THE SELECTIVITY OF FLUMETSULAM TO CHICKPEAS, LENTILS AND VETCH VAR. POPANY

Robert Dorigo
Dow AgroSciences Australia Ltd.
PO Box 720, Clare, SA 5453

Abstract Since 1990, Dow AgroSciences, various state Departments of Agriculture and independent researchers have conducted trials to determine whether flumetsulam was selective to the above mentioned crops.

Flumetsulam applied at 20 g ha\(^{-1}\) with no surfactant caused some transient yellowing to both chickpeas and lentils with no obvious varietal differences. The use of crop oil or surfactants increased the level of crop injury to chickpeas and therefore is not recommended. The addition of these adjuvants to flumetsulam, when applied to lentils, did not increase the level of injury. Crops generally recovered well and yield was unaffected. Flumetsulam caused little or no injury when applied post-emergence to vetch var. popany at up to 40 g ha\(^{-1}\) with or without the addition of crop oil concentrate. Vetch var. popany was tolerant of Broadstrike applied post-emergent.

All three crops displayed adequate tolerance to post-emergence applications of flumetsulam when applied at the growth stages recommended on the product label.

INTRODUCTION

Flumetsulam was first registered as Broadstrike\(^*\) (800 g kg\(^{-1}\) flumetsulam) for use in wheat, pastures and field peas in 1994 and has since gained registrations for use in many crops including chickpeas and lentils. These registrations were important because the area sown to these crops has increased and there is a lack of existing broadleaf weed control options. Before registration flumetsulam was evaluated for its potential use in these crops by Dow AgroSciences research scientists, various Departments of Agriculture as well as independent researchers. In many of these trials flumetsulam was selective to these crops and was subsequently used by growers on that basis. As these off-label uses became more common, the decision was made to pursue registration on these crops. Much of the selectivity data generated was used to gain registration and this paper summarises the results of these trials.

MATERIALS AND METHODS

Trials were conducted by various researchers across WA, SA, Vic., NSW and Qld. Some trials were conducted in commercial crops and others were part of multi-variety grain legume screens. Most trials were of a randomised complete block design with three or four replicates.

In most situations, treatments were applied using small plot sprayers, that were either tractor or vehicle mounted, or handheld, delivering between 65 and 230 L ha\(^{-1}\). Some trials were assessed for crop injury three to six weeks after application. Some trials were harvested using small plot harvesters and grain yield was expressed as a percentage of the yield of the untreated plot.

Chickpeas Thirty one trials were conducted by Dow AgroSciences between 1990 and 1998, on nine varieties. Flumetsulam was applied at 12 g ha\(^{-1}\) alone, 20 and 40 g ha\(^{-1}\) alone, with nonionic surfactant or with crop oil concentrate. Thirty trials were assessed for crop injury following application and injury expressed using a 1-5 scale. Nine trials were harvested and grain yield expressed as a percentage of untreated control.

Fifteen trials were conducted by independent researchers, on 12 varieties of chickpeas. Flumetsulam was applied at the same rates and with the same adjuvants as the trials mentioned above. Eight trials were assessed for crop injury following application and injury expressed using a 1-5 scale. Nine trials were harvested and grain yield expressed as a percentage of untreated control.

The varieties of chickpeas included in the trials were Amethyst, Barwon, Bumper, Desavic, Dooen, Garnet, Kaniva, Macarena, Norwin, Opal, Semsen and Tyson. In 39 of the trials, applications were made between the two and eight branch growth stage of the crop. Application timing in the other seven trials ranged between the nine and 12 branch growth stage and one was made during the early stages of flowering.
**Lentils**  Flumetsulam was applied to seven different varieties of lentils at 14 sites between 1991 and 1998, at 20 g ha$^{-1}$ alone, with nonionic surfactant or crop oil concentrate and at 40 g ha$^{-1}$ alone or with crop oil concentrate. At all sites treatments were applied between the two and four node growth stage of the crop. Varieties covered in the trials included Aldinga, Callisto, Cobber, Digger, Laird, Matilda and Northfield.

Trials at 11 of the 14 sites were assessed for crop injury following the application of flumetsulam and seven sites were harvested and grain yield expressed as a percentage of the untreated control.

**Vetch var. Popany**  Flumetsulam was applied to popany vetch at the Hart Field Days site in six different seasons from 1991 to 1998. It was applied at 20 g ha$^{-1}$ alone, with nonionic surfactant or with crop oil concentrate, and at 40 g ha$^{-1}$ alone or with crop oil concentrate.

Plots were assessed for injury, using a 1-5 scale, following application. They were not harvested.

### RESULTS AND DISCUSSION

**Chickpeas**  In the 38 trials where crop injury was evaluated, generally there was some injury to the crop noted. This injury was in the form of crop shortening and discolouration and in most cases was deemed to be acceptable. The chickpeas recovered quite well, and there were no obvious differences between varieties. The severity of the crop injury increased with increasing rate of flumetsulam or addition of adjuvants, either nonionic surfactants or crop oil concentrates. Injury from later application timings tended to be more long lasting and in many cases delayed flowering of the crop.

### Table 1. Summary of chickpea grain yield by variety as a percentage of untreated plots.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Rate: 12 g ha$^{-1}$</th>
<th>20 g ha$^{-1}$</th>
<th>20 g ha$^{-1}$ + nis</th>
<th>20 g ha$^{-1}$ + coc</th>
<th>40 g ha$^{-1}$</th>
<th>40 g ha$^{-1}$ +nis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dooen</td>
<td>95.8 1</td>
<td>84.6 2</td>
<td>102.1 7</td>
<td>105.7 1</td>
<td>78.3 2</td>
<td>80.7 1</td>
</tr>
<tr>
<td>Desavic</td>
<td>96.5 2</td>
<td>96.7 3</td>
<td>103.1 1</td>
<td></td>
<td>93.1 3</td>
<td></td>
</tr>
<tr>
<td>Amethyst</td>
<td>103.2 1</td>
<td>98.5 7</td>
<td>100.2 9</td>
<td>80.2 3</td>
<td>100.3 7</td>
<td>92.7 2</td>
</tr>
<tr>
<td>Tyson</td>
<td>109.5 2</td>
<td></td>
<td></td>
<td>103.5 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barwon</td>
<td>85.1 1</td>
<td></td>
<td></td>
<td>85.1 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semsen</td>
<td>98 2</td>
<td>95.4 3</td>
<td>99.1 2</td>
<td>105.3 1</td>
<td>89.9 3</td>
<td></td>
</tr>
<tr>
<td>Norwin</td>
<td>107 1</td>
<td></td>
<td></td>
<td>97.2 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macarena</td>
<td>83.9 2</td>
<td></td>
<td>81.95 2</td>
<td>96 4</td>
<td>98.4 1</td>
<td></td>
</tr>
<tr>
<td>Kaniva</td>
<td>110.3 7</td>
<td>117.7 7</td>
<td>111.75 2</td>
<td>96 4</td>
<td>98.4 1</td>
<td></td>
</tr>
<tr>
<td>Garnet</td>
<td>104.3 1</td>
<td>106.2 2</td>
<td></td>
<td>86.3 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opal</td>
<td>100 1</td>
<td></td>
<td></td>
<td>113.5 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average across all varieties</td>
<td>104.6 14</td>
<td>101.3 29</td>
<td>102.3 23</td>
<td>90.3 5</td>
<td>94.6 26</td>
<td>90.1 5</td>
</tr>
</tbody>
</table>

nis - nonionic surfactant.
coc - crop oil concentrate.
bold - number of trials.
Across the 26 trials in which grain was harvested, flumetsulam applied at 12 and 20 g ha\(^{-1}\) alone and 20 g ha\(^{-1}\) with a nonionic surfactant resulted in yields of between 101 and 104.6\% of the untreated plots. Increasing the application rate of flumetsulam to 40 g ha\(^{-1}\) reduced the average yield to 95\% of untreated plots. The addition of a crop oil concentrate to 20 g ha\(^{-1}\) of flumetsulam and the addition of a nonionic surfactant to 40 g ha\(^{-1}\) reduced yield to 90\% of that in the untreated plots. There were no obvious differences between varieties (table 1).

**Lentils** At 10 of the 11 sites assessed, the selectivity of flumetsulam was not influenced by whether an adjuvant was used or not. At all sites except Hart 1996, there was only nil or slight damage observed. At Hart 1996, damage was moderate, bordering on marginal. All varieties displayed similar tolerance to flumetsulam.

At the 7 sites where grain yield was measured, the grain yield of all varieties in individual trials ranged from 82-125\% of the untreated plots. The average of across all varieties regardless of rate or the adjuvant used ranged from 97.5-103.3\% of the untreated plots (table 2).

Flumetsulam applied at up to 40 g ha\(^{-1}\) alone or with adjuvants was selective to the seven lentil varieties in the 14 trials conducted.

**Vetch, var. Popany** Flumetsulam applied at 20 and 40 g ha\(^{-1}\) alone, with nonionic surfactant or with crop oil concentrate resulted in little or no injury to popany vetch in any of the seasons in which the trials were conducted. Plots were not harvested.

Flumetsulam did not reduce the vigour of popany vetch whether applied alone or with adjuvants.

**ACKNOWLEDGMENTS**

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