Minor Oil-Producing Crops of the United States

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In view of present international relations and disturbed economic conditions, it is well to consider more carefully our own resources of certain crops and commodities that are of a minor or auxiliary character. In this paper we propose to deal with the subject of lesser known and little used vegetable oils, which may or may not be byproducts of crops grown in considerable abundance. Some of them are not being produced at all for lack of a market or a price return that will justify collection, processing and refining; others are in production in small quantities but not to the potential limit of the supply of oil-bearing material.

It is a fact that oil prices in general have risen sharply in the last year due to our own increased needs, lend-lease arrangements, and lowered imports. The situation is, of course, an unusual and artificial one but it is also true that decisive and permanent changes in trade and commerce will result from the present state of flux. Domestic producers will receive benefit by absorbing markets which in times past have gone to foreign competitors. Byproduct industries will receive the impetus which previously was denied and profits will accrue from former waste materials. A war-torn world will be succeeded by one impoverished of the very essentials of simple living for its inhabitants.

Processing residues of fruits and vegetables and unmarketable grades of such commodities are the first materials to which it is logical to turn in search of vegetable oils, for at least a part of such wastes embraces seeds which are oil-bearing. Pits from the dried fruit industries, tomato waste and citrus waste from canneries and byproduct plants are rich sources of easily obtained and readily refined edible oils. Raisin seeds and seeds from grape pomace fall in this category. Then there is rice bran which is not only a source of vitamin B1 but also of an easily recovered oil. Cull and frost-damaged avocados can be processed for oil similar in its glyceride constituents to olive oil, which is now selling at fabulous prices. Cull Persian or English walnuts have little value but can be made to yield a superior drying oil.

The oils just referred to may be grouped conveniently as:

1. Pit and Nut Oils
2. Fruit Pulp Oils
3. Seed Oils

The first and third classes are both seed oils, to be sure; nevertheless, there is a natural distinction between them in that fruit pits are characterized by their size with relation to the fruit and their tough woody shells, which necessitate somewhat different treatment in an oil-recovery plant. As the various available oils are considered in turn, production statistics will be cited wherever possible as well as potential supplies residing in the wastes from processing plants. The latter are limiting figures only and need not be construed necessarily as a practical goal because of economic factors such as decentralization, or lack of sufficient material in the smaller plants to justify either recovery equipment or haulage to a custom-pressing establishment.

Pit and Nut Oils

The pit oils of the apricot, prune, peach, and cherry bear a striking resemblance to each other in composition and indeed are with difficulty distinguishable one from the other. They are like sweet almond oil for which they are often substituted (1). A rising demand for pit oils is indicated by the Department of Commerce figures (2) which list imports of peach and apricot kernel oils amounting to 47 tons in 1938, 67 tons in 1939 and 83 tons in 1940. Sweet almond oil imports were 43, 53 and 43 tons, respectively, showing no definite trend. The specialty oils are usually handled by essential oil brokers.

Almonds—Within the past year, one company in the Los Angeles area has started to produce almond oil in substantial quantities from domestically grown nuts. Ungraded, shelled nuts, principally of the Nonpareil variety, containing about 50 per cent oil, are dried, coarsely ground and cold-pressed. About 75 per cent of the oil is removed at 450-lb. pressure. The oil is low enough in free fatty acids that it may be refined to a high-grade salable product by the use of bleaching agents alone. American almond oil has an iodine value of about 103 which is slightly higher than U.S.P. specifications. Nevertheless, it is commonly accepted by the trade.

The meal, containing about 20 per cent oil, is edible but slightly bitter because of the skins. It is ground, sieved to various sizes and sold to the cosmetic and baking trades. The current season (1941) has yielded an abnormally low almond crop, 6,500 tons, which is resulting in an increased price for the nuts and oil. The average annual crop for the five-year period, 1936-40, was 14,400 tons.

Apricot pits—Nearly all of the apricot industry is located in certain well defined areas of California such as the Santa Clara, Sacramento, and San Joaquin Valleys, and a few of the southern counties. The average crop for the past four years was about 237,000 tons (3) of which the bulk, 84 to 93 per cent, was dried or canned. Many of the larger growers dry their own fruit from which the pits are removed and are able to sell the latter at prices ranging from $30 to $45 per ton, which is sometimes in excess of the price received for fresh fruit. Four plants in California buy and shell apricot pits in amounts as high as 14,000 tons per year if the crop is good. Apricot kernels are in demand as a substitute for almonds in bakery goods, though it is necessary to process them first in a way that will remove the bitter taste and liberate the hydrogen cyanide, such as by heating the ground meats in a current of steam (4). The bulk of this product formerly was exported to Europe but the domestic market is now the only one available. There is no market for broken meats that result in-

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cidentally from the shelling operation, and to minimize the loss that would otherwise be sustained these are pressed for oil, which is sold to the cosmetic and drug trades at the now very good price of 40 to 48 cents a pound. The present market, however, is a distinctly limited one, probably not in excess of 150 tons. The 14,000 tons of pits previously mentioned would yield, if all were pressed for oil, about a thousand tons in round figures.

At present there are two companies in California engaged in pressing pit oils, of which apricot is the chief. The cracking, separation of shells from meats, and pressing present no difficulties. If the meats are floated from the shell in brine, they must be promptly washed and dried to prevent hydrolysis of amygdalin and consequent release of "oil of bitter almonds" into the fixed oil. Refining losses can be held to a low figure. The oil bleaches easily and it is sufficiently bland that no deodorization is required. It is an excellent cooking and salad oil. The meal is nitrogenous and is sold for lawn fertilizer.

Prune pits—No prune-pit oil is produced at present although a little has been pressed in years past. It is similar to apricot- and peach-pit oils. The prune industry differs somewhat from the apricot industry in that the bulk of the crop is dried without being pitted. Some prune products are now put out minus the pit but these are of small volume. Ninety per cent of the United States prune crop of over 200,000 tons is produced in California (5-year average) (5), the balance coming principally from Washington and Oregon.

Prune pits average 12.5 per cent by weight of the fruit (6). They yield about 7 per cent of oil. An outside figure for the oil from prune pits for the entire annual crop is about 2,000 tons. This amount, however, could never be realized unless present marketing practices were to change in favor of pitted prunes.

Morgan of the Home Economies Division, University of California, College of Agriculture, found that prune-pit oil is relatively rich in vitamins A and E (7).

Peach pits—Peaches bear a certain similarity to apricots in the disposition of the crop, especially in the western states, which account for about 50 per cent of the national total. Here we find the bulk of the crop dried and canned, whereas in the East only minor quantities are thus processed. Pits separated from the fruits in these operations represent the only practical sources of oil.

A four-year average of the tonnages of both clingstone and freestone peaches dried and canned (3) is summarized as follows:

<table>
<thead>
<tr>
<th></th>
<th>Tons canned</th>
<th>Tons dried</th>
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<tbody>
<tr>
<td>Clingstones</td>
<td>305,000</td>
<td>23,400</td>
</tr>
<tr>
<td>Freestones</td>
<td>33,580</td>
<td>102,660</td>
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The total of these figures is 454,640 tons, which is equivalent to about 1,100 tons of oil. Pits at the present time can be had at a nominal price from companies in California, because at present there is no demand for peach kernels. A few tons of peach-kernel oil are being pressed by one or two small plants in California. Like the closely related apricot oil it can be refined and bleached to a sparkling light-colored bland oil ideal for a general cooking and salad oil. It is in small demand by the cosmetic trade.

The peach kernel represents only about eight per cent by weight of the pit whereas apricot kernels run close to 25 per cent. In considering utilization of both kinds of kernels, a profitable return on the shells is highly desirable. No particularly exclusive uses are known for the shells. Some shells have been ground for use as dynamite base, carbonized to make absorbent chars, and blended with carburizing compounds; some have been applied in the coarse form as a loose surfacing material for drives and parking areas. Whole peach pits are ground and briquetted for fuel by one western plant.

It might prove profitable to remove the volatile oil of bitter almonds from the meal by steam distillation. Finely ground, light colored meal has been used in beauty packs for its rubefacient properties.

Cherry pits—In 1930 Jamieson and Gertler (8) pointed out the excellent qualities of cherry kernel oil for the exacting requirements of the pharmaceutical and cosmetic trades. Since then the cherry crop has expanded appreciably until now we have annual yields as high as 96,000 tons of sour cherries which comprise the bulk of our canned pitted cherries. When the output of No. 2 cans is considered in terms of fresh fruit, the pack is estimated to be about 45,000 tons, or almost one-half the crop.

Cherry pits represent 12 to 15 per cent by weight of the fruit and contain about 11.2 per cent of oil. Thus, if all the pits from the cherries canned in factories were made available for oil, about 600 tons of oil could be obtained.

The oil has a somewhat higher iodine value than apricot and peach pit oils but not sufficiently high to place it in the drying class. It has good keeping qualities.

The meal contains 30 per cent or more of proteins and an amygdalin similar to that present in peach and apricot meals.

One company in Wisconsin is known to have produced cherry-pit oil in amounts less than 50 tons per year but is no longer operating. In quite recent years, another middle western company has produced natural cherry flavor by steam distillation of the ground meats but did not recover the fixed oil.

English walnuts—Walnut oil is distinctly different from the pit oils. It is a drying oil comparable to linseed oil.

About 90 per cent of the English walnuts grown in the United States are produced in California (5). The crop is divided almost equally between northern and southern counties (9, 10). The majority of the growers are members of an association which manages the disposal of the crop. Market saturation for walnuts is about 30,000 tons (11). Including culls and blow-offs domestic production is usually well above this figure, and it is necessary to provide some outlets for surplus to avoid depressing market prices. Surplus walnuts have been exported or shelled and the lowered returns to the grower have been partly compensated for by diversion payments.

It is now regular practice to press the inedible portion of culls for oil which is done largely in the Los Angeles area. There has been general acceptance of this oil by the paint industry at a price somewhat less than that of linseed. Output has been small, the