Controlling flaxleaf fleabane (*Conyza bonariensis*): a notorious emerging summer weed in the Western Australian Wheatbelt

Dr Mohammad Amjad and Dr Abul Hashem, Department of Agriculture and Food Western Australia, Northam

Key messages

- Changes in farming systems, farm management practice and climate are resulting in changes in summer weed spectrum including fleabane in the western region.
- Several herbicides alone, as tank mix or in sequence were applied in two field trials at different growth stages of fleabane during summer of 2014/2015 at Grass Valley (Northam) and only at flowering stage at Geraldton.
- Application of a mixture of glyphosate and 2, 4-D followed by the application of Spray.Seed® was highly effective on fleabane whether applied in December 2014 or March 2015. This treatment was also highly effective on couch.
- Herbicides were more effective on fleabane when applied at seedling or flowering stage than rosette stage.

Aims

Fleabane, also commonly known as flaxleaf fleabane (*Conyza bonariensis*) is an emerging summer weed in Western Australia. Fleabane has small seeds that emerge from the soil surface. Therefore, its occurrence is more common in no-tillage systems. There is a wide range of herbicides to control fleabane. However, 58 populations of fleabane have been confirmed resistant to glyphosate predominantly in no-till farming systems in Southern Queensland, Northern New South Wales and South Australia (Preston 2015). Summer weeds may increase production cost by $50/ha (Stuchbery 2008). This weed can produce up to 110,000 seeds per plant and seed can be blown over 1 km by wind. However, if this weed is killed before seed production, emergence of this weed is drastically reduced during the subsequent spring.

Summer emerging weeds such as fleabane remove moisture and nitrogen from the soil profile, reducing the yield potential of the following crop (Osten et al 2006). Further, they can delay the seeding operation. The main issue with controlling summer weeds is the time of spray application. If the plants germinate in summer and are not sprayed immediately, weed plants may become stressed due to dry summer conditions, making them more difficult to control with herbicides. Alternatively, if the plants germinate in spring and are not targeted by selective herbicide in crop, then they will be mature by harvest time and are more difficult to control over the summer fallow. Peltzer (2010) reported that mature fleabane is difficult to kill especially in mid to late summer in the western region.

The aim of the study was to examine the efficacy of herbicides to control fleabane during summer in Western Australia.

Method

After the 2014 harvest, two experimental sites with fleabane infestation were selected across a wheat paddock on sandy loam soils at Grass Valley and Geraldton, Western Australia. Eight herbicide treatments were applied in a completely randomised block design with three replications at Grass Valley and four at Geraldton (Table 1). The plot size was 5 m x 4 m at Grass Valley and 40 m x 2 m at Geraldton. The first knockdown herbicide treatments were applied on 16 December 2014 (between 8:00 – 9:00 am, temperature 25^{o}C, humidity 32% and SE wind speed 12 km/hr) at Grass Valley and on 10 March 2015 at Geraldton. The follow up second treatments of double knockdowns were applied on 19 December 2014 (between 8 to 9 am, temperature 26^{o}C, humidity 30% and SE wind speed 10 km/ha) at Grass Valley and 17 March 2015 at Geraldton.

Grass Valley

Initial fleabane plant density was counted from two fixed quadrats before spraying and the final density of the surviving fleabane plants was counted from the fixed quadrats three weeks after spraying. Density of actively growing fleabane plants was assessed separately for each growth stage such as seedling (< 10 cm plant height), rosette stage and flowering stage on 16 December 2014 (before spraying) and on 7 January 2015 (3 weeks after spraying). In the post-treatment assessment, all plants, unaffected or affected but regrowing actively, at different stages were counted as surviving.

Plants per quadrat were converted to plants per square meter. Density of surviving fleabane plants recorded on the 7th of January was expressed as the percentage of the plants present on the 16 December 2014. Weed control was also assessed visually independently by two assessors for each plot as a percent of the untreated control at three weeks after spraying.

Geraldton

The fleabane plants were mostly at flowering stage when sprayed in March 2015. Another prominent summer weed present on this site was couch grass (*Cynodon dactylon*). The control level of both fleabane and couch grass were visually assessed 3 weeks after spraying.

Data analysis

Data were subjected to ANOVA and means were separated by LSD at 5% level of significance. Correlation analysis was performed between the control percentages obtained based on the plant numbers at different growth stages and the visual assessment performed at 3 weeks after spraying for Grass Valley only.

Results

Grass Valley

At Grass valley, all treatments were found effective in controlling fleabane although the efficacy of herbicides to control fleabane during summer varied with plant growth stages (Table 1). In some treatment, surviving fleabane plants were affected to variable degrees by herbicides but plants regrew and developed when assessed 3 weeks after the second spraying.

Table 1. Effect of different herbicides applied alone, as tank mixes or as double knockdowns on fleabane at various stages at Grass Valley, Northam, Western Australia. (Active ingredient: Glyphosate (570 g/L), Spray.Seed® (paraquat 135 g/L + diquat 115 g/L) (SS), glufosinate (200 g/L), 2, 4-D Ester (E) (680 g/L), saflufenacil (700 g/kg); '+' indicates tank mix and '/' indicates herbicides applied in sequence).

Treatments	Fleabane control (%)				Green plants/m^2	
	Seedlings	Rosette	Flowering	Over all control% (Visual assessment)	Before spraying	3 weeks after spraying
Control (no herbicide)	0	0	0	0	20	21
2,4-D E/SS	92	53	91	81	35	7
Glyphosate + 2,4-D E/SS	100	98	94	96	89	5
Glufosinate+2,4-D E /SS	96	94	79	87	188	36
Glyphosate + glufosinate	98	43	87	76	33	7
Glyphosate + saflufenacil	77	44	81	71	29	8
Glufosinate + saflufenacil	98	37	6	84	37	7
Glyphosate + saflufenacil/SS	100	78	93	89	42	4
P-value	<.001	<.001	<.001	<.001	0.001	0.011
LSD (5%)	19.5	19.0	8.5	6.4	34.9	8.8
SE	9.6	38.5	17.2	12.9	69.8	20.0

All applied herbicides were effective on fleabane when applied to seedlings and at flowering. Most herbicide mixtures or double knockdowns were weak on fleabane (37% to 78% control) when applied at the rosette stage (Table 1).

However, double knockdowns with a mixture of 2,4-D ester + glyphosate followed by Spray.Seed® provided 98% control while double knockdowns with a mixture of 2,4-D ester+ glufosinate followed by Spray.Seed® provided 94% control of fleabane when applied at rosette stage. Most herbicide treatments provided 80% to 94% control of fleabane when applied at flowering stage. Similar results were reported by Peltzer (2010) for controlling mature fleabane during summer of 2009 in Western Australia. The most effective treatment identified was a double knock application of glyphosate or glyphosate + 2, 4-D amine followed by paraquat 7 days later kills 100% of mature fleabane. Glyphosate or glyphosate + 2,4-D amine applied as a single dose also provides good but incomplete control (Peltzer, 2010).

The overall visual assessment on fleabane control at Grass Valley strongly correlated with control levels assessed by counts, particularly at seedling and flowering stages (R^2 = 0.97 for fleabane control at seedling stage, 0.66 for fleabane control at rosette stage, and 0.95 for fleabane control at flowering stage) (Figure 1).

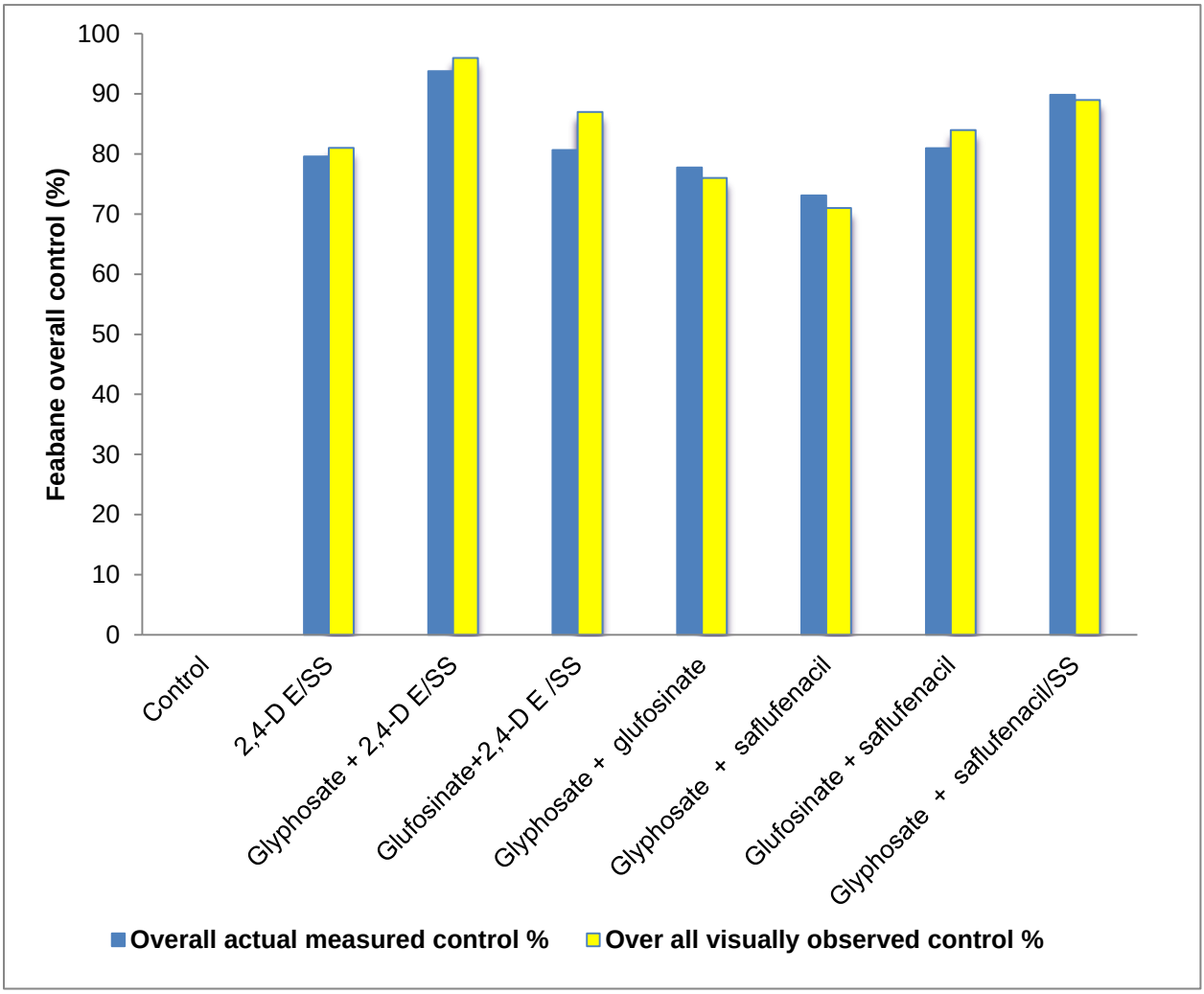

Figure1. Average fleabane control percentage achieved by actual counts at different growth stages compared to visual assessment of weed control recorded three weeks after spraying of herbicides at Grass Valley, Western Australia from December 2014 to January 2015. Glyphosate (570 g/L), Spray.Seed® (paraquat 135 g/L + diquat 115 g/L) (SS), glufosinate (200 g/L), 2,4-D Ester (E) (680 g/L), saflufenacil (700 g/kg); '+' indicates tank mix and '/' indicates herbicides applied in sequence. P-value = <0.001, LSD (5%) = 6.4.

Geraldton

At Geraldton, all treatments worked very well and almost 100% control was observed in fleabane. However the couch grass control varied from 79% to 100% (Table 2). Double knockdown of glyphosate tank mix with 2,4-D or saflufenacil followed by Spray.Seed® was highly effective on couch.

Table 2. Effect of different herbicides applied alone, as tank mixes and or as double knockdowns on fleabane and couch grass at Geraldton, Western Australia. Glyphosate (570 g/L), Spray.Seed® (paraquat 135 g/L + diquat 115 g/L) (SS), glufosinate (200 g/L), 2,4-D Ester (E) (680 g/L), saflufenacil (700 g/kg); '+' indicates tank mix and '/' indicates herbicides applied in sequence.

Treatment	Fleabane (%)	Couch (%)
Control (no herbicide)	0	0
2,4-D ester/Spray.Seed®	99	92
Glyphosate + 2,4-D ester / Spray.Seed®	100	100
Glufosinate+2,4-D E /Spray.Seed®	100	95
Glyphosate + Glufosinate	100	91
Glyphosate + saflufenacil	100	96
Glufosinate + saflufenacil	100	79
Glyphosate + saflufenacil/ Spray.Seed®	100	100
P-value	<.001	<.001
LSD (5 %)	0.7	4.7

Conclusion

This study suggests that double knockdown treatments were generally more effective to control fleabane at different growth stages (seedling, rosette, and flowering) during summer in the central and northern regions of Western Australia. These results are based on one trial in two different environments during summer of 2014/2015. Therefore, caution is needed in interpreting the results for wider applications. For the control of couch, a double knockdown of glyphosate-based tank mix followed by Spray.Seed® was the most effective treatment.

Key words

Flaxleaf fleabane, couch grass, double knockdowns, tank mixes, summer weed control.

Acknowledgments

Research was supported by DAFWA and GRDC under emerging summer weeds project in collaboration with University of Adelaide. Thanks to Barb Sage, Paul Bartlett, Dave Nicholson and Northam Research Support Unit for their technical support. Special thanks to Craig Scanlan and Andrew Royce for hosting the trial site at their property at Grass Valley and Geraldton. We acknowledge Alex Douglas for reviewing the paper.

GRDC Project Number: UA 00149

References

1. Preston, C (2015). http://www.glyphosateresistance.org.au/register_summary.html
2. Osten, V., A. **Hashem**, E. Koetz, D. Lemerle and G. Wright. (2006). Impacts of summer fallow weeds on soil nitrogen and wheat in the southern, western and northern Australian grain regions. In C. Preston (ed) proceedings of the 15th Australian Weeds Conference. pp 395-398. Weed management Society of South Australia, SA, Australia).
3. Peltzer, S (2010). Controlling mature fleabane. Crop Update, Perth.
4. Stuchbery, J (2008) GRDC final report on summer weed control. John Struchbery and Associates. Pp 40.