

Punjab Flax

for seed production in Imperial Valley

L. G. Goar

APPROXIMATELY 50% OF THE PUNJAB flaxseed in California is produced in Imperial Valley. The cash value of this crop in Imperial Valley in 1947 was approximately \$11,424,000.

The flax industry, apparently, is well established in Imperial Valley. No other area in the world of like size produces so high an average yield of flaxseed.

The 1947 average yield on 68,000 acres was about 24 bushels per acre. All previous world flaxseed production records were shattered in 1947 by an Imperial Valley farmer who produced 64 bushels of flaxseed per acre on 19 acres.

Imperial Valley grown Punjab flaxseed is recognized for its high oil content and its excellent drying properties. The oil content of Punjab flaxseed averages about 40%, and the iodine number about 188.

Flax is a cool-weather crop. While in the fruiting stage, it can be damaged by either frost or heat. Plantings made from November 1 to 20 usually escape both of these hazards and produce higher yields than earlier or later plantings.

Irrigation

It is usually wise to withhold the first irrigation as long as the plants are growing normally and maintaining a bright green color. A bluish cast in the color of the foliage is a drought distress sign that the grower should never fail to heed. More frequent irrigations should be given from early bud stage through the blossoming period. Most growers use five irrigations.

Temperature rather than month or date determines whether or not so-called late irrigations make additional flaxseed. If the temperature is 92° F or more while the flax blossoms are open, little or no seed will develop. Irrigation under this condition retards maturity of the flax crop, delays harvest, and increases weed growth.

Untimely late irrigation often makes a weedy field out of a clean one.

When flax is damaged by frost at any time, it should be irrigated immediately.

Disease and Its Control

Many common flax diseases are preventable to a considerable extent. Disease control in the growing crop is usually impossible.

The best-known preventives of flax disease are: 1. Crop rotation. Plant flax following alfalfa, sugar beets, vegetables, or a leguminous green-manure crop such as sesbania, guar, cowpeas, or clover. 2. Do not grow more than two consecutive flax crops on the same land without rotating crops. 3. Plant only high-grade, re-cleaned seed of tested high purity and germination. 4. Be sure the seed has been properly treated with an approved disinfectant. 5. Do not plant seed shipped into the Imperial Valley from any other part of the country because of the danger of introducing seed-borne diseases. 6. Supply your flax plants with plenty of plant food—phosphorus and nitrogen.

Weeds and Methods of Control

Weeds constitute one of the greatest limiting factors in the production of flax when it is grown under the present conventional cultural methods.

Land occupied by weeds cannot produce flax, and because flax makes relatively slow growth in its early development, it does not compete well with weeds.

One method of preventing weeds is to irrigate the land several times during the summer and early fall and destroy the weeds by cultivation after each irrigation. The soil should be plowed, disked, and floated, or chiseled—or subsoiled—disked, and floated before the first irrigation is given.

After each subsequent irrigation, the land should be cultivated very thoroughly but to a shallow depth. This shallow cultivation is important inasmuch as it prevents bringing up weed seed from a greater depth.

A spring-tooth harrow run not more than four inches deep is best for this work as it does not throw the land out of level, and at the same time does a good job of destroying the germinated weed seeds.

Growing a green-manure crop in the summer, with frequent heavy irrigation, does much to eliminate weeds by rotting the seeds in the surface soil. Plowing or chiseling should be done before planting the covercrop.

The green-manure crop should be worked into the surface soil with a disk while the soil is quite moist. In this condition, with plenty of heat, air, and moisture, decomposition will be comparatively rapid.

In 10 to 14 days after disking this crop under, the land should be irrigated and disked again as soon as dry enough to work well.

After this, the land should be floated and made ready for the preirrigation which is to be given some 10 days before the flax planting date.

Sinox, a selective spray material, has been used successfully for the control of certain weeds in flax. When applied under favorable conditions, it has given good control of broadleaf annual weeds but it has no value in the control of wild oats, Canary grass, cheat grass, or other plants in the grass family. Other sprays are being developed for the control of grass plants including wild oats. This development is still experimental, and a general recommendation for its use cannot be made at this time. For the best results, spraying should be done when the flax plants are not more than five inches high and while the weeds are very small. Under no circumstances should the spray be applied after the flax does reach the bud stage.

Planting flax in rows and cultivating for weed control has been very successful in some cases. The rows should be not less than 18 inches nor more than 24 inches apart. They should run north and south if possible rather than east and west. For this method of planting, a four- or six-row planter should be used instead of a grain drill.

The recommended rate of seeding for the various distances between rows is as follows:

Distance between rows	Amount of seed per acre
6 inch (drilled)	42 pounds
7 inch (drilled)	40 pounds
18-inch rows	32 pounds
21-inch rows	28 pounds
24-inch rows	24 pounds

Fertilizers

The previous cropping and fertilization history of the land to be planted to flax should be taken into account before deciding the kind and amount of commercial fertilizer to use. Both phosphorus and nitrogen are needed for maximum production.

From 65 to 100 units of available phosphate and 32 to 80 units of nitrogen should be used for a maximum yield. The phosphate, if in dry form, should be drilled into the soil just before the preirrigation, some two weeks before the planting date. If in liquid form, it should be put in the preirrigation water. Nitrogen may be applied at the first irrigation after the flax is up, or at any time thereafter until the first blossoms begin to appear.

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IRRIGATION

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a depth of about six feet, the trees and vines probably will come through the season without serious damage, but the current season crop may be reduced.

We suggest that the first irrigation be applied now if the rainfall has not been enough to wet the soil to a depth of about six feet.

If water for only one additional irrigation is available, a second watering, for fruit trees, should be given about the latter part of June.

Our experiments show that it is best to keep the trees and vines supplied with water early in the season. Lack of water is more injurious in early season than in the fall, although a continuous supply of readily available water at all times is most desirable.

Economizing

Economy in the use of water by annual crops may also be obtained by applying the principle that satisfactory returns can be obtained by delaying irrigation until the soil moisture is reduced close to the permanent wilting percentage.

For example, in the Sacramento Valley it is possible to raise as large a crop of sugar beets with three irrigations of eight acre-inches each as with more frequent applications, provided the soil is wet to a depth of about six feet by rains.

Cotton usually is irrigated very frequently, but good crops may be obtained with one or two irrigations in addition to the preplanting irrigation.

Watermelons on deep loam or clay soils may not need irrigation if the soil is wet deeply before planting, but cantaloupes which are not so deep rooted as watermelons, probably will need irrigation during the growing season.

Tomatoes, a deep rooted crop, likewise may be raised with one or two irrigations on deep fine textured soil.

Suggested Practices

The suggestions made may be summarized briefly as follows:

Do not plant annual crops unless an assured supply of water is available.

Remove all weeds, but do not waste time and effort cultivating in their absence.

Put water on in one application to wet to the full depth of rooting rather than giving frequent applications with shallower wetting, thus reducing waste.

Delay irrigation until the soil moisture is reduced to about the permanent wilting percentage, taking into consideration the size of the stream available and the acreage to be irrigated.

With a limited supply of water, irrigate in the first part of the season to keep the

crops supplied with readily available moisture, because lack of water is more injurious in early summer than late in the fall.

Find out how much water in depth of application is required and how frequently it should be applied for each crop. Material savings may be made by reducing the frequency of irrigations.

Farm advisers have bulletins and detailed information concerning the depth of rooting and irrigation of various crops.

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all probability, be found to be carriers of the quick decline virus.

Progress has been slow because symptoms do not appear on one- to two-year-old trees until 15 months or longer after inoculation. Smaller trees are now being used in certain experiments. A sweet orange top is grafted onto sour orange seedlings having trunk diameters of from one-eighth to one-quarter inch.

Such trees can be prepared in a relatively short time and it is hoped that after being inoculated they will show symptoms quicker than the larger trees.

Seek Virus Carriers

In the late summer of 1946, graft-transmission experiments, started in June of 1945, showed conclusively that quick decline is a virus disease.

A study, commenced two years before it was known that quick decline was a virus disease, discovered that more than 225 different species of sucking insects were present in affected areas. Perhaps not more than one species will be found to be capable of transmitting the virus. Extensive experimental studies are thus necessary to determine the role of insects in the spread of quick decline.

In order to establish ideal conditions for experiments involving insect carriers of virus, the Riverside Experiment Station erected a "screen house" at one of the experimental plots within the quick decline area. The screen is small enough to filter out practically all insects that could cause infection. Controlled inoculation tests are now being conducted by entomologists of the Citrus Experiment Station.

Similar Disease in South America

Experiments in Brazil have indicated an aphid to be the virus carrier of the

disease, Tristeza, which is similar to the California orange tree quick decline.

An aphid closely related to the Brazilian carrier is present in California and efforts are being made to determine if this insect may be causing spread of the quick decline virus.

Other insects, particularly several other aphids and leaf-hopper species, are also being tested as carriers.

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Harvesting

To windrow the flax and later thresh with combine equipped with pick-up attachment, or to combine the standing grain direct, is a question on which there is divided opinion among growers and threshermen alike. Naturally, there are both advantages and disadvantages to each method. Both methods are extensively used. In many cases, circumstances force the decision, for if the flax contains any appreciable amount of green weeds it cannot be threshed standing.

Only clean fields of mature dry flax, or ones in which the weeds and flax are both dry, can be direct combined. If conditions are favorable to direct combining, the cost of windrowing is avoided. On the other hand, dry standing flax is susceptible to loss by wind damage which in many cases more than offsets the cost of windrowing.

If windrowed, the flax should be cut as soon as the seeds are botanically ripe. This occurs several weeks before the plants are dry enough to permit direct combining. At this stage, no loss of seed from shattered bolls will have occurred. Windrowing also permits harvesting early enough to destroy most summer-growing weeds before they mature their seeds to infest the soil. Other advantages of windrowing are the more favorable weather conditions—less humidity—for threshing early in the season, and earlier use of the land for the summer rotation crop.

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Improvement in the technology of preservation of fruit juices by freezing, particularly control of the enzymes responsible for the curdling of frozen juice, is under study by the Division of Food Technology.