Peppermint Oil Production
In Washington

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Peppermint culture is a comparatively new industry in the Pacific Coast States, being introduced in Oregon about 25 years ago. The industry has grown steadily until at the present time the output of oil from this region amounts to more than 15 per cent of the total for the United States. In Washington the cultivation of mint is largely confined to sections of the Columbia and Yakima Valleys.

Approximately one million pounds of peppermint oil are used annually in America. The cool refreshing flavor makes it very popular for improving the taste of medicinal preparations. It is also used in candies, and in chewing gum and its chief constituent, menthol, finds extensive use in cold remedies and in unguents.

To supply the present demands of the United States for peppermint oil requires more than 75,000 acres. The muck lands of southern Michigan and northern Indiana produce about two-thirds of the annual requirements. The remainder is supplied largely by Washington, Oregon, and California, with several other states furnishing small amounts.

Plant Varieties

The botanical name of the peppermint plant is Mentha piperita. The variety known as Black Mitcham has been found to be the most profitable for distillation purposes in America. It has deep-green, slightly serrated, broadly pointed leaves growing on very erect square stems of a dark purplish color. The plant reproduces by sending out numerous stolons or runners at or near the surface of the soil. Under favorable conditions these runners root very readily and form new growths at nearly all nodes.

In contrast to the black mints, such as the Black Mitcham, the so-called white varieties are less productive and not as hardy. The white varieties find little favor in this country despite the fact that they produce oil of superior quality.

Soil Types

Although well drained swamp lands are most favorable for the thrifty growth of peppermint, it may also be grown with commercial success upon upland soils provided reasonable care is used in the selection of the type of soil. Open textured, deep soils that are rich in humus and remain moist are to be preferred, provided they are well drained. Upland soils capable of growing corn or potatoes successfully are suitable if they are prepared carefully.

Clean land is essential for the production of oil of good quality. Summer fallowing previous to planting aids materially in keeping the field free from weeds. Because a mint field requires considerable cultivation and care, it is not advisable to plant too extensively the first year.

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Planting and Cultivation

A good seed bed is prepared, after which furrows six inches deep are marked off, 40 inches apart. Selected runners are then placed in the furrows so that they form a continuous row. Some growers prefer to lap them slightly in order to insure a good stand. The roots are then covered with loose earth sufficient to keep them from being pulled out by implements used for covering. The field is then finished by smoothing over with a drag or harrow.

The planting may be done either in the fall or in the spring, but the spring planting should not be delayed beyond the middle of April. The above system of planting requires about 20 sacks of roots per acre. Heavier planting is sometimes followed where the grower transplants from his own plots.

After planting, the surface is kept from caking by harrowing across the rows with a spike tooth harrow or similar weeder. This is repeated in a different direction as often as needed to keep the plot free from weeds and is continued until the plants are high enough to escape injury. As the plants grow they will spread into the space between the rows. It is usually necessary to continue the cultivation by hand weeding between the plants and by stirring the soil with hand tools until the mint is ready for cutting. Cultivation should be conducted in such a manner that no ridges are left to interfere with the close cutting of the mint.

Harvesting

Mint is harvested in the same manner as hay crops. Cutting may be done with a scythe, by hand, or with a mower, according to the size and condition of the field. The cutting should be done early in the day and the mint allowed to lie until about half dry. The curing is then finished in small cocks or in windrows similar to those made for handling clover hay. Side delivery rakes, hay loaders, and other modern haying equipment is frequently used in large fields.

Peppermint oil may be distilled from mint hay that has not been cured, but drying the mint is more economical, since the dry hay yields the oil more readily during the distillation and is lighter, less bulky, and generally easier to handle. Because the larger portion of the oil is contained in the leaves, the harvesting should be conducted so that the loss of leaves by shattering is reduced to a minimum. Exposure to rain lessens the yield of oil and should be avoided.

The time of year in which the harvesting is done will vary with the weather conditions and with the section of the state in which the mint is grown. Ordinarily the crop in Washington is in the best condition for cutting during the first two weeks in August; although in some districts it is much later than this.

Harvesting should be done when the plants are in bloom to obtain the maximum yield of oil. Judgment must be exercised in the time of cutting, since the individual plants open at different times and the period of blooming for the field is relatively long. In large fields, the cutting should be done when blossoming starts so that when the last part of the crop is harvested the majority of the plants will still be in bloom.

As the foliage begins to fall with the passing of the flowering period, the oil content diminishes rapidly. Hence the loss of oil, when the cutting is late, is greater than if the crop is harvested before it is prime. New mint matures
later than old mint, thus permitting the harvesting of old stands before the new fields are ready.

In some sections, two cuttings are made each season, and in this case, care must be taken to harvest the first crop as early as is consistent with good yields of oil. The immature mint from the early cutting, when two-crop harvesting is practised, very often yields oil of inferior quality. The demand for higher quality oil may make this an important factor and due consideration should be given to the quality as well as to the quantity, before deciding upon the number of crops to be harvested.

Extracting the Oil

Extracting the oil is simple in principle although somewhat complicated in practice. The mint hay is placed in a vessel, known as a distilling tub, a vat, or a retort, which is fitted with a vapor-tight cover connected with an air-cooled or water-cooled condenser. Live steam is then introduced at the bottom of the tub and passed through the mint herb and into the condenser carrying with it the peppermint oil.

In the condenser, both the steam and the oil are condensed to liquid which is in turn collected in what is known as the receiver or the separating can. In the receiver the liquid separates into two layers, the lighter oil floating on top of the water from which it is run off by suitably located drains in the side of the can.

Source of Steam

The boiler for generating steam is a major item of expense in the distilling equipment. Excessive costs are frequently avoided by using steam tractors or reconditioned high-pressure boilers which are still safe for use at the relatively low pressures required by the distillation procedure. Care should be taken to see that all safety appliances on the boiler are in working order.

The gauge pressure of the steam in the boiler will range from 40 to 100 pounds. The pressure is of value, not for forcing the steam through the mint hay, but for increasing the temperature of the steam delivered at the bottom of the distilling tub. Steam at zero gauge pressure, which is the same as steam from water boiling in an open vessel, will have a temperature of 212°F. At a gauge pressure of 40 pounds the steam will have a temperature of 287°F, and at 100 pounds gauge pressure a temperature of 338°F, is obtained. The importance of the higher temperature in the distillation is obvious. Steam at low pressure, and consequently at a relatively low temperature, strikes the bottom of the tub and the mint hay and, instead of continuing upwards as steam, is condensed to water and remains in the bottom of the tub. At higher steam pressures the tub and contents are heated with much less condensation while the increased temperature brings about a much more efficient distillation.

Distilling Vats

The vat is a cylindrical vessel whose diameter and height each may range from six to nine feet. These were formerly made from wood in the shape of a large tub but are now generally constructed of galvanized steel of about 16
gauge. In some vats the bottom is of smaller diameter than the top in order to facilitate better packing of the herb.

The cover of the vat must be removable for filling and at the same time must be so constructed that it is vapor tight during the distillation. In the conventional form of still, the vat has a strip of packing material riveted to the top edge. The cover is held tightly down against this packing material by means of short rods hinged from the main body of the vat in such a manner that they can be turned up into slots in the cover and tightened by means of large wing nuts.

A novel departure from the conventional type of seal has been successfully used for many years by a firm on the Pacific Coast. In the stills made by this firm, the body of the vat has an extra water-tight jacket around the top about 10 inches deep. The cover has an extension which fits in the channel between the body of the vat and the jacket and when this channel is filled with water, a vapor-tight seal is obtained. The only precaution to be observed with this type of equipment is to guard against the development of pressure in the upper part of the vat.

In the conventional form of still the vapors are conducted to the condenser through a hole near the top edge of the vat while in the water-sealed equipment just described, the outlet is in the center of the cover. The outlets are large, seven or eight inches in diameter, to prevent any appreciable back-pressure from developing in the upper part of the vat.

Condensers

Condensers are of two types, the worm condenser and the tubular condenser. The worm condenser is made of a single pipe which, in order to conserve space, is doubled back and forth giving the worm-shaped appearance from which it takes its name. The total length of piping in an average worm condenser is approximately 100 feet. The first few sections consist of pipe of large diameter, perhaps seven or eight inches. The condensation of part of the vapor to liquid then permits the use of sections of smaller diameter. The sections decrease successively in diameter to two inches for the final section of pipe.

Worm condensers depend upon the large surfaces exposed to the air for the cooling necessary for condensation. The cooling is rendered more efficient by placing perforated troughs above the “worm,” thus permitting cold water to flow over the outside of the condenser tube. In more isolated instances the lower sections of the worm are submerged in a tank of water.

The tubular condenser consists of a number of pipes of small diameter which are inclosed in a tubular shell as arranged that cold water can be circulated around the outsides of the pipes. The steam and oil vapors from the retort are then conducted into the pipes where they are cooled and condensed. Because of the large number of tubes in the tubular condenser the rate of travel of the vapors is slow and this condition, together with the efficient cooling by the circulating water, permits the use of condensers as short as 10 feet. Tubular condensers are to be recommended for permanent installations on the basis of durability, compactness and efficiency; but these advantages must be weighed against the disadvantage of a considerably higher initial cost.
Receivers

A properly designed separating can is of great assistance in the final collection of the oil. Such receivers are of 10 to 50 gallons capacity and are arranged to facilitate the separation of the condensed water and oil into distinct layers. If the mixture of oil and water is allowed to flow directly into the receiver considerable agitation and churning may take place often resulting in an intimate mixture of the oil and water, called an emulsion, which does not separate readily, so that some of the oil is entrained and lost as the excess condensed water is drawn off from the bottom of the receiver.

The liquid coming from the condenser consists of about nine parts of water and one part of oil. In order to avoid the need for a receiver large enough to hold all the liquid from the condenser, the receiver is constructed so that the water may be drained off continuously leaving the oil in a layer on top of the water remaining in the receiver. To accomplish this the receiver is fitted with a pipe opening from the lower edge and extending upwards to a height equal to the level of liquid desired in the receiver. When the receiver fills with liquid from the condenser, the water, being heavier than the oil, collects in a layer on the bottom of the receiver and, as the condensed liquid continues to fill the receiver, the water is drained from the bottom leaving the oil in the upper layer. The oil is drawn off through drain-cocks fixed at suitable distances from the top.

In order to prevent the formation of an emulsion by the oil and water, the receiver is arranged to aid in the separation. This is done by letting the oil enter the receiver through a pipe extending a considerable distance below the top of the can where it is directed upwards by means of an elbow. In another type, the inlet is through the side of the can, about one-third of the distance from the bottom, with baffle plates arranged inside the can to give the incoming oil an upward direction.

Secondary Stills

Despite the precautions taken in the design of the separating can, the condensed water drained off will contain some peppermint oil. Where considerable distilling is done, this oil is sometimes recovered by collecting the overflow from the receiver and subjecting it to a second distillation.

Operating the Still

In charging the still it is customary to place a sling made of an iron ring with cross chains, in the bottom of the tub. The tub is then packed as uniformly as possible until it is half full when a second sling is introduced and the packing finished. After the distillation the tub is readily emptied by lifting the slings out by means of an overhead crane.

A small quantity of steam is frequently admitted during the filling of the tub to aid in packing the herb. After the packing is completed and the cover is in place, the steam is introduced rapidly until the condensed oil and water begin to appear at the end of the condenser. The volume of steam is then reduced to the maximum that can be handled by the condenser without allowing any vapors to pass through uncondensed.
The time required to complete the distillation will vary with the conditions. If the herb is dry and a high steam pressure is used, the herb may be completely exhausted in an hour. The distillation is complete when the vapors from the small try-cock in the cover of the retort do not carry any perceptible odor of peppermint. Most stills are equipped with two vats for each condenser so that one vat may be filled with herb while the other is distilling.

Redistillation

Before using, the oil is purified by redistilling. The oil from the first distillation contains a number of impurities, possessing characteristic odors, that are detrimental to the flavor. The most important of these objectionable substances is a compound called dimethyl sulfide which is a colorless liquid of disagreeable odor, boiling at 99°F., and having a specific gravity just slightly less than oil of peppermint. It is these objectionable substances that are removed by the second distillation.

It is generally conceded that the slightly higher price received for redistilled oil is not sufficient to make it profitable for the grower to purify the crude oil. Redistilling results in some unavoidable loss of oil, which, together with the additional expense, counteracts any gains resulting from higher prices.

Price Variations

The profit from growing peppermint will necessarily depend upon prices obtained at local markets. The price of peppermint oil is not steady; in the United States during the past 20 years it varied from less than $1.00 per pound to $28.00 per pound. In Washington the maximum price during the last six years has been less than $3.00.

In view of the wide variation in the price of oil it is difficult to estimate an average price that one can expect to receive. The yield per acre, and various production factors obviously play an important part in determining the price at which oil can be produced at a profit. Those interested in growing peppermint as a basic crop should, therefore, carefully investigate local cost of production and distilling before planting.