Age-Old Resins of the Mediterranean Region and Their Uses

Many of the resins or resin-like substances of the Mediterranean and adjoining regions have been exploited by man from the earliest times. Good examples are myrrh and frankincense with their Biblical associations and use in incense. Others were much valued for medicinal purposes. Some were used by the Egyptians in embalming, while mastic and sandarac have long been valued for special paints and varnishes. In the Middle Ages the famous Italian painters made use of them, the actual formulae used being sometimes closely guarded secrets.

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Introduction

Gums and resins are kindred groups of economic plant products, both being natural secretions of plants. The essential difference between the two groups is that the true gums are more or less soluble in water or swell to a jelly-like mass with water but remain insoluble in organic solvents, whereas resins are unaffected by water but are soluble, more or less, in various organic solvents.

Some plant exudations consist of a mixture of both gum and resin and are commonly termed " gum-resins ". Other exudations, usually of a more or less soft consistency, consist of a mixture of gum and resin plus essential or volatile oil. For these the term " oleo-gum-resin " is employed. Very frequently oleo-gum-resins are pleasantly fragrant, owing to the presence of the essential or volatile oil in some quantity. This may have accounted for their popularity, in part at least, with the Ancients. Some were greatly esteemed for medicinal purposes. In general their use in medicine has very much declined.

The Mediterranean region is notable for the number of different oleo-resins or oleo-gum-resins that are produced by the plants of that area. This may be due to climatic factors, for it is known that a dry type of climate favours the production of both resins and gums (13).

Mastic

This resin, restricted in its production to the eastern Mediterranean, may vary in colour and appearance according to grade but is generally a pale yellow and in small tears, usually ¼ to $^{5}/_{16}$ inch in diameter. These are clear and glassy when fresh, also brittle, breaking with a conchoidal fracture. Not infrequently cylindrical pieces occur which may be up to ¾ inch long and ⅓ inch wide.

The main source of supply of the resin has always been the island of Chios in the Aegean. At one time the Greek emperors held a monopoly of the resin. In the Middle Ages the island was noted for its mastic. The resin was mentioned by Theophrastus who lived in the fourth century before the Christian era, so its use goes back to very early times (7).

The age-long use of mastic in Mediterranean countries was as a masticatory to sweeten the breath, being of a sweet smelling or aromatic nature itself. It was also considered to preserve the teeth and gums. As mastic is used at the present time in the preparation of chewing gum, its early use as a masticatory may be said to have been maintained but in modern form. At one time it was freely used medicinally and also in flavouring alcoholic beverages and cordials. Its use in medicine is now more restricted, but it does enter into the preparation of various pharmaceutical products, also perfumes (13).

The main use of mastic today and for many years past has been in the manufacture of pale, high grade varnishes required for special purposes, such as the protection of pictures in both oil and water colours. So employed it has the great advantage of being easily removed, either by solvents or by friction, without injury to the picture. The gelatinous material megilp, so well known to artists and valued on account of its good working qualities, consists of mastic, turpentine and linseed oil. It is named after its inventor—McGuilp (11).

In the island of Chios where mastic has so long been regularly and systematically collected the industry is said to be now well organised. An informative and most comprehensive account of the industry has recently been given by Davidson (9), who visited the island for the purpose of studying the mastic industry in 1947. The following remarks are largely drawn from his account.

The tree or shrub cultivated for mastic in Chios is that known botanically as *Pistacia lentiscus* L. var. *chia*. It is evergreen and dioecious, and normally reaches a height of only six to ten feet, but may be taller. Although normally bushy it is usually trained as a standard with a solitary main stem. The usual method of propagation is by cuttings (*in situ*), and it is said that it is the male plant that is always propagated because the female yields an inferior mastic. Among the growers or producers of mastic in Chios a number of local varieties are recognised. These are distinguished from one another by the size or shape of the leaves and by other characteristics as well as the quality of the mastic yielded. In establishing a grove or plantation the cuttings, a metre or so long, are spaced at intervals of three to four metres in lines four to five metres apart. In the fifth or sixth year the young trees may give their first small yield of mastic. They are pruned periodically to preserve a good shape. Cultivation and feeding with animal manure are practised. Good results have also been obtained by green manuring and by the use of artificial fertilizers.

A peculiarity about the mastic industry in Chios is that it is limited to the southeast corner of the island where the tree thrives and yields its resin at various altitudes up to 500 metres, the average annual rainfall being about 29 inches. It is said that when grown in other parts of the island, or in adjoining islands, the tree may grow normally and flourish but does not yield a "gum" with true mastic characteristics. The suggestion has been made that the geological nature of the southeastern part of the island may have a bearing on the matter.

Collection of mastic in Chios is now limited by law to the three-month period July 15–Oct. 15 in order to avoid collection of inferior "winter mastic", known locally as "kokkologi". Tapping is carried out with a small tool resembling a carpenter's gouge. The shallow incisions made may be on the larger branches as well as on the main stem. Tapping is done periodically for about six weeks. The mastic which oozes from the wounds either forms tears on the bark or falls to the ground. Before tapping, the

ground under the trees is levelled, beaten hard and sprinkled or covered with white earth. This causes the mastic which falls to retain a good colour. The tears set fairly hard about a fortnight after they have formed.

During the collecting season the peasants store the mastic collected in their homes, spread out in a single layer in some convenient place. When all has been collected it is cleaned, washed and graded for size and quality, special names being used for different grades (4).

With regard to yield it is stated (Davidson) that a five- to six-year-old tree will yield only five drams. A ten-year-old tree may yield ten drams. This increases to 100–150 drams at the age of 50 or 60 years. Exceptional trees have yielded 400 drams a year, but the usual yield of middle-aged trees is 50–60 drams (4).

Sandarac

This resin is obtained from *Tetraclinis articulata* Mast., a coniferous tree that occurs in some of the mountainous areas of northwest Africa and also to some extent in Spain (Armeria) and in Malta. The resin is collected by the natives and shipped mainly from Mogadore, Casablanca and Nazagan, "Mogadore sandarac" being a trade term in common use at one time.

The resin is pale yellow and usually in tears ¼ to ¾ inch long. Sometimes these are cylindrical or stalactitic in form or they may be united into small mases. The tears or fragments, generally covered with yellowish dust, are brittle, and the broken surface clear and vitreous. Sometimes small insects may be seen imbedded in them. The odour and taste are terebinthinate or suggestive of turpentine, and this is intensified on warming. About one percent of volatile oil is present, and traces of a bitter principle. When chewed this resin does not agglomerate into a plastic mass as do mastic and most other resins but merely breaks up into a sandy or mealy powder in the mouth. The resin is easily powdered (17).

Like mastic sandarac was known to the Ancients and to peoples of the Mediterranean in the Middle Ages, being used medicinally and as a picture varnish. It is still employed to some extent medicinally. In pharmacy its chief use is in the preparation of pill varnishes, and it is sometimes utilized in alcoholic solution on cotton wool as a temporary filling for teeth. The resin is completely soluble in alcohol and in ether; partly soluble in chloroform, carbon bisulphide and oil of turpentine.

The main use for sandarac is for varnishes of special types. With alcohol it yields a hard white spirit varnish which is prone to be brittle unless mixed with other resins. The resin has been much used as a metal varnish and gives good lustre in thin coats. It has also been used as a leather and paper varnish, being often employed for indoor labels. The gloss may vary according to the nature of the solvent used (11). In bygone days sandarac was used in powdered form as pounce for preparing the surface of parchment for writing.

The tree yielding sandarac belongs to a monotypic genus allied botanically to *Callitris* and *Widdringtonia* but differing from them in its four-ranked leaves and its flattened *Thuja*-like divisions of the branchlets. Its small rounded cones (⅓ to ½ inch in diameter) are deeply grooved and composed of four scales. Six seeds are usually produced by each cone. The tree is an evergreen and normally of pyramidal habit, reaching 40 to 50 feet in height with a trunk two to four feet in girth. In its natural habitat it is often exposed to long periods of drought and is to be seen on poor soil or almost pure rock where little other vegetation can exist. It is common in some of the mountainous areas of Morocco

and Algeria where it is important for timber quite apart from the resin. In Morocco there are extensive forests at the higher altitudes in the central and southwestern parts of the country (13).

The wood is fragrant, yellowish brown or reddish, and is hard and short grained. Sometimes it is beautifully marked as in bird's-eye maple. The wood has long been popular for fancy cabinet work and for furniture. It is said to be the " citrus wood " of the Romans who preferred it to all other woods for roofing temples.

The bark of the living tree contains numerous schizo-lysigenous cavities which are full of the liquid resin. Some of the resin collected by the natives appears on the surface of the trunk as a result of natural exudation, and some is obtained as a result of making incisions in the bark. The secretion gradually hardens and is finally picked off when quite hard and dry.

Australian sandarac, which is altogether a newer and more recent product, is obtained from several species of the allied genus *Callitris* in Australia, the trees being commonly known there as the " cypress pines ". The resin is very similar to ordinary or African sandarac, both in its physical and chemical properties and in the uses to which it may be put. The product appears to have been mainly consumed in Australia and but little exported so far. The most important species are considered to be *Callitris calcarata* R.Br. (" black cypress pine "), *C. glauca* R.Br. (Murray River Pine) and *C. verrucosa* R.Br. (13).

Dragon's Blood

This fanciful name has been employed for a number of different resins that are of a dark red colour and used either medicinally or for varnishes. Most of the dragon's blood that enters commerce at the present time is derived from climbing jungle palms, species of *Daemonorops*, from the Malayan region. Originally, however, the name was used only for the dragon's blood of Socotra, derived from *Dracaena cinnabari* Balf., a liliaceous palm-like tree that occurs on that island (8).

Socotrine dragon's blood is known to have been used by the peoples of the Mediterranean from very early times and constituted an article of trade with them. It may therefore be fitting to refer to it here, although it is not one of the resins that are produced within the Mediterranean basin. Some of the early writers, among them Dioscorides and Pliny, referred to it. It was held in high esteem for its medicinal or its alleged medicinal properties by the Greeks and Romans. The Arabs also made use of the resin in this way and knew it as " dam-ul-akh-wain ", a name which it retains among them at the present day (13).

In European medicine dragon's blood was formerly used in dysentery and diarrhoea, and as an astringent in tooth powders. Other uses are for colouring mahogany-coloured varnishes and for staining marble.

A trade term at one time in use for Socotrine dragon's blood was " Zanzibar drop ", the reason for this being that the resin often found its way to Bombay or Zanzibar before being exported to Europe.

Frankincense

The use of frankincense or olibanum, as it may also be called, goes back to a very early period, and there are numerous references to it and to incense, of which it formed an essential ingredient, in the Bible. As typical of the great esteem in which frankincense was held in Biblical times, the memorable gifts presented by the Magi to the infant Saviour may be called to mind. Herodotus relates how the Arabians paid to Darius, King of Persia, an annual trib-

ute of 1000 talents of frankincense. It has also been established that many centuries before Christ the Phoenicians and Egyptians carried on trade in frankincense. In the temple of Dayr el Bahri in Upper Egypt there are said to be paintings illustrating the trade carried on between Egypt and a country called Pount, as early as the 17th century B.C., in which representations of frankincense or bags of frankincense occur, also of frankincense trees planted in tubs or baskets being conveyed by ship to Egypt. The country Pount is considered to have been what is now the Somali coast, together with a portion of the opposite Arabian coast (7).

With regard to the early use of incense outside the Mediterranean region, it is an interesting fact that the Arabs in their trade with the Chinese, which existed as early as the tenth century, exchanged frankincense, myrrh, dragon's blood and storax, all these commodities being imported from the West into China (7: 12).

Frankincense is obtained from species of *Boswellia,* mainly *B. carteri* Birdw. and *B. frereana* Birdw. The genus *Boswellia* belongs to the family Burseraceae, well known for its fragrance, and consists of about a dozen species of small trees or shrubs that occur mainly in dry parts of northeast Africa and southeast Arabia. It would seem that for some time past frankincense has been collected only in Africa and not in Arabia (5). Ducts occur in the bark and other parts of the plant, and these contain the fragrant oleo-gum-resin. When this exudes, as a result of injury or wounding, it is at first a thin milky fluid but soon thickens and hardens to a solid or semi-solid consistency.

In Somaliland the species mainly exploited for frankincense are *Boswellia carteri* Birdw. and *B. frereana* Birdw. The frankincense-yielding or potential frankincense-yielding areas are extensive and generally consist of rough, inhospitable or mountainous country which renders collection difficult. Frequently only the more accessible trees are tapped, while those in the more remote or difficult situations are neglected. As the resin is readily spoiled by rain, collection is carried out only in the dry season. Even so as the resin is transported to the coast or is stored prior to shipment, " blocking " of it commonly takes place, i.e., the tears become consolidated, which results in a lower price (6).

Tapping is carried out about the end of March or early April and may go on for five or six months. It may be effected by scraping away portions of the bark instead of making incisions. For this a special tool, termed " mengaff ", may be used. It resembles a double scalpel with a sharp and a blunt end. The sharp edge is used in the actual decortication, and the blunt end in assisting to remove the resin when it is harvested. The first collection of the resin may take place about a fortnight after tapping when the globular pear-shaped or club-shaped tears are removed. Subsequent collections are made every few weeks, the wound being freshened each time.

An idea of the attitude of the natives towards the tree in Somaliland and the method of regeneration is afforded by the following remarks: " Reproduction takes place by seed. The seed falls from the parent plant on to the rocks below, penetrates into one of the innumerable openings that the rocks present, finds there a little earth borne by the wind, germinates, puts out rudimentary leaves and a fleshy rootlet. For some time the young plant has a precarious existence, then it gradually gains strength and extends its root or enlarges its sucker according to the circumstances of its situation. . . . Certainly the natives do not concern themselves, and have never concerned themselves with the propagation of the precious plant—' Allah takes

thought for everything, ours not to understand.' And with that convenient tribute to divine providence they are dispensed from any further trouble in the matter. It appears indeed that a descendent of the Osman Mahmud once tried to transplant some incense plants into open ground near the wady of Botiala, removing them from the mountain with great care, and with portions of rock adhering to their suckers. The plants, according to the story told by an aged chief, after a few years of exuberant growth came to grief in the waters that flooded the wady as a result of some exceptionally heavy rains. Allah had his revenge" (10).

The frankincense of commerce is usually pale yellow but sometimes has a reddish or greenish tinge. The fragments or tears vary much in size and are brittle and easily broken with the fingers. Their odour is of course fragrant. When chewed they have a slightly bitter taste and form a plastic mass in the mouth. The composition is approximately 60% to 70% resin, 27% to 35% gum and 3% to 8% volatile oil.

The main use of frankincense today is in the manufacture of incense, for which substance it is regarded as an essential ingredient. Other uses are in fumigating powders and pastilles, but in most countries it is no longer an ingredient of medicine.

Other species of *Boswellia* are known to yield fragrant resins, although not of commercial importance. In West Africa *B. dalzielii* Hutch., also a small to medium-sized tree with sweet smelling flowers and common in some areas, yields an aromatic resinous exudation. This is collected by the natives and burned to fumigate clothing or to drive away flies and mosquitoes from dwellings (13). In dry hilly areas of northern India *B. serrata* Roxb. yields a fragrant oleo-gum-resin ("Indian olibanum") which has been exported and may be used for incense. Resins of the frankincense type are yielded also by *B. ameero* Balf. in the island of Socotra and by *B. bhaudajiana* Birdw. and *B. papyrifera* Hochst in northeast Africa.

Ladanum

Ladanum or labdanum, a fragrant resinous substance used mainly as a fixative in perfumery and in scenting certain kinds of soap and tobacco, is obtained from various species of *Cistus* or "rock rose" in the Mediterranean region.

The ladanum of Spain, Portugal and France is considered to be mainly derived from *Cistus ladaniferus* L. and that of Crete from *C. creticus* L., an allied species. *Cistus ladaniferus* is an evergreen shrub three to five feet high with somewhat clammy branches, owing to the presence of resin. It is often grown as an ornamental on account of its handsome flowers which are mainly white and large—three to four inches across. The petals possess a crimpled margin and have a blood-red spot near the base. There is, however, a form with pure white flowers with no red spot at the base of the petal. This "rock rose" has the largest flowers of any of the many species cultivated out-of-doors in the British Isles, but it is not so hardy as some of the other species. The plant is native to southern Europe and North Africa.

In Spain the common method of obtaining ladanum is to boil the twigs, collected in spring and early summer, usually between March and July, and skim off the resin that comes to the surface. However, solvent extraction processes may be used, as in France, and these are claimed to yield a superior product with less loss of aroma (1). Ladanum commonly comes into commerce in the form of dark blackish-brown to greenish lumps. Extraneous matter is often present in some quantity,

or it may be adulterated with other resins. Sometimes the odour is faintly ammoniacal.

In Crete, where *Cistus creticus* is the species mainly exploited, unusual methods of collecting the resin may be practised. A rake-like frame bearing two long leather straps or thongs is used to whip the plants, which causes the odorous resinous substance to stick to the thongs. It is then scraped off and rolled into thick sticks or lumps for the market. At one time it was said to be gathered from the beards of goats that had been browsing on the plants, also by driving sheep to and fro among the bushes and then combing the resin from their fleeces. *Cistus creticus* is smaller than *C. ladaniferus,* being usually about two feet in height. Its flowers are also much smaller, purple or purplish, with the petals yellow at the base.

Ladanum is reputed to be much used in Turkey. The odour varies a good deal with different botanical or geographical sources. It may be of the heavy oriental type or powerful and sweet with something in common with ambergris, or it may have the detrimental ammoniacal odour. It is much valued in certain classes of perfumes and as a fixative. Ladanum is the nearest approximation to ambergris in the Vegetable Kingdom. It is used in the preparation of artificial ambers and as a fixative in perfumes of the following types—carnation, hyacinth, lavender, lily, narcissus, patchouli, rose, reseda, trifle, verbena, violet, wallflower. Ladanum also has a place in fumigating preparations, especially in cone pastilles, the popular form. In soap perfumery it is perhaps favoured most for toilet soaps of the lavender and sandalwood classes.

Asafoetida

Asafoetida is one of several resins derived from the family Umbelliferae which is so well represented in the vegetation of the Mediterranean region. The resin has undoubtedly been used medicinally from very early times. Some consider that the substance which the Ancients called " laser " was actually asafoetida, but others are inclined to question this. Laser was one of the substances from India or Persia on which duty was levied at the Roman custom house of Alexandria in the second century. The word " hingu ", which occurs in many Sanskrit works, especially in epic poetry, is also considered to refer to asafoetida. Asafoetida was known to the Persian and Arabian geographers, and to travellers of the Middle Ages. Like many other commodities it found its way into western European commerce during the Middle Ages through the trading cities of Italy. In the 13th century the " Physicians of Myddfai " in Wales considered asafoetida to be one of those substances which every physician " ought to know and use " (7).

Asafoetida is collected from the living root of *Ferula foetida* Regel, *F. rubricaulis* Boiss. and probably other species that occur in Persia or Afghanistan. The method of collecting varies in different localities. A common technique is to scrape away the soil from the top of the large fleshy root and to make incisions in it, or the top part may be cut away. After the resinous juice that exudes has dried it is collected and eventually finds its way to the market. Large schizogenous resin canals are very abundant in the root. In the Fars district of Persia where the asafoetida plant reaches seven to ten feet in height and is termed " anghuzeh ", the main stem of the plant may be severed at intervals nearer and nearer the base and the resin obtained that way. The asafoetida from this area goes mainly to Bombay via Persian Gulf ports, such as Bundar Abbas (17). From Bombay it is exported to European and other countries.

Commercial asafoetida is either in the

form of tears or in an agglomerated mass, the latter being the more common form and the form most likely to contain impurities, such as fragments of root or stems, fruits, earth, small stones or other matter. The tears may vary from a quarter of an inch or less to over an inch in diameter. They may be yellow, grey or reddish-brown. The resin softens markedly on warming and powders best if cooled first. It has a strong alliaceous odour and taste. Good samples consist of approximately 40% to 64% resin, 25% gum and 10% to 17% volatile oil. Medicinally asafoetida is employed as a carminative in flatulence and as a sedative in nervous disorders (in hysterical conditions); also as an expectorant in chronic bronchitis. The resin or drug is often used in veterinary work. It is said to be a constituent of certain sauces.

Galbanum

This oleo-gum-resin is so similar to asafoetida that it may well be considered with it. In the first place it is the product of species of *Ferula* and is collected in Persia in some of the same areas as asafoetida. The method of collecting is also similar, a portion of the root being laid bare and incisions made in it, or the top cut off to induce the resin to flow. Slices of the root may be removed at intervals. Like asafoetida commercial supplies reach western markets mainly via the Persian Gulf ports and Bombay. Some of the resin collected is the result of natural exudation, in many instances due to insect attack.

Although there is still some doubt as to all the species of *Ferula* that may yield asafoetida or galbanum, it is considered that galbanum is derived mainly from *F. galbaniflua* Boiss. and possibly *F. schir* Boiss.

Galbanum, as marketed, appears either in tears or in an agglutinated mass with impurities in the form of earthy matter or vegetable debris. The tears are brownish and usually smaller than those of asafoetida. They are also softer—soft enough to be flattened between the finger and thumb. The odour is pleasant but the taste somewhat unpleasant and characteristic. The composition is variable with different samples, but is usually within the following range—resin 50% to 70%, gum about 20%, volatile oil 5% to 20%. When used medicinally galbanum may be employed as a stimulant expectorant in chronic bronchitis or externally in the form of plaster for inflammatory swellings.

Ammoniacum

There are two main forms or varieties of this oleo-gum-resin which has medicinal uses very much the same as asafoetida and galbanum, although little used at the present time. These two forms are Persian ammoniacum and African ammoniacum. The former is the better known and the one that generally enters commerce, being derived from *Dorema ammoniacum* D. Don and probably other species such as *D. aucheri* Boiss. that occur in Asia Minor. African or Moroccan ammoniacum, on the other hand, although very similar, is derived from species of *Ferula*. The ammoniacum known to the Ancients and referred to by Dioscorides and Pliny and succeeding Greek and Latin writers on medicine is believed to have been that obtained from *Ferula*.

Persian ammoniacum has also been known from fairly early times and is reputed to have been referred to by a Persian physician in the tenth century who called it "ushak", a name which it still retains in Persia. *Dorema ammoniacum* is a perennial plant with the main or flowering stem reaching six to eight feet in height. It has large compound leaves and is covered in the young state with fine hairs giving it a greyish look. It occurs over a wide area in Asia Minor and is common in some localities,

especially in central Persia. It is reputed to be very prevalent in the area between Ispahan and Shiraz. The resin when collected is largely despatched to Ispahan, whence it passes via the Persian Gulf ports to Bombay.

The stem of the plant contains the resinous milky juice which flows out with the slightest puncture. It may solidify next the wound or puncture, or run down the stem. The resin collected is mainly the result of natural exudations caused through the punctures of insects, chiefly beetles. The exudations appear and are collected mainly in May and June.

Like asafoetida and galbanum, ammoniacum appears in commerce in two forms, as tears or in lump (agglutinated) form when it is apt to contain impurities such as pieces of stem, fruits or earthy matter. The tears are yellowish, more or less round, and may be anything up to about an inch in diameter. The tears are harder than those of galbanum but soften on being warmed. The odour is characteristic and the taste bitter and acrid. Ammoniacum contains up to 6% of volatile oil, 60% to 70% of resin and about 20% of gum.

Sagapenum and Opopanax

These two resins of the Mediterranean region or Asia Minor do not normally enter commerce and have not done so for many years, although they appear to have been well known and freely used in earlier times. In mediaeval pharmacy sagapenum was frequently called "serapinum" (7). As it is frequently mentioned by the older writers, it must have been fairly plentiful. The botanical origin is not known with certainty but is believed to be species of *Ferula* (possibly *F. persica* Willd. and *F. szowitziana* DC.) that occur in Persia and Arabia. Sagapenum is described as possessing a bitter, nauseous taste, and an odour more aromatic than but not so strong as that of asafoetida. Its uses are similar to those of asafoetida and galbanum (19).

Opopanax is described as occurring in hard nodular lumps of an orange brown colour, and to possess a penetrating offensive odour reminiscent of crushed ivy leaves (7). The botanical source has been stated to be *Opopanax chironium* Koch, an umbelliferous plant that occurs in Persia and the Mediterranean region, the resin being obtained by incising the root as with asafoetida (19).

Storax

The name "storax" or "styrax" is used for different products of varying botanical origin. There are two main forms of this resin known to commerce or medicine at the present time, the one a product of the Old World and the other of the New. The Old World product is a balsam or liquid resin derived from the tree *Liquidambar orientalis* Mill. which occurs mainly in the south-west of Asia Minor, while American storax, a similar product, is obtained from the closely allied *Liquidambar styraciflua* L. or sweet gum, a tree native to the United States. Another storax is the solid resin derived from *Styrax officinalis* L., mainly in the eastern Mediterranean area.

Both the liquid and the solid styrax or storax of the Mediterranean region, referred to above, have been known and used since early times and are mentioned by the classical writers. Greek physicians of the sixth and seventh centuries are reputed to have mentioned liquid storax in their writings (18). The early Arabian physicians were also said to have been familiar with it under the name of "miha" ("maya"), and also knew how and whence it was obtained. From an early date storax was shipped to Bombay via the Red Sea and thence to China.

Liquid storax is obtained by injuring or bruising the bark of the tree in early summer. This causes production of the balsam in the bark which is collected in the autumn, and the balsam extracted either by pressure or with boiling water or a combination of both. The liquid storax is a soft viscid resin, opaque and greyish brown, with the consistency of a thick honey. When heated loss of water takes place, the colour darkens and any impurities present sink to the bottom. It has a pleasant aromatic smell and a sharp rather pungent taste. The medicinal uses of storax are similar to those of Peru balsam (*Myroxylon pereirae* Klotzsch) and benzoin (*Styrax benzoin* Dry), but it is now seldom used (13). It is said to be a constituent of Friar's balsam.

In its natural habitat *Liquidambar orientalis* is a handsome tree that may reach 100 feet in height, but is usually considerably smaller. In the relatively cool climate of Britain its growth is very slow but it withstands the winter.

Solid storax from *Styrax officinalis* is said to somewhat resemble benzoin in appearance and to have a fragrant balsamic odour, but the resin has long been scarce, owing to trees having been cut out in many areas. The tree is a native of Greece and Asia Minor up to elevations of 3,600 feet. It is extremely attractive when in flower. In the climate of the British Isles it may be grown only in the most favoured localities or with the protection of a south wall.

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Utilization Abstract

Bark Wax. After many months of development the Oregon Wood Chemical Company, of Springfield, Oregon, began commercial production of wax from Douglas fir bark, formerly burned as a waste product, by means of hot benzene as an extracting agent. The benzene is then separated from the dissolved wax by steam distillation, and the resulting wax is harder than beeswax but not so hard as carnauba. "Already many uses have been found for the wax, including polishes, ski wax, ointments, lubricants, soaps, art and sculpture work, preservatives, and a score of similar applications". (Anon., *Chemurgic Digest 9*(7): *9. 1950*).