The control of annual (Wimmera) ryegrass in cereal crops

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The key to cultural control of annual ryegrasses in cereal crops is an understanding of the factors which govern germination of the seed. Covering the seed with soil keeps out light and provides a more stable moisture supply, bringing about a faster rate of germination. This is the basis of control programmes recommended in this article.

Recommendations for chemical control are also included.

The annual ryegrasses are valuable pasture plants in Western Australia, yet have become one of the major weed problems in cereal crops. Other common annual grasses in the cereal and sheep districts of Western Australia rarely cause much difficulty in cereal crops. These include barley grass, silver grass and brome grass. Where these do cause trouble, it is usually due to inadequate or incorrect cultivation before the cereal is planted.

However, crops are often choked with annual ryegrass despite the most thorough cultivation before seeding. Once the weed has appeared in the crop there is no chemical which can be used to remove ryegrass.

The dormant seed problem

The seeds of barley grass, silver grass and brome grass which form in the spring will not germinate immediately because they are dormant. This dormancy is essential for the survival of naturalised plants because it prevents germination after summer thunderstorms.

Over the summer the seed dormancy of the three grasses gradually decreases and by about April or early May all the seeds which formed the preceding spring will germinate with adequate moisture. Annual ryegrass seed follows a similar pattern except that in some districts not all the seeds are ready to germinate with the first rains.

The reasons for this delayed germination are not yet fully understood. Because of the importance of annual ryegrass as a weed the Department of Agriculture is carrying out a detailed research programme to determine the pattern of seed dormancy in this species.

Dormancy varies from district to district. In the northern agricultural districts the dormancy cycle is complete by the opening of the following growing season. The seeds germinate quickly soon after the opening rains and the seedlings are killed by the normal cultivation programme.

In the other agricultural districts the dormancy cycle of annual ryegrass seed is not necessarily completed by the autumn. Some
seeds may germinate with the opening rains and some may not until later.

Soil temperatures also influence the germination pattern. In cool districts even the non-dormant seeds germinate relatively slowly. Sometimes they germinate so slowly that they can still produce seedlings after the cultivation programme has been completed.

Depth of the seed in the soil also helps determine the proportion of seeds which germinate with the first rains. If the seed is on the soil surface, sometimes as much as 50 per cent. or more does not germinate. The seeds give their greatest germination when they are buried at about half an inch, while at greater depths the proportion again falls.

**Effect on crop yield**

Annual ryegrass competes most effectively if it germinates at the same time as the crop and if favourable growing conditions continue for about six weeks. If the finishing rains are good at the end of the growing season the crop can reverse the situation, competing effectively with the ryegrass and often yielding as well as an uninfested crop.

It is difficult to predict accurately the likely loss of yield in any specific situation because of this seasonal influence. In experimental plots, ryegrass infestations of 50 to 100 plants per square yard three weeks after planting have often failed to reduce crop yield; in other cases they have reduced yields by 8 bushels or more per acre.

*Over a large number of trials, however, the reduction has averaged 4 to 5 bushels per acre.*

**Control by management and cultivation**

In the present financial situation the economics of chemical control are doubtful, so the obvious alternative is to prevent the weed problem from developing.

This can be done to a large extent by undertaking an effective management programme before and after the cropping season starts.

Reduction of the seed population and autumn cultivation are the main cultural control measures.

**Reduction of seed population**

There are a number of ways to reduce the quantity of seed in the soil and so reduce the density of the potential infestation. It is possible to prevent seed formation in the previous spring by heavy grazing before and during the flowering and seeding stage. Mowing or topping at the flowering stage is often also effective. Spraying at the same growth stage with paraquat (Gramoxone) will achieve a similar result.

If seed formation does take place, autumn burning to kill the seed should be considered. If this is adopted, it is necessary to reduce grazing during the summer to retain sufficient topgrowth for an adequate fire. The reduced grazing also prevents the seed being trampled into the soil.

**Autumn cultivation**

There are still aspects of annual ryegrass seed dormancy which are not well understood. There are wide variations from district to district and the prior management of the paddock to be cropped can have a large influence.

Careful observation over several years should give a farmer some appreciation of the seed germination pattern on his property. With this as a basis, an effective cultural programme
CULTURAL PROGRAMMES FOR RYEGRASS CONTROL

PROGRAMME 1
Sowing 21 days
after break

1st. week 2nd. week 3rd. week 4th. week 5th. week 6th. week
Shallow cultivation Plough Scarify Sow

PROGRAMME 2
Sowing 28 days
after break

1st. week 2nd. week 3rd. week 4th. week 5th. week 6th. week
Shallow cultivation Plough Scarify Sow

PROGRAMME 3
Sowing 35 days
after break

1st. week 2nd. week 3rd. week 4th. week 5th. week 6th. week
Plough Scarify Sow

PROGRAMME 4
Sowing 42 days
after break

1st. week 2nd. week 3rd. week 4th. week 5th. week 6th. week
Plough Scarify Sow
should be planned to obtain the quickest germination of seed possible, so that later cultivations can kill the seedlings.

A number of experiments have been undertaken to determine suitable autumn cultivation programmes. With some modification in accordance with property location, previous paddock history and local experience, the following operations could be included:—

- **A shallow working** immediately before or after the opening rains to cover the seed with soil, will increase the speed and percentage of germination of the non-dormant seeds. This cultivation should be very shallow and the seed should not be buried below one inch. Other weed seeds will also be encouraged to germinate by this treatment.

- **Ploughing or scarifying** should not be done for at least 10 days and preferably should be left for 14 days to allow for maximum germination. The timing of this operation should be related to the anticipated seeding date and should be about 14 days before seeding.

- Where it is necessary to **work the paddock back**, best results have been obtained by scarifying, with a 7-day interval before sowing.

Trials have shown that better control of ryegrass can be obtained by delaying the time of seeding. However, planting should not be delayed later than the time recommended for the district, because of the effect of the shorter growing season.

The following table shows the recommended cultural programme based on planting a crop 21, 28, 35 or 42 days after the opening rains.

The programme chosen should not make the seeding date any later than that normally recommended for the district. Where the season opens late, it is probably necessary to plant according to the first two programmes. For early seasons, with a longer growing season than normal, it would be possible to use the second two programmes.

<table>
<thead>
<tr>
<th>Cultural programmes for annual ryegrass control</th>
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<tr>
<td>(The numbers refer to days after the opening rains)</td>
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<tr>
<td>Days after opening rains</td>
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<tr>
<td>Shallow working</td>
</tr>
<tr>
<td>1. At opening rains</td>
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<tr>
<td>2. At opening rains</td>
</tr>
<tr>
<td>3. Nil</td>
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<tr>
<td>4. Nil</td>
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Where ploughing can be delayed by 3-4 weeks after the opening rains there will be no need to undertake the shallow working mentioned.

**Chemical control**

Two chemicals are recommended for the control of annual ryegrass in wheat and barley. Both must be applied at the time of seeding and before the crop has emerged.

The main disadvantage of using chemicals is their high cost. A cash payment for chemical, equal to 2 to 4 bushels per acre and subtracted from the gross return of a wheat quota, must be considered very carefully.

Another disadvantage is that the farmer must undertake the treatment before the extent of the infestation is seen.

**Avadex**

Avadex,* although related to Avadex BW, is more effective and has not previously been available in Western Australia. It will kill annual ryegrass and wild oats.

Avadex must be mixed into the top layer of soil by cultivation and acts by killing the seeds as they germinate.

An application of one pint per acre can be expected to give 80 per cent. control; if a higher degree of control is required the rate of application should be increased to 1½ pints.

To ensure the most efficient use of Avadex the following conditions should be observed:—

- Prepare a level seed bed without large clods.

<table>
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<tr>
<th>Chemicals which can be used for the control of annual ryegrass in wheat and barley</th>
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<td><strong>Chemical</strong></td>
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<tr>
<td>Avadex</td>
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<tr>
<td>Lasso</td>
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                 | 80             | 3.60                  |

| 0x-8 |
Heavy stands of annual ryegrass do not always cause large yield reductions. However, in this trial at Avondale Research Station the heavily infested control plot (right) yielded 48 bu. per acre and the plot on the left, where the ryegrass was controlled by spraying with Lasso, yielded 54.2 bu. per acre.

The following conditions should be observed:

- Spray Avadex onto a bare soil free of annual ryegrass plants immediately after seeding is completed.
- Incorporate the chemical evenly into the surface layer by diamond, peg or 5-row harrows, followed by cover harrows, immediately after spraying.
- Apply the Avadex in 5 to 10 gallons of water per acre, using no more than 30 lb. pressure.

Application to soils that are cloddy, very wet, ridged or covered with plant debris will reduce the effectiveness of Avadex.

**Lasso**

Lasso* is a new herbicide which is only effective against annual ryegrass. It is applied immediately after seeding and does not require harrowing. Provided 30 to 50 points of rain fall within 10 to 14 days the chemical will move into the soil and kill the ryegrass seed as it germinates.

Lasso would be suited to heavy soils which are normally sown when moist and before the heavy winter rains are expected.

The recommended rate of application is 1½ pints (32 fluid ounces) per acre.

Cost of chemicals

The cheapest chemical treatment is one pint of Avadex per acre, costing $2.29.

The cash outlay in planting a wheat crop would be about $4.00 per acre, without herbicide treatment. When quotas are involved a smaller acreage can be planted to yield the required amount of wheat if a herbicide is used to control weeds. However, unless the land is used to increase the farm income by other means, no advantage is gained.

If the chemical is used to control weeds in barley the increased yield is cash profit once the cost of the chemical and application has been met.

With the other two chemical treatments, which cost about $3.50 per acre, the advantages are dubious. If wild oats are also present the only treatment likely to be effective is Avadex at 1¼ pints per acre.

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*Avadex and Lasso are registered trade names of Monsanto (Australia) Ltd.*