Mobility of Flucarbazone in Two Prairie Soils

Nicole L. Tanner[1], Anna M. Szmigielska[2] and Jeff J. Schoenau[2]

[1] Undergraduate thesis student, College of Agriculture, Univesity of Saskatchcewan, Saskatoon, SK. nlt919@mail.usask.ca
[2]Dept. of Soil Science, University of Saskatchewan, Saskatoon, SK.

Introduction

The mobility of herbicides in the soil can have agronomic implications, such as movement of residual compound below the rooting zone. This movement can affect residual weed control as well as the appearance of injury in following rotational crops.

Objective

The objective of this study was to determine the potential for flucarbazone herbicide (Everest^{TM}) to move in the soil profile. The study was conducted using soil cores collected from two different landscape positions (upper and lower) in a farm field in south central Saskatchewan. A mustard root length inhibition bioassay was used to assess the movement.

Materials and Methods

Six soil cores were taken from each of the landscape positions. These cores were saturated with approximately 10 L of water over a 2 day period. Flucarbazone was applied at field rate (30 g.a.i ha-1) to 3 cores from each position using a small glass syringe. The herbicide solution was allowed to equilibrate with the soil for 24 hours before the application of a simulated rainfall event. A significant rainfall event of 6 cm was simulated for all of the cores. The water was allowed to infiltrate the soil for 4 days. Each soil core was separated by weight into 5 layers. Each layer was air - dried and made to pass through a 2 mm sieve. Oriental mustard seeds were grown in 4-50 g samples of soil from each layer at 20% moisture content (field capacity). These bioassays were incubated at 20ºC for 3 days before they were harvested to determine percent root length inhibition.

Results and Discussion

Analysis of the data showed that significant root length inhibition occurred following the application of flucarbazone. Root length inhibition was observed in each layer of the soil profile (Table 1, Figs 1 and 2), indicating movement of flucarbazone downward in the soil column with water. At the upper slope position, root length inhibition was greater than 50% for each of the 5 layers (Figure 2). The root length inhibition that occurred at depth in the lower slope position (Figure 1) was reduced compared to the upper slope.

The upper slope position soil had lower organic carbon levels and higher sand content than the lower slope position. Eliason et. al (2004) showed that phytotoxicity of flucarbazone in the soil increased when soil organic carbon was lower. Higher levels of soil organic carbon would increase the ability of the soil to adsorb flucarbazone, reducing the mobility and phytotoxicity

observed at depth. The ability of herbicide compounds to move with soil water via mass flow may explain the unexpected occurrence of injury symptoms in following rotational crops. If roots grow into a layer containing the herbicide, or if water carries the herbicide through the soil to the roots, injury symptoms may be observed.

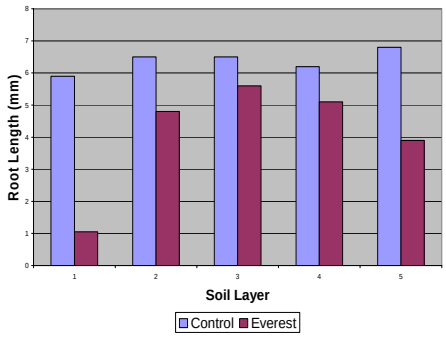

Figure 1: Root lengths of mustard in treated and untreated soil taken from the lower slope position

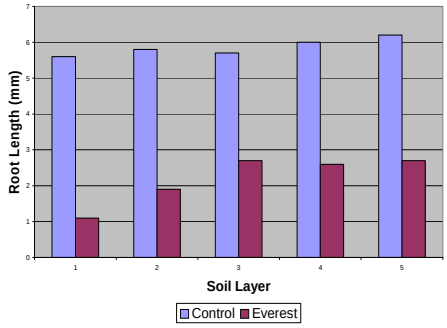

Figure 2: Root lengths of mustard in treated and untreated soil taken from the upper slope position

Table 1: Percent root length inhibition (%R.L.I.) of mustard in soils treated with flucarbazone from two slope positions. Each layer represents a 5cm depth increment.

Soil Layer	Lower Test Area			Upper Test Area		
	Control	Everest applied	% R.L.I.	Control	Everest Applied	% R.L.I.
1	5.9	1.05	82.2	5.6	1.1	80.4
2	6.5	4.8	26.2	5.8	1.9	67.2
3	6.5	5.6	13.8	5.7	2.7	52.6
4	6.2	5.1	17.7	6	2.6	56.7
5	6.8	3.9	42.6	6.2	2.7	56.5

Conclusion

This research suggests that flucarbazone mobility is affected by the amount of soil organic carbon that is present in the soil sample, as soil organic matter will bind flucarbazone. Low soil organic carbon and sandy texture results in greater mobility of flucarbazone.

References

Eliason R., Schoenau, J.J., Szmigielska, A.M., and W.M. Laverty. 2004. Phytotoxicity and persistence of flucarbazone-sodium in soil. Weed Sci. 52:857-864.