A new look at sweet lupins in Western Australia

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A NEW LOOK AT SWEET LUPINS  
IN WESTERN AUSTRALIA

BECAUSE they have a seed protein content of 30 to 45 per cent., sweet lupins are playing a growing role in animal feeding, particularly in the poultry industry. Their value as a protein supplement should ensure a continued local market as at current prices they are highly competitive with soya beans in cost per unit of protein.

Sweet lupins are so called because they lack the bitter principles (alkaloids) present in the herbage and seeds of wild lupins.

Although some good yields of sweet lupins have been harvested, experience over the past five years has shown an alarming percentage of crop failures and an average yield of less than 8 bushels an acre. As sweet lupins have a potential of at least 35 bushels per acre, this article discusses the reasons for failures and provides recommendations which should allow consistently good yields (greater than 15 bushels) to be obtained. The most important of the recommendations made by Dr. J. S. Gladstones in his reviews of lupin agronomy (Department of Agriculture Bulletins 3671 and 3697) are repeated here, but there are some modifications.

Soil and Climate

As a result of farmer experience with the bitter New Zealand and W.A. blue (sandplain) lupins, the current sweet lupin varieties Uniwhite and Weiko III have been grown over a wide range of environments. In many cases the conditions have been quite unsuited to the sweet varieties.

The bitter wild lupins were often sown as pioneer legumes on roughly cleared new land, but attempts to use sweet lupins in a similar role as a "pioneer cash crop" have brought disastrous results. Poor nodulation has been a feature of such situations, with pale yellowish plants which make only a partial recovery in the spring.

Sweet lupins should not be sown on new land, except on good soils free of plant root debris.

As Dr. Gladstones (Bulletin 3697) suggests, the best sweet lupin yields are to be expected as the first crop after a clover ley on old land.
Like most plants, lupins will grow best on the best soils. There has been considerable emphasis on the success of lupins on light sandy soils but in a cash cropping system with high returns per acre, the best soils should be chosen. The sweet lupins are best sown after clover ley, in areas not subject to winter waterlogging.

Rainfall

Rainfall requirements for Uniwhite have been quoted as 20 to 22 inches in northern areas and 17 inches in the south. Now, however, we believe that 24 inches or more is necessary except on the south coast where 18 inches should be sufficient. North of Perth, reliable yields can only be expected on good soils in good seasons. The risk factor also is much higher north of Perth.

The changed recommendation is necessary because of the consistent susceptibility of Uniwhite to warm to hot spring conditions. As the species has been generally adapted to much cooler continental climates, such conditions result in considerable flower losses (see below).

North of Perth the risk factor of at least partial crop failure is too high for any general recommendation of Uniwhite except on good soils in the Gingin and Dandaragan Shires. Despite good yields in many northern areas during the highly favourable 1970 season, growers would be well advised to restrict acreages until earlier maturing types such as Unicrop (see below) become generally available.

Generally, Weiko III has yielded some 50 per cent. less than Uniwhite wherever the two have been grown together. Thus, despite a possible price differential in favour of Weiko III, the variety cannot be recommended as consistently able to produce economic yields in Western Australia. Even where Weiko III does produce well, it will almost invariably be outyielded by Uniwhite.

When to inoculate seed

Inoculation of lupin seed with nitrogen fixing bacteria is recommended for all situations except: (i) Where lupins are being sown as a first crop after good clover pasture. Sufficient soil nitrogen is usually available for a good crop in this situation. (ii) Where the area has grown good lupin crops in past years, and lupin bacteria will be present in the soil.

Early planting needed

The importance of early planting of lupins cannot be overemphasised. Given the choice of somewhat inadequate weed control in April-May and good weed control with a June or July planting, farmers should choose April-May. Uniwhite is able to grow very rapidly in warm, moist autumn conditions and competes efficiently with weeds. Like other leguminous crops (such as clover seed) sweet lupins will almost always yield highest with April and early-May seeding.

Flower losses in lupins

Many farmers have been alarmed at the loss of lupin flowers which results in only a few pods from as many as 50 flowers on the central flowering stalk. Typical figures for these losses in Uniwhite are shown in the table below.

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<table>
<thead>
<tr>
<th></th>
<th>Flowers</th>
<th>Pods</th>
<th>Per cent pod set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perth 1970</td>
<td>42</td>
<td>14</td>
<td>33-0</td>
</tr>
<tr>
<td>Perth 1970 (Irrigated)</td>
<td>47</td>
<td>13</td>
<td>27-6</td>
</tr>
<tr>
<td>Mt. Barker 1970</td>
<td>42</td>
<td>6</td>
<td>14-3</td>
</tr>
<tr>
<td>Three Springs 1970</td>
<td>35</td>
<td>4</td>
<td>11-4</td>
</tr>
<tr>
<td>Perth 1969</td>
<td>32</td>
<td>3</td>
<td>9-8</td>
</tr>
<tr>
<td>Badgingarra 1969</td>
<td>31</td>
<td>2</td>
<td>6-4</td>
</tr>
</tbody>
</table>
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Even under very good conditions, flower loss is severe. It appears that 75 per cent. flower loss is to be expected with Uniwhite lupins, but even with such losses good yields can still be obtained. The figure may be somewhat higher for northern areas and slightly less for cool wet areas such as Bridgetown and Boyup Brook.

Research into the problem, which is much less severe in the sandplain lupin, is continuing with the use of "stop drop" sprays and the search for better varieties.

Sweet lupins and lupinosis

Lupinosis disease, characterised by weight losses and death of sheep grazing dry lupins has been associated with bitter and sweet lupin varieties. The disease is probably caused by a fungus which grows on the dead stalks, particularly after summer rain.

To make the best use of the very valuable lupin stubbles, they should be grazed out as quickly as possible after harvesting by using heavy stocking rates, say 25 to 30 sheep per acre. The lupinosis problem is then avoided.

Uniwhite—Uniharvest—Unicrop

Some farmers may be confused by the spate of new varieties with somewhat similar names produced recently by the University. All the...
varieties have white flowers and white seeds and so are easily distinguished from the bitter New Zealand blue lupins, although they are of the same species.

Uniwhte is the current variety which although it has reduced shedding does in fact sometimes shed rather badly in areas north of Perth. The new variety Uniharvest, otherwise identical to Uniwhte, is completely non-shedding and as such is to be preferred to Uniwhte, which it should largely replace.

Unicrop is also non-shedding but considerably earlier than Uniharvest. Its flowering time is influenced by the temperature of the environment. At Geraldton it flowers about 3 to 4 weeks earlier than Uniwhte or Uniharvest, about 2 weeks earlier in Perth and only about 1 week earlier at Esperance. Single plant and small plot data suggest it will yield if not higher than Uniwhte or Uniharvest, then at least more reliably and as such may ultimately largely replace Uniharvest, as it too is completely non-shedding. Because of its early maturity Unicrop has a good chance of economic yields on the coastal areas north of Perth.

Economics of lupin growing
cv. Uniwhte or Uniharvest relative to some alternatives

The economics of all the serious alternatives to wheat—linseed, rape, barley and lupins—are part of a constantly changing pattern of prices—conditioned by supply and demand. Improved varieties of lupins and barley in the short term and rape and linseed in the longer term provide additional reasons why farmers should gain experience with all four of these alternative crops and adapt them to farming rotations in their own areas. To cash in on the opportunities that might arise experience is essential for lupins, linseed and rape at least, as these require considerably greater farming expertise than cereal cropping.

Budgets at the best are approximations as not only do the costs of various operations (variable costs) differ from farm to farm, but wide variations in yield are to be expected. In our budgets it has been assumed that our recommendations for time of planting, soil and rainfall regimes have been followed and that pest control has been effected (see Bulletin 3697 for pest control recommendations).

Lupins may be grown in three farm situations, each carrying a different set of costs. These differences will alter the relative profitability of lupins. The price per bushel of lupins used in the budgets is for the Perth market, and other prices would have to be used to gauge the profitability of growing lupins for export.

The Table below shows the gross margin of lupins relative to feed barley in the different farming situations.

<table>
<thead>
<tr>
<th></th>
<th>Expected yield</th>
<th>Price per</th>
<th>Gross return</th>
<th>Variable</th>
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<tbody>
<tr>
<td></td>
<td>bushels</td>
<td>bushel</td>
<td>per acre</td>
<td>costs</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td>Lupins</td>
<td>15</td>
<td>1.40</td>
<td>21</td>
<td>6.75</td>
<td>14.25</td>
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<tr>
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<td>0.60</td>
<td>18</td>
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<td>13.95</td>
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<td>Budget B—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lupins</td>
<td>15</td>
<td>1.40</td>
<td>21</td>
<td>9.25</td>
<td>11.75</td>
</tr>
<tr>
<td>Barley</td>
<td>30</td>
<td>0.60</td>
<td>18</td>
<td>6.55</td>
<td>11.45</td>
</tr>
<tr>
<td>Budget C—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lupins</td>
<td>15</td>
<td>1.40</td>
<td>21</td>
<td>5.95</td>
<td>15.05</td>
</tr>
<tr>
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<td>18</td>
<td>6.55</td>
<td>11.45</td>
</tr>
</tbody>
</table>

Price and marketing

At the present price of $1.65 per bushel delivered to Perth, lupins can partly replace imported soybean meal in poultry rations.
However, the production from about 30,000 acres would fill the present local requirement. Any surplus would have to be exported.

Because of freight rates and prices of alternative protein sources on overseas markets a maximum export price of $1.20 per bushel on farm can be anticipated. *Also, no markets have yet been established for lupins overseas.*

The outlook for 1971 is for an acreage in excess of 30,000 acres. If some of this is to be sold overseas, markets must be established.

A special market for lupins for sowing as seed is opening up in Western Europe and may absorb small quantities of high quality, graded seed at prices of $80 per ton or more at Fremantle.

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**CHECK LEGUME INOCULANTS CAREFULLY**

Farmers are strongly advised to take the following precautions when buying and storing inoculants for legume seeds.

- Check that the inoculant is the correct one for the seed being treated.
- Check that the inoculum is used before the ageing date on the packet. This is particularly important because the inoculant central authority, the Australian Inoculant Research Control Service, sometimes grants shortened shelf life to certain batches.
- Store the inoculants in a cool place, preferably a refrigerator, but they must not be frozen. Avoid exposure to heat from either the sun (such as in cars, near windows) or from machinery.
- Sow the seed as soon as possible after inoculation as the number of bacteria fixed on the seed decreases with time after inoculation. Try to avoid storing inoculated seed for more than three weeks.

Farmers who buy pelleted and inoculated seed, or have their seed contract inoculated, should satisfy themselves that these precautions have been taken.

Checking beforehand costs little but nodulation failure could be very costly in the farming programme.