Winter wheat: its effect on ryegrass seed yield and control options

Key Points

- Three trials (two wheat, one barley) have shown little reduction in ryegrass seed yield below approximately 20 plants/m² (Figure 1).
- Teedal gave complete control of winter wheat without affecting seed yield.
- Glyphosate at 0.3 l/ha and 0.25 l/ha gave very good control of wheat and barley respectively without affecting seed yield.
- When applying Moddus after application of either Teedal or Glyphosate, take into consideration that, both can reduce crop dry matter by 16 and 42% respectively; in turn acting as a grow regulator themselves e.g. the addition of Moddus may act as a double PGR effect (see Table 1, compare between, 1.0 l/ha Moddus and respective chemical treatments).
- Application of Glyphosate requires extreme caution in relation to rate and timing.

Attention
NB: Correction to FAR Arable Update Weeds, Pests & Diseases, No. 60. Re: Teedal for Barley Control. Optic (Barley) was described as fully tolerant to Teedal. FAR regard this as a one-off as previous results have shown barley to be fully susceptible to Teedal and do not recommend application on any barley crops. Teedal has been used for barley control in ryegrass seed crops (see below).

Background
Both ryegrass and wheat are important crops in the rotation of arable farming within New Zealand. Worldwide, much work has been completed looking at the impact of weeds on the grain yield of cereals. For example, wild oats and Italian ryegrass have been shown to reduce wheat yields at low plant populations (by up to 60% at higher populations) (FAR Arable Update Cereals No. 74 and Appleby et al 1976). However limited work has been completed on the effect of cereals on the seed yield of ryegrass (exception being wild oats, see FAR Arable Update Herbage No. 12). Some estimates of grain losses during the harvesting of cereal crops put potential losses at between 40 and 470 seeds/m² (approx. losses of 20 – 235kg/ha). Volunteer cereals can be a major weed in autumn sown herbage seed crops. The presence of cereals is of concern due to a number of factors:

i. Direct competition with the crop species,
ii. Seed contamination (export issues),
iii. Disease carryover (take all etc).

This update is a summary of a number of FAR funded trials looking at:

a) The effect of winter wheat at low populations (often the case when ryegrass follows wheat) and its effect on ryegrass seed yield.
b) Chemical trials investigating wheat and barley control options in perennial ryegrass.

Trial background
Two seasons of trials (2004 and 2005 harvests) were planted at Lincoln with the ryegrass cultivar, Aries HD. Contaminant wheat cultivars sown were, Claire (year 1) and Amarok (year 2) with populations of between 0 and 37 plants/m² established.

FAR has also funded two trials investigating cereal control in ryegrass. The first was sown in 1999, cultivar Nui, sown with barley contamination; the second sown in 2005, cultivar Banquet sown with wheat contamination. Treatments included Teedal and Glyphosate (common to both trials), wick wiping, and kerb.

Results

Winter wheat: its effect on ryegrass seed yield

Ryegrass seed yield followed a similar trend in the two seasons of trials with no statistical difference between contamination levels (0 up to 37 plants/m²) (Figure 1). There was a general trend for a slight increase in seed yield at low populations. Results from a combination of three trials (two wheat and one barley) suggest no yield penalty until a cereal population of approximately 20 plants/m². This is followed by a rapid decline in ryegrass seed yield as cereal population increases. (Figure 1).
A critical population of 20 plants/m² was identified. Above this, competition had a large effect on relative seed yield, with an average drop off of 1.5% per cereal plant e.g. for a 2000kg/ha crop this would equate to a 30kg/ha loss for each cereal plant above 20 plants/m². This result is consistent with wild oat studies as reported in FAR Arable Update Herbage No. 12. Wright and Hebblethwaite (1983) found a reduction of 1% per 10 wheat plants under UK growing conditions.

**Winter barley control**

Three chemicals were included, Teedal (7kg/ha), Moddus (1 & 2/ha) and Glyphosate (250ml/ha) on ryegrass cultivar Banquet. Applications of Teedal and Glyphosate took place on 7 September while Moddus was applied on 22 November. Cereal contamination was 36 plants/m² in late winter which equated to up to 39 ears/m² in January (Table 1).

Application of Teedal controlled all cereal volunteers while Glyphosate controlled the majority (table 1).

**Table 1: Trial results for chemical control options of winter wheat, FAR arable site, dryland, 2006 harvest**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Moddus applied (l/ha)</th>
<th>Wheat heads/m² (14/1/06)</th>
<th>Seed Yield (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ryegrass only control</td>
<td>-</td>
<td>0</td>
<td>1116</td>
</tr>
<tr>
<td>Ryegrass + wheat</td>
<td>-</td>
<td>39</td>
<td>1210</td>
</tr>
<tr>
<td>Moddus 1.0/ha</td>
<td>1.0</td>
<td>39</td>
<td>1310</td>
</tr>
<tr>
<td>Moddus 2.0/ha</td>
<td>2.0</td>
<td>34</td>
<td>1245</td>
</tr>
<tr>
<td>Glyphosate (360) 0.3/ha</td>
<td>-</td>
<td>0</td>
<td>1214</td>
</tr>
<tr>
<td>Glyphosate (360) 0.3/ha</td>
<td>1.0</td>
<td>1</td>
<td>1136</td>
</tr>
<tr>
<td>Teedal 7.0kg/ha</td>
<td>-</td>
<td>0</td>
<td>1079</td>
</tr>
<tr>
<td>Teedal 7.0kg/ha</td>
<td>1.0</td>
<td>0</td>
<td>1122</td>
</tr>
<tr>
<td>LSD 0.05</td>
<td></td>
<td>12</td>
<td>NS</td>
</tr>
</tbody>
</table>

There was no statistical difference between treatment yields although a trend occurred for chemical treatments, with the application of Moddus, to have lower yields compared to the Moddus applications only. This may be a result of the chemical application slowing growth before the application of Moddus (double PGR effect). Moddus had no effect on reducing the cereal population.

**General discussion**

Results from both New Zealand and the UK suggest cereals (both wheat and barley) can be very competitive towards perennial ryegrass, with yield reductions of approximately 1.5% per cereal plant, when populations exceed 20 plants/m². These results suggest that at low cereal populations, ryegrass is a strong competitor during the reproductive phases of growth, while wheat is more competitive during vegetative growth.

Control of both wheat and barley was achieved by the application of Teedal or Glyphosate. When using Glyphosate extreme care must be taken when considering rate and timing. Crops must have adequate tiller numbers as growth will be reduced by up to 50%. Teedal will also reduce growth but to a lesser extent, approximately 16%. Grazing can be used on most late cultivars (including Italian ryegrass) to effectively remove the growing point of most cereal volunteers. However this does not necessary give 100% control which may be required.

Although populations of cereals below approximately 20 plants/m² did not reduce seed yield, they can reduce saleability of the seed line and carry over disease. When cereals survive in a crop (where they are a weed) they effectively act as a host for all cereal weeds, removing the aim of most rotations e.g. carryover of take all. Any crop which is to meet export criteria to Australia must be free of cereals.

**Acknowledgements**

FAR would like to thank AgResearch, NZArable and PGG Wrightson who carried out this work.

**References**


© This publication is copyright to the Foundation for Arable Research and may not be reproduced or copied in any form whatsoever without their written permission. This Arable Update is intended to provide accurate and adequate information relating to the subject matters contained in it. It has been prepared and made available to all persons and entities strictly on the basis that FAR, its researchers and authors are fully excluded from any liability for damages arising out of any reliance in part or in full upon any of the information for any purpose. No endorsement of named products is intended nor is any criticism of other alternative, but unnamed product.