Managing Resistant Ryegrass

1. Know the problem

- Record ryegrass presence in paddocks. Is the ryegrass present as patches or over the whole paddock? Are numbers greater than 50-60 plants/m^2?
- Has ryegrass escaped spraying with grass selective herbicides (fops or dims)?
- Over the years is there more and more ryegrass appearing in cropped paddocks?

2. Critical management issue

If any of the above apply and it is not dealt with immediately then ryegrass can:

- rapidly develop full resistance to Group A herbicides (and possibly to other herbicide groups as well).
- be more difficult and more expensive to control.
- seriously impact on crop yield.

3. Short term solutions are not the answer

Short term solutions which come out of a drum are NOT the answer to managing resistant ryegrass. New products such as Hussar are options to an immediate need but will NOT fix the problem because:

- the longevity of these products is short (resistance will develop quickly).
- most of the new products are expensive.
- many of these products have long residuals which make their use difficult in the rotation

4. Sustained ryegrass management

The successful long-term management of ryegrass requires:

- reducing the soil seed bank (run down the number of weed seeds).
- reduce seed set (additions to the seed bank).
- knowing which herbicides the rye is resistant to.
- managing the limitations of using trifluralin and other pre-emergent herbicides.
- making sure there is at least a two year (and preferably a three year break) after a year when ryegrass has set seed.
- develop a rotation plan which is based on ryegrass population density.
- use all control practices in the 'tool kit' (i.e, chemical and mechanical).

5. What do break years do?

Break years will reduce the soil seed bank by running down the number of weeds which germinate each year. They should also reduce the seed set of ryegrass. Bill Roy from WA has clearly demonstrated the importance of break years in reducing the ryegrass numbers to be able to successfully crop without detrimental ryegrass numbers (Figure 1).

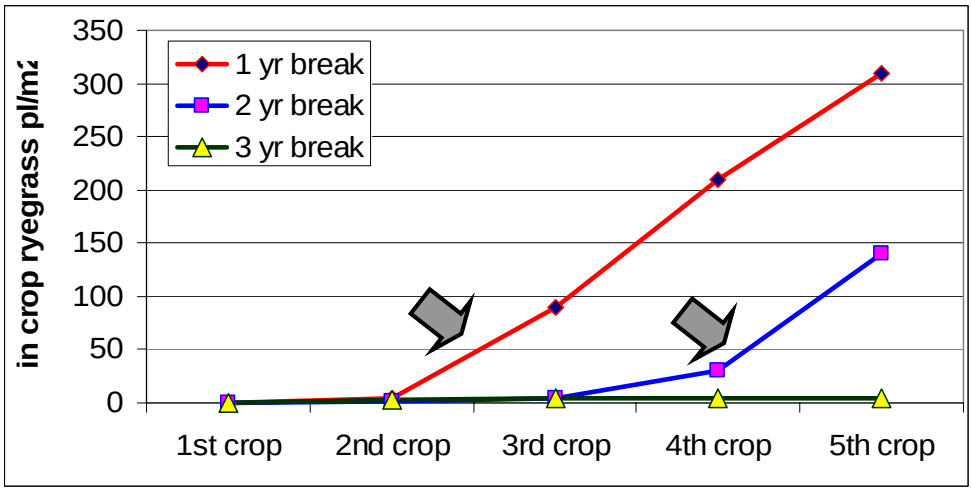

Figure 1. The impact of 'Years with a break' on ryegrass populations. This figure clearly illustrates that with only a 1 year break that ryegrass numbers rapidly increase during the second crop after a break; and with a 2 year break that numbers don't build up until the fourth crop; etc. Data from Bill Roy GRDC project. The arrows indicate the critical level of 50 plants/m^2.

6. Strengths and Weaknesses of different herbicides used for controlling ryegrass

Product / Group	Strength	Weakness
Fops Group A	▪ Very efficient when not resistant ▪ Now relatively cheap	▪ Resistance has developed on most farms
Dims Group A	▪ Very efficient when not resistant ▪ Select/Aramo excellent in canola	▪ Rye is now partially or fully resistant to Achieve on many farms ▪ Select®/Aramo® last line of in-crop defence, use these products to their potential (spraying conditions etc)
New sub-group Group A	▪ New product on the market (Axial®) increased activity to fops	▪ Resistance is likely if the population is already resistant to Select.

Product / Group	Strength	Weakness
SU Group B	▪ Glean® is ok on small ryegrass (2 to 3 leaf) ▪ Atlantis® has good suppression ▪ Hussar® has control of ryegrass up to mid tillering	▪ Glean is cheap but should not be used every year (resistance in ryegrass and broadleaf weeds – especially radish) ▪ Atlantis and Hussar are expensive ($28 to 38/ha) ▪ Long residual with both products ▪ Resistance will develop quickly to the SUs (three to four consecutive applications)
IMI Group B	▪ On-Duty® and Midas® have activity on ryegrass ▪ Shorter residual than SU's on high pH	▪ On-Duty and Midas are expensive (+$40/ha) ▪ Cross resistance to SUs develops within one to two consecutive applications
Triazine Group C (Simazine/ Atrazine®)	▪ Simazine® and Atrazine® have activity when used Post-sowing and Pre-emergent ▪ Atrazine has additional activity when used (EPE) Early Post Emergent on small ryegrass ▪ Different group to A and B – and useful for additional activity on ryegrass	▪ Only partially useful for controlling ryegrass (maybe 60 to 80% activity) ▪ EPE ryegrass has to be small (1-3 leaf) ▪ Need good conditions (rain within 10 days of application) ▪ Usually only useful when growing TT canola
Triazinone Group C (Lexone®/Sencor®)	▪ Different chemical sub group ▪ Able to be used in barley ▪ Maybe useful addition to trifluralin in barley	▪ Weak on ryegrass unless conditions are perfect – wet soil and follow up rain ▪ Registered in barley (although not for ryegrass) ▪ Not useful for practical ryegrass control
Diuron® (sub group Urea) Group C	▪ Good on capeweed, mustard and radish	▪ Some activity on ryegrass but it is marginal ▪ Crop damage if large rainfall event follows application

Product / Group	Strengths	Weaknesses
Trifluralin Group D	▪ Reasonably good activity on ryegrass (80 to 90%) when incorporated properly (harrowed) ▪ Canola is tolerant at high rates (1.5 – 1.7L/ha) ▪ Can be used on dry soil ▪ Can be used at high rates (.7L/ha) in stubble when using higher water rates and No Till systems	▪ Volatilises from wet soil hence has to be incorporated or at least covered by at sowing ▪ Trifluralin binds readily to stubble ▪ Difficult to use in a No Till system with disk seeders ▪ Resistance has developed and will continue to increase because trifluralin use is increasing rapidly ▪ Wheat, barley emergence damage when seed is not separated from trifluralin layer
Avadex® Group E	▪ In laboratory trials Avadex has activity on ryegrass ▪ In some trials also shown increased activity when mixed with trifluralin	▪ Must be incorporated – not suited to No Till with disk seeders ▪ Some additional benefit when used together with trifluralin ▪ Expensive
Dual® Group K	▪ Increased activity (in barley/oats) when incorporated at sowing or Post-Sowing Pre-emergent (especially when used in combination with trifluralin)	▪ Must rain within 7 days when used PSPE. Otherwise activity is lost. ▪ Reduced activity when used IBS (still requires rain) ▪ Only works on ryegrass before it emerges ▪ Expensive ▪ Registered at 0.5L/ha (required rate) in oats and barley (not in wheat) ▪ Some trials have shown crop damage in wheat when used at 0.5L/ha rate
Gramoxone® Group L	▪ Different group ▪ Excellent for seed set control (spray topping in pasture fallows or crop topping in pulse crops) ▪ No known resistance in ryegrass (there is in barley grass)	▪ Needs high water rates (80l/hs) ▪ Use only fine to medium droplets ▪ Spray conditions best in late afternoon or at night ▪ Inactivated by dust or muddy water ▪ Highly toxic to humans

Product / Group	Strengths	Weaknesses
Roundup Group M	▪ Highly effective ▪ Excellent pre-sowing and for seed set control (chemical fallow)	▪ Resistance has been reported ▪ Risk of drift when used pre-seeding on adjacent newly emerged crops ▪ Inactivated by dust or muddy water ▪ Inactivated when spray water is hard (use Ammonium Sulphate to overcome this effect)

7. More on Trifluralin

Trifluralin use is increasing and resistance to trifluralin is being reported from all areas.

- Trifluralin turns into a gas when it gets wet – in the gaseous state it will be lost (through volatilisation) unless it is locked in the soil (i.e. covered by a layer of soil).
- Trifluralin is nearly all root uptake – hence the trifluralin must be in contact with the roots of weeds (ryegrass).
- Trifluralin will damage wheat and barley if the sown seed is in contact with the trifluralin layer.
- The seeder must be set up so that seed is placed in the seeding row with some coverage of soil which does not contain trifluralin before the soil thrown from the adjacent row (containing trifluralin) can be in contact with the cereal seed - this will depend on the disk opener (angle), row width, speed of sowing, soil conditions (especially moisture).
- In a No Till system the ryegrass seed are found near or on the surface – when trifluralin is sprayed onto the paddock, the trifluralin is in close proximity to the weed seeds. The No Till seeding operation requires a small amount of soil (5 to 10mm thick) on top of the trifluralin to protect it from volatilisation.
- In a No Till system there is often ryegrass growing in the seeding row (no trifluralin because the seeding operation throws the soil containing the trifluralin from the row onto the inter row).
- In a No Till system it is better to use a high water rate (at least 80L/ha) because coverage through the stubble onto the soil is important.

8. Practices for controlling ryegrass

(i) Reducing the seed soil bank reserves (ie running down amount of weed seed which germinates in the crop)

- Delay seeding (knock-down or cultivate prior to seeding after the break)
- Use double-knock (glyphosate followed by gramoxone – to reduce survivors into the crop)
- Cultivate (tickle) to stimulate germination prior to sowing

- Consider break crops (break from cropping whilst controlling seed set in a mechanical control phase – such as oaten hay)

(ii) Controlling seed set (to reduce the amount of seed returned to the soil during the cropping phase)

- Crop top with gramoxone in beans, lentils and field peas
- Green manure or fallow
- Selective herbicides (trifluralin, Select, Hussar)
- Hay
- Seed catching (bins or bales) and removing seed from paddock
- Competitive crops (narrow row spacing; high seeding rates, barley is better than wheat)
- Burning (once every 4 to 5 years a hot burn)
- Wick-wipe short crops such as lentils before ryegrass has set seed

9. Developing a Ryegrass plan

- Set up a system of Rules for controlling ryegrass which are reviewed every season and are adhered to (these Rules will be paddock specific).
- Monitor every paddock at the flowering stage of the crop – do not crop paddocks next year which have more than 50 ryegrass plants/m^2 (consider hay or other options).
- If paddocks are sown in 2006 which have more than 50 rye/m^2 then use crops (i.e. canola) which have control options other than fops/dims. However, this option is not a long term control strategy!
- Start investigating alternative practices for economic viability (i.e. hay, deed catching).
- Plan to sow some paddocks only after a germination of ryegrass.
- Consider No Till seeding options which allow for higher rates of trifluralin to be used 'safely' and 'effectively'.
- Document the cost of control options (machinery, chemicals, rotations).
- Know the resistance status of ryegrass in most paddocks (in-paddock testing or lab testing).