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LINSEED WITHIN THE CLOVER LEY FARMING SYSTEM

By Agricultural Advisers of the Esperance District Office

LINSEED was one of the first crops to be widely used as an alternative to cereals in the over-17 inch rainfall areas. It is now an established crop with a total 1969 production worth just under half a million dollars.

Linseed is currently worth nearly twice as much as wheat per bushel, with its short term prospects still attractive. In the over 17 inch rainfall areas, linseed is likely to give higher returns per acre than cereals providing its growth requirements are fully appreciated. If such requirements cannot be met cereals may be more profitable.

The comparative profitabilities of linseed and cereals also depend largely on seasonal conditions, influencing time of seeding and weed control. In some seasons it will pay to sow cereals instead of a planned crop of linseed. Even under normal conditions, the care needed with linseed means that about 250 acres is possibly as much as can be managed easily by one operating unit.

Requirements for linseed

Climate

Linseed should only be grown in areas with 17 in. or more annual rainfall, and preferably with a growing season longer than six months.

Soil type

Sandy surfaced soils with clay at a depth of more than 6 in. are likely to produce consistently better yields than other soil types. Crops on soils with less sand over clay may produce high yields but are much more likely to suffer from moisture stress during dry periods in spring.

The sandy soils have a better moisture hold-capacity after a period under clover ley. This allows good development of root systems in case of moisture stress or water logging. However, areas that may be waterlogged for long periods should not be sown.

[Field observations do suggest that linseed is at least as tolerant as cereals to waterlogging, but all crops are adversely affected by prolonged waterlogging.]

Soil fertility

Linseed yields best on paddocks that have been under clover for at least four years. Successive cropping is also profitable after a long clover ley, providing weeds and disease are controlled, and high levels of nitrogen fertiliser are applied.

On new land, the experience with linseed is too limited to recommend other than small trial areas. However, pioneer sowings of linseed on new land in Department of Agriculture trials have given very low yields despite heavy applications of phosphate, nitrogen and trace elements.

Weed control*

Linseed is a poor weed competitor because of its upright habit during its early growth stages. Weed control should begin in the year before seeding if high yields are to be obtained. Excessively weedy land should be avoided.

Pasture management

If annual weeds such as Wimmera ryegrass and capeweed predominate, continuous grazing at a high stocking rate will help prevent seed set. Where heavy stocking is impossible, mowing can reduce seeding of annual grasses such as ryegrass. Alternatively, where there is sufficient dry

*A more detailed discussion of weed control in linseed was contained in the Journal of Agriculture, April, 1969.
A young crop of linseed offers little competition to weeds. The upright growth habit and the sparcity of crop leaves enables weeds to thrive, particularly during the important first few weeks of growth.

matter to carry a fire, a good burn before cropping will destroy many weed seeds on the soil surface.

**Chemicals**

In the year before cropping, one pint of paraquat (Gramoxone) per acre, together with an effective wetting agent at two pints per 100 gal. spray mixture, will prevent seed setting of most annual weeds. The chemical can be used in association with grazing, mowing and cultural treatments, but must be applied before the weeds develop mature seeds.

**Cultivation**

Where annual ryegrass is a problem it is advisable to delay the first cultivation for as long as possible—perhaps for three weeks after the break of the season. The delay allows the weed seeds to germinate before they are ploughed in.

This first cultivation must be effective, and preferably about 3 to 4 in. deep. Subsequent workings should be less than 1½ in. Disc ploughs are more effective than scarifiers for burying plant material and should be set to obtain much the same result as mouldboard. (The mouldboard plough if available, gives the best result.)

Where adequate weed control has not been obtained by grazing and cultivation, paraquat can again be used immediately before or after sowing. The paraquat should be applied one to two days before seeding, or four to five after seeding—before the crop emerges.

**Post-emergence herbicides**

In some seasons, in spite of all precautions weeds can still infest a linseed crop. No suitable chemicals can be recommended for treating such weeds once they have appeared. Two herbicides, propazine and linuron, can be applied directly after the seed is sown but are more effective on broad-leaved weeds than on grasses. Both should be applied at 1½ lb. per acre.

**Linseed varieties**

The linseed varieties grown at Esperance are:

- Gibson—violet flowered.
- Kameniza—pale blue flowered and four to seven days later maturing than Gibson.

No long-term differences have been measured in the yields of these varieties but in years with a high October rainfall Kameniza tends to yield best, while Gibson does best if the October rainfall is low.

The current recommendation is that both varieties should be planted, with the Kameniza seeded first.

**Sowing linseed**

**Time of sowing**

Linseed needs a long growing season to yield well and therefore should be planted from mid-May to mid-June.

Yields vary on soils with shallow gravelly sands or clay at the surface because such soils tend to dry out quickly in periods of moisture stress. This can cause the crops to mature early, especially if they have been planted late. On the other hand, crops planted early on shallow sands over clay tend to lodge, although they can still be harvested in clean paddocks.

Crops on soils with 9 to 12 in. sand over clay yield better if planted in June but may still yield well if planted as late as July.


**Depth of sowing**

Because of linseed's small seed, planting should be no more than \( \frac{1}{2} \) to 1in. deep. At Esperance Downs Research Station a disc drill is used with the discs cultivating lightly and the tubes removed from their boots. The seed and fertiliser are then buried with heavy or light harrows.

Whatever machine is used, a check should be made to see that the seed is not buried too deeply. If a combine is used the back tynes must not be set too deep.

**Rate of sowing**

Linseed should be sown at 35 lb. clean seed per acre, using the fine side of the drill. Some growers prefer to use a higher rate but experience indicates that, in a normal season, the varieties now in use yield well at 35 lb. per acre.

Cleaned linseed runs out about one-third faster than wheat for the same setting of the machine, so the drill should be set to sow about 23 lb. wheat per acre if there is no calibration for linseed. However, pickled seed sometimes runs slightly slower. In either case, the drill should be checked to ensure that the seeding rate is about four acres to the bag.

**Germination**

Poor emergence of linseed sown at the recommended rate may be due to poor viability of the seed. Laboratory tests with some lines of seed have given germinations as low as 5 per cent., and even test germinations of 50 to 60 per cent. would be unsatisfactory crop seed. In fact, sowing rates should be adjusted to provide the equivalent of 35 lb. seed germinating at 90 per cent.

Reasons for the low germination of some lines of linseed are not fully understood but may be associated with temperatures, humidity and rainfall during the few weeks before harvesting. Some mechanical injury may also take place unless the harvesting machinery is correctly adjusted. These problems are being investigated.

Seed viability should always be checked before sowing by forwarding a sample of about 8 oz. to the Seed Testing Laboratory, Department of Agriculture, Jarrah Road, South Perth, 6151. Germination tests take about two weeks.

**Wind erosion**

Linseed is very susceptible to damage from sand blasting, a hazard which is most serious on sandy soils, on clover harvested areas, and on successively cropped paddocks. Chemical weed control, combined with minimum cultivation, will reduce this hazard.

Cereals are much more tolerant of sand blasting. Where both cereals and linseed are to be grown the cereals should be sown on the erosion-prone areas.

Rolling has not been tested as a means of reducing sand blasting but the experience of several growers in 1968 suggested that the compaction and ridging caused by a Cambridge roller could be beneficial.

**Fertilisers**

**Superphosphate**

The levels of superphosphate (or any other fertiliser) used in a cropping programme should be based on current Department of Agriculture recommendations for each district and soil type. The recommendations vary with soil type, previous super history, and method of application.

**Nitrogen**

Like cereals, linseed responds to nitrogen when sown as a second or third successive crop. Depending on location and soil type, rates as high as 35 to 45 lb. per acre of nitrogen (equivalent to 75 to 100 lb. urea) should be used.

**Trace elements**

Responses to zinc have been irregular but any paddock which has received a low rate of zinc, but has some gravel content, could be zinc deficient.

**Disease**

**Pasmo**

Pasmo is a foliage disease caused by the fungus *Sphaerella linorum*. The disease is favoured by warm humid conditions.

It is usually first seen as small circular spots on the lower leaves and stem. The spots on the stem elongate and the disease gradually spreads to younger foliage and the floral parts.

Pasmo survives from season to season as spores or fungal threads on infected linseed stubble. It is carried over into new
areas by infected seed or diseased plant debris in unclean seed samples.

Losses can be minimised by

- Dry pickling the seed with 2 oz. per bushel of Chloranil, or any organic mercury dust.
- Early burning or ploughing in of diseased stubble.
- Not planting linseed on or near areas which grew an infected crop in the previous year.

Rust

The commercial varieties Gibson and Kameniza are resistant to the current strains of rust. Breeding of new rust-resistant varieties is essential if the linseed industry is to survive a breakdown in resistance of the commercial varieties.

Insect control

Reg legged earth mite

The red legged earth mite damages linseed during seedling emergence. It is therefore essential that all crops be sprayed within seven days of planting, before the seedlings emerge.

If red legged earth mite is likely to cause trouble, 4 oz. of D.D.T.* active ingredient is required per acre. However, if only light infestations are expected, the rate can be lowered to 2 to 3 oz. active ingredient per acre.

Systemic insecticides are ineffective on bare soil and it could be dangerous to wait for the linseed seedlings to emerge before controlling red legged earth mites with such materials.

Spraying the boundaries of neighbouring clover paddocks with an insecticide such as Imidan or Dimethoate (Rogor) will help prevent the movement of mites from pasture into linseed crops. Damage from such transfers has been observed in a previous linseed survey.

Native budworm (climbing cutworms)

The native budworm moth is active in the growing crop during spring, and caterpillars may be present during and soon after flowering. Farmers should inspect their crops frequently after the first sign of moth activity.

* D.D.T. should not be used in established dairy pastures, or where animals are being finished for slaughter.

If spraying is to be carried out, the following points may be important:

- Moths lay eggs singly on the foliage of host plants and hatching occurs from two to 8 days later.
- Spraying is warranted whenever one or two caterpillars per square yard are found in the crop. Thorough inspection is needed to determine such low population densities.
- If D.D.T. is sprayed when the budworms are less than an inch long, 8 oz. D.D.T. a.i. per acre is suggested (1 3/5 pt. of 25 per cent. D.D.T. per acre). If the budworms are larger than an inch, 2 2/5 to 3 1/5 pt. of 25 per cent D.D.T. should be used per acre, depending on whether the budworms are approaching full maturity or have reached the mature stage.

Because a second infestation may occur after the first spraying, regular inspections must be made over an extended period.

The residual effect of D.D.T. lasts from seven to 14 days but will not benefit any new plant growth. It is possible however, to use a mister and utility on young crops to control infestations without causing too much crop damage.

Harvesting

Linseed ripens relatively slowly compared with cereals and requires a period of warm weather before it will thresh satisfactorily. However, the crop should be harvested as soon as practicable after maturity.

The crop is ready for harvest when the bolls "rattle," even if the stems are still slightly green.

Linseed lodges if it is planted early or is forced to mature under moisture stress in spring. Crop lifters pick up a large proportion of the crop but this can be difficult if paddocks are rough, making harvesting close to the ground impossible.

Weather conditions at harvest can cause losses during threshing of bolls; seed can be cracked and/or thrown over the back of the machine. As the level of humidity varies according to the time of day it is essential that the harvester is set correctly.
for the prevailing conditions. In the past some operators have suffered yield losses because they spent too little time on adjustments. Drum speed should be reduced to about 800 to 900 revolutions per minute.

Most harvesting machines are capable of taking linseed off satisfactorily if they are correctly adjusted to avoid serious losses of seed. Simple alterations can be made to riddles and screens of machines to allow f.a.q. samples to be obtained from very "weedy" crops.

Losses from delayed harvesting, hurried harvesting and inattention to changing weather conditions are just as expensive as not using enough fertiliser.

Losses caused by using old harvesters or slapdash methods can be serious.

**Grain receival standards**

Receival of linseed by C.B.H. is subject to the standards laid down by the Canadian No. 1 Flax Standard. For a sample to be accepted it must contain less than 12.5 per cent. cracked grain, and less than 2.5 per cent. foreign matter. However, a sliding scale of dockages applies to levels of foreign matter between 1.0 and 2.5 per cent.

Cracking of seeds should not be a problem to farmers, although there will be differences between seasons and areas. Meeting the f.a.q. standard for level of foreign matter will thus depend on the ability of the crop to yield well.

If a crop is weedy, lower yields are expected and a high level of foreign matter (grass seeds mainly) will occur. Strong crops that suffer from late infestations of Wimmera ryegrass may look "dirty" but most farmers can reach an acceptable level without dockage.

Marketing of linseed in world trade requires that samples be 100 per cent. pure to gain top prices. Admixture, mainly Wimmera ryegrass, can be minimised by close attention to paddocks in the year before cropping to reduce grass seed set. Any contaminated harvested sample can be successfully cleaned using conventional grading machinery.

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