Spray Nozzles for Grass Weed Control

Summary

Knockdown herbicides

Spraying small ryegrass with translocated herbicides such as Roundup®, the droplet spectrum is not as critical as what was first thought. When spraying Roundup during the time of year when drift is a problem, which occurs mainly at sowing during autumn, nozzles which produce droplets which drift less such as the Air Inducted nozzles (AI) can be used (in our trials water rates were kept at 60L/ha).

However, when using a contact herbicide such as Spray.Seed® coverage is essential and a fine to medium droplet spectrum is required. Air Inducted nozzles are not appropriate for these contact herbicides.

In-crop grass selective herbicides

When spraying medium sized ryegrass (five to six leaf) or self sown cereals (end of tillering) in pulse crops the water rate is more critical than nozzle selection. Effective weed control can be achieved when using a minimum water rate of 60L/ha and a droplet spectrum in the medium to coarse range.

Background

Optimum weed control is critical in the success of modern farming systems. Sub-optimum weed control leads to decreased yields from weeds competing with crops for moisture and nutrients as there are more weeds surviving and it can also lead to an increase in herbicide resistance.

Reducing water rates and increasing travel speed is good for covering more ground but it may come at the expense of in-effective weed control.

Knowing how herbicides with different modes of action, enter, move and work within plants allows an understanding of what level of coverage is necessary to achieve commercially acceptable control. Water rates and nozzle selection can then be made to suit the herbicide and prevailing spray conditions.

Off target herbicide damage as drift, is becoming an increasing problem, particularly as more horticultural crops are being grown in what were once traditional broad-acre cropping districts and when the duration of sowing time increases (especially for those farmers sowing pulses after cereals).

The BCG has undertaken trial work with different nozzle set ups since 2002 to try and determine what is good practice for weed control whilst minimising the potential for drift.

This paper summarises the trial work undertaken with an emphasis on improved grass control.

Methods and Results

Many grass selective herbicides have a label specification to use a droplet spectrum between 200 and 300 microns, which is towards the medium end of fine to medium droplet range. In these trials we used nozzles to include the coarse range.

Trial 1: Self sown barley control in Lentils

Trial in 2002 where a low rate of barley was under-sown with a lentil crop.

Treatments: Verdict520® @ 60ml/ha + Uptake oil 0.5% with 5 nozzles at 3 water rates

Replicates: 3

Sites: Birchip and Rupanyup

Crop: Lentils (Northfield)

Target: Barley (Gairdner) at GS30 (end of tillering)

Nozzle set up is described in Table 1.

Table 1: Nozzle type, pressure and droplet spectrum for self-sown barley control

Nozzle	Description	Pressure (bar)	Droplet Spectrum
TJ 110-02	110° TwinJet (2 x 110-01)	3	Very Fine
XR 110-02	110° Standard flat fan	3	Fine
DG 110-02	110° Low drift	3	Medium
TT 110-02	110° Turbo TeeJet	3	Medium
AI 110-015	110° High Pressure Air Induct	5	Coarse

Three water rates were used (30, 60 and 90L/ha) which was achieved by varying the application speed.

When using Verdict at low water rates (30L/ha) none of the nozzles were very effective in controlling self sown barley at the end of tillering phase. At 60L/ha and 90L/ha water rates all nozzles worked effectively in controlling self sown barley (Table 2).

Table 2: EWRC* scores for barley (GS30) control, 30 DAS, average for two sites sprayed with Verdict.

Nozzle	Droplet Spectrum	Water Rate L/ha		
		30	60	90
TJ 110-02	Very Fine	6	9	9
XR 110-02	Fine	6	8	9
DG 110-02	Medium	5.5	9	9
TT 110-02	Medium	5	9	9
AI 110-015	Coarse	6	9	9

* EWRC scores: 1 – no damage; 3 – slight damage effects reversible; 5 – severe dis-colouration and stunting; 7 – heavy damage, some plants killed; 9 – complete loss

Trial 2: Small ryegrass control with Roundup and Spray Seed

This trial was undertaken in 2004 on a pasture paddock as a knock down before cropping.

Treatments: RoundupPMax® (540g/L) 0.8L/ha and Spray.Seed 1.5L/ha + wetter 0.1% with 3 nozzles

Replicates: 4

Site: St Arnaud

Target: Ryegrass at GS12-13 (2 to 3 leaf), minimum of 100 plants/m2

Conditions: Temperature 12oC; Humidity 66%, Delta T 3.5

Nozzle set up is described in Table 3.

Table 3: Nozzle type, pressure and droplet spectrum for small ryegrass control

Nozzle	Description	Pressure (bar)	Droplet Spectrum
XR 110-02	110° Standard flat fan	2	Fine
DG 110-02	110° Low drift	2	Medium
AI 110-015	110° High Pressure Air Induct	5	Coarse

Water volume for the XR and DG nozzles was 65L/ha, and for the AI nozzle 76L/ha.

When using Roundup all three nozzles were effective. With Spray.Seed the coarse droplets produced by the Air Inducted nozzle lost efficacy (Table 4).

Table 4: EWRC* scores for ryegrass (GS12-13) control, 30 DAS

Nozzle	Droplet Spectrum	RoundupPMax at 0.8L/ha	Spray.Seed at 1.5L/ha
XR 110-02	Fine	7.8	5.5
DG 110-02	Medium	7.8	6.0
AI 110-015	Coarse	7.3	4.3
Significant difference: LSD 0.05		**NS**	**P<0.05 1.1**

* EWRC scores explanation see table 2.

Trial 3: Ryegrass control with Select

This trial was undertaken in 2005 with Select® for ryegrass control in a paddock of vetch.

Treatments: Select 250 ml/ha + Hasten® 1% applied using 4 different nozzles

Replicates: 4

Site: St Arnaud

Crop: Vetch 7 to 10 node

Target: Ryegrass at GS15-16 (5 to 6 leaf)

Conditions: Temperature 15°C; Humidity 63%, Delta T 4

Nozzle set up is described in Table 5. Spraying was conducted with 80L/ha of water.

Table 5: Nozzle type, pressure and droplet spectrum for ryegrass control in vetch

Nozzle	Description	Pressure (bar)	Droplet Spectrum
DG 110-02	110o Low drift	2.2	Medium
TT 110-02	110o Turbo TeeJet	2.2	Medium
TTI 110-02	110o Air Induct Turbo TeeJet	2.2	Coarse
IDK 120-015	120o Low Pressure Air Induct	2.2	Coarse

Two Air Inducted nozzles were compared to the more traditional Drift Guard and Turbo Teejet nozzles. The trial site is known to have ryegrass with some resistance to dim chemistry. The control plots had on average 873 ryegrass seed heads/m2 at GS80, whilst the spray plots had, on average, 110 ryegrass seed heads/m^2. In relation to nozzle type there were no significant differences in efficacy (Table 6).

Table 6: EWRC* scores (21 DAS) and ryegrass seed heads at GS80

Nozzle	Droplet Spectrum	EWRC score	Seed heads/m2
DG 110-02	Medium	7.0	123
TT 110-02	Medium	7.3	91
TTI 110-02	Coarse	6.8	113
IDK 120-015	Coarse	6.5	110
Significant difference:		NS	NS

* EWRC scores explanation see Table 2

Trial 4: Demonstration of Ryegrass control with Select

This demonstration was undertaken in 2005 with Select for ryegrass control in a paddock of vetch.

Treatments: Select 250 ml/ha + Hasten 1% with 4 nozzles

Replicates: 1 (demonstration only)

Site: St Arnaud

Crop: Vetch 7 to 10 node

Target: Ryegrass at GS15-16 (5 to 6 leaf)

Conditions: Temperature 14^{o}C; Humidity 62%, Delta T 4

Nozzle set up is described in Table 7. All treatments in this demonstration were sprayed with 80L/ha.

Table 7: Nozzle type, pressure and droplet spectrum for ryegrass control in vetch

Nozzle	Description	Pressure (bar)	Droplet Spectrum
XR 110-02	110° Standard flat fan	2.2	Fine
TT 110-02	110° Turbo TeeJet	2.2	Medium
AI 110-015	110° High Pressure Air Induct	6	Coarse
IDK 120-015	120° Low Pressure Air Induct	2.2	Coarse

In this trial a motorbike boom spray was used to spray ryegrass at GS15-16 with Select using 4 different nozzles, comparing the Air Inducted nozzles (high pressure Air Inducted nozzle (AI110-015) and a low pressure Air Inducted nozzle (IDK120-02)) to more conventional Standard Flat Fan and Turbo TeeJet nozzles. There was very little difference observed in the efficacy of each of these nozzles on the control of ryegrass (Table 8). The site for this demonstration was adjacent to Trial 3, hence the ryegrass is partially resistant to the dim group of chemistry.

Table 8: EWRC* scores (21 DAS) and ryegrass seed heads at GS80

Nozzle	Droplet Spectrum	EWRC score	Seed heads/m2
XR 110-02	Fine	7.2	87
TT 110-02	Medium	7.0	37
AI 110-015	Coarse	6.5	120
IDK 120-015	Coarse	6.8	60

* EWRC scores explanation see Table 2

Interpretation

The main message from trial work using grass selective herbicides, on grass weeds with a reasonable target area, is that high water rates from 60L/ha upwards, is more important than droplet spectrum (fine to coarse). As long as the nozzles were used according to their specification.

The grass weeds sprayed in these trials ranged from self sown barley at the end of tillering with large flat leaves to ryegrass at the five to six leaf stage with smaller flat leaves, 4 to 5mm wide. In none of the trials was there a significant difference in grass weed control efficacy due to the nozzle used – as long as the water rate was at least 60L/ha.

For small ryegrass at the two to three leaf stage, nozzle selection was important, especially when using a contact herbicide such as Spray.Seed. Even at a water rate of 65L/ha there was a decrease in efficacy when using a coarse droplet spectrum as produced by an Air Inducted nozzle (AI 110-015 at 5bar). With a translocated herbicide such as Roundup it made no difference whether a Fine, Medium or Coarse droplet was used – they were all equally effective in controlling small ryegrass.

Commercial Practice

Roundup

To avoid drift causing off site damage when spraying small grass weeds with Roundup in May, June and July when conditions are conducive to drift (low wind speeds, high humidity and low temperatures) it is best to avoid nozzle set ups which produce a fine droplet spectrum.

Under these conditions with a high risk to drift, it is better to use nozzles which produce a medium to coarse droplet.

Nozzles which have lower drift potential such as the low drift nozzle (DG110-02) and the Air Inducted nozzle (AI110-015) can be used to produce highly effective weed control with Roundup provided water rates of 60L/ha are maintained.

Spray.Seed

When spraying Spray.Seed under similar conditions as described for Roundup then a nozzle must be used which produces a fine droplet spectrum.

Spray.Seed is a contact herbicide and for it to be effective there must be good coverage and nozzles which produce a coarse spectrum will not work effectively.

Be careful of drift to neighboring crops under these conditions.

Grass Selective Herbicides

When spraying grass selective herbicides for controlling self sown cereals or ryegrass later in the season when the grasses have some size (from five leaf onwards) than the efficacy of control is more related to water rate (minimum 60L/ha) then to droplet spectrum.

Effective grass suppression/control was achieved when using droplets which ranged in size from medium to coarse.

These droplet spectrums can be achieved with high pressure Air Inducted nozzles and low pressure Air Inducted nozzles, as well as low drift nozzles.

When spraying, nozzles must always be used according to the manufacturers specification for pressure, height above crop, overlap etc.