Flax Production in South Dakota

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Flax Production in South Dakota
Flax Production in South Dakota

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and Leon S. Wood, Extension Plant Pathologist

Flax is grown in South Dakota at the rate of 6 to 9 million bushels a year, making it one of our major cash crops. In counties where the major acreage is grown, cash income from flax outranks all other cash crops. And, in these areas, growers often realize an additional income by selling flax straw.

Marketed flax seed is used commercially for the production of linseed oil with linseed oil meal as a valuable by-product. A bushel of flaxseed will yield about 19 pounds or $\frac{2}{3}$ gallons of oil. The flaxseed oil or linseed oil is used in the manufacturing of paint, varnish, linoleum, oilcloth, and many other commercial products. In recent years it has found a new use as an antispalling agent to protect concrete against deterioration from freezing and thawing. Linseed oil meal is an important livestock feed.

Until recent years, flax growers have enjoyed a ready market for their crop. Flax has not been in the high surplus crop category and carryover has been at a relatively low level. This situation is changing with a trend toward depressed flax seed prices. The flax crop is facing strong competition from other oilseed crops, from oil imports and from non-agricultural synthetic materials. Surplus seed stock and price fluctuations will depend to some degree on national yearly production, and production by competitive nations, particularly Canada and Argentina, both large flax producers. Normally about 80 percent of the United State's crop is consumed locally, leaving 20 percent for export trade.

Recent research has improved the old uses for flaxseed oil and also has opened the way for new uses of flaxseed and flax by-products. This has direct bearing on the economics of flax production and on making it more competitive with other crops.

EXPECTED FLAX YIELDS

Flax yields have fluctuated from one year to another indicating that rainfall and growing conditions do have a definite influence. The annual average yield, according to the South Dakota Crop and Livestock Reporting Service, has varied from a low of 8.5 bushels to a high of 14 bushels per acre. However, the potential yield and even the annual average yield can be significantly greater than what is being reported. The more successful flax growers are aiming for and getting 20 bushels or more per acre.

The Flax Development Committee of the U. S. Flax Institute has been sponsoring a "Flax Growers' Contest." The top yields in this contest have been near, and some over, 30 bushels per acre. The contest has demonstrated what yields are possible and economically feasible when proper cultural and management practices are employed.

The main purpose of this fact sheet is to set forth those production practices and principles essential to growing flax and attaining maximum yields.

GENERAL PRODUCTION REQUIREMENTS

The major flax producing area of South Dakota is in the northeast counties. In that area, under proper cultural practices, flax is a relatively low risk crop. Moderate summer temperatures and adequate rainfall make for favorable growing conditions. When flax is grown west and south of the flax producing area, however, it becomes a high risk crop with less economic advantage.

In order to be a successful flax grower, follow these cultural practices:

1. Follow timely moisture saving tillage practices.
2. If the field has a 3 percent slope or more, plant on the contour to prevent water runoff.
3. Sow on land where weeds were controlled the previous year.
4. Plant high germinating seed in a firm, well prepared seedbed.
5. Plant early.
6. Plant in good, fertile soil; have a soil test made previously to determine fertility needs.

FLAX IN THE ROTATION

Flax can fit into many rotations or sequence of crops. It is a poor "weed competitor" so consideration must be given to any possible weed problem. Do not plant flax on land where a weed problem existed the previous year.

Flax often follows corn or other row crops which is very satisfactory, provided weeds were
controlled through clean cultivation. Much of the flax in the flax producing area is often sown after small grain. Flax is a very good crop to plant on grassland being put back to cropland. The land should be plowed in August to permit some break­up of the sod during the fall and winter months. The fact that flax is a poor “weed fighter” makes this crop a “good companion” for establishing grass and legume seedings. Flax on fallow land is good providing weeds have been controlled. The extra supply of available nitrogen on fallow can stimulate weed growth and take over flax. The flax producer does have access to herbicides and, if they are used and managed properly, he can usually keep weed problems under control.

**WEED CONTROL**

Following recognized cultural weed control practices is essential for successful flax production. When flax is to follow small grain, a tillage operation soon after the small grain harvest will help control perennial weeds, prevent seed production, and stimulate fall germination of weed seeds. Shallow tillage before seeding flax reduces the possibility of bringing weed seeds near the surface to germinate. Crop rotations can be an effective means of weed control. Chemical methods also may become necessary in controlling some weeds under certain conditions.

Use 1/8 to 1/4 pound acid equivalent MCPA amine or 2,4-D amine per acre to kill several species of broadleaved weeds as soon as they emerge. Killing young weeds requires less chemical and reduces the risk of injuring the crop. Flax appears to be slightly more tolerant to MCPA than 2,4-D.

Use ¾ pound acid equivalent of dalapon (1 pound Dowpon) per acre to kill foxtails or barn­yard grass. For best results dalapon should be applied before the grass weed seedlings are 2 inches tall. MCPA or 2,4-D may be used with dalapon in one spray application.

Where wild oats is a problem, spring tillage before planting flax in late May kills many wild oats seedlings. Harrow and pack the area early in the spring to form a good firm seedbed and induce early germination of wild oats. After the wild oats emerge, kill them with cultivation before seeding flax. Plant Summit, Bolley, Linott or Windom because late seeding does not reduce the yield of these varieties as much as it does others.

Diallate or barban can be used to help control wild oats. Use 1½ pounds active ingredient (1½ quarts of Avadex) per acre on a level seedbed immediately before or immediately after planting flax and incorporate with a harrow. Use ¼ pound active ingredient of barban (1 quart of Carbyne) when wild oats are in the two-leaf stage in good stands of flax. For further details in weed control, see the following publications available at the County Extension Office:

- “Weed Control in Field Crops”
- “Chemical Weed Control in Crops”
- “Control and Elimination of Wild Oats”
- “Weed Control in Small Grain”

**FERTILIZING FLAX**

Experiment Station trials in the past years have not shown consistent response with commercial fertilizer on flax so the common recommendation is to fertilize the previous crop in the rotation and plan on some carryover. Frequently commercial nitrogen fertilizer stimulates weed growth in flax, resulting in a serious weed problem.

More recent tests and many flax growers’ experiences, however, are showing economic responses with wise use of commercial fertilizer. If applied with a drill attachment, a general suggestion would be about 100 pounds of a 10-20-0 fertilizer. No more than 10 pounds of actual nitrogen per acre should be applied with the seed. No problem should result from the phosphorus. Broadcasting the fertilizer and plowing it under is an excellent method of application. This is the practice used by many of the flax growers who entered the “Flax Growers Contest” sponsored by the Flax Development Committee of the U. S. Flax
Institute. The fertilizer is not on the surface to stimulate early weed growth but the flax taproot will reach the available essential nutrients when the flax plant needs them the most.

SEEDBED PREPARATION
Proper seedbed preparation is one cultural practice in flax production that must not be neglected. It should include weed control, shallow tillage for moisture conservation, and a firm seedbed to permit shallow planting.

If time permits and if flax is to follow corn, fall disk ing of the corn stalks will help speed up the rotting of the corn residue and will make for easier preparation of the seedbed in the spring. The residue needs to be well cut-up and incorporated into the soil so it will not interfere with uniform depth of planting of the flax seed. Early spring plowing or fall plowing where wind erosion is not a problem is suggested where the field will be plowed. This will allow for a couple of shallow tillage operations before the flax is seeded which will stimulate early weed seed germination, destroy weed seedlings and make for a firm seedbed. Soybean land will need only a light disk ing before seeding the flax.

The plow, packer, and pony-press drill is an excellent once over seedbed preparation and seeding method for flax. This is becoming the most popular method, regardless of the previous cultivated crop.

TREAT THE SEED
Seed treatment is recommended to reduce seed decay and to provide protection against harmful soil borne organisms. Often the seedcoat of flax has been damaged during the harvest operation, in many cases so slightly that it is not visible to the eye. But even this slight damage makes them more susceptible to seed decaying organisms. Proper seed treatment provides necessary protection while the seed is germinating. Uniform coverage of the treatment on the seed is essential to obtain adequate protection. Several recommended fungicide seed treatments are available. Follow the directions on the container carefully for rates and methods of application.

Tests have shown that for best results, seed should be treated at least 48 hours before planting. Treated seed can be stored several weeks before planting with no bad effects. This enables you to treat your seed early in the spring before other work becomes pressing.

EARLY SEEDING USUALLY BEST
Long time experimental records of the South Dakota Experiment Station show that the optimum planting date for flax is April 15 to April 25. Flax varies in its reaction to frost. On the average, light frosts do little damage and in some seasons very heavy freezes have had little effect on flax yield. The critical time for frost injury is at the small seedling stage. Because cool weather favors the growth of flax seedlings, early planting often makes it possible to get a head start on many troublesome weeds common to flax (foxtails and other warm season types).

Sometimes, because of drought, excessive moisture, or a wild oats problem, it becomes necessary to delay planting. Experimental tests show that early to medium-early maturing varieties such as Summit, Windom, Linott or Bolley should be selected for late plantings. This is important.

METHOD OF PLANTING
Flax can be seeded best with a grain drill in a level, firm seedbed. If seeded into a loose seedbed, there is danger of planting the seed too deeply, the main reason for poor stands and slow seedling emergence. The press drill is superior to the regular grain drill since it permits more accurate control of depth and also packs the soil above each drill row. The pony-press drill, as previously mentioned, has been used successfully and is highly recommended for flax. The pony-press drill has the advantage of placing the seed in moist soil and packing the soil. The packing promotes rapid germination, letting the flax get ahead of the weeds.

Plant flax seed relatively shallow. Actual planting depth is determined somewhat by soil texture and moisture condition. In heavy soil, ½ to 1 inch is usually deep enough. But on lighter soils, 1 to 1½ inches is better.

RATE OF SEEDING
Rate of seeding per acre will vary with size of seed, rainfall, time of seeding, and germination. In eastern counties of South Dakota — where rainfall is usually more adequate than outside the flax producing area — the recommended rate of seeding for medium to large seeded varieties is 42 to 56 pounds per acre. For small seeded varieties, rate of seeding can be reduced by one-fourth. These seeding rates are for seed with germination of 90 percent or higher. Test all seed for germination before planting. As a general rule for rate of seeding, adjust the drill to sow four to five seeds per inch in the drill row.
**HARVESTING**

Flax does not shatter or lodge as easily as small grains, and therefore, can be left standing until seed is fully mature, with little danger of loss in yield or quality. When the bolls turn brown, the flax is ready to harvest.

Flax is a difficult crop to cut. It should be harvested with a combine or swather that is in good running order and has a sharp sickle.

Clean standing flax, free of weeds, can be straight combined if moisture content of seed is below 12 percent. Because of green weeds and uneven ripening, most operators cut flax with a windrower and allow it to dry in the swath. Moisture in green flax bolls or green foreign material can lower the quality of harvested seed.

Flax in the windrow should be combined as soon as the moisture in the seeds is below 12 percent. Flax windrows are not too stable in a strong wind and can be rolled together, or end-up in the fence row, or in the roadside ditch. The seed quality will deteriorate in a rainy period.

**HARVEST AND STORAGE CARE**

Take special care to prevent cracking or injury to seed during threshing or other handling. Cracked seed often causes poor germination. Lowering combine cylinder speeds and speeds of other machines handling flaxseed helps prevent cracking and excessive injury to the seedcoat. Cylinder teeth must be properly aligned. Rub-bar-type cylinder combines have been satisfactory when adjusted and operated properly.

Flaxseed cannot be stored safely until moisture content is 11 percent or less.

**FLAX DISEASES**

**Wilt:** This is a soil-borne fungus disease which can attack a susceptible plant in all stages of its development. In typical wilt, the leaves turn yellow or grayish-yellow, the top leaves may thicken, growth stops, and the plants die and turn light brown. Frequently, the plant is only stunted, in which case the leaves turn yellow and fall prematurely, or the primary stem dies and new, apparently healthy lateral branches develop from the first node. A late infection or a weak attack may be evidenced by premature ripening. At one time, wilt was the most widespread and destructive disease of flax. Through plant breeding, all present day recommended varieties have an acceptable degree of resistance to wilt.

**Rust:** Light-yellow, orange-yellow, to reddish-yellow pustules occur on leaves, stems and bolls during the growing season. Rust reduces seed production and quality. As recently as 1951 loss in the United States exceeded 10 million dollars.

New races of rust are occasionally produced in nature which have the ability to attack previously resistant varieties. For example, in 1962 the development of race 300 resulted in grower -accepted but susceptible varieties, such as Arny, Marine, and Marine 62, being eliminated as recommended varieties. Fortunately, plant pathologists and breeders had new resistant varieties available. Thus, race 300 did not have an opportunity to become established as a limiting factor to flax production. The grower is protected by selecting rust resistant varieties. Flax varieties now recommended are resistant to the known races of rust in this area.

**Pasmo:** This fungus disease is recognized by circular, greenish-yellow to dark brown spots on the leaves. As the disease develops the stems become infected and all of the infected leaves may turn brown, die and drop off. Infected stems have areas of green healthy tissue alternating with brown infected tissue in a pronounced banded appearance; then the stems brown entirely as plants are defoliated in the areas where the disease is severe. Small, black-bodies are commonly observed scattered throughout the infested leaf and stem tissues. Bolls may also be attacked. Yields may not be seriously affected when the disease appears after flowering. When the disease becomes established before or during flowering and weather conditions are favorable for spread of fungus, yield losses may be extensive. While Summit and Bolley are listed as being susceptible in the variety chart, they appear to have some tolerance. Nored is moderately resistant to pasmo. For further information see Fact Sheet 196, “Pasmo of Flax.”
Aster Yellows: This disease is characterized by a yellow, stunted growth; contorted foliage; distortion and proliferation resulting in the development of prominent yellow, star-shaped floral parts; and failure of boll formation. Usually, the entire plant is involved but sometimes only a portion of the plant appears to be infected.

For many years this disease was considered to be caused by a virus. However, in 1968 it was established that it is not a virus disease and that the causal agent is a bacterial-like organism called Mycoplasma. While aster yellows occurs to some extent in most years, the development of widespread epidemics is associated with those years in which high populations of the six-spotted leafhopper occur early and persist for some time during the crop season. All varieties apparently are equally susceptible.

Seedling blight: Soil-borne fungus organisms cause seedling blights. These organisms attack the stem just below the soil surface. Infected plants frequently die, resulting in drastic thinning of the stand. Unfavorable environmental conditions favor outbreaks of the disease. All varieties are more or less susceptible. Cracked or split seed coats favor development of seedling blight. The use of treated, sound, healthy certified seed with as low a percentage of cracked seed as possible, along with good management practices appear to be the best protection against this disease.

**PLANT RECOMMENDED VARIETIES**

Flax variety recommendations are based on unbiased Experiment Station yield test results, disease resistance, market quality and consistency of performance. No attempt is made to designate the best variety, but rather to present a list of good varieties from which growers can select the variety or varieties best for their farms. Some of the varieties in the non-recommended group may have local interest with satisfactory yields, but do not offer any superiority over the recommended varieties. (See table.)

Flax producers are well supplied with good varieties having a range of maturity and offering the maximum protection against flax diseases. By using certified seed and following the best cultural practices, flax growing can be a successful enterprise.

Flax variety recommendations according to crop adaptation areas, are given in the current fact sheet on Field Crop Varieties.

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### Flax Varieties

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield</th>
<th>Maturity</th>
<th>Plant Height</th>
<th>Seed Size</th>
<th>Seed Color</th>
<th>Flower Color</th>
<th>Oil Content</th>
<th>Quality</th>
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*Symbols used to indicate degrees of resistance or susceptibility to diseases are: I=immune; R= resistant; MR=moderately resistant; S=susceptible; MS=moderately susceptible; VS=very susceptible.*

Use of tradenames does not imply endorsement of one product over another.

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