DAN WATKINS SCHOLARSHIP IN WEED SCIENCE

Dan Watkins was one of the founders of the Ivon Watkins Ltd herbicide company, based in New Plymouth, which later became Ivon Watkins Dow and is now Dow AgroSciences. He was a leading figure in the early weed science research arena within New Zealand. Dan Watkins was a founder of the New Zealand Weeds conference, forerunner of the New Zealand Plant Protection Society. He was also a member of the New Zealand National Research Council and was involved with other scientific bodies. This scholarship has been set up and financed by Dr George Mason, one of the founders of Taranaki Nuchem (now Zelam Limited), in memory of Dan Watkins and to recognise his contribution to weed science within New Zealand.

Hossein Ghanizadeh, recipient of the 2012/13 Dan Watkins Scholarship in Weed Science, is in the second year of his PhD programme in the Institute of Agriculture and Environment at Massey University. The title of his research project is “Aspects of herbicide resistance in three New Zealand weeds,” and the work is mainly funded by a Massey University Doctoral Scholarship, but also with some funding from the Ministry of Primary Industries through the Sustainable Farming Fund and the Foundation for Arable Research.

Herbicides have been used for over 60 years as the key method to control weeds. However, persistent applications of herbicides with the same mode of action have led to the appearance of weed biotypes that are resistant to herbicides. To date, 302 herbicide resistant biotypes have been confirmed for more than 500,000 locations around the world. In New Zealand, the number of herbicide resistant weeds has increased slowly compared to other countries like Australia and only 12 weed species have evolved resistance to herbicides so far. However, it is important to prevent herbicide resistance developing, and this is one of the primary aims of integrated weed control in New Zealand.

A useful first step in herbicide resistance studies is to develop quick and easy tests to determine if weeds are starting to develop resistance and what the level of resistance is. Early results from such quick methods would be valuable because most weed management decisions must be made early in the growing season before plants mature and develop seeds. In this study Hossein intends to adapt techniques used overseas as well as try developing new ones. The advantages of the new techniques are that they take less time and space than the current time-consuming techniques of spraying large numbers of whole plants.

The work will involve studying both dicamba resistance and glyphosate resistance. Fathe (Chenopodium album) growing in Waikato maize paddocks developed resistance to triazine herbicides several decades ago, and now some biotypes have also developed resistance to dicamba. Quick tests are being developed to determine easily which fathen plants are resistant to triazines and dicamba, which will help with management of this problem.

The latest cases of herbicide resistance that have developed within New Zealand have been found on several vineyards in Marlborough and Nelson. Hossein’s work has confirmed the presence of this resistance in both perennial ryegrass (Lolium perenne) and Italian ryegrass (Lolium multiflorum) using traditional pot spraying trials. A paper will be presented at the 2013 New Zealand Plant Protection Society conference outlining this work, the first cases of glyphosate resistance to be found within New Zealand. However, other experiments are also being conducted to develop quick tests for confirming glyphosate resistance within ryegrass plants found elsewhere. Traditional pot spraying experiments can take several months to complete, especially if mortality data are used, although this can be reduced slightly using growth reduction data. Techniques are being developed that will give results within several days of receiving fresh plant samples.

The mechanism by which these ryegrass plants are able to survive higher rates of glyphosate will also be investigated by using a number of techniques including measuring shikimate levels within treated plants and also conducting experiments using radiolabelled glyphosate. The inheritance of the resistance gene will also be studied.