ 2,617	-
Total	375,257	407,415	570,646	278,377	201,662	294,493
	Value					
Taiwan	$23,187	$78,056	$137,482	$64,668	$63,486	$114,280
Japan	59,306	13,320	3,213	-	627	-
All other	-	1/ 1,960	-	-	2/ 2,346	-
Total	82,493	93,336	140,695	64,668	66,459	114,280

1/ Includes 6,614 pounds, valued at $1,410, from Malaysia and 2,339 pounds, valued at $550, from the Netherlands.
2/ All from Haiti.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Camphor oil: Exports from Taiwan, by principal markets, 1964-66

(In pounds) 1/

Market	1964	1965	1966
Japan	565,106	347,416	486,268
United States	315,571	545,926	269,373
France	153,656	95,224	121,403
West Germany	13,812	52,790	33,902
Argentina	-	16,801	16,497
Belgium	11,902	-	22,040
Australia	-	2,248	13,555
United Kingdom	-	13,612	13,532
New Zealand	11,240	19,263	11,240
Netherlands	4,800	2,400	9,601
All other	36,529	20,431	-
Total	1,112,616	1,116,111	997,411

1/ Converted from kilograms.

Source: Compiled from official statistics of the Inspectorate General of Customs, Taipei.

Table 3.--Camphor oil: Exports from Japan by principal markets, 1964-67

(In pounds) 1/

Market	1964	1965	1966	1967
United States	63,973	11,245	200	-
United Kingdom	9,995	19,995	-	-
France	2,700	1,322	-	-
Ryukyu	3,055	-	2,204	-
Mexico	882	1,322	-	1,322
India	75	-	-	-
Total	80,680	33,884	2,404	1,322

1/ Converted from Kilograms.

Source: Compiled from official statistics of the Ministry of Finance of Japan, as published by the Japan Tariff Association.

Commodity	TSUS item
Cedar leaf oil----------	452.14

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the chief producer and consumer of cedar leaf oil; annual consumption of this commodity probably does not exceed 75,000 pounds or a value of $450,000.

Comment

Cedar leaf oil, also known commercially as thuja oil, is a colorless to yellow or yellowish-green liquid with a characteristic balsamic, aromatic, and camphoraceous odor resembling that of sage. It is extracted by steam distillation chiefly from the ends of branches and the adherent leaves of the eastern arborvitae, Thuja occidentalis (sometimes called the eastern white cedar). Cedar leaf oil is only rarely obtained from the leaves of the red cedar, Juniperus virginiana, and there is no known production from this source in commercial quantities; however, the wood of J. virginiana is the source of cedarwood oil (item 452.80).

The most important constituent of thuja oil is thujone, which comprises about 60 percent by volume. Thujone is a somewhat poisonous material, although it is not harmful at the normal use levels of cedar leaf oil; its presence and that of fenchone give the oil its camphoraceous quality. Cedar leaf, or thuja, oil is produced primarily in the northeastern part of North America. Most of it is produced in New York State, and some, in Vermont, New Hampshire, Maine, and the Province of Quebec, Canada.

Cedar leaf oil is used principally in blends for scenting various room sprays, wick types of deodorants, disinfectants, paints, and similar preparations. It has a minor use as a flavoring agent in foods, and for this use, specifications for the oil are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences--National Research Council.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1970) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
452.14	Cedar leaf oil------	4% ad val.	Free

The duty-free treatment effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1970, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, is the rate applicable on August 31, 1963, the effective date of the TSUS.

Separate statistics on U.S. production of cedar leaf oil are not available. Production is usually a part-time occupation of farmers when they are not otherwise occupied with crops or hampered by severe weather. Distillation is carried out in portable stills, usually near the source of the raw material in the woods near a stream.

Annual U.S. consumption is estimated at 50,000 to 75,000 pounds. Most of this demand has been supplied domestically, and most of the remainder has been imported from Canada (see accompanying table). Imports from Canada were considerably larger in 1967 and 1968 than in the preceding 3-year period (see accompanying table) and showed an overall upward trend during 1964-68, probably reflecting a replacement of domestically produced cedar leaf oil by imports of Canadian origin.

U.S. exports, if any, are not separately reported.

Cedar leaf oil: U.S. imports for consumption, by sources, 1964-68 1/

Source	1964	1965	1966	1967	1968
	Quantity (pounds)				
Canada	4,518	6,812	16,500	24,885	23,676
France	440	661	-	397	-
West Germany	5	30	52	-	20
Kenya	-	-	878	-	-
Total	4,963	7,503	17,430	25,282	23,696
	Value				
Canada	$12,534	$19,486	$72,074	$123,431	$100,894
France	270	774	-	870	-
West Germany	158	189	374	-	375
Kenya	-	-	649	-	-
Total	12,962	20,449	73,097	124,301	101,269

1/ No separate statistics are available for the years before 1964.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Pine needle oil	452.58

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its domestic requirements of pine needle oil. Exports are probably negligible.

Description and uses

"Pine needle oil," as the term is used commercially, includes not only oil obtained from several species of pine trees, but also that obtained from certain firs and perhaps some spruces. In fact, the most important of the commercial pine needle oils are obtained from three species of fir--Abies sibirica, A. balsamea, and A. alba--and are often marketed as fir needle oil rather than pine needle oil. The first of these three species of Abies is distributed over wide areas of the U.S.S.R.; the second grows mainly in the Canadian Province of Quebec and in Maine; and the third is found in Bavaria, France, Switzerland, the Tirol, and Yugoslavia. Pine species from which pine needle oil is obtained include Pinus mugo, the dwarf or Swiss mountain pine found in the Bavarian, Tirolean, and Italian Alps; P. sylvestris, the Scotch or Norway pine which grows in the Tirol and Yugoslavia, as well as in Siberia; and P. cembra, the Swiss stone pine whose habitat is the same as that of P. mugo. Pine needle oil from all of these species is obtained by steam distillation from the young terminal branches and the adherent leaves (needles) of the tree.

Russian pine needle oil, derived from Abies sibirica, is the most important type and is superior in quality to pine needle oil from other sources; however, pine needle oil derived from A. alba is also highly regarded. A. balsamea furnishes most of the pine needle oil consumed in the United States.

Although oil of quality comparable to that of Russian oil could, according to industry sources, be produced from several American hemlocks and spruces, including Tsuga canadensis, there has been little or no commercial production in the United States. So-called Canadian white pine needle oil from Pinus strobus, a tree of the midwestern and northeastern United States, is rarely produced.

Pine needle oil, which is colorless to pale yellow or olive yellow, is used as a scent in toilet and shaving soaps, bath preparations, room sprays, disinfectants, and various other related products. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences--National Research Council.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1970) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1971
452.58	Pine needle oil-------	4% ad val.	2% ad val.

The rate effective January 1, 1971, represents the final reduction of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The first stage of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1970, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, had remained unchanged from August 31, 1963 (the effective date of the TSUS), through 1967. The column 2 rate of duty in the TSUS applicable to imports from Communist countries (see general headnote 3(e) in the TSUSA-1970) is the statutory rate of 25 percent ad valorem.

U.S. consumption, production, and trade

U.S. consumption is approximately equal in volume to imports since there is very little or no domestic production. There are about eight manufacturers of essential oil in the metropolitan New York area that import, process, and resell pine needle oil.

During 1963-68, annual imports averaged 70,000 pounds. In 1965 and more recent years Canada has been the largest source of imports; however, West Germany and the U.S.S.R. were larger sources in 1963 and 1964, respectively (see accompanying table). In 1968, Canada, the U.S.S.R. and West Germany accounted for 45 percent, 22 percent, and 21 percent, respectively, of the U.S. market.

Foreign production and trade

Although no statistics are available on U.S.S.R. production or exports of pine needle oil, it is known that the U.S.S.R. is the chief supplier on the world market of the superior product obtained from Abies sibirica (which is native to that country).

In Japan, large quantities of so-called pine needle oil are believed to be produced chiefly from two species of fir--Abies sachalinensis and A. mayriana--but little of this oil enters international commerce.

Statistics on exports of essential oils from Canada and West Germany do not show separate statistics on pine needle oil. It is noted, however, that in recent years the predominant part of exports of all essential oils (including pine needle oil) from Canada have entered the U.S. market, whereas only a small portion (about 2 percent) of West Germany's total exports of essential oils entered the United States. Germany's exports generally went to markets in the European Economic Community.

Pine needle oil: U.S. imports for consumption, by principal sources, 1963-68

Source	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)					
Canada	12	19	47	26	22	38
U.S.S.R	10	25	18	23	16	16
West Germany	24	13	11	14	19	17
France	3	2	5	3	1	4
Switzerland	2	2	4	3	2	2
All other	1	5	4	3	-	2
Total	52	66	89	72	60	79
	Value (1,000 dollars)					
Canada	17	34	70	41	32	59
U.S.S.R	19	49	34	40	33	29
West Germany	25	14	12	15	19	28
France	4	4	13	8	3	9
Switzerland	4	4	2	1	1	1
All other	1	11	13	12	-	6
Total	70	116	144	117	88	132

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Rosemary oil	452.62

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements of rosemary oil; the value of annual U.S. imports in 1962-68 averaged $265,000.

Comment

Rosemary oil is the volatile oil obtained by steam distillation from the leaves, twigs, and fresh flowering tops of the bushy perennial shurb Rosmarinus officinalis. This plant grows wild in Mediterranean coastal areas, particularly those of France, Spain, Yugoslavia, and northern Africa. The largest producer and principal commercial source is Spain.

The oil is colorless or pale yellow and has a minty forestlike odor which tends to be masked by a camphoraceous odor in the lower quality oils. The most important constituent of the oil is the alcohol borneol. Other significant constituents are esters occurring as bornyl acetate, and camphor, cineole, and the terpenes alpha-pinene and camphene.

The oil is marketed in the technical grade and the medicinal or National Formulary (N.F.) grade. Rosemary oil is one of the less expensive essential oils; the technical grade is used in the scenting of soap and related products. It is also used extensively in combination with other fragrances, such as citrus, lavender, and pine needle, in colognes and toilet waters. Small quantities are used to denature olive oil and alcohol. The terpeneless oil is frequently used in combination with olibanum and cinnamon bark oil in fine perfume compositions. It is also used in combination with drugs as a carminative, and in linaments. Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences - National Research Council.

U.S. imports of rosemary oil are entered free of duty under TSUS item 452.62. The duty-free status was provided for in the orig-

inal Tariff Act of 1930 under paragraph 1731 and in the TSUS, which became effective August 31, 1963; it was bound, effective January 1, 1968, as a concession granted in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade.

The United States does not produce rosemary oil and thus must import all its requirements. U.S. consumption has been relatively stable and adequately supplied by imports.

During 1962-68, annual U.S. imports averaged 195,000 pounds, valued at $265,000. The bulk of the imports came from Spain (see accompanying table). Smaller quantities of oil of higher average unit value came from France, and oil of lower average unit value came from Tunisia. The larger part of the U.S. imports from Spain are of the N.F. grade. Imports of the less expensive technical grade oil are limited in quantity.

The regions of Spain in which rosemary oil is produced are in the central and southern parts of the country, chiefly in the rocky, hilly regions of the Provinces of Murcia and Albacete. Distillation posts, which consist of several simply constructed stills, are situated in the fields near the sites of collection and near streams. At each distillation post about 100 families collect the plant material and distill out the oil. The yield of oil to plant material is less than 1 percent by volume. The oil is shipped from the stills to the Sevilla Province and other centers, where it is reprocessed, refined, and packed for overseas shipping.

According to statistics published by the Spanish chemical industry and approved by the Spanish Government, 162,780 kilos (358,116 pounds) of rosemary oil, valued at $534,750, was produced in Spain in 1965. Exports of rosemary oil are not separately classified in official Spanish statistics; however, statistics on exports of a group of eight essential oils which includes rosemary oil show that the United States is the largest market for such oils, absorbing about 30 percent of the total in 1967; the United Kingdom and France were the next largest markets, each absorbing about 20 percent of the total of the group. It is believed that a similar pattern prevails for Spanish exports of rosemary oil alone.

Although India currently consumes about 55,000 pounds of rosemary oil a year, there is no commercial production of this essential oil in that country. It is believed, however, that a quasi-governmental organization is attempting to introduce cultivation, on an experimental basis, of the plant from which the oil is derived.

Rosemary oil: U.S. imports for consumption, by principal sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
Spain	148	135	97	122	79	156	143
France	20	8	57	64	72	54	86
Tunisia	4	2	12	-	-	7	21
All other	-	-	1/ 62	2/ 17	2	-	-
Total	172	145	228	203	153	217	250
	Value (1,000 dollars)						
Spain	160	150	125	209	104	199	176
France	27	29	76	98	111	79	112
Tunisia	5	3	14	-	-	7	23
All other	-	-	1/ 116	2/ 27	5	-	-
Total	192	182	331	334	220	285	311

1/ Includes 42 thousand pounds, valued at $70 thousand dollars, from Japan and 17 thousand pounds, valued at $43 thousand dollars, from Brazil.

2/ All from Malaysia.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Thyme oil	452.66

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States imports all its requirements of thyme oil. During 1962-68 the value of annual U.S. imports of this oil averaged $50,000. The United States is the largest market for thyme oil exports from Spain, which supplies the bulk of the world demand.

Comment

Thyme oil is a colorless, yellow, brownish-red, or red liquid having a characteristic pleasant odor and a pungent taste. It contains as its most important fraction at least 40 percent of phenols, mainly thymol, although a small amount of carvacrol, an isomer of thymol, is also present. Thyme oil is distilled from the gracilis variety of the small flowering evergreen shrub Thymus zygis or from Thymus vulgaris. Most of the commercial supply is of Spanish origin and is derived from the T. zygis species, which grows wild in Spain. Thyme oil is also produced in Israel.

Thyme oil is commercially available in two grades--the slightly higher priced, more refined, redistilled white oil, and the red oil. So-called Cyprian thyme oil is actually origanum oil (item 452.46).

Thyme oil is used as a flavoring material in processed foods and sausages. Since it is an antiseptic and germicide, it is also used in medicines, and in inhalants and dental preparations; specifications for oil so used are given in the National Formulary (N.F. XII). Specifications for the oil for use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences - National Research Council. Thyme oil is also used in soaps. It is no longer used as a source of thymol (item 437.72), since the synthetic preparation of thymol is far more economical.

The United States does not produce or export thyme oil. U.S. consumption is supplied entirely by imports.

U.S. imports of thyme oil are entered free of duty under TSUS item 452.66. The duty-free status was provided for in the original

Tariff Act of 1930 under paragraph 1731, and in the TSUS, which became effective August 31, 1963; it was bound effective January 1, 1968, as a concession granted in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade.

The low volume of U.S. imports and the predominance of Spain as a source of these imports in recent years are shown in the accompanying table. Little or none of the U.S. imports from France are believed to have been produced in that country. Annual imports fluctuated considerably during 1962-68, ranging in quantity from 10,000 to 33,000 pounds, and in value from $22,000 to $95,000.

The bulk of the world supply of thyme oil originates in southeastern Spain, in the Provinces of Murcia and Almeria, and is entirely separated from the producing sections of Spanish origanum oil (see item 452.46). The thyme is tediously collected by hand during midsummer and distilled in portable field stills. The yield of oil approximates 0.7 percent of the total plant material. According to statistics published by the Spanish chemical industry, the 1965 output of thyme oil amounted to 9,575 kilos (21,065 pounds). Exports of thyme oil are not separately classified in official Spanish statistics; however, statistics on exports of a group of eight essential oils which includes thyme oil show that the United States is the largest market for such oils, absorbing about 30 percent of the total in 1967, with the United Kingdom and France next, each absorbing about 20 percent of the total of the group.

Thyme oil: U.S. imports for consumption, by principal sources, 1962-68

Year	Total		Spain		France	
	Quantity	Value	Quantity	Value	Quantity	Value
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
1962	1/ 9,672	1/ 22,104	8,962	20,369	600	1,496
1963	21,636	48,075	21,050	46,700	586	1,375
1964	10,297	26,082	9,312	23,475	985	2,607
1965	21,467	68,077	19,913	64,428	1,554	3,649
1966	16,669	50,206	16,029	48,476	640	1,730
1967	13,553	44,220	12,397	39,618	1,156	4,602
1968	2/ 32,995	2/ 95,365	22,637	69,117	6,998	13,618

1/ Includes negligible amounts from the Malagasy Republic.
2/ Includes 2,205 pounds, valued at $5,955, from Denmark and 1.155 pounds, valued at $6,675, from Italy.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Miscellaneous essential oils----	452.80

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1970) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. production supplied about 75 percent, by value, of the essential oils covered by this summary which were consumed domestically; the value of U.S. consumption in 1968 was estimated at $13.5 million.

Description and uses

More than 70 essential or distilled oils not specifically provided for elsewhere in the TSUS are covered in this summary. These oils are obtained from diverse areas of the globe and are of varying importance as perfumery and flavoring materials.

Nutmeg oil, also called myristica oil, is a colorless or pale yellow liquid derived by steam distillation from the dried kernels of the ripe seed of the common nutmeg tree, Myristica fragrans. The East Indian type grows principally in Indonesia, primarily in Sumatra, Java, and the Moluccas, and the West Indian type grows principally in the Island of Grenada in the British Windward Islands. The essential oil is produced mainly in Indonesia; it is produced in the United States in minor quantities from nutmegs imported primarily from Indonesia, the Windward Islands, and Ceylon (see summary on item 161.63 in another volume). The chief constituents of nutmeg oil, comprising 80 percent by volume, are the terpenes dextrocamphene and destropinene; among the other constituents is included the important phenolic ester myristicin (about 4 percent). Nutmeg oil is listed in the National Formulary (N.F. XII), and specifications for its use as a flavoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences--National Research Council. Nutmeg oil has been widely used as a flavor in numerous food products. Small quantities are used in perfumery, cosmetics, and soaps, and as an ingredient in medicinal preparations.

Among the more important oils included in this summary are the following:

Name of oil	Botanical origin	Principal geographic source	Principal uses
Amyris (formerly also called West Indian sandalwood oil).	Wood of Amyris balsamifera.	Haiti	Perfume fixative, in soap and low-priced cosmetics. 1/
Basil----------	Flowering tops or entire plant of Ocimum basilicum.	France, Reunion, Comoro Islands.	Baked goods, confectionery, meat; 1/ soap perfume.
Bay (Myrcia)-----	Leaves of Pimenta racemosa.	Dominica, Puerto Rico, Virgin Islands.	Antiseptic; lotions and hair tonics. 1/
Cedarwood--------	Wood of Juniperus virginiana and other Juniperus species.	United States	Fixative in perfume; soap; with microscope lenses.
Clary sage-------	Flowering tops and leaves of Salvia sclarea.	U.S.S.R., Hungary, France,	Toilet water; cosmetics; soap; food flavor. 1/
Coriander--------	Fruit (seed) of Coriandrum sativum.	U.S.S.R., Hungary, Poland, Rumania, Czecho-slovakia.	Condiments, bakery goods, beverages; 1/ pharmaceuticals.
Ho (see summary on item 452.08)	Leaves and wood of Cinnamomum camphora.	Taiwan, Japan	Perfume; for isolation of linalool; substituted for bois de rose oil.
Mandarin---------	Peel of Citrus reticulata (sometimes called C. nobilis).	Italy, Spain	Beverages, candy and liqueurs; 1/ perfume.

See footnote at end of table.

Name of oil	Botanical origin	Principal geographical source	Principal uses
Ocotea cymbarum (also called O. pretiosa).	Wood of tree Ocotea cymbarum.	Brazil	For isolation of safrole; in soaps; sprays; substituted for camphor oil.
Pimenta leaf----	Leaves of Pimenta officinalis.	West Indies, mainly Jamaica.	Flavoring agent; 1/ perfume material; for isolation of eugenol.
Pine----------	Wood of Pinus palustris.	United States	Deodorants, disinfectants, soap, insecticides; mining industry; solvent and wetting agent.
Sage----------	Leaves of Salvia officinalis.	Yugoslavia, Italy.	Sauces, meat, canned goods. 1/
Spearmint-------	Leaves and stems of Mentha spicata.	United States, Germany, United Kingdom, U.S.S.R.	Food, candy, chewing gum, mouthwashes, toothpaste. 1/

1/ Specifications for the oil for use as a falvoring agent in foods are published in the Food Chemicals Codex, 1966, of the National Academy of Sciences - National Research Council.

All the oils shown in the tabulation above are obtained by steam distillation, with the exception of mandarin oil, which is expressed.

In addition to the oils listed above, many other essential oils of small commercial importance which are used in foods, pharmaceuticals, and perfumary of various types are included in this summary. Among these are oils of wormseed (also called chenopodium), American pennyroyal, sassafras, dillweed, erigeron, and tansy, which are largely products (though minor) of the United States; oils of costus, angelica root and seed, chamomile, celery seed, and galbanum, all largely products of France; oils of marjoram, European pennyroyal, and Spanish sage, which are products of Spain; oil of cardamon, from Ceylon; and oil of guaiacwood, from Paraguay. Included also are onion oil, from Belgium, and garlic oil, from Italy.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1970) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1969
452.80	Miscellaneous essential oils.	4% ad val.	3% ad val.

The rate became effective in the second stage (calendar year 1969) of staged rate reductions of a concession granted by the United States in the sixth (Kennedy) round of trade negotiations under the General Agreement on Tariffs and Trade. The first stage of the reduction became operative January 1, 1968. Further reductions scheduled for this item have not become effective. See footnote 1 to Staged Rates and Historical Notes to part 5 of schedule 4 of the TSUSA-1970 as shown in appendix A to this volume. The rate shown above as existing prior to January 1, 1968, had remained unchanged from August 31, 1963 (the effective date of the TSUS), through 1967. The trade agreement rate does not apply to products from Communist countries, and the rate of 25 percent ad valorem is applicable to such imports.

U.S. consumption

U.S. consumption in 1968 of the essential oils covered herein valued at an estimated $13.5 million, of which about 75 percent was accounted for by domestic production; the remainder represented imports. Spearmint oil and pine oil accounted for $3.6 million and $5.5 million, respectively, representing in the aggregate an increase over the total for both oils of about $6.8 million estimated for the year 1963. The increase was mainly accounted for by the rise in production and consumption of spearmint oil.

U.S. production

In 1968, as in previous years, pine oil and spearmint oil constituted the vast bulk of the total (estimated at 75 million pounds) of the domestic production of miscellaneous essential oils. In that year, production of cedarwood, sassafras, and wormseed oils together approximated 850,000 pounds, valued at an estimated $1 million. Minor amounts of oils of dillweed, tansy, erigeron and American pennyroyal are also produced domestically.

About 80 percent of the natural pine oil produced in the United States originates in Georgia and Florida, and the remainder, in

Louisiana and the South Atlantic States; eight companies produce natural pine oil in about 12 plants. On the basis of statistics on production of pine oil (including both synthetic and natural) which were published by the Department of Agriculture, annual output increased from about 232,000 barrels (11,600,000 gallons) to about 289,000 barrels (14,450,000 gallons) during 1962-68. As reported by the U.S. Department of Commerce, production of natural pine oil in 1963 and 1967 was as follows:

Year	Quantity (1,000,000 pounds)	Value (1,000,000 dollars)
1963	64.8	8.4
1967	72.0	10.2

U.S. production of spearmint oil rose rapidly from 1964 until 1967, following a decline (see tabulation below), as reported in official statistics of the Department of Agriculture. In 1967, 88 percent of U.S.-produced spearmint oil originated in the State of Washington, and the remainder in Indiana and Michigan. In 1968, production, again predominantly from Washington, dropped, but rose again in 1969. U.S. production of spearmint oil in 1962-69, compiled from statistics of the U.S. Department of Agriculture is as follows:

Year	Quantity (1,000 pounds)	Value (1,000 dollars)
1962	1,123	3,183
1963	707	2,166
1964	486	1,786
1965	578	2,865
1966	1,050	6,012
1967	1,632	8,971
1968	1,383	7,807
1969	1,752	8,442

U.S. exports

Except for pine oil and spearmint oil, separate statistics are not available on U.S. exports of the essential oils covered by this summary; these oils are included in a broad export class which includes various other essential oils and resinoids not covered herein. It is assumed, however, that of the total value of exports of the products covered here, exports of pine oil and those of spearmint oil together accounted for the predominant part.

Exports of pine oil, as reported in official statistics, consist of the naturally derived type. Such exports rose irregularly from 2.8 million gallons, valued at $2.8 million, in 1962 to 4.1 million gallons, valued at $4.8 million, in 1968 (table 1). Among the many markets for these exports, Canada, the United Kingdom, and Brazil were foremost. Exports to Brazil, and those to Mexico as well, grew rapidly during 1962-68.

U.S. exports of spearmint oil were first reported separately in official statistics in 1968. They were formerly included in a class described as "mint oil, except peppermint"; it is assumed, however, that virtually all exports under this class were spearmint oil. As shown in table 2, exports of spearmint oil rose irregularly from 446,000 pounds, valued at $1.9 million, in 1962 to 589,000 pounds, valued at $4.2 million, in 1968. The United Kingdom was the most important market. Exports to Japan, the second largest market, grew rapidly during 1962-68.

U.S. exports of cedarwood oil are believed to have an approximate value of $500,000 a year.

U.S. imports

The average annual value of U.S. imports of the various essential oils covered herein rose to $3.4 million during the 4-year period 1965-68, from about $2 million for the preceding 3 years. (Data on imports of such oils in 1962-68 are shown in table 3).

An analysis of official documents of the U.S. Bureau of Customs for June through December 1967 indicated that nutmeg oil from Indonesia was the essential oil covered by this summary which had the largest dollar value of imports. In 1968, the first year in which imports of nutmeg oil were separately reported, they amounted to 139 thousand pounds, valued at $610 thousand; virtually all came from Indonesia. Among the many other oils imported are highly specialized flavoring materials, such as onion oil and garlic oil. Imports of onion oil and garlic oil during June-December 1967 were less than $10 thousand and $15 thousand, respectively; the former came mainly from Belgium, and the latter, mainly from Italy.

The most important imports (in terms of estimated value) of the more than 70 oils represented in the analysis referred to above were as follows:

Item	Estimated value (1,000 dollars)	Chief source
Nutmeg oil	226	Indonesia
Ocotea cymbarum oil	187	Brazil
Pimenta leaf oil	85	Jamaica
Bay oil	72	Dominica
Amyris oil	67	Haiti
Sage oil	61	Italy
Coriander oil	50	France
Basil oil	47	Comoro Islands
Clary sage oil	43	France
Mandarin oil	33	Italy
Spearmint oil	26	Holland
Costus oil	22	France

Spearmint oil is the only import of relative importance included under this item which competes directly with an important essential oil produced in the United States; however, the ratio of imported to domestically produced spearmint oil is estimated at only 3 percent, by value.

Foreign production and trade

Data on foreign production of the oils covered herein are too fragmentary to be useful in arriving at an estimate of world production.

Oil of ocotea cymbarum, or Brazilian sassafras oil, is one of the most important of the oils covered herein which is primarily produced outside the United States. Virtually all of the world supply of this essential oil is produced in Brazil, which, according to official statistics of Brazil, exported 794,000 kilograms, or about 1.7 million pounds, valued at $544,343, in 1967. Of these exports, 56 percent, by value, went to the United States and 24 percent, by value, were shipped to France. The bulk of the remainder went to other European countries.

Table 1.--Pine oil, natural: U.S. exports of domestic merchandise, by principal markets, 1962-68

Market	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 gallons)						
Canada	468	424	597	531	574	791	767
United Kingdom	556	472	628	986	889	579	576
Brazil	44	34	66	87	183	264	433
Venezuela	108	94	222	218	255	253	350
Australia	419	307	390	355	343	321	344
Netherlands	245	229	292	198	278	83	298
Mexico	11	7	166	236	251	415	188
Chile	110	74	72	163	124	189	186
Argentina	36	38	78	118	137	99	150
South Africa	91	92	129	118	191	178	142
Peru	106	83	69	120	81	47	93
Colombia	32	47	34	31	72	23	90
Portugal	6	4	6	3	1	5	61
France	87	9	18	14	31	14	36
New Zealand	93	68	44	51	88	49	46
Sweden	11	19	30	31	14	11	42
Congo	16	2	30	52	49	8	35
Costa Rica	6	12	13	10	20	20	27
All other	376	413	576	555	514	427	232
Total	2,821	2,428	3,460	3,877	4,095	3,776	4,096
	Value (1,000 dollars)						
Canada	461	426	579	516	552	803	780
United Kingdom	483	404	545	728	869	613	598
Brazil	57	44	81	105	223	350	563
Venezuela	127	108	257	265	317	333	350
Australia	405	290	385	370	378	361	367
Netherlands	215	206	255	205	306	97	334
Mexico	14	10	183	275	302	519	233
Chile	129	88	88	189	142	198	222
Argentina	44	46	91	141	162	121	196
South Africa	102	96	130	132	215	186	195
Peru	116	89	78	132	94	60	120
Colombia	39	54	41	38	88	29	113
Portugal	6	4	7	3	2	6	67
France	38	9	20	17	57	23	62
New Zealand	107	68	47	52	97	55	57
Sweden	12	21	32	35	16	12	50
Congo	14	2	33	56	53	10	44
Costa Rica	8	13	17	14	25	30	37
All other	384	408	539	541	538	486	435
Total	2,761	2,386	3,408	3,864	4,436	4,292	4,823

Source: Compiled from official statistics of the U.S. Department of Commerce.

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Table 2.--Spearmint oil: 1/ U.S. exports of domestic merchandise, by principal markets, 1962-68

Market	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
United Kingdom	154	147	135	154	110	82	138
Japan	34	30	64	132	68	105	99
France	38	45	65	53	29	42	72
Italy	9	8	9	11	25	39	53
Canada	30	30	37	22	33	45	47
Mexico	27	16	34	23	21	44	34
Brazil	26	20	15	20	24	12	31
Australia	35	34	36	29	19	16	27
West Germany	15	6	26	20	30	22	18
Netherlands	9	4	7	19	15	11	13
Republic of South Africa	10	4	5	7	5	5	7
Hong Kong	3	4	9	7	10	5	8
All other	56	62	70	58	62	60	42
Total	446	410	512	555	451	480	589
	Value (1,000 dollars)						
United Kingdom	634	560	576	861	671	599	988
Japan	154	141	327	680	489	681	691
France	155	155	229	265	159	281	502
Italy	34	27	38	54	223	311	359
Canada	128	150	169	122	202	253	346
Mexico	131	53	143	136	122	242	235
Brazil	117	73	48	76	166	98	220
Australia	166	154	155	133	117	122	198
West Germany	55	26	85	91	195	185	127
Netherlands	37	16	25	98	93	66	88
Republic of South Africa	62	20	27	50	25	55	60
Hong Kong	11	9	35	22	65	44	54
All other	230	203	216	209	239	259	295
Total	1,914	1,587	2,073	2,797	2,816	3,196	4,163

1/ Reported as "Mint oils, except peppermint" during 1962-67.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Miscellaneous essential oils: U.S. imports for consumption, by principal sources, 1962-68

Source	1962	1963	1964	1965	1966	1967	1968
	Quantity (1,000 pounds)						
France	83	60	64	49	45	43	58
Indonesia	14	32	54	81	112	86	149
Brazil	1	342	957	1,435	1,245	1,103	1,432
Italy	12	26	40	36	23	53	28
Jamaica	58	40	56	69	54	62	56
Leeward and Windward Islands	21	25	21	15	21	24	27
Yugoslavia	29	19	14	25	34	27	33
U.S.S.R	5	15	7	20	26	21	27
Netherlands	1	5	12	10	13	17	8
Haiti	80	42	61	67	227	107	86
All other	200	269	197	312	234	261	239
Total	509	910	1,550	2,151	2,049	1,827	2,161
	Value (1,000 dollars)						
France	640	664	747	724	754	601	762
Indonesia	57	113	110	446	767	420	654
Brazil	1	103	313	569	480	376	564
Italy	52	115	153	133	144	229	212
Jamaica	110	96	138	207	183	186	158
Leeward and Windward Islands	62	75	60	74	104	128	132
Yugoslavia	109	83	71	149	148	97	126
U.S.S.R	38	90	36	67	121	96	100
Netherlands	13	13	71	44	94	107	87
Haiti	72	47	51	70	255	96	78
All other	333	478	616	855	631	558	459
Total	1,496	2,029	2,400	3,436	3,753	3,022	3,392

Source: Compiled from official statistics of the U.S. Department of Commerce.

A P P E N D I X A

Tariff Schedules of the United States Annotated (1970): General headnotes and rules of interpretation, and excerpts relating to the items included in this volume.

Note: The shaded areas in this appendix cover headnotes and TSUS items not pertaining to summaries in this volume.

GENERAL HEADNOTES AND RULES OF INTERPRETATION

1. Tariff Treatment of Imported Articles. All articles imported into the customs territory of the United States from outside thereof are subject to duty or exempt therefrom as prescribed in general headnote 3.

2. Customs Territory of the United States. The term "customs territory of the United States", as used in the schedules, includes only the States, the District of Columbia, and Puerto Rico.

3. Rates of Duty. The rates of duty in the "Rates of Duty" columns numbered 1 and 2 of the schedules apply to articles imported into the customs territory of the United States as hereinafter provided in this headnote:

(a) Products of Insular Possessions.

(i) Except as provided in headnote 6 of schedule 7, part 2, subpart E, [and] except as provided in headnote 4 of schedule 7, part 7, subpart A, articles imported from insular possessions of the United States which are outside the customs territory of the United States are subject to the rates of duty set forth in column numbered 1 of the schedules, except that all such articles the growth or product of any such possession, or manufactured or produced in any such possession from materials the growth, product, or manufacture of any such possession or of the customs territory of the United States, or of both, which do not contain foreign materials to the value of more than 50 percent of their total value, coming to the customs territory of the United States directly from any such possession, and all articles previously imported into the customs territory of the United States with payment of all applicable duties and taxes imposed upon or by reason of importation which were shipped from the United States, without remission, refund, or drawback of such duties or taxes, directly to the possession from which they are being returned by direct shipment, are exempt from duty.

(ii) In determining whether an article produced or manufactured in any such insular possession contains foreign materials to the value of more than 50 percent, no material shall be considered foreign which, at the time such article is entered, may be imported into the customs territory from a foreign country, other than Cuba or the Philippine Republic, and entered free of duty.

(b) Products of Cuba. Products of Cuba imported into the customs territory of the United States, whether imported directly or indirectly, are subject to the rates of duty set forth in column numbered 1 of the schedules. Preferential rates of duty for such products apply only as shown in the said column 1. 1/

(c) Products of the Philippine Republic.

(i) Products of the Philippine Republic imported into the customs territory of the United States, whether imported directly or indirectly, are subject to the rates of duty which are set forth in column numbered 1 of the schedules or to fractional parts of the rates in the said column 1, as hereinafter prescribed in subdivisions (c)(ii) and (c)(iii) of this headnote.

(ii) Except as otherwise prescribed in the schedules, a Philippine article, as defined in subdivision (c)(iv) of this headnote, imported into the customs territory of the United States and entered on or before July 3, 1974, is subject to that rate which results from the application of the following percentages to the most favorable rate of duty (i.e., including a preferential rate prescribed for any product of Cuba) set forth in column numbered 1 of the schedules:

(A) 20 percent, during calendar years 1963 through 1964,

(B) 40 percent, during calendar years 1965 through 1967,

(C) 60 percent, during calendar years 1968 through 1970,

(D) 80 percent, during calendar years 1971 through 1973,

(E) 100 percent, during the period from January 1, 1974, through July 3, 1974.

(iii) Except as otherwise prescribed in the schedules, products of the Philippine Republic, other than Philippine articles, are subject to the rates of duty (except any preferential rates prescribed for products of Cuba) set forth in column numbered 1 of the schedules.

(iv) The term "Philippine article", as used in the schedules, means an article which is the product of the Philippines, but does not include any article produced with the use of materials imported into the Philippines which are products of any foreign country (except materials produced within the customs territory of the United States) if the aggregate value of such imported materials when landed at the Philippine port of entry, exclusive of any landing cost and Philippine duty, was more than 20 percent of the appraised customs value of the article imported into the customs territory of the United States.

(d) Products of Canada.

(i) Products of Canada imported into the customs territory of the United States, whether imported directly or indirectly, are subject to the rates of duty set forth in column numbered 1 of the schedules. The rates of duty for a Canadian article, as defined in subdivision (d)(ii) of this headnote, apply only as shown in the said column numbered 1.

(ii) The term "Canadian article", as used in the schedules, means an article which is the product of Canada, but does not include any article produced with the use of materials imported into Canada which are products of any foreign country (except materials produced within the customs territory of the United States), if the aggregate value of such imported materials when landed at the Canadian port of entry (that is, the actual purchase price, or if not purchased, the export value, of such materials, plus, if not included therein, the cost of transporting such materials to Canada but exclusive of any landing cost and Canadian duty) was --

(A) with regard to any motor vehicle or automobile truck tractor entered on or before December 31, 1967, more than 60 percent of the appraised value of the article imported into the customs territory of the United States; and

(B) with regard to any other article (including any motor vehicle or automobile truck tractor entered after December 31, 1967), more than 50 percent of the appraised value of the article imported into the customs territory of the United States.

(e) Products of Communist Countries. Notwithstanding any of the foregoing provisions of this headnote, the rates of duty shown in column numbered 2 shall apply to products, whether imported directly or indirectly, of the following countries and areas pursuant to section 401 of the Tariff Classification Act of 1962, to section 231 or 257(e)(2) of the Trade Expansion Act of 1962, or to

1/ By virtue of section 401 of the Tariff Classification Act of 1962, the application to products of Cuba of either a preferential or other reduced rate of duty in column 1 is suspended. See general headnote 3(e), infra. The provisions for preferential Cuban rates continue to be reflected in the schedules because, under section 401, the rates therefor in column 1 still form the bases for determining the rates of duty applicable to certain products, including "Philippine articles".

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action taken by the President thereunder:
Albania
Bulgaria
China (any part of which may be under Communist domination or control)
Cuba 1/
Czechoslovakia
Estonia
Germany (the Soviet zone and the Soviet sector of Berlin)
Hungary
Indochina (any part of Cambodia, Laos, or Vietnam which may be under Communist domination or control)
Korea (any part of which may be under Communist domination or control)
Kurile Islands
Latvia
Lithuania
Outer Mongolia
Rumania
Southern Sakhalin
Tanna Tuva
Tibet
Union of Soviet Socialist Republics and the area in East Prussia under the provisional administration of the Union of Soviet Socialist Republics.

(f) Products of All Other Countries. Products of all countries not previously mentioned in this headnote imported into the customs territory of the United States are subject to the rates of duty set forth in column numbered 1 of the schedules.

(g) Effective Date; Exceptions - Staged Rates of Duty. 2/ Except as specified below or as may be specified elsewhere, pursuant to section 501(a) of the Tariff Classification Act of 1962 (P.L. 87-456, approved May 24, 1962), the rates of duty in columns numbered 1 and 2 become effective with respect to articles entered on or after the 10th day following the date of the President's proclamation provided for in section 102 of the said Act. If, in column numbered 1, any rate of duty or part thereof is set forth in parenthesis, the effective date shall be governed as follows:

(i) If the rate in column numbered 1 has only one part (i.e., 8¢ (10¢) per lb.), the parenthetical rate (viz., 10¢ per lb.) shall be effective as to articles entered before July 1, 1964, and the other rate (viz., 8¢ per lb.) shall be effective as to articles entered on or after July 1, 1964.

(ii) If the rate in column numbered 1 has two or more parts (i.e., 5¢ per lb. + 50% ad val.) and has a parenthetical rate for either or both parts, each part of the rate shall be governed as if it were a one-part rate. For example, if a rate is expressed as "4¢ (4.5¢) per lb. + 8% (9%) ad val.", the rate applicable to articles entered before July 1, 1964, would be "4.5¢ per lb. + 9% ad val."; the rate applicable to articles entered on or after July 1, 1964, would be "4¢ per lb. + 8% ad val.".

(iii) If the rate in column numbered 1 is marked with an asterisk (*), the foregoing provisions of (i) and (ii) shall apply except that "January 1, 1964" shall be substituted for "July 1, 1964", wherever this latter date appears.

1/ In Proclamation 3447, dated February 3, 1962, the President, acting under authority of section 620(a) of the Foreign Assistance Act of 1961 (75 Stat. 445), as amended, prohibited the importation into the United States of all goods of Cuban origin and all goods imported from or through Cuba, subject to such exceptions as the Secretary of the Treasury determines to be consistent with the effective operation of the embargo.

2/ The purpose of headnote 3(g) was to provide for an effective date for the rates of duty initially contained in the Tariff Schedules of the United States. By Presidential Proclamation 3548 of August 21, 1963, these rates of duty, except as noted in subparagraphs (i), (ii), and (iii) of headnote 3(g), became effective on August 31, 1963.

4. Modification or Amendment of Rates of Duty. Except as otherwise provided in the Appendix to the Tariff Schedules --

(a) a statutory rate of duty supersedes and terminates the existing rates of duty in both column numbered 1 and column numbered 2 unless otherwise specified in the amending statute;

(b) a rate of duty proclaimed pursuant to a concession granted in a trade agreement shall be reflected in column numbered 1 and, if higher than the then existing rate in column numbered 2, also in the latter column, and shall supersede but not terminate the then existing rate (or rates) in such column (or columns);

(c) a rate of duty proclaimed pursuant to section 336 of the Tariff Act of 1930 shall be reflected in both column numbered 1 and column numbered 2 and shall supersede but not terminate the then existing rates in such columns; and

(d) whenever a proclaimed rate is terminated or suspended, the rate shall revert, unless otherwise provided, to the next intervening proclaimed rate previously superseded but not terminated or, if none, to the statutory rate.

5. Intangibles. For the purposes of headnote 1 --
(a) corpses, together with their coffins and accompanying flowers,
(b) currency (metal or paper) in current circulation in any country and imported for monetary purposes,
(c) electricity,
(d) securities and similar evidences of value, and
(e) vessels which are not "yachts or pleasure boats" within the purview of subpart D, part 6, of schedule 6,
are not articles subject to the provisions of these schedules.

6. Containers or Holders for Imported Merchandise. For the purposes of the tariff schedules, containers or holders are subject to tariff treatment as follows:

(a) Imported Empty: Containers or holders if imported empty are subject to tariff treatment as imported articles and as such are subject to duty unless they are within the purview of a provision which specifically exempts them from duty.

(b) Not Imported Empty: Containers or holders if imported containing or holding articles are subject to tariff treatment as follows:

(i) The usual or ordinary types of shipping or transportation containers or holders, if not designed for, or capable of, reuse, and containers of usual types ordinarily sold at retail with their contents, are not subject to treatment as imported articles. Their cost, however, is, under section 402 or section 402a of the tariff act, a part of the value of their contents and if their contents are subject to an ad valorem rate of duty such containers or holders are, in effect, dutiable at the same rate as their contents, except that their cost is deductible from dutiable value upon submission of satisfactory proof that they are products of the United States which are being returned without having been advanced in value or improved in condition by any means while abroad.

(ii) The usual or ordinary types of shipping or transportation containers or holders, if designed for, or capable of, reuse, are subject to treatment as imported articles separate and distinct from their contents. Such holders or containers are not part of the dutiable value of their contents and are separately subject to duty upon each and every importation into the customs territory of the United States unless within the scope of a provision specifically exempting them from duty.

(iii) In the absence of context which requires otherwise, all other containers or holders are subject to the same treatment as specified in (ii) above for usual or ordinary types of shipping or transportation containers or holders designed for, or capable of, reuse.

7. Commingling of Articles. (a) Whenever articles subject to different rates of duty are so packed together or mingled that the quantity or value of each class of articles cannot be readily ascertained by customs officers (without physical segregation of the shipment or the contents of any entire package thereof), by one or more of the following means:

(i) sampling,

(ii) verification of packing lists or other documents filed at the time of entry, or

(iii) evidence showing performance of commercial settlement tests generally accepted in the trade and filed in such time and manner as may be prescribed by regulations of the Secretary of the Treasury,

the commingled articles shall be subject to the highest rate of duty applicable to any part thereof unless the consignee or his agent segregates the articles pursuant to subdivision (b) hereof.

(b) Every segregation of articles made pursuant to this headnote shall be accomplished by the consignee or his agent at the risk and expense of the consignee within 30 days (unless the Secretary authorizes in writing a longer time) after the date of personal delivery or mailing, by such employee as the Secretary of the Treasury shall designate, of written notice to the consignee that the articles are commingled and that the quantity or value of each class of articles cannot be readily ascertained by customs officers. Every such segregation shall be accomplished under customs supervision, and the compensation and expenses of the supervising customs officers shall be reimbursed to the Government by the consignee under such regulations as the Secretary of the Treasury may prescribe.

(c) The foregoing provisions of this headnote do not apply with respect to any part of a shipment if the consignee or his agent furnishes, in such time and manner as may be prescribed by regulations of the Secretary of the Treasury, satisfactory proof --

(i) that such part (A) is commercially negligible, (B) is not capable of segregation without excessive cost, and (C) will not be segregated prior to its use in a manufacturing process or otherwise, and

(ii) that the commingling was not intended to avoid the payment of lawful duties.

Any article with respect to which such proof is furnished shall be considered for all customs purposes as a part of the article, subject to the next lower rate of duty, with which it is commingled.

(d) The foregoing provisions of this headnote do not apply with respect to any shipment if the consignee or his agent shall furnish, in such time and manner as may be prescribed by regulations of the Secretary of the Treasury, satisfactory proof --

(i) that the value of the commingled articles is less than the aggregate value would be if the shipment were segregated;

(ii) that the shipment is not capable of segregation without excessive cost and will not be segregated prior to its use in a manufacturing process or otherwise; and

(iii) that the commingling was not intended to avoid the payment of lawful duties.

Any merchandise with respect to which such proof is furnished shall be considered for all customs purposes to be dutiable at the rate applicable to the material present in greater quantity than any other material.

(e) The provisions of this headnote shall apply only in cases where the schedules do not expressly provide a particular tariff treatment for commingled articles.

8. Abbreviations. In the schedules the following symbols and abbreviations are used with the meanings respectively indicated below:

$	-	dollars
¢	-	cents
%	-	percent
+	-	plus
ad val.	-	ad valorem
bu.	-	bushel
cu.	-	cubic
doz.	-	dozen
ft.	-	feet
gal.	-	gallon
in.	-	inches
lb.	-	pounds
oz.	-	ounces
sq.	-	square
wt.	-	weight
yd.	-	yard
pcs.	-	pieces
prs.	-	pairs
lin.	-	linear
I.R.C.	-	Internal Revenue Code

9. Definitions. For the purposes of the schedules, unless the context otherwise requires --

(a) the term "entered" means entered, or withdrawn from warehouse, for consumption in the customs territory of the United States;

(b) the term "entered for consumption" does not include withdrawals from warehouse for consumption;

(c) the term "withdrawn for consumption" means withdrawn from warehouse for consumption and does not include articles entered for consumption;

(d) the term "rate of duty" includes a free rate of duty; rates of duty proclaimed by the President shall be referred to as "proclaimed" rates of duty; rates of duty enacted by the Congress shall be referred to as "statutory" rates of duty; and the rates of duty in column numbered 2 at the time the schedules become effective shall be referred to as "original statutory" rates of duty;

(e) the term "ton" means 2,240 pounds, and the term "short ton" means 2,000 pounds;

(f) the terms "of", "wholly of", "almost wholly of", "in part of" and "containing", when used between the description of an article and a material (e.g., "furniture of wood", "woven fabrics, wholly of cotton", etc.), have the following meanings:

(i) "of" means that the article is wholly or in chief value of the named material;

(ii) "wholly of" means that the article is, except for negligible or insignificant quantities of some other material or materials, composed completely of the named material;

(iii) "almost wholly of" means that the essential character of the article is imparted by the named material, notwithstanding the fact that significant quantities of some other material or materials may be present; and

(iv) "in part of" or "containing" mean that the article contains a significant quantity of the named material.

With regard to the application of the quantitative concepts specified in subparagraphs (ii) and (iv) above, it is intended that the de minimis rule apply.

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10. General Interpretative Rules. For the purposes of these schedules --

(a) the general, schedule, part, and subpart headnotes, and the provisions describing the classes of imported articles and specifying the rates of duty or other import restrictions to be imposed thereon are subject to the rules of interpretation set forth herein and to such other rules of statutory interpretation, not inconsistent therewith, as have been or may be developed under administrative or judicial rulings;

(b) the titles of the various schedules, parts, and subparts and the footnotes therein are intended for convenience in reference only and have no legal or interpretative significance;

(c) an imported article which is described in two or more provisions of the schedules is classifiable in the provision which most specifically describes it; but, in applying this rule of interpretation, the following considerations shall govern:

(i) a superior heading cannot be enlarged by inferior headings indented under it but can be limited thereby;

(ii) comparisons are to be made only between provisions of coordinate or equal status, i.e., between the primary or main superior headings of the schedules or between coordinate inferior headings which are subordinate to the same superior heading;

(d) if two or more tariff descriptions are equally applicable to an article, such article shall be subject to duty under the description for which the original statutory rate is highest, and, should the highest original statutory rate be applicable to two or more of such descriptions, the article shall be subject to duty under that one of such descriptions which first appears in the schedules;

(e) in the absence of special language or context which otherwise requires --

(i) a tariff classification controlled by use (other than actual use) is to be determined in accordance with the use in the United States at, or immediately prior to, the date of importation, of articles of that class or kind to which the imported articles belong, and the controlling use is the chief use, i.e., the use which exceeds all other uses (if any) combined;

(ii) a tariff classification controlled by the actual use to which an imported article is put in the United States is satisfied only if such use is intended at the time of importation, the article is so used, and proof thereof is furnished within 3 years after the date the article is entered;

(f) an article is in chief value of a material if such material exceeds in value each other single component material of the article;

(g) a headnote provision which enumerates articles not included in a schedule, part, or subpart is not necessarily exhaustive, and the absence of a particular article from such headnote provision shall not be given weight in determining the relative specificity of competing provisions which describe such article;

(h) unless the context requires otherwise, a tariff description for an article covers such article, whether assembled or not assembled, and whether finished or not finished;

(ij) a provision for "parts" of an article covers a product solely or chiefly used as a part of such article, but does not prevail over a specific provision for such part.

11. Issuance of Rules and Regulations. The Secretary of the Treasury is hereby authorized to issue rules and regulations governing the admission of articles under the provisions of the schedules. The allowance of an importer's claim for classification, under any of the provisions of the schedules which provide for total or partial relief from duty or other import restrictions on the basis of facts which are not determinable from an examination of the article itself in its condition as imported, is dependent upon his complying with any rules or regulations which may be issued pursuant to this headnote.

12. The Secretary of the Treasury is authorized to prescribe methods of analyzing, testing, sampling, weighing, gauging, measuring, or other methods of ascertainment whenever he finds that such methods are necessary to determine the physical, chemical, or other properties or characteristics of articles for purposes of any law administered by the Customs Service.

General statistical headnotes:

1. Statistical Requirements for Imported Articles. Persons making customs entry or withdrawal of articles imported into the customs territory of the United States shall complete the entry or withdrawal forms, as provided herein and in regulations issued pursuant to law, to provide for statistical purposes information as follows:

(a) the number of the Customs district and of the port where the articles are being entered for consumption or warehouse, as shown in Statistical Annex A of these schedules;

(b) the name of the carrier or the means of transportation by which the articles were transported to the first port of unloading in the United States;

(c) the foreign port of lading;

(d) the United States port of unlading;

(e) the date of importation;

(f) the country of origin of the articles expressed in terms of the designation therefor in Statistical Annex B of these schedules;

(g) a description of the articles in sufficient detail to permit the classification thereof under the proper statistical reporting number in these schedules;

(h) the statistical reporting number under which the articles are classifiable;

(ij) gross weight in pounds for the articles covered by each reporting number when imported in vessels or aircraft;

(k) the net quantity in the units specified herein for the classification involved;

(l) the U.S. dollar value in accordance with the definition in Section 402 or 402a of the Tariff Act of 1930, as amended, for all merchandise including that free of duty or dutiable at specific rates; and

(m) such other information with respect to the imported articles as is provided for elsewhere in these schedules.

2. Statistical Annotations. (a) The statistical annotations to the Tariff Schedules of the United States consist of --

(i) the 2-digit statistical suffixes,
(ii) the indicated units of quantity,
(iii) the statistical headnotes and annexes, and
(iv) the italicized article descriptions.

(b) The legal text of the Tariff Schedules of the United States consists of the remaining text as more specifically identified in headnote 10(a) of the general headnotes and rules of interpretation.

(c) The statistical annotations are subordinate to the provisions of the legal text and cannot change their scope.

3. Statistical Reporting Number. (a) General Rule: Except as provided in paragraph (b) of this headnote, and in the absence of specific instructions to the contrary elsewhere, the statistical reporting number for an article consists of the 7-digit number formed by combining the 5-digit item number with the appropriate 2-digit statistical suffix. Thus, the statistical reporting number for live monkeys dutiable under item 100.95 is "100.3520".

(b) Wherever in the tariff schedules an article is classifiable under a provision which derives its rate of duty from a different provision, the statistical reporting number is, in the absence of specific instructions to the contrary elsewhere, the 7-digit number for the basic provision followed by the item number of the provision from which the rate is derived. Thus, the statistical reporting number of mixed apple and grape juices, not containing over 1.0 percent of ethyl alcohol by volume, is "165.6500-165.40".

4. Abbreviations. (a) The following symbols and abbreviations are used with the meanings respectively indicated below:

s. ton	-	short ton
C.	-	one hundred
Cwt.	-	100 lbs.
mg.	-	milligram
M.	-	1,000
bd. ft.	-	board feet
M. bd. ft.	-	1,000 board feet
mc.	-	millicurie
cord	-	128 cubic feet
square	-	amount to cover 100 square feet of surface
sup. ft.	-	superficial foot
oz.	-	ounces avoirdupois
fl. oz.	-	fluid ounce
oz. troy	-	troy ounce
pf. gal.	-	proof gallon

(b) An "X" appearing in the column for units of quantity means that no quantity (other than gross weight) is to be reported.

(c) Whenever two separate units of quantity are shown for the same article, the "v" following one of such units means that the value of the article is to be reported with that quantity.

APPENDIX A

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1970)

HISTORICAL NOTES

Amendments and Modifications

PROVISIONS	
Gen Hdnte--3(a)(i)	Language "Except as provided in headnote 6 of schedule 7, part 2, subpart E," added; language "except that all articles" deleted and language "except that all such articles" inserted in lieu thereof. Pub. L. 89-805, Secs. 1(a), (c), Nov. 10, 1966, 80 Stat. 1521, 1522, effective date Jan. 1, 1967.
	Language "Except as provided in headnote 4 of schedule 7, part 7, subpart A," added. Pub. L. 89-806, Secs. 2(b), (c), Nov. 10, 1966, 80 Stat. 1523, effective date March 11, 1967.

PROVISIONS	
Gen Hdnte--3(d), (e), (f) and (g)	Headnotes 3(d), (e), and (f) redesignated as headnotes 3(e), (f), and (g), respectively, and new headnote 3(d) added. Pub. L. 89-283, Secs. 401(a), 403, Oct. 21, 1965, 79 Stat. 1021, 1022; entered into force Oct. 22, 1965, by Pres. Proc. 3682, Oct. 21, 1965, 3 CFR, 1965 Supp., p. 68.
Gen Hdnte--6(b)(i)	Language "and containers of usual types ordinarily sold at retail with their contents," added. Pub. L. 89-241, Secs. 2(a), 4, Oct. 7, 1965, 79 Stat. 933, 934, effective date Dec. 7, 1965.

SCHEDULE 4. - CHEMICALS AND RELATED PRODUCTS

APPENDIX A

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1970)

SCHEDULE 4. - CHEMICALS AND RELATED PRODUCTS

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Schedule 4 headnotes:

1. This schedule does not include --
   (i) any of the mineral products provided for in schedule 5;
   (ii) metal-bearing ores and other metal-bearing materials, provided for in part 1 of schedule 6; or
   (iii) metals provided for in part 2 of schedule 6.

2. (a) The term "compounds", as used in this schedule, means substances occurring naturally or produced artificially by the reaction of two or more ingredients, each compound --
   (i) consisting of two or more elements,
   (ii) having its own characteristic properties different from those of its elements and from those of other compounds, and
   (iii) always consisting of the same elements united in the same proportions by weight with the same internal arrangement.

The presence of impurities which occur naturally or as an incident to production does not in itself affect the classification of a product as a compound.

(b) The term "compounds", as used in this schedule, includes a solution of a single compound in water, and, in determining the amount of duty on any such compound subject to duty in this schedule at a specific rate, an allowance in weight or volume, as the case may be, shall be made for the water in excess of any water of crystallization which may have been in the compound.

3. (a) The term "mixtures", as used in this schedule, means substances consisting of two or more ingredients (i.e., elements or compounds), whether occurring as such in nature, or whether artificially produced (i.e., brought about by mechanical, physical, or chemical means), which do not bear a fixed ratio to one another and which, however thoroughly commingled, retain their individual chemical properties and are not chemically united. The fact that the ingredients of a product are incapable of separation or have been commingled in definite proportions does not in itself affect the classification of such product as a mixture.

(b) The term "mixtures", as used in this schedule, includes solutions, except solutions defined as compounds in headnote 2(b) of this schedule.

Item	Stat. Suf-fix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty 2
		PART 5. - FLAVORING EXTRACTS; ESSENTIAL OILS			
		Subpart A. - Flavoring Extracts, and Fruit Flavors, Essences, Esters, and Oils			
		Subpart A headnote:			
		1. This subpart covers flavoring extracts of vegetable origin, and fruit flavors, essences, esters, and oils, both natural and synthetic, including flavors which are artificial mixtures containing aromatic or odoriferous compounds provided for in part 1C of this schedule.			
		Flavoring extracts, and fruit flavors, essences, esters, and oils, all the foregoing whether or not containing ethyl alcohol:			
		Not containing alcohol:			
450.10	00	In ampoules, capsules, tablets, or similar forms	X	8.5% ad val.	25% ad val.
450.20	00	Other	Lb	6% ad val.	25% ad val.
		Containing alcohol:			
450.30	00	Containing not over 20 percent of alcohol by weight	Lb	4.2¢ per lb. + 4.5% ad val.	20¢ per lb. + 25% ad val.
450.40	00	Containing over 20 percent but not over 50 percent of alcohol by weight	Lb	8.4¢ per lb. + 4.5% ad val.	40¢ per lb. + 25% ad val.
450.50	00	Containing over 50 percent of alcohol by weight	Lb	16.8¢ per lb. + 4.5% ad val.	80¢ per lb. + 25% ad val.
		Subpart B. - Essential Oils			
		Oils, distilled or essential, including terpeneless oils:			
452.02	00	Almond, bitter	Lb	Free	Free
452.04	00	Anise	Lb	Free	Free
452.06	00	Bergamot	Lb	Free	Free
452.08	00	Camphor	Lb	Free	Free
452.10	00	Caraway	Lb	Free	Free
452.12	00	Cassia	Lb	Free	Free
452.14	00	Cedar leaf	Lb	1.5% ad val.	25% ad val.
452.16	00	Cinnamon	Lb	Free	Free
452.18	00	Citronella	Lb	Free	Free
452.20	00	Clove	Lb	Free	25% ad val.
452.22	00	Cornmint, including "peppermint" derived from Mentha arvensis	Lb	Free	25% ad val.
452.24	00	Eucalyptus	Lb	3.5% ad val.	15% ad val.
452.26	00	Geranium	Lb	Free	Free
452.28	00	Grapefruit	Lb	8.5% ad val.	25% ad val.
452.32	00	Lavender and spike lavender	Lb	Free	Free
452.34	00	Lemon	Lb	12% ad val.	25% ad val.

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1970)

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452.36 - 452.80

SCHEDULE 4. - CHEMICALS AND RELATED PRODUCTS
Part 5. - Flavoring Extracts; Essential Oils

Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty 2
		Oils, distilled or essential, etc. (con.):			
452.36	00	Lemongrass	Lb.	Free	Free
452.38	00	Lime	Lb.	Free	Free
452.40	00	Lignaloe or bois de rose	Lb.	Free	Free
452.42	00	Neroli (orange flower)	Lb.	Free	Free
452.44	00	Orange	Lb.	8.5% ad val.	25% ad val.
452.46	00	Origanum	Lb.	Free	Free
452.48	00	Orris	Lb.	3% ad val.	25% ad val.
452.50	00	Palmarosa	Lb.	Free	Free
452.52	00	Patchouli	Lb.	Free	25% ad val.
452.54	00	Peppermint derived from Mentha piperita	Lb.	17% ad val.	25% ad val.
452.56	00	Pettigrain	Lb.	Free	Free
452.58	00	Pine needle	Lb.	2.5% ad val.	25% ad val.
452.60	00	Rose (attar of roses)	Oz.	Free	Free
452.62	00	Rosemary	Lb.	Free	Free
452.64	00	Sandalwood	Lb.	Free	25% ad val.
452.66	00	Thyme	Lb.	Free	Free
452.68	00	Vetivert	Lb.	Free	25% ad val.
452.70	00	Ylang ylang (cananga)	Lb.	Free	Free
452.80		Other	.....	3% ad val.	25% ad val.
	20	*Nutmeg*	*Lb.*		
	40	*Other*	*Lb.*		

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1970)

STAGED RATES AND HISTORICAL NOTES

Notes p. 1
Schedule 4,
Part 5

Staged Rates

Modifications of column 1 rates of duty by Pres. Proc. 3822 (Kennedy Round), Dec. 16, 1967, 32 F.R. 19002:

TSUS item	Prior rate	Rate of duty, effective with respect to articles entered on and after January 1 --				
		1968	1969	1970	1971	1972
450.10	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
450.20 1/	7.5% ad val.	6.5% ad val.	6% ad val.	5% ad val.	4% ad val.	3.5% ad val.
450.30	6¢ per lb. + 7% ad val.	5.4¢ per lb. + 6% ad val.	4.8¢ per lb. + 5.5% ad val.	4.2¢ per lb. + 4.5% ad val.	3.5¢ per lb. + 4% ad val.	3¢ per lb. + 3% ad val.
450.40	12¢ per lb. + 7% ad val.	10.8¢ per lb. + 6% ad val.	9.5¢ per lb. + 5.5% ad val.	8.4¢ per lb. + 4.5% ad val.	7¢ per lb. + 4% ad val.	6¢ per lb. + 3% ad val.
450.50	24¢ per lb. + 7% ad val.	21.5¢ per lb. + 6% ad val.	19¢ per lb. + 5.5% ad val.	16.8¢ per lb. + 4.5% ad val.	14.4¢ per lb. + 4% ad val.	12¢ per lb. + 3% ad val.
452.14	4% ad val.	3% ad val.	2% ad val.	1.5% ad val.	0.5% ad val.	Free
452.20	6.25% ad val.	Free	Free	Free	Free	Free
452.22	6.25% ad val.	Free	Free	Free	Free	Free
452.24 1/	4% ad val.	3.5% ad val.	3.5% ad val.	3% ad val.	3% ad val.	3% ad val.
452.28	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
452.34	17.5% ad val.	15.5% ad val.	14% ad val.	12% ad val.	10% ad val.	8.5% ad val.
452.44	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
452.48 1/	4% ad val.	3.5% ad val.	3% ad val.	2.5% ad val.	2% ad val.	2% ad val.
452.52	6.25% ad val.	Free	Free	Free	Free	Free
452.54	25% ad val.	22% ad val.	20% ad val.	17% ad val.	15% ad val.	12.5% ad val.
452.58	4% ad val.	3.5% ad val.	3% ad val.	2.5% ad val.	2% ad val.	2% ad val.
452.64	8% ad val.	Free	Free	Free	Free	Free
452.68	3% ad val.	Free	Free	Free	Free	Free
452.80 1/	4% ad val.	3.5% ad val.	3% ad val.	2.5% ad val.	2% ad val.	2% ad val.

1/ In accordance with general note 3(f) to Schedule XX (Geneva - 1967), the rates of duty for this item in the columns headed 1970, 1971, 1972 were to become effective unless the European Economic Community and the United Kingdom had not proceeded with certain reductions provided for in their respective schedules annexed to the Geneva (1967) Protocol to the GATT. These two participants have not so proceeded, and the President has so proclaimed (Pres. Proc. 3950, Dec. 24, 1969, 34 F.R. 20299, effective date January 1, 1970), with the result that the rate of duty in the column headed 1969 will continue in effect unless or until the President proclaims that they have agreed so to proceed. See related footnote 1 to Kennedy Round Stated Rates at the end of schedule 4, parts 2, 3, 4, 7, 8, 9, and 13; schedule 5, part 1; schedule 6, part 2; and schedule 7, parts 2, 9, 12, and 13.

Other Amendments and Modifications

PROVISION

452.24--Column 1 rate of duty of 5% ad val. reduced to 4% ad val. on Jan. 1, 1964. General headnote 3(g).

PROVISION

452.29--Item 452.29 (Cuba--10% ad val.) deleted. Pres. Proc. 3822 (Kennedy Round), Dec. 16, 1967, 32 F.R. 19002, effective date Jan. 1, 1969.

Statistical Notes

PROVISION	Effective date
452.24--See Other Amendments and Modifications	
452.80--	
00--Disc. (transferred to 452.8020 & 40).....	*Jan. 1, 1968*
20--Estab. (transferred from 452.8000pt).....	*do*
40--Estab.	*do*

A P P E N D I X B

Value of U.S. imports for consumption, by TSUS items included in the individual summaries of this volume, total and from the 3 principal suppliers, 1969

Value of U.S. imports for consumption, by TSUS items included in the individual summaries of this volume, total and from the 3 principal suppliers, 1969

(In thousands of dollars. The dollar value of imports shown is defined generally as the market value in the foreign country and therefore excludes U.S. import duties, freight, and transportation insurance)

Summary title and page; TSUS item	All countries		First supplier		Second supplier		Third supplier	
	Amount in 1969	Percent change from 1968	Country	Value	Country	Value	Country	Value
Flavors and extracts (p. 3)								
450.1000	5	+508.2	W. Germany	5	Hong Kong	1/	-	-
450.2000	3,849	-3.5	Spain	1,704	Switzerland	683	Morocco	405
450.3000	174	-6.1	Brazil	68	W. Germany	67	Switzerland	22
450.4000	60	+18.6	U.K.	41	Italy	10	Canada	5
450.5000	127	-32.1	U.K.	60	Spain	42	France	21
Bitter almond oil (p. 13)								
452.0200	38	-37.0	France	35	Netherlands	3	-	-
Anise oil (p. 17)								
452.0400	1/	1/	-	-	-	-	-	-
Caraway oil (p. 21)								
452.1000	55	-64.5	Netherlands	47	France	8	-	-
Cassia oil (p. 23)								
452.1200	11	+68.2	Switzerland	11	-	-	-	-
Cinnamon oil (p. 25)								
452.1600	90	-15.5	Ceylon	78	Seychelles	8	France	3
Clove oil (p. 29)								
452.2000	1,830	+16.0	Malagasy	1,564	Tanzania	222	Indonesia	36
Eucalyptus oil (p. 33)								
452.2400	300	+21.4	Portugal	180	W. Africa	47	Spain	29
Origanum oil (p. 37)								
452.4600	9	-19.0	Spain	7	U.K.	2	-	-
Bergamot oil (p. 41)								
452.0600	1,616	-23.0	Italy	1,217	France	219	Switzerland	178
Citronella oil (p. 45)								
452.1800	1,757	+30.5	Taiwan	1,212	Indonesia	205	Guatemala	187
Geranium oil (p. 49)								
452.2600	1,751	-27.8	Malagasy	728	France	675	Algeria	293
Lavender and spike lavender oils (p. 55)								
452.3200	2,587	-29.8	France	2,356	Spain	213	Yugoslavia	10
Lemongrass oil (p. 59)								
452.3600	815	+43.9	Guatemala	684	India	92	Argentina	20
Linaloe (lignaloe) or bois de rose oil (p. 63)								
452.4000	715	-26.6	Brazil	584	Peru	122	Chile	8
Neroli or orange flower oil (p. 69)								
452.4200	166	-21.2	France	129	Italy	36	Switzerland	1

See footnote at end of table.

Value of U.S. imports for consumption, by TSUS items included in the individual summaries of this volume, total and from the 3 principal suppliers, 1969

(In thousands of dollars. The dollar value of imports shown is defined generally as the market value in the foreign country and therefore excludes U.S. import duties, freight, and transportation insurance)

Summary title and page; TSUS item	All countries		First supplier		Second supplier		Third supplier	
	Amount in 1969	Percent change from 1968	Country	Value	Country	Value	Country	Value
Orris oil (p. 73)								
452.4800	1/	1/	-	-	-	-	-	-
Palmarosa oil (p. 77)								
452.5000	297	+73.5	India	205	Brazil	58	Italy	19
Patchouli oil (p. 81)								
452.5200	351	-61.8	Indonesia	285	France	24	Singapore	11
Petitgrain (pettigrain) oil (p. 85)								
452.5600	690	+12.3	Paraguay	635	Argentina	27	France	25
Rose oil (p. 91)								
452.6000	1,071	+38.3	France	595	Bulgaria	262	Turkey	137
Sandalwood oil (p. 95)								
452.6400	1,795	-17.4	India	1,379	Singapore	144	Yugoslavia	110
Vetiver (Vetivert) oil (p. 99)								
452.6800	1,661	-22.8	Haiti	1,110	Malagasy	328	France	141
Ylang ylang and cananga oils (p. 103)								
452.7000	855	-28.0	France	446	Malagasy	335	Indonesia	40
Cornmint oil (p. 107)								
452.2200	343	+23.7	Brazil	338	Taiwan	5	-	
Peppermint oil (p. 111)								
452.5400	78	-38.0	Italy	73	U.K.	3	Belgium	2
Grapefruit oil (p. 119)								
452.2800	59	-50.1	Israel	57	Jamaica	2	-	-
Lemon oil (p. 125)								
452.3400	2,874	+14.5	Italy	2,239	Greece	274	Switzerland	84
Lime oil (p. 133)								
452.3800	4,165	-40.5	Mexico	2,319	Haiti	1,073	Bahamas	207
Orange oil (p. 137)								
452.4400	635	+14.7	Switzerland	318	Dom. Rep.	64	Italy	51
Camphor oil (p. 145)								
452.0800	79	-30.6	Taiwan	79	-	-	-	-
Cedar leaf oil (p. 151)								
452.1400	75	-25.4	Canada	50	Brazil	25	-	-
Pine needle oil (p. 155)								
452.5800	108	-18.3	Canada	58	W. Germany	20	U.S.S.R.	14
Rosemary oil (p. 159)								
452.6200	150	-52.2	Spain	67	France	56	Tunisia	14

See footnote at end of table.

Value of U.S. imports for consumption, by TSUS items included in the individual summaries of this volume, total and from the 3 principal suppliers, 1969

(In thousands of dollars. The dollar value of imports shown is defined generally as the market value in the foreign country and therefore excludes U.S. import duties, freight, and transportation insurance)

Summary title and page; TSUS item	All countries		First supplier		Second supplier		Third supplier	
	Amount in 1969	Percent change from 1968	Country	Value	Country	Value	Country	Value
Thyme oil (p. 163)								
452.6600	44	-54.0	Spain	43	France	1	-	-
Miscellaneous essential oils (p. 167)								
452.8020	506	-17.1	Indonesia	451	Ceylon	27	U.K.	17
452.8040	3,262	+17.3	France	1,172	Brazil	725	Leeward & Windward Islands	147

1/ No imports in 1969.

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4:8

OTHER AVAILABLE VOLUMES OF THE SUMMARIES SERIES

Schedule	*Volume*	*Title*
1	1	Animals and Meats
1	2	Fish: Fresh, Chilled, Frozen, or Cured
1	3	Fish Products, Shellfish, and Shellfish Products
1	4	Dairy Products and Birds' Eggs
1	5	Live Plants and Seeds
1	6	Cereal Grains, Malts, Starches, and Animal Feeds
1	7	Vegetables and Edible Nuts
1	8	Edible Fruit
1	9	Sugar, Cocoa, Confectionery, Coffee, Tea and Spices
1	10	Beverages
1	11	Tobacco and Tobacco Products
1	12	Animal and Vegetable Fats and Oils
1	13	Hides, Skins, Leather; Feathers, and Miscellaneous Articles of Animal Origin
1	14	Edible Preparations, Natural Resins, and Miscellaneous Articles of Vegetable Origin
2	1	Wood and Related Products I
2	2	Wood and Related Products II
2	3	Paper and Related Products I
2	4	Paper and Related Products II
2	5	Books and Other Printed Matter
3	2	Fibers, Yarns, Waste, and Intermediate Products of Silk, Manmade Fiber, Metalized, Paper, Certain Hair, and Yarns, N.S.P.F.
3	4	Felts, Batting, Nonwoven Fabrics, Fish Nets, Machinery Belts and Clothing, Hose, Coated Fabrics, and Other Fabrics for Special Purposes
3	5	Textile Furnishings and Apparel
3	6	Cordage, Braids, Elastic Yarns and Fabrics, Trimmings, Packing, Polishing Cloths, Sacks, Labels, Lacings, Rags, and Other Miscellaneous Textile Products
4	2	Inorganic Chemicals I
4	3	Inorganic Chemicals II
4	4	Inorganic Chemicals III
4	6	Organic Chemicals II
4	9	Glue, Gelatin, Aromatic Substances, Toilet Preparations, Surface-Active Agents, Soaps, Dyes, and Tannins
4	10	Pigments, Inks, Paints, and Related Products
4	12	Fatty Substances, Waxes, and Miscellaneous Chemical Products