

The Production and Use of Safflower Seed

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Safflower is an oilseed crop which has been grown since ancient times in semi-arid regions of the Middle East, northern Africa, and India, where it is the source of a dye and an edible oil (Greve, pers. com., 1961). The crop was introduced experimentally as an oil crop in the United States in 1925 (Univ. Nebr. Coll. Agri. Report S-3, 1951). American farmers began growing safflower about the end of World War II. Commercial production has begun in western Nebraska, eastern Colorado, eastern Wyoming, eastern Montana, California, and southern Arizona, and is being considered in parts of Oregon, Washington, Idaho, Utah, and the Dakotas.

About 175,000 acres of safflower were planted in the United States in 1958. By 1960 the acreage had increased to 250,000 acres (Liljegren, pers. com. 1961). In 1961 it was listed as a recommended crop with acreage restriction by the Agricultural Stabilization and Conservation Service, U.S.D.A. The 1961 safflower crop contracted by the Pacific Vegetable Oil Corporation amounted to 150,000 tons. A fifty per cent increase in contracted acreage is planned for 1962 (The Sydney Telegraph, 1961).

The safflower plant (*Carthamus tinctorius*) is an annual of the thistle family, and varies from 1½ to 4 feet in height when mature. Commercial varieties grown in the United States are spiny. In some varieties the seed contains about 35 per cent oil. Plant breeders are developing new varieties with increased oil content. The present spineless varieties contain too little oil, or do not yield well (U.S.D.A. Bull. 2133, 1959).

The plant has composite flower heads with green bracts. The most common varieties have yellow or orange flowers. Each seed produces one main stem which usually has two to five heads, each head containing 20 to 100 seeds.

In the Western Plains safflower that is planted in April or early May will usually require 8 to 15 days to emerge. It does not begin to germinate until soil temperatures are above 40°F. It grows rather slowly for the first three weeks, after which growth is very rapid until its full height is attained. Maturity usually occurs about four weeks after the plants have finished blooming. Safflower has a taproot which is capable of drawing moisture and nutrients from depths of five to six feet.

Safflower is adapted to areas of the world which have low relative humidity from the time of bud formation until after harvest. In the United States this limits its economic production to the western states, but its eastern limit of adaptability has not at present been determined. Tests have been made to indicate that it is adapted as a non-irrigated crop in the western Great Plains. In California, the area of greatest production, it is often grown as a second crop on irrigated land.

It has a wide range of soil adaptability—from heavy clays to sandy loams. The best safflower soils are those which hold moisture well. For best yields soils should be deep enough to allow roots to penetrate at least five feet.

In general, the preparation of a seed bed should be similar to that used for wheat or barley. All volunteer grain or weed growth should be killed before planting safflower seed. Most of the safflower in dry wheat-land areas is planted with a regular drill at rates of between fifteen to thirty pounds of seed per acre. The row width can be anywhere from twenty to forty-two inches apart. If planted in rows wide apart it should be cultivated. It will usually yield somewhat more if planted in cultivated rows rather than when planted in solid drilling. Weeds can be controlled better if the crop is cultivated.

Safflower is not ready to harvest until nearly all the leaves have turned brown, and when the moisture content of the seed is less than eight per cent. In some areas it may be necessary to wait for a killing frost before it is harvested. It can be harvested with a regular combine, adjusted to handle small seeds, and driven somewhat slower than for harvesting wheat or barley (Wolcott, pers. com. 1961).

Yields in the western part of the northern Great Plains have ranged from five hundred to two thousand pounds of seed per acre (U.S.D.A., ARS-34-6). On irrigated land of average fertility the yield is usually from 1750 to 2750 pounds per acre. Safflower yields following potatoes usually are higher than those following wheat. It also does well following a bean or beet crop. Because of possible increase in disease it should not be grown on the same field two years in succession. If cultivated two or three times it is more likely to be damaged by soil blowing. In the United States the most prevalent diseases are rust, root rot, leaf spot and bud rot. Irrigated safflower seems to be more susceptible to disease than when it is grown on dry land.

Most of the acreage in safflower is grown under contract with the Pacific Vegetable Oil Corporation, San Francisco, California, or with General Mills, Minneapolis, Minnesota, who set a minimum price guarantee so farmers can be assured a reasonable return for their crop (Thigpen, pers. com. 1961).

The price paid to farmers for the seed is dependent upon supply and competition with other crops produced in the areas, namely, rice, barley, and cotton, in California. The price to the farmer in California has been increased from about \$65.00 to \$70.00 per short ton in the early years to \$85.00 to \$90.00 per ton in recent years (Hammond, pers. com. 1961). The price paid in Nebraska and Montana, where it was introduced only a few years ago, has increased from about \$60.00 per ton to \$80.00 per ton in the past year (Wolcott, pers. com. 1961).

When a new plant is introduced into a country it takes years to get farmers to grow the plant in commercial quantities, and for industry to find out how it can best be used, and a market found for the products.

In the Middle East and Far Eastern countries safflower seed is used as a food and oil product in the same manner as the seeds of rape, niger, sunflower, flax, cotton, and soybeans are used. In India the flower of the plant is used to a small extent for a reddish-yellow dye which is used in preparation of a vegetable rouge.

The primary use for safflower oil in this country, until a few years ago, was as a pale non-yellowing drying oil for use by the protective coating industry in paints, enamels, synthetic resins, linoleums, and other similar products. During the past two or three years medical researchers have discovered that poly-unsaturated oils, particularly those high in linolenic glyceride, were active in reducing the serum cholesterol level in the blood, and this seems to give an indication that it might be a method

of solving the problem of atherosclerosis. Now safflower oil is being viewed as the best and most effective of the cholesterol lowering polyunsaturated edible oils (Hammond, pers. com. 1961).

As a result of this discovery a great number of experiments to mix safflower oil with many of our cooking oils, salad oils, and other edible products have been tried with satisfactory results. Margarine developed from safflower in 1961 (and as yet unnamed) promises to help develop what is described as a seemingly unlimited market for safflower seed (Scottsbluff Star-Herald, 1961).

As a salad oil it is supposed to impart a neutral flavor and palatability enhanced by the absence of "overoiliness". As a cooking oil it makes an ideal liquid shortening for both deep and shallow frying, with a smoke point well above normal cooking temperatures. As a basic mixing or processing ingredient it works well with margarine, mayonnaise, dairy products, sauces, diet preparations, and health foods.

The low cost of the non-yellowing, light colored, fast drying, film forming qualities of safflower oil has firmly established it in the paint industry, (U.S.D.A. Agri. Mktg. Serv. F.O.S.-190, 1958). As a protein supplement for cattle limited experiments have found it to be about equal in feeding value to soybean pellets of the same crude-protein level (Univ. Nebr. Coll. Agri. S.B. 447 and S.B. 458, 1960). Its use as an edible oil seems to be unlimited. If future experiments by the medical profession prove that it is the best and most efficient of the cholesterol lowering polyunsaturated edible oils it no doubt will be added to many of our food products.

In Australia where safflower was first grown commercially in 1956-1957 it is now an export crop. The Union of South Africa also has found it a satisfactory crop and has a surplus for export. Other countries are finding safflower oil very satisfactory as an edible oil. Japan, who imported only 3,306 metric tons in 1952-1956, imported 71,349 metric tons in 1960, mainly from the United States (Foreign Crops and Markets, U.S.D.A. For Agri. Serv. 1961). West Germany too has recently been increasing her imports.

The greater demand caused by new uses in the United States and the increasing demand by other non-producing countries seems to indicate that safflower as an oilseed crop is becoming firmly established in the drier land of western United States, and that acreage will be continually expanded, being limited only by price competition of soybeans, flaxseed, and by expansion of production in other countries.

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