What We Do With Our Vegetable Oils

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A RECENT issue of *The Nation's Business* names two out of five outstanding achievements in modern chemistry—the development of vegetable oils and the manufacture of artificial leather. As striking examples, it was stated that there are not sufficient cattle to supply natural leather for automobile manufacture alone and that vegetable shortening replaces the fat or lard of many million hogs per year. It is interesting to see the vegetable oil industry given the recognition it deserves. The history of its growth and development, however, is not described by such brief analogy.

Little has been written of the early methods of producing vegetable oils. The history of producing cottonseed oil, by Wesson, in the proceedings of the Institute of Chemical Engineers, Vol. XII, part 2, is the best and most interesting account of the beginning of that branch of the vegetable oil industry in the United States.

Linseed oil production was an earlier development beginning before the 60's. Cottonseed and other vegetable edible oils have been developed in the United States in the last thirty-five years. In fact, it is safe to say that every investor and those employed in the vegetable oil business today can thank the grand old man of the industry, David Wesson; because, until he started the deodorization of vegetable oils in 1892, there was little development and probably would not have been more than this little were it not for his invention.

Vegetable oils can be briefly classified as follows:

1. Solid fats or oils.
2. Non-drying oils.
3. Semi-drying oils.
4. Drying oils.

Cocoanut, peanut, cotton and linseed oils are examples of each class and are those most extensively used in the United States. They are used principally for edible purposes with the exception of linseed oil which is used industrially in the arts.

Cocoanut oil consumption by the soap makers is enormous and they produce from it a soap giving a quick luxurious lather and one that cleanses in spite of hard, and even sea waters. The latter quality is peculiar to the cocoanut oil class only. This oil is also adapted for any use where oxidation would cause odors, as in textile soaps and lubricants. The iodin number of 8 to 11 being extremely low, the oil is subject only to very slow oxidation or rancidity.

The consumption as edible oil goes into many of the high quality food products. As a shortening for biscuits requiring long keeping quality its slow reaction to oxygen makes it without equal for this purpose. The amount and kind of fat used in a biscuit is the measure of its keeping quality. For example, it is well known that hard tack contains no fat or shortening agent and therefore keeps indefinitely.

By chilling and pressing cocoanut oil in bags the stearine is made. This, however, is not a true stear-

ine, but a solid portion of the oil melting around 84 to 88° F. The liquid or soft portion is called "olein" and melts around 72 to 74° F. The stearine is the more valuable product having a high latent heat of fusion and when mixed with sugar and placed between wafers makes the well-known Nabisco which has the pleasing, cooling taste when eaten. This is due to the quick absorption of heat by the stearine changing from a solid to a liquid within the narrow range of 2 to 4° F. Other uses for this product of cocoanut oil is for shortenings and coatings. The soft portion or olein is an excellent frying fat for peanuts, potato chips and even clams. It is also used as shortening in baked products. The production of stearine in the United States is perhaps ten million pounds per year.

Probably the most important use for cocoanut oil is in margarine where 82 million pounds per year are used in the purely vegetable product. Langworthy & Holmes of the U. S. Bureau of Home Economics have shown by human digestive experiments that cocoanut oil is slightly more digestible than butter fat. The flavor and light color of this oil is not equaled by any other consumed here. The importations as oil and the production from copra for the year 1925 were, respectively, 233,174,000 pounds and 229,367,000 pounds, and of the total 462,541,000 pounds only 17,900,000 pounds were exported, the balance being consumed in the U. S. In addition to the amount consumed by the purely vegetable margarine manufacturers considerable is used in what is called animal fat margarine.

Palm kernel oil with an iodin number of 15 to 17 is very similar to cocoanut oil in physical constants and use. However, only 52,624,000 pounds were imported in 1925 and none was produced here. Though there is a striking similarity between palm kernel and cocoanut oil experience has taught the consumer that cocoanut oil is the sweeter and better keeping product of the two.

Peanut oil is an example of the non-drying class having an iodin number of 90 to 94 and is used for shortening, frying, and as a table or salad oil, like olive oil. Though the iodin number is rather low, yet peanut oil remains limpid in the home icebox or refrigerator and therefore is practically a salad oil as is. It has the wonderful power of producing a thicker emulsion when made into mayonnaise dressing than other similar oils. The work of Langworthy & Holmes shows it to be slightly more digestible than most oils. However, that might not be the reason that considerable quantities are consumed in the manufacture of chewing tobacco. The importation of peanut oil in the year 1925 was only 3,026,000 pounds while the domestic production the same year was 15,156,000 pounds. Before the increased tariff on this product there was imported and produced in 1918 about 96,000,000 pounds. The production being small the use of this oil is limited and it might be safe to say that the main consumption for this product is in margarine where it adds plasticity or buttery texture.

Cottonseed oil with an iodin number of 108 is hardly representative of the semi-drying oils but it can be called the leader of all vegetable oils. The production of refined oil in 1925-26 crop year was 1,363,098,000 pounds, of which 21,000,000 pounds were exported, the remainder being consumed in the United States. The greatest consumption of this oil is in the form of vege-

table shortening which has been greater than the consumption of hog lard in this country, being 1,-152,620,000 pounds in 1925. The quality of the product is accepted by consumers to be equal to and better than hog lard, and at times it sells for a considerably higher price. Dr. Clarke E. Davis, however, has shown by his "short-ometer" that the animal product is somewhat more efficient as a shortening agent. About 15 or 20 per cent of the refined cottonseed oil production, or 270,000,000 pounds, is converted into winter cottonseed oil. This product is the universal salad or table oil. Its use extends from the packing of fine sardines to the most delicate and delicious salads. A large portion of this product goes for home and commercial mayonnaise and salad dressings. Mayonnaise contains from 77 to 87 per cent of oil and about 50 to 60 million pounds are used in the manufacture of commercial dressings yearly.

For deep frying, such as doughnuts and potatoes, large quantities of both cottonseed oil and vegetable lard are used. Some of the cottonseed stearine made by the winterizing process and the hydrogenated oil are used in margarine.

Corn oil is certainly representative of the semi-drying oils having an iodin number of 117. Practically the whole production of 104,000,000 pounds in 1925 went to the trade for use as a salad and cooking oil. There seems to be a belief among some experimenters on shortening agents that the higher the iodin number the better the shortening. However, in making mayonnaise, it is easy to demonstrate that corn oil does not produce as thick or stable an emulsion as cotton oil does. Yet, large quantities are evidently used by the housewife today for this purpose.

Soya bean oil is almost a drying oil—but not fast drying like linseed—and can be classed as semi-drying, with an iodin number of 126 to 134. Practically none of it is used for edible purposes now, although during the war large quantities were used in this way. Imports of 19,492,000 pounds in 1925 went almost entirely to the paint, varnish and lacquer trade for some special use; such as, for artificial leather coatings and for adding flexibility to gums and enamels.

China wood oil is one of the drying oils, although in the raw state it dries slower than linseed. When cooked in the varnish kettle it will dry as quickly and will harden much faster than linseed in the paint and varnish film, the treatment and other conditions being similar. Imports of 101,000,000 pounds in 1925 show that it is of considerable importance. Because of its wonderful property of waterproofing rosin in the varnish film it is used almost entirely by the varnish makers. It is not used in its raw state as linseed and soya are except where a peculiar, yet beautiful crystallizing effect is desired in the paint or varnish. It is also peculiar in that it has not been successfully refined by caustic, acids or Fuller's Earth.

Linseed oil is the premier and universal paint and varnish oil having been used for centuries and as such it still holds first place. Over 763,000,000 pounds were produced in the United States in 1925. Although nitrocellulose lacquers may replace considerable varnish, it is unlikely that linseed oil consumption has been curtailed while perhaps the use of China Wood oil has. In fact, recent experiments have been performed showing that linseed oil adds to the stability of lacquers better than gums and the

other oils originally used. For patent leather varnishes and lacquers linseed oil seems to be unexcelled. Four distinct types of linseed oils are used by the manufacturers of paints, varnishes and artificial leather coatings—raw oil, blown oil, caustic refined and acid refined—each having its distinct and preferred use. However, one of the most recent developments by R. H. Adams after years of experimenting in the refining of linseed oil has entirely changed the old methods. By his new process a linseed oil is produced without the aid of refining agents, having a color lighter than any linseed oil refined with caustic or acids. As one oil it replaces in use the raw, caustic and acid-treated oils, and gives a quality never thought possible.

It is interesting to note that such oils as rape and sesame, while used to a great extent for edible purposes in Europe, have not found favor in America. Undoubtedly rape and sesame oils are fine edible oils equal in digestibility to peanut oil and their low iodin numbers and other qualities make them strong competitors of this product elsewhere. Practically the entire importation of rape oil is blown or oxidized for use in artificial leather coatings, except that which is refined with acid and used by petroleum refiners to raise the flash point of their illuminating oils.

Olive oil is unique because it is possibly the only vegetable oil consumed here in its natural raw state without any refining or processing. Though it has been the leader as a salad oil for centuries, the majority now prefer the neutral flavor of refined cotton and peanut oils for both cooking and salad purposes.

The use of vegetable oils industrially has just begun, from a scientific viewpoint, as many concerns are spending very large sums yearly for research in this vast field.

BULLETIN ON TUNG OIL

According to a bulletin recently published by the University of Florida, experimentation with Tung Oil trees is progressing actively at that place. On one six-acre planting, 14 different fertilizers and combinations of fertilizers have been tried, and a number of buds from selected trees added to this planting. During the year, 75 pounds of seed and over 1,900 trees were distributed for testing purposes to 70 growers in the state.

Vegetable Oils Victorious in Pure Food Ruling

Canned sardines packed in any pure, wholesome, edible vegetable oil may be labelled under the Federal food and drugs act as "Packed in Vegetable Salad Oil" or "Packed in Salad Oil" without specifying the exact oil employed, according to a ruling issued by the Bureau of Chemistry, United States Department of Agriculture.

In 1907 after the public had become used to buying sardines packed in olive or peanut oils, other oils came into use, prominent among which was cottonseed oil. Regulations were passed at that time which made necessary the naming of the oil on the label. Later, in 1923, the term, "Salad Oil" came into use, and it is believed by the chemistry department that a continuation of this term will not create deception.