

Grain grower perceptions of the economic value and longevity of glyphosate

Rick Llewellyn

School of Agricultural & Resource Economics, Western Australian Herbicide Resistance Initiative, Faculty of Natural and Agricultural Sciences, University of Western Australia, Crawley, WA, 6009.
<http://wahri.agric.uwa.edu.au> Email rllowell@agric.uwa.edu.au

Abstract

Modern Australian cropping systems have become highly dependent on the use of glyphosate. Recent developments in herbicide resistance have led to the sustainability of the current level of reliance on glyphosate being questioned. In this study, grower perceptions are examined with the objective of informing glyphosate management extension. Grain grower perceptions relating to the likelihood of glyphosate resistance development and the economic value of glyphosate to the farming system are examined, together with past and expected future use. Based on a survey of 132 Western Australian grain growers conducted in 2000 and 2001, the results show that growers generally increased the number of glyphosate applications over the past four years and do not expect to reduce the use of glyphosate in the future. The ability to use glyphosate was valued highly by growers. In terms of willingness to pay for farm land in a major cropping region, the value of land with ryegrass resistant to Group A and B herbicides was reduced by 41% if the ryegrass was also resistant to glyphosate. On average, growers expected continuous complete reliance on glyphosate to result in resistant ryegrass after 16 applications, although under the conditions of use on their own land, growers expected a much higher number of applications before resistance developed. A high proportion of growers reported use of the 'double-knockdown' practice, with increased adoption expected in the future.

Key Words

Herbicide tolerance, extension, adoption

Introduction

Glyphosate has become established as one of the most important agricultural herbicides in the world (1). In Australia, it is relied upon heavily as a knockdown herbicide and its use has facilitated the widespread adoption of soil conservation practices in modern cropping systems. More recently, the first cases of glyphosate resistance (2,3), the development of glyphosate-tolerant crops, and the widespread loss of post-emergence herbicide options due to resistance (4), have led to increasing concerns about the sustainability of current levels of glyphosate reliance. To better understand what role extension can play in improving glyphosate management decisions it is useful to consider the existing perceptions and management intentions of grain growers. As part of a larger study of the factors influencing herbicide resistance management decisions, information relating to glyphosate and its management was collected in a survey of Western Australian grain growers.

Methods

In March 2000 and 2001, visits were made to 132 randomly selected Western Australian farms and interviews were conducted with primary cropping decision-makers. Using a fully specified questionnaire, grower perceptions of weed management practices, herbicides and herbicide resistance were elicited (5), along with weed management practice use. Growers were from the Dalwallinu (64) and Katanning-Woodanilling shires (68). Properties managed by growers in the Dalwallinu shire (DAL) were larger on average than those in Katanning-Woodanilling (KAT) (3864 ha versus 1812 ha), had a greater proportion of land cropped (70% versus 55%), and received a lower average annual rainfall (approx. 325 mm versus 450 mm). The proportion of growers who reported that they had a herbicide-resistant weed population on an area of their farm was 70% and 47% respectively.

Results

No grower in the study reported a reduction in the average number of glyphosate applications per cropping paddock over the past 4 years. Only 6% of growers expected a reduction over the next four years. The average total number of reported glyphosate applications to typical cropping paddocks in their history was 11 in DAL and 7 in the less intensive cropping region of KAT. Nineteen percent of typical cropping paddocks in DAL had received greater than 15 applications compared to 4% in KAT, suggesting that many growers in major cropping regions are facing higher glyphosate resistance risk. On average, growers in both regions expected to be able to apply an additional 23 future glyphosate applications to their typical cropping paddocks before glyphosate became ineffective in the control of ryegrass.

In a hypothetical scenario where glyphosate was the only herbicide applied to a paddock with no herbicide history, the median response from growers was that they expected a resistant ryegrass problem to most likely develop after 12 consecutive annual applications (mean 15.9). This result is reasonably consistent with modelling of similar resistance selection scenarios (6). In another hypothetical scenario, growers were asked their willingness to pay (WTP) for neighbouring cropping land with varying levels of herbicide resistant ryegrass. In DAL, the average WTP for land with no herbicide resistance was \$662/ha; for land with ryegrass resistant to all Group A and Group B herbicides, \$500/ha; and for land with ryegrass resistant to all Group A and Group B herbicides and glyphosate, \$295, while in KAT the WTP was \$1163; \$872; and \$721 respectively. As such, land with ryegrass resistant to glyphosate and Group A and B herbicides was devalued 41% by growers in DAL compared to land with only Group A and B resistance. In KAT, where grazing enterprises are more profitable, the devaluation was 18%. Land with glyphosate resistant ryegrass was devalued by 95% of all growers.

Sixty-three percent of DAL growers and 53% of KAT growers reported using the double-knockdown practice in the past four years (in which pre-seeding glyphosate and paraquat/diquat applications may avoid selection for glyphosate resistance). Eighty-three percent of growers in DAL and 66% in KAT expect to use the practice in the next 4 years.

Conclusion

Glyphosate is perceived by growers to be of major economic value in the farming system. Although glyphosate resistance is not yet widespread, large numbers of previous applications and continued high reliance indicates that many growers are facing a significant risk of glyphosate resistance evolution in the future. Growers generally expect that glyphosate resistance will develop relatively rapidly under intense selection pressure. However, it is generally not expected that glyphosate resistance will evolve in the short to medium term on their cropping land. This may be partly explained by the current rarity of observable on-farm examples of glyphosate resistance and expectations that glyphosate can continue to be used in ways that do not lead to resistance.

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