

Benzoin: Production, Uses and International Trade

By John JW Coppen, Non-Timber Forest Products Specialist,
Rainham, Kent, U.K.

Description and Sources of Benzoin

Benzoin is a balsamic resin obtained from trees of the genus *Styrax* from Southeast Asia. There are two types of benzoin of commerce: Siam benzoin from *Styrax tonkinensis* (Pierre) Craib ex Hartwiss and Sumatra benzoin from *S. benzoin* Dryand. and *S. paralleloneurum* Perkins. Laos is the major producer, and may, at times, be the sole producer, of Siam benzoin. Vietnam produces much smaller, and only occasional, amounts. Indonesia, specifically north Sumatra, is the only producer of Sumatra benzoin. The scale of production of the two types of benzoin is very different, however. Annual production of Siam benzoin is around 50 tonnes while that of Sumatra benzoin is of the order of 1000 tonnes.

In the People's Republic of China, *S. tonkinensis*, *S. hypoglauca* Perk. and *S. cascarifolia* are tapped, but the products, though used domestically, are not believed to enter world trade.

Apart from the distinction between Siam benzoin and Sumatra benzoin, there are two English terms used to describe the resinous product from *Styrax* trees: "benzoin" (sometimes erroneously called gum benzoin) and "gum benjamin". The latter is used as the description in Singapore's trade statistics and by Singaporean traders. Since Singapore is the major international trading center for benzoin, the term "gum benjamin" is often used elsewhere in trade. In Indonesian trade statistics, benzoin is misleadingly called frankincense, a term usually applied to the resinous exudate from *Boswellia* spp. of Arabia and Africa.

Benzoin appears in international trade in several forms. After cleaning and grading, most Siam benzoin exported from Laos remains in the form in which it is collected from the tree; namely, hard, usually cream-colored/pale-orange flat pieces. If broken, these pieces reveal a milky white color. The benzoin is quite pale in color when freshly collected, but darkens gradually during storage to a sandy color. Some of the larger pieces are inevitably broken down to smaller ones during handling and these, as well as dust and siftings, are also exported.

Some aspects of the literature on benzoin resin have been reviewed in the past.¹ The author recently included benzoin as part of a desk study of gums, resins and latexes of plant origin.² The following review is based on first-hand research undertaken during a two-month mission in Southeast Asia, carried out by the author in 1997 for the government of the Lao People's Democratic Republic (Laos) and funded by the Food and Agriculture Organization of the United Nations.

Sumatra benzoin is similar in appearance to the Siam described above and is traded (often known as "almonds") with the same sort of grades. However, there are also substantial quantities of darker, lower-grade materials. Even more common is a semi-processed form of block benzoin, which generally contains pieces of damar embedded in a matrix of low-grade benzoin. Occasionally, pure benzoin almonds are used in the production of block benzoin instead of damar. The block is a convenient form in which to transport and handle the benzoin. In volume terms, it is the form in which most benzoin enters world trade.

Chemistry and Uses

The chemical compositions of the two types of benzoin account for their sensory characteristics and determine the uses to which they are put. There are both similarities and differences in composition and this means that although they are both used for flavor and fragrance purposes, they usually satisfy different parts of the markets. Both contain mixtures of organic acids and esters along with numerous other, mostly minor, components. Both can be described as balsamic in odor.³ However, in Siam benzoin, the chief constituents are benzoic acid and its esters (such as coniferyl benzoate, benzyl benzoate and cinnamyl benzoate), while in Sumatra benzoin the major constituents are cinnamic acid and its esters (such as coniferyl cinnamate and cinnamyl

cinnamate). The two types can easily be distinguished by thin-layer chromatography, which also detects the presence of damar in block benzoin.⁴ Laboratory studies in Laos have shown that use of a “dip” solution to visualize the spots on the TLC plate give far superior results to conventional spraying. Vanillin is present in both types of benzoin and gives rise to its familiar vanilla odor, most readily detected in the Siam type.

Exporters rarely, if ever, lay down analytical specifications for benzoin. They sell according to grade, which the extractor or end-user knows from experience (backed up by appropriate analysis), will suit its purposes. The sensory characteristics are not easy to quantify in the laboratory and the perfumer’s nose is still the best means of assessing odor quality. However, the superior properties of Siam benzoin over Sumatra benzoin are well recognized and account for the higher price of the former. Siam benzoin has a rounder, more vanilla-like odor than Sumatra benzoin, which is harsher to the nose.

For use by the flavor, fragrance and pharmaceutical industries, a resinoid, tincture or other type of extract is prepared.⁵ Siam benzoin produces lighter-colored extracts than Sumatra benzoin. Alcohol is commonly employed for extraction, although the extract is often redissolved in another solvent such as benzyl benzoate, benzyl alcohol or propylene glycol, according to customer requirements.

Although there are some minor applications of benzoin, such as a glazing agent in polishes and wood finishes, it is used chiefly for incense purposes and in the flavor, fragrance and pharmaceutical industries.

Fragrances

In volume terms, the greatest use of benzoin, the Sumatra type, is for incense purposes. Most commonly, small or crushed pieces of the raw benzoin in block form are simply placed on an open fire, either in the home or in the place of worship. It is used by several of the major religions, including Muslims and Hindus, as well as in Chinese temples. Religious applications account for the fact that the Middle East, North Africa, parts of Asia and the Indian sub-continent are important export destinations for Sumatra benzoin. It is also used in the Catholic and Orthodox Churches and is often formulated with other natural fragrance materials such as frankincense, myrrh and storax. Extracts of Sumatra benzoin are used to produce fragrances for joss sticks. India uses fragrances containing benzoin and other natural oils and resins in the manufacture of agar batti (incense sticks).

The better grades of benzoin are extracted and used in the manufacture of fragrances that are later compounded and employed in a wide range of end products. These include: personal health-care products such as toilet soaps, shampoos, body lotions and creams, bath oils, aerosols and talcs; and household and other products such as liquid soaps, air fresheners, fabric softeners, washing detergents, and other cleaning agents.

Although there is occasional overlap in end use, such as shampoos, the pleasant, rounder fragrance of the more expensive Siam benzoin is generally used for fragrances at the higher end of the market, such as fine fragrances (perfumes and colognes) and the more expensive soaps. Extracts of Sumatra benzoin also tend to be darker than those of Siam benzoin, and for those products where this is not acceptable (and where the higher price of Siam can be tolerated), Siam benzoin is used in preference. However, Sumatra benzoin is not simply used as a less-expensive substitute for Siam benzoin, it may be selected on its own merits for use in perfumes. The Siam type is used to impart a sweet, “oriental” note to the fragrance while the Sumatra type is used more in “spicy” and “floral-balsamic” fragrances.

Although benzoin contributes its own fragrance to the final, formulated product, one of its important functions is to serve as a fixative for the other fragrance materials, increasing the tenacity and preventing loss of the middle and top notes of the more volatile components.

Flavors

Benzoin’s principal role in foods is as a flavoring agent. The presence of substantial amounts of cinnamates in Sumatra benzoin accounts for its use in the manufacture of chocolate flavors. These cinnamates are also present in cocoa and their compatibility facilitates production of the flavor and improves its properties. The flavors are used in chocolate bars, ice cream, milk products, syrups and other products. The level of incorporation in the flavor is around 0.1%, while the flavor may represent up to 4% of the final product.

Benzoin is used as a flavorant in baked goods, especially those containing vanilla or cassia, where it also serves to “fix” the other flavors and increase their spiciness. It is especially popular in Denmark and Sweden for this purpose. It is also employed as a glazing agent. Tinctures of benzoin are used to confer a lustre to chocolate eggs. In Japan, benzoin is employed as a chewing gum base.

In the US, benzoin has GRAS status and is approved for food use. A tentative specification exists for benzoin as a food additive.⁶ Like all food additives, benzoin is subject to periodic scrutiny by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) to assess its safety. The most recent pronouncement of JECFA, in 1996, reaffirms the position given at their 21st session (1977), that no toxicological data were available and therefore no ADI was allocated.^{7,8}

In Indonesia, an important outlet for Sumatra benzoin is in flavoring tobacco. It is still used by some people in Central Java in its raw form, by mixing it with tobacco when making their own cigarettes. However, it finds wider use in the production of “Manila” and other types of tobacco flavors. Benzoin is also used by the tobacco industry in China.

Pharmaceuticals

Benzoin has well-established uses in both allopathic and traditional forms of medicine. Several national pharma-

copoeias, including the British, Chinese, French, Italian, Japanese, Swiss, Thai and US, describe specifications and tests for benzoin. Some specify either Siam or Sumatra types while others include both.

In the form of a tincture, benzoin is used as an inhalant with steam for the relief of catarrh, laryngitis, bronchitis and upper respiratory tract disorders. The British Pharmacopoeia specifies the use of Sumatra benzoin in Benzoin Inhalation and Compound Benzoin Tincture (both preparations include another natural resin, storax).⁹ The US Pharmacopoeia also describes a Compound Benzoin Tincture, although it does not specify which type of benzoin is to be used (in addition to storax it contains a third natural resin, tolu balsam).¹⁰

Other official and proprietary preparations contain benzoin. These include lotions for the prevention and treatment of cold sores, a Compound Podophyllum Paint (British Pharmacopoeia) for the treatment of warts and a mouthwash for dental disorders (Italian Pharmacopoeia). In Indonesia, benzoin extract is employed in a well-known antibacterial powder used to freshen and soothe dry skin and ameliorate skin allergies.

In the form of over-the-counter herbal medicines, which are finding increasing use in Western society, benzoin (probably the Sumatra type) is employed in cough and cold remedies. It is also applied in the topical treatment of itching skin rashes, wounds and ulcers.¹¹ An ointment containing witch hazel and benzoin is used for treating piles. In aromatherapy, benzoin is regarded as soothing and relaxing for tired muscles and can be used either in the form of massage oil or as an additive to bath water. Benzoin is widely used in Chinese medicines.

Benzoin Production

Laos: *Styrax tonkinensis* is found at 400-1600 m and production of benzoin takes place in the mountainous northern provinces.^{12, 13} The trees are managed within the shifting cultivation cycle that is widely practiced. After the rice crop is harvested, the *Styrax* seedlings produced as a result of natural regeneration are allowed to grow during the fallow period. When the trees are large enough to yield benzoin they are tapped for several years before the cycle starts again and the land is cleared.

Traditionally, Luang Prabang, Phong Saly, Houa Phan and Oudomxai Provinces have been the main centers of production. However, production in Oudomxai has declined in recent years. Total production of benzoin in Laos is around 50 tonnes annually. Although production is relatively small, at least in comparison with that in Indonesia, it provides a welcome source of cash income to the people who collect the material. Almost all the benzoin produced is exported so it also makes a small contribution to the national economy through foreign exchange earnings.

The production of benzoin entails tapping the tree by making cuts into the stem wood and collecting the exuded resin at a later date after it has dried. In Luang

Prabang Province, tapping is carried out at the end of the rainy season, usually around September/October. The resin remains on the tree during the dry season and is collected before the onset of the rains, usually about March. The tapper makes a series of staggered incisions into the stem, starting as near the base as is convenient. The lower part of the cut bark is allowed to remain attached to the tree and this serves to trap the resin when it flows from the wound. In this way it is prevented from running down the face of the tree and accumulating dirt and other foreign matter. The hardened resin forms characteristic flat-shaped pieces.

Once the benzoin has been picked from the trees, it is cleaned by people within the village to free it from pieces of bark and any other extraneous matter. It is then sold as mixed, "clean" benzoin to an agent who arranges for it to be transported to the exporter in Vientiane (unless it is to be exported to China or Vietnam, when it will exit Laos through northern borders). Here, it is sorted and graded according to size. Typically, three sieves are used which results in four grades, from the large pieces, greater than 16 mm (grade A), to the dust and siftings (grade D). However, there may be some variation amongst exporters. Each pile of sieved benzoin is then cleaned to remove pieces of bark that have escaped the primary village cleaning. The cleaned, graded benzoin is then stored in a separate air-conditioned room ready for export.

Indonesia: Collection of benzoin in Indonesia occurs in the Tapanuli region of North Sumatra, mainly in the highlands above 1000 m to the west and south of Lake Toba. Some production is from wild trees, but many families plant *Styrax* to provide a source of cash income.

The large amounts of block benzoin that are exported from Indonesia make it exceedingly difficult to quantify real production of benzoin resin (as opposed to semi-processed benzoin of commerce) from an examination of trade statistics. Two widely varying estimates of production illustrate the divergence of views. An official report shows annual production of benzoin in North Tapanuli well in excess of 4000 tonnes for the years 1990-93 (Table 1).¹⁴

Jafarsidik, in contrast, states that total production of benzoin in 1986 was about 470 tonnes, of which 420 tonnes was from Tapanuli, an order of magnitude lower than the estimates in Table 1.¹⁵

Indonesian methods of tapping differ slightly from those used in Laos. Small, vertical cuts are made in the tree, about 30 cm apart, so as to penetrate the wood. On smaller trees, a single line of cuts is made, but this increases to two or three on larger trees. As in Laos, tapping may extend to

Table 1. Benzoin production in Indonesia, 1990-1993 (tonnes)

1990	1991	1992	1993
4416	4431	4454	5782

as high as 5 m on the large trees. Harvesting of the benzoin takes place 3-4 months after tapping.

More resin runs down the tree, rather than being trapped between the cut bark and the stem, than is the case in Laos. This results in a large number of different types and qualities of benzoin. Darker, dirtier grades are produced that do not have Lao equivalents. *Styrax paralleloneurum* is said to produce the best quality benzoin but in lower yields than *S. benzoin*.

A network of internal trading exists. Agents purchase different types of benzoin from centers in or near the forest areas such as Tarutung. The "almond" type is sold to larger traders, exporters or processors in Medan or Pematang Siantar, who clean and sort it into grades. The grading terms are comparable with the Lao ones. They are graded according to size: grade 1 for the larger pieces and grade 4 for dust/siftings. Producers of block benzoin in Pematang Siantar either export it themselves or sell to other traders in Medan who export it.

Vietnam: The natural distribution of *S. tonkinensis* extends from the northern parts of Laos into neighboring Vietnam, reaching the northwest of Hanoi. Historically, at the beginning of the century, Siam benzoin produced in Vietnam was being exported to Europe along with that from Laos. Production was limited mainly to the northern provinces which continued into the 1950s. This has since declined, apparently because the price is not sufficiently attractive to induce the people to tap the trees. The only area where benzoin collection is still practiced is just west

of Viet Tri in Vinh Phu province. Exports from Vietnam are small (probably around 12 tonnes/year at most) and do not necessarily represent indigenous production. Some benzoin enters Vietnam from Houa Phan Province, Laos, and is re-exported.

International Trade

Although some Sumatra benzoin is exported directly from Indonesia to the final destinations, most is exported to Singapore. Here, the importer either re-exports it without any material change apart from possible re-packaging, sells it on to other Singaporean traders, or subjects it to some form of processing (the products of which are mostly exported). For Siam benzoin, most exports from Laos, apart from those to China and Vietnam, generally pass in transit through Bangkok.

Therefore, for both types of benzoin, it is instructive to examine export statistics for these intermediate destinations (secondary sources), as well as those, where they exist, for the primary producers. Before doing so, however, the following points should be made. First, unofficial trade

Table 2. Exports of benzoin from Laos, 1988-1995 (tonnes)

1988	1989	1990	1991	1992	1993	1994	1995
12.0	16.0	27.0	36.6	30.0	40.0	47.5	51.3

Source: Statistics Division, Ministry of Commerce, Vientiane

Table 3. Exports of benzoin from Indonesia and destinations, 1987-1995 (tonnes/1000 US\$)

	1987	1988	1989	1990	1991	1992	1993	1994	1995
Total volume	1331	1157	975	884	1126	806	825	830	1156
Total value ^a	1486	1279	1262	1062	1671	1184	1207	1399	1380
Of which to (volume):									
Singapore	1324	1099	881	773	1062	735	781	755	1058
Malaysia	-	7	36	27	17	39	7	17	24
Taiwan	-	21	30	-	13	-	12	16	25
Japan	-	~	~	1	8	6	12	6	12
Hong Kong	-	2	-	16	-	-	-	-	-
India	-	-	-	59	-	~	11	8	10
Pakistan	-	-	-	-	16	-	-	-	-
UAE	-	20	-	-	-	-	2	-	-
Kuwait	-	-	16	-	-	-	-	-	-
Saudi Arabia	-	-	-	~	1	9	-	~	~
Switzerland	3	4	1	3	3	6	-	4	2
France	1	2	6	2	4	3	-	1	1
UK	-	-	-	-	-	~	-	17	20
Netherlands	1	1	-	-	-	-	-	5	-
Spain	-	-	-	1	1	~	~	~	~
USA	2	1	2	2	1	2	-	1	3
Suriname	-	-	3	-	-	5	-	-	-

Source: Indonesia Foreign Trade Statistics
a FOB value recorded in source data in US\$

(benzoin which does not pass through customs points) does not appear in trade statistics. Some Siam benzoin from Laos enters Thailand in this way and the same may be true for some benzoin that goes into China and Vietnam.

Second, the data are only as good as the customs' returns allow. That is to say, if the exporter chooses not to describe shipments as benzoin (or gum benjamin) to avoid import duties or for some other reason, then it clearly will not be recorded as such and official returns will underestimate exports. Occasionally, items are misclassified which can result in either inflated or deflated figures. Use of terms which are not immediately recognizable as benzoin (such as "resin of frankincense" in Indonesian trade statistics) may lead to some under-accounting by those not familiar with them.

Third, benzoin may not be separated in the trade statistics of the country concerned. If it is a major item, then it usually is, but otherwise it is included with similar commodities under a general heading such as "other natural gums and resins" or "not elsewhere specified." This is the case for member countries of the European Union in the *Eurostat* statistics and for other countries such as Japan and China.

Finally, the statistics do not distinguish between the two types of benzoin, Siam and Sumatra, nor between the different forms in which they are traded. For example, there is no distinction between pure almonds, semi-processed block benzoin, extracts and resinoids. This makes it impossible to quantify accurately the movements of the different types in international trade.

Table 4. Exports of benzoin from Singapore and destinations, 1987-1996 (tonnes/,000 US\$)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Total volume	2827	3499	3945	3134	3826	3873	3739	3659	3411	4063
Total value ^a	3431	4110	4265	3457	4235	3878	4173	4231	4754	5205
<i>Of which to</i>										
<i>(volume):</i>										
Saudi Arabia	819	872	904	662	858	835	735	746	708	869
UAE	135	141	174	145	196	161	328	442	428	268
Kuwait	114	249	120	25	-	-	-	-	36	36
Oman	16	9	21	24	25	16	18	-	12	-
Yemen	-	-	-	15	43	115	129	73	105	160
Yemen, Dem.	-	-	-	17	20	-	-	-	-	14
Jordan	-	-	-	-	74	131	-	37	-	-
Djibouti	283	317	457	340	646	374	405	505	235	366
Ethiopia	-	-	-	-	-	135	36	93	72	162
Morocco	114	209	187	166	165	180	212	176	123	167
Tunisia	84	110	279	195	158	90	117	54	221	118
Egypt	-	180	50	120	59	182	-	144	-	98
Algeria	-	-	-	-	-	-	72	54	-	-
Nigeria	32	26	92	95	89	106	164	36	103	102
South Africa	-	-	-	-	-	-	-	-	24	37
Other Africa	77	97	94	73	56	90	105	52	-	162
India	318	378	434	456	370	511	317	260	244	350
Sri Lanka	146	147	205	171	219	223	354	245	285	308
Pakistan	39	29	51	63	51	40	58	38	48	36
Bangladesh	-	-	149	-	-	-	-	-	-	193
Malaysia	248	278	237	204	318	212	368	362	390	307
Taiwan	88	79	90	92	133	104	20	12	39	22
Japan	33	33	49	20	23	12	14	16	22	8
Vietnam	-	-	-	-	-	-	-	15	20	-
France	80	124	89	88	51	56	73	78	90	72
Germany	26	36	108	41	71	64	53	64	62	79
UK	50	40	54	47	51	40	22	33	15	10
Netherlands	-	4	4	3	12	13	21	13	-	-
Italy	5	6	4	3	4	3	17	-	-	-
Greece	15	18	14	12	12	13	-	-	9	12
Denmark	-	-	-	-	41	40	-	-	-	-
USA	43	38	14	16	19	47	30	26	14	-
Others	62	79	65	41	62	80	71	85	105	107

Source: *Singapore Trade Statistics*

^a a FOB value in S\$ converted to US\$ using historical exchange rates

Notwithstanding the above comments, valuable information can be derived from published trade statistics on benzoin and these are discussed below.

Export Data for Primary-Source Countries

Laos: Export data for Laos for the period 1988-95 are shown in Table 2. Although it is impossible to judge either their reliability or their completeness, the more recent volumes involved do appear to be in line with rough estimates made by the author as a result of discussions with traders and others in Laos.

Indonesia: Exports of benzoin from Indonesia and destinations for the period 1987-95 are shown in Table 3. From 1996 onward, unfortunately, benzoin is not separated from other unspecified gums and resins in the trade statistics.

The data show that annual exports of benzoin in the nine-year period varied between approximately 800 tonnes and 1300 tonnes, with an average of 1010 tonnes. As indicated above, most (93% on average) is shipped to Singapore. Other, minor, but reasonably regular, destinations include Malaysia, Taiwan, Japan, Switzerland, France and the US.

Annual exports are valued at between US\$1 million and US\$1.6 million. If unit values for individual countries are calculated it becomes apparent that exports to Europe and the US are significantly more valuable than those to Singapore, Malaysia and Taiwan (for example). This is in agreement with expectations. The higher grades go for fragrance, flavor and pharmaceutical uses, while the lower grades are destined, on the whole, for incense purposes.

Export Data for Secondary-Source Countries

Exports of benzoin from Thailand are small and erratic and are not useful in interpreting international trade. Exports from Singapore, however, are well-documented and provide a valuable insight into the geographical and end-use

markets for benzoin. Exports of benzoin (gum benjamin) from Singapore, and destinations, for the ten years 1987-96 are shown in Table 4.

Annual exports have varied from around 2800 tonnes (1987) to just over 4000 tonnes (1996). The annual average is 3600 tonnes. Since 1991, the source data indicate that a majority of the total exported benzoin (just over 50%) was of domestic origin. The material was processed in Singapore (mostly into block form) from imported raw material.

The volumes of benzoin exported are clearly much greater than the exports from Indonesia to Singapore would have suggested. Recorded exports to Singapore averaged 940 tonnes for 1987-95, compared with Singapore exports for the same period of 3500 tonnes. Apart from the not-uncommon mismatch between two countries' trade statistics, much of the difference is explained by the preparation of block benzoin in Singapore, together with the higher moisture content of the latter compared to the imported raw material.

The destinations listed in Table 4 have been grouped according to geographical region and several features are evident. Most significantly, the data support the statements from traders that the major markets are in the Middle East, North Africa and India, where the benzoin is used for incense purposes. The Middle East accounts for about a third of the exports and Saudi Arabia is the biggest single market, which may re-export to some smaller Gulf states. However, the United Arab Emirates also import significant quantities directly. In Africa (which accounts for between a quarter and one third of total exports), Djibouti serves as an *entrepôt*. Morocco, Tunisia and Egypt are other prominent importers. In West Africa, Nigeria is important. In the Indian sub-continent, India and Sri Lanka import large amounts of benzoin. In Asia, Malaysia is by far the biggest importer. France, Germany and the UK are the biggest markets in Europe.

The total value to Singapore of the exports ranged from US\$3.4 million in 1987 to US\$5.2 million in 1996. Using value data for individual countries (not shown), Saudi Arabia remains the major market in value terms, but India, which was third behind Djibouti in volume terms, is the second-biggest market in value. Unit values, when calculated, are greatest for Europe and the US, and lowest for Africa. Although Europe only accounts for around 5-6% of Singapore's benzoin exports in quantity, this share increases to around 14-16% in value terms. Within Europe, Italy's imports have had a consistently and significantly higher unit value than those of the other countries. Greece, on the other hand, has the lowest unit value of the European destinations, indicating, perhaps, that the benzoin is intended mainly for incense use in the Greek Or-

Table 5. Imports of (assumed) benzoin^a into the European Union^b from Laos and Vietnam, 1988-1995 (tonnes)

	1988	1989	1990	1991	1992	1993	1994	1995
<i>From:</i>								
Laos	5	15	27	7	21	19	29	14
<i>Of which to:</i>								
France	5	15	27	7	19	19	29	14
Germany	-	-	-	-	2	-	-	-
<i>From:</i>								
Vietnam	12	5	5	1	2	3	11	-
<i>Of which to:</i>								
France	9	5	5	-	-	-	-	-
Germany	3	-	-	1	1	1	2	-
UK	-	-	-	-	1	2	9	-

Source: Eurostat

^a Classified as 'Natural gums, resins, gum-resins and oleoresins other than lac and gum arabic'.

^b Only data for the 12 member states of the former European Community are shown, i.e. the UK, France, Germany, Belgium, Luxembourg, Netherlands, Italy, Ireland, Denmark, Portugal, Spain and Greece.

thodox Church. Figures for India are higher than those for other countries in the Indian sub-continent, and this may be a reflection of the strong fragrance and flavor industries there, as well as higher standards for suitable, quality benzoin.

Import Data

Official statistics for imports of benzoin are less reliable than those for exports. Indonesia, for example, is never cited as a country of origin for Singaporean imports despite the fact that it is overwhelmingly the major source. India specifies benzoin (separated into "benjamin ras" and "benjamin cowrie"), but imports are very erratic and their accuracy is open to question.

Trade statistics for European Union member states do not separate benzoin from the broader category of natural gums and resins. However, if Laos is separated out as a country of origin, and most, if not all, of the imports for the category are assumed to comprise Siam benzoin, a not-unreasonable assumption, then putative levels of imports are within the levels of recorded Lao exports of benzoin referred to earlier. France is seen to be the dominant importer (Table 5). A similar assumption for Vietnam is in line with known European importing countries of Vietnamese benzoin. The high unit values for the imports (not shown) support the view that they represent benzoin.

The official statistics cited above are not always reconcilable with the opinions of people in the trade. One German importer of benzoin, mainly from Laos and Vietnam, estimates German imports of Siam benzoin to be 10-15 tonnes per year, considerably more than the data in Table 5 indicate.

Conclusion

The support given to the project in Laos, from which the above information is drawn, indicates the importance which the Lao government attaches to benzoin and its production by villagers. Socio-economic studies and tapping trials have been carried out and longer-term silvicultural studies aimed at identifying superior germplasm of *S. tonkinensis* are in progress. All are aimed at raising the quality, productivity and sustainability of benzoin production in Laos and safeguarding the continued use of Siam benzoin (alongside Sumatra benzoin) by the fragrance and flavor industries.

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References

Address correspondence to John Coppen, 12 Devon Close, Rainham, Kent ME8 7LG, U.K.

1. H.M. Boelens, D. de Rijke and H.G. Haring. Studies of some balsamics in perfumery, *Perfum. Flavor.*, **6**(6), 7-14 (1982)
2. J.J.W. Coppen. Benzoin, pp. 81-86. In *Gums, Resins and Latexes of Plant Origin*, Non-Wood Forest Products Series No. 6, Food and Agriculture Organization, Rome (1995)
3. D.A. Moyler and R.A. Clery. The aromatic resins: their chemistry and uses, paper presented at Royal Soc. Chem. Symp. on Flavours and Fragrances, 1 May 1997, Univ. Warwick, UK
4. K. Helliwell and P. Jennings. A critical evaluation of commercial Sumatra benzoin, *J. Pharm. Pharmacol.*, **35**(Supplement), 17P (1983)
5. S. Arctander. Benzoin, pp. 87-91. In *Perfume and Flavor Materials of Natural Origin*, Allured (1962)
6. Anon. Benzoin gum, pp. 187-188. In *Compendium of Food Additive Specifications*, FAO Food and Nutrition Paper 52 (Joint FAO/WHO Expert Committee on Food Additives. Combined Specifications from 1st through the 37th Meetings, 1956-1990), Food and Agriculture Organization, Rome (1992)
7. Anon. Benzoin gum, p. B-3. In *Summary of Evaluations Performed by JECFA*, Food and Agriculture Organization, Rome (1996)
8. Anon. Benzoin gum, p. 27. In *Evaluation of Certain Food Additives*, Twenty first Report of JECFA, WHO Technical Report Series No. 617, World Health Organization, Geneva (1978)
9. Anon. *British Pharmacopoeia*, Vol. 2, p. 791, Her Majesty's Stationery Office, London (1993)
10. Anon. *The United States Pharmacopoeia*, p. 178, The United States Pharmacopoeial Convention, Rockville (1994)
11. P. Ody. Benzoin, p. 100. In *Handbook of Over-the-Counter Herbal Medicines*, Kyle Cathie, London (1996)
12. K. Pinyopusarerk. *Styrax Tonkinensis: Taxonomy, Ecology, Silviculture and Uses*, ACIAR Technical Report 31, Australian Centre for International Agricultural Research, Canberra (1994)
13. S. Ketphanh. Benzoin (*Styrax tonkinensis*), pp. 5-7. In *Country Paper of Lao*, paper presented at Regional Expert Consultation on Non-Wood Forest Products: Social, Economic and Cultural Dimensions, 28 Nov.- 2 Dec., 1994, Bangkok, Food and Agriculture Organization, Regional Office for Asia and the Pacific
14. Anon. *Informasi Pasar Industri Produksi Lokal Jenis Tanaman Kemenyan di Kabupaten Tapanuli Utara*, Report of the Institute of Land Rehabilitation and Conservation, Ministry of Forestry, Regional Office, Medan, North Sumatra (1993)
15. Y. Jafarsidik. Benzoin-producing species, *J. For. Res. Develop.* (Bogor, Indonesia), **2**(1), 4-6 (1986)

