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Project Code	
Project Type	

FINAL REPORT 2023

PROJECT CODE	TC 121
PROJECT TITLE	
Improving crop safety and broadleaf weed control with herbicides in lentil	

PROJECT DURATION						
Project start date	**1/04/2021**					
Project end date	**30/06/2023**					
SAGIT Funding	2021/22		2022/23		2023/24	

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PROJECT REPORT:

Executive Summary

This project has demonstrated the variability of group 5 and 14 herbicide behaviour on soil types that differed in texture and soil pH that are representative of SA soils where lentils are grown. Some key findings include:

- Lentil crop safety varied greatly between alkaline sand, acidic sand and medium textured sites for products such as Reflex®, diuron, metribuzin and terbuthylazine herbicides. The alkaline sand sites incurred more herbicide damage compared to the other two soil types.
- Using Reflex® (1000mL/ha) averaged 21% grain yield loss on alkaline sands across two seasons, whilst no yield loss occurred on the acidic sands. The variability of grain yield loss from Voraxor® was lower on alkaline sands (0-26%) compared to acidic sands (0-49%). Using Terrain® averaged only 5% and 3% yield loss when compared to the control at the alkaline sand sites and acidic sand sites, despite losing 40% and 25% of plants on average, respectively.
- Effective control of bifora, common sowthistle, Indian hedge mustard, and marshmallow populations were achieved with Reflex® and Terrain® applied in combination with registered Group 2, 5 and 12 herbicides.
- Rotating imidazolinone herbicides with the newly registered use pattern of the Group 14 mode of action will reduce resistance selection pressure on this vulnerable Group 2 herbicide and sustain its efficacy on important weeds further into the future.

Project objectives

The aim of this project is to improve broadleaf weed control in lentil, while minimising negative crop effects, with a particular focus on sandy soils. This will build on findings from projects TC116 and TC119 and will include understanding the role for new residual Group 14 herbicide registrants and their interaction with existing herbicide strategies.

The two primary areas for investigation are:

1. Best practice herbicide strategies on loam and sandy soils; including assessment of crop safety and herbicide efficacy of Group 2, 5, 12 and 14 herbicides and their interactions.
2. Management of key broadleaf weeds including bifora (*Bifora testiculata*), Indian hedge mustard (*Sisymbrium orientale*) and common sow thistle (*Sonchus oleraceus*), on loam and sandy textured soils.

Overall Performance

Overall, all KPIs were achieved on time and to a high standard. Project/trial planning and trial field work was executed by Sam Trengove, Stuart Sherriff and Jordan Bruce from Trengove Consulting and Navneet Aggarwal from SARDI Clare. The experiments were set up at the properties of Green Ag Partners Pty Ltd at Bute, Pontifex Farming at Paskeville, SM &TM Hewett Farming at Wards Hill and Trengove Farming Trust at Alford and Bute. There were no complicated factors encountered throughout this project.

In terms of extension of the research findings from this project, the amount of extension events and total grower/advisor reach was well above the anticipated amount at the beginning of the project. Jordan Bruce and Navneet Aggarwal were invited to present alone or in combination at a total of 10 events over the two years including the GRDC updates at Adelaide and Bute in 2022 and 2023, indicating the quality of the results and the importance of the topic to industry.

KEY PERFORMANCE INDICATORS (KPI)

KPI	Achieved	If not achieved, please state reason.
Identify sites that meet selection criteria for four herbicide trials. (2021) Implement trial treatments and sow trials.	Yes ☒ No ☒	

Implement in season herbicide treatments (2021).	Yes ☒ No ☐	
In season assessment of trials (2021). • Plot emergence score • Herbicide damage scores • Weed control counts • Greenseeker NDVI • Weed seed production assessment	Yes ☒ No ☐	
Trials harvested. Data collated, analysed and reported in SAGIT progress report (2021).	Yes ☒ No ☐	
Identify sites that meet selection criteria for four herbicide trials. (2022) Implement trial treatments and sow trials.	Yes ☒ No ☐	
Implement in season herbicide treatments (2022).	Yes ☒ No ☐	
In season assessment of trials (2022). • Plot emergence score • Herbicide damage scores • Weed control counts • Greenseeker NDVI Weed seed production assessment	Yes ☒ No ☐	
Trials harvested. Data collated, analysed and reported in SAGIT progress report (2022).	Yes ☒ No ☐	
Final report submitted to SAGIT (2022).	Yes ☒ No ☐	

TECHNICAL INFORMATION

Introduction - The release of imidazolinone (IMI) herbicide tolerant lentils coupled with the availability of this technology in most other broadacre crop species has led to the over-reliance of Group 2 herbicides. Developing IMI herbicide resistance in broadleaf weeds is a major constraint to achieving yield potential in pulse crops. New mode of action herbicides for broadleaf weed control have recently become available in lentil including Reflex® and Terrain® (both belong to Group 14). Reflex® (fomesafen 240g/L) was registered in 2021 for pre-emergent use in pulses and vetch and provides more opportunities for rotating modes of action. Lentil is the most sensitive pulse species to Reflex®. Terrain® (flumioxazin 500g/kg) is newly registered pre-emergent herbicide for lentil in 2022. Voraxor® (saflufenacil 250 g/L + trifludimoxazin 125 g/L), another Group 14 herbicide, is currently registered for pre-emergent use in cereals, chickpeas, faba beans and field peas but is not registered for use in lentil. With a newly registered mode of action becoming available it is important to test crop safety and weed control to see how these products fit into farming systems and how the herbicides behave across different soil types.

Method - A total of eight trials were conducted over the 2021 and 2022 seasons consisting of two acidic sand sites, two neutral-alkaline medium textured sites and four alkaline sand sites (Table 1). Herbicides were applied using a 2m hand boom and the small plots were sown using a knifepoint press wheel system.

Table 1. The range of pH (H_2O), organic carbon (OC) % and soil texture at 0–10cm for the trial sites in 2021 and 2022.

Soil type	pH (H_2O)	OC %	Soil Texture	# of sites
Alkaline sand sites	8.1–8.4	0.84–0.96	Sand–loamy sand	4
Acidic sand sites	5.8–6.8	0.76–0.87	Sand–loamy sand	2
Medium textured sites	7.4–8.1	1.33–1.96	Loam–light clay	2

In season assessments included GreenSeeker NDVI, weed density, weed seed set and detailed herbicide damage scoring collected at multiple timings to assess the different herbicide symptoms including chlorosis, necrosis and stunting. All plots were harvested to record grain yields.

Rainfall conditions

The summary of rainfall received at the trial sites in two years is summarized below:

Site/year	Crop season rainfall (mm)	Rainfall within two weeks after sowing (mm)	Late winter to spring rainfall (mm) (August to October)
Bute (alkaline sands and neutral loamy soil) in 2021	278 (End May to October)	52	45
Wards Hill (alkaline loamy sand) in 2022	219 (June to November)	39	119
Paskeville (neutral clay soil) in 2022	295 (June to November)	53	145

Results (crop safety) - In general, the most damaging soil type for herbicide damage from any herbicide was at the alkaline sand sites. The neutral-alkaline medium textured sites generally incurred less herbicide damage than the alkaline sand sites but more than the acidic sand sites.

Plant establishment – Using Reflex® did not result in any plant establishment reduction on any soil type when applied alone at the 500mL/ha and 1000mL/ha rates. Using Terrain® reduced plant establishment at all sites regardless of soil type, except for one alkaline sand site in 2021. Terrain®

caused greater reduction in plant establishment at the alkaline sand and medium textured sites compared to the acidic sand sites. However, plant establishment was still reduced by 25% on average at the acidic sand sites. The Terrain® label states not to use on lighter soil types (sand) due to high levels of crop damage, however, the reduction in plant establishment on the medium textured sites was greater than 50% on average, which was a greater reduction than the sandy sites. Voraxor® did not reduce plant establishment at the acidic sand sites. Plant establishment was reduced at three of four alkaline sand sites ranging from 43-47% reduction. Reduction in plant establishment was consistent at the two medium textured sites ranging from 37-47% reduction. This crop damage might be associated to the washing of pre-emergent herbicide into the crop row due to the large amounts of rainfall received within two weeks of sowing in both years.

Herbicide damage (stunting and biomass) - The main herbicide damage symptom present across all soil types was stunting of the lentil plants. Stunting was caused mainly by the group 14 herbicides but also by some group 5 herbicides at the alkaline sand and medium textured sites. The appearance of the stunting symptoms differed for the three group 14 herbicides with Reflex® having the most pronounced symptoms. The symptoms were often exacerbated when applying group 5 and 14 herbicides together in mixtures. Stunting caused by Reflex® was rate responsive and was generally worse on alkaline sands compared to acidic sands and medium textured soils. The stunting symptom was barely present within the first six weeks post-emergence but gradually worsened into late winter and early spring, which may be due to the persistence of Reflex® in the soil. Recovery from this symptom was highly dependent on the amount of spring rainfall received, which influenced plant stress levels and the length of time for recovery. In the 2021 season, the late winter and spring rainfall was well below average resulting in lack of recovery from earlier herbicide damage. Conversely, the 2022 spring rainfall was average to above average, which allowed for good moisture availability, longer recovery time and resulted in greater recovery from herbicide damage. Stunting symptoms caused by Terrain® and Voraxor® were less dependent on soil type with similar low-moderate levels observed on all three soils. Herbicide damage scores for Terrain® in both years in July were generally consistent. In 2022, two herbicide damage scores were recorded, late July and mid-August. Stunting from Terrain® improved over all soil types as the season progressed in 2022, in contrast to Reflex® and Voraxor® where stunting symptoms remained unchanged or increased on the sands into September. The NDVI (i.e., biomass) of the lentil plots was mainly driven by either the presence or absence of stunting symptoms and was correlated with grain yield at the alkaline and acidic sand sites for both seasons. Previous lentil trials suggest that Spring biomass often correlates moderately-strongly with grain yield on sandy soils and this relationship held true for these trials, especially on the alkaline sands (Figure 1).

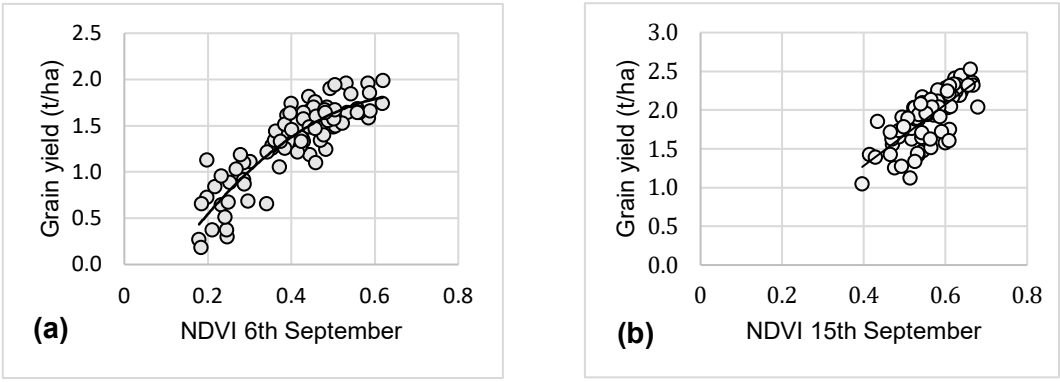

Figure 1. The relationship for Greenseeker NDVI and grain yield recorded (a) 6 September for the alkaline sand trial at Alford in 2021 ($y = -5.2444x^2 + 7.3026x - 0.706$, $R^2 = 0.77$), and (b) 15 September for the alkaline sand trial at Wards Hill in 2022 ($y = 3.955x - 0.2994$, $R^2 = 0.56$).

Grain yield - Comparable grain yield data was only collected at the alkaline and acidic sand sites as weeds were removed during the growing season, whereas the medium textured sites were not weeded, and yields were impacted by both crop herbicide effects and weed competition. Over the two seasons, the grain yield differences caused by the preceding herbicide damage was generally consistent across the sandy sites. Herbicides including diuron and Reflex® applied alone were more damaging at the alkaline sand sites, which aligns with recorded spring NDVI values. Reflex® yield loss is rate responsive with the 500mL/ha rate averaging 6% yield loss compared to the control treatment, whilst the 1000mL/ha rate averaged 21% yield loss across alkaline sand sites and years.

When Reflex® was applied with diuron, the herbicide damage and resulting yield loss compared to the control was larger. The use of Reflex® at 1000mL/ha did not result in any yield loss at the acidic sand sites over the two seasons. Using Terrain® averaged only 5% and 3% yield loss when compared to the control at the alkaline sand sites and acidic sand sites, despite losing 40% and 25% of plants on average, respectively. Over the two seasons and soil types in this project, Terrain® herbicide behaviour appears to be influenced less by the soil pH of sands than some other herbicides. Voraxor® yields were variable across soil types and seasons. Yield loss from Voraxor® at three alkaline sand sites ranged from 11-26%, with no yield loss at the fourth site. The yields were particularly variable for the acidic sand sites with 49% yield loss in 2021 and no yield loss in 2022.

Broadleaf weed control – The efficacy of herbicides on broadleaf weeds varied with their rates, background weed dynamics and weather conditions in different regions. Imidazolinone (IMI) herbicide Intercept® did not provide adequate control of Indian hedge mustard (IHM) and was not different to the unsprayed control at all the experimental sites at Bute and Alford in 2021, and the two experiments at alkaline loamy sand site (Wards Hill) in 2022. This poor control of IHM may be explained by an increase in IHM populations developing resistance to IMI herbicides in this area (Chris Davey, personal communication). These findings are also in line with the latest herbicide resistance screening studies where a total of 13% IHM samples collected in South Australia were found resistant to Intervix® (Peter Boutsalis, personal communication). Further, IHM was effectively controlled with Intercept® only at one site in Paskeville during 2022 out of seven sites where it was present in this two-year study. This highlights that strategic use of IMI herbicides in combination with alternative modes of action is needed to delay the increase of IMI resistant broadleaf weeds or to manage already resistant populations. Alternative mode of action is now available in Group 14 with products Reflex® and Terrain®.

Reflex® applied at 1000mL/ha as incorporated by sowing (IBS) effectively controlled IHM populations in lentil. The level of IHM control improved to 74% with increasing Reflex® rates from 500mL/ha (217 IHM pods/m^2) to 97% with 1000mL/ha (24 IHM pods/m^2) as compared to unsprayed control plots (836 IHM pods/m^2) at medium textured soil experimental site at Bute in 2021. However, the lower Reflex® rates were as effective as the highest label rates at the alkaline sandy soil site in 2021 where background weed number were lower than site with medium textured soil. Terrain® at 120g/ha IBS was equally effective at controlling IMI resistant IHM populations to Reflex® applied at 1000mL/ha IBS at four out of seven sites. However, Reflex® 1000 mL/ha proved more effective than Terrain® at the other three sites. This variation in Terrain®'s efficacy is in line with its label that claims Terrain provides suppression at the registered rate of 120 g/ha in lentil. Most of the surviving IHM plants in Reflex® and Terrain® treated plots were in the intra-row spaces, where the applied herbicide was likely moved out into inter-row area with soil by the seeding operation. Where Reflex® or Terrain® was applied IBS and followed by a Group 5 herbicide, metribuzin, diuron or Terbyne® as a post-sowing pre-emergence (PSPE) application, the surviving weeds in the intra-row area were mostly controlled. Voraxor® proved as effective as Reflex® 1000 mL/ha at 6 out of 7 sites where it was present, except alkaline sandy soil at Bute where Reflex® provided better control of IHM than Voraxor®.

Reflex® was highly effective in controlling bifora in both the seasons. The efficacy of Reflex® on bifora was similar for rates between 500 and 1000mL/ha in 2021 and reduced its seed set to 21-35 seeds/m^2 compared to 1987 seeds/m^2 in unsprayed control plots. There was higher background bifora population at 2022 Paskeville experimental site compared to Bute site from 2021. This coupled with ~ 150 mm rainfall for 2022 late-winter and spring season (August to October) contrast to ~45 mm rainfall in the same time interval in 2021 resulted in bifora setting 338% higher seeds (6724/m^2) in unsprayed control plots in the second year. Reflex® was more effective at higher rates of 750 and 1000mL/ha with <1 bifora seed/m^2 compared to 500mL/ha with 475 bifora seeds/m^2 under these conditions. Further, application of Intercept®, either on its own or in combination with Reflex®, provided excellent control of bifora, reducing its seed set to 0-4/m^2 compared to existing pre-emergent herbicide options metribuzin (323 and 6416 bifora seeds/m^2 in 2021 and 2022, respectively) and Terbyne® (1672 and 8110 bifora seeds/m^2 in 2021 and 2022, respectively). Terrain® did not prove effective for controlling bifora that set 2575 and 11664 seeds/m^2 in 2021 and 2022, respectively. A subsequent post-emergent application of Intercept® was needed after Terrain® IBS to achieve improved bifora control. Similarly, Voraxor® on its own did not provide effective control of bifora in both years. Reflex® also proved more effective for capeweed (93% control) compared to Terrain® (69% control) and Intercept® (48% control).

The Paskeville site in 2022 had a background population of marshmallow. The level of marshmallow control improved with increasing Reflex® rates from 500mL/ha (807 pods/m^2) to 750mL/ha (196 pods/m^2) to 1000mL/ha (231 pods/m^2). Terrain® (286 marshmallow pods/m^2) and Voraxor® (178 marshmallow pods/m^2) proved as effective as Reflex® applied at higher rates and were better than

Reflex® 500mL/ha. Group 14 herbicides provided higher level of marshmallow control compared to Group 5 herbicides metribuzin (1176 pods/m^2) and Terbyne (660 pods/m^2). A follow up application of Intercept® was needed after Reflex®/Terrain®/Voraxor® IBS to achieve effective control of marshmallow (<1 pod/m^2). Intercept® also achieved effective control of marshmallow without an upfront herbicide. But the inclusion of an IBS herbicides will reduce selection pressure for Intercept® to delay future herbicide resistance build-up in marshmallow. Intercept® application was also the stand-out herbicide for achieving medic control up to 100% in lentil, with the next best non-IMI herbicide treatment Diuron 830 g/ha (IBS) + Diflufenican 150 ml (POST) reducing the medic population by 90%.

The combination of Reflex® + Intercept®, Terrain® + Intercept® and Voraxor® + Intercept® provided high levels of common sow thistle control at all the experimental sites where it was present in both the years. Importantly, the paddocks where common sowthistle is IMI-resistant, will still have this weed surviving in the intra-row spaces even after applying Group 14 IBS herbicide followed by post-emergent Intercept®. Where Reflex®/Terrain®/Voraxor® was applied IBS and were followed by a Group 5 herbicide metribuzin, diuron or Terbyne® as PSPE application, the surviving common sowthistle in the intra-row areas were mostly controlled. Therefore, to achieve the desired level of broadleaf weed control in lentil, it is important to know the likely weed types, population, and resistance status prior to deciding on herbicide treatment.

The registration of the new Group 14 herbicides Reflex® and Terrain® has increased the options for achieving improved broadleaf weed control in lentil, including weeds potentially resistant to IMI herbicides. However, consideration should be given to the associated risks of crop damage and yield loss with new herbicides when applied alone or with Group 5 herbicides, depending on the herbicide rates especially on high-risk alkaline sandy textured soils. Careful decisions regarding safe dosage rates of Reflex® and Terrain®, as governed by the soil type and rainfall conditions, their efficacy at a particular rate, and a follow-up application of Group 5 and Group 12 herbicides provide broad-spectrum broadleaf weed control in lentil. Group 2 IMI herbicides will continue to be a valuable tool for broadleaf weed control in lentil, especially for weeds that have not evolved resistance to this mode of action, and the weeds such as medics that are not effectively controlled with other herbicides. Using Reflex® and Terrain® in conjunction with IMI herbicides, metribuzin, Terbyne® or diuron, will diversify the selection pressure for broadleaf weed control in lentil and delay the resistance build up to a specific mode of action.

CONCLUSIONS REACHED &/OR DISCOVERIES MADE.

Crop safety

- Overall, pre-emergent herbicides applied in the 2022 trials resulted in lower yield losses compared to the 2021 trials. Recovery from herbicide damage symptoms from Reflex® was highly dependent on seasonal weather conditions, with better recovery in 2022 due to higher spring rainfall and milder conditions than 2021.
- Lentil crop safety varied greatly between alkaline sand, acidic sand and medium textured sites for products such as Reflex®, diuron, metribuzin and terbuthylazine herbicides. The alkaline sand sites incurred the most herbicide damage compared to the other two soil types.
- Plant establishment is not affected by all Group 14 herbicides. Reflex® did not reduce plant establishment on any soil type, whereas Voraxor® had reductions on alkaline sands and loams and Terrain® reduced plant establishment on all three soil types at 7/8 sites.
- The appearance of the stunting symptoms differed for the three Group 14 herbicides with Reflex® having the most pronounced symptoms.
- Reflex® and Voraxor® herbicide damage symptoms worsened slowly through winter, whilst Terrain® symptoms were more severe earlier but improved towards the end of winter.
- Using Reflex® (1000mL/ha) averaged 21% grain yield loss on alkaline sands whilst no yield loss occurred on the acidic sands. The variability of grain yield loss from Voraxor® was lower on alkaline sands (0-26%) compared to acidic sands (0-49%). Using Terrain® averaged only 5% and 3% yield loss when compared to the control at the alkaline sand sites and acidic sand sites, despite losing 40% and 25% of plants on average, respectively.

Broadleaf weed control

- The level of broadleaf weed control achieved in lentil varied with Group 14 herbicide type, herbicide rates and type of the weed species targeted.

- Reflex® was equally effective in controlling bifora at rates between 750 and 1000mL/ha and reduced its seed set by >99% compared to unsprayed control plots in both the years. Reflex® applied at 500mL/ha IBS proved equally effective to 750 and 1000mL/ha at low background weed pressure. Terrain® and Voraxor® did not provide effective bifora control in both years.
- The level of Indian hedge mustard (IHM) control improved with increasing Reflex® rates from 500mL/ha to 1000mL/ha. Terrain® at 120g/ha IBS was equally effective at controlling IMI resistant IHM populations to Reflex® applied at 1000mL/ha IBS at four out of seven sites, whereas Voraxor® at 200 mL/ha IBS proved as effective as Reflex® 1000 mL/ha at 6 out of 7 sites in a two-year study. At the remaining sites, Reflex® applied at 1000mL/ha IBS proved superior to both Terrain® and Voraxor®.
- The level of marshmallow control improved with increasing Reflex® rates from 500mL/ha to 750mL/ha, though, the efficacy did not increase further at higher 1000mL/ha rate. Terrain® and Voraxor® provided similar level of marshmallow control as achieved with Reflex® at 750-1000 mL/ha IBS and was more effective than Reflex® at 500 mL/ha IBS. These three Group 14 herbicides reduced marshmallow seed set by 84-90% when used at the highest rates as compared to unsprayed control plots (1772 marshmallow pods/m^2). A follow up application of Intercept® was needed though after Reflex®/Terrain®/ Voraxor® IBS to achieve effective control of marshmallow (<1 pod/m^2).
- Reflex® proved more effective for controlling capeweed (93% control) compared to Terrain® (69% control), Voraxor® (81% control) and Intercept® (48% control).
- Intercept® proved most effective against medics that are not controlled as effectively with other herbicide options in lentil.
- Two- and three-way combinations of Group 14 herbicides with Group 2 (Intercept®) and Group 5 (metribuzin and Terbyne®) provided effective control of wide spectrum broadleaf weeds including bifora, Indian hedge mustard, common sowthistle, marshmallow and medics.
- Two- and three-way combinations of Reflex® with Group 2 (Intercept®) and Group 5 (metribuzin and Terbyne®) produced bifora-seeds free lentil grain samples, thereby reduced the risk of price dockages at delivery due to weed-seed contamination.
- Herbicide strategies on high-risk alkaline sandy soil types needs to be careful planning to balance avoiding crop damage and achieving adequate weed control.

INTELLECTUAL PROPERTY

No intellectual property was generated from this project. All herbicides used are commercially available for broadacre use. However, the use of Terrain® (since registered for lentil) and Voraxor® (not registered for lentil) was not on label. There is potential the data generated from this project may have or has the potential to influence BASF's decision of whether or not to pursue pre-emergent registration in lentil.

APPLICATION / COMMUNICATION OF RESULTS

Results were communicated to the industry by the following means:

Presentations by Sam Trengove, Jordan Bruce, Stuart Sherrif and Navneet Aggarwal include:

- Site visits by growers, consultants, agronomists, and representatives of chemical companies on field days organized by NSS in September 2021, and July and October 2022.
- Results presented to the industry through GRDC Grains Research Update Online Southern Region on 09/02/2022.
- Zoom presentation of project and current findings to Crop Science Society meeting on 13/4/2022.
- Findings presented to the industry through GRDC Grains Research Update – Ardrossan on 18/8/2022.
- Findings presented to the industry through GRDC Grains Research Update – Adelaide on 7/2/2023.
- Findings presented to the industry through GRDC Grains Research Update – Bute on 9/2/2023.
- Findings presented to the industry at the Nelshaby Ag Bureau/Upper North Farming Systems trial results session on 6/3/2023.

- Findings presented to lentil grower groups at Minnipa, Mudamuckla, Lock and Kimba on 12/04/2023 and 13/04/2023.
- Findings presented to the industry at the Hart Winter Walk on 18/7/2023.

Publications

- Extension publication: Bruce J, Aggarwal N, Trengove S, Sherriff S and Roberts P (2022). Crop safety and broadleaf weed control implications for various herbicides and combinations in lentil. 2022 Southern GRDC Grains Research Update Series, pp 72-79.
- Extension publication: Roberts P, Day S, Aggarwal N, Blake S, Bruce J, Trengove S and Sherriff S (2022). Lentil variety update and the existing herbicide options in pulses. 2022 Southern GRDC Grains Research Update - Ardrossan, pp 43-49.
- Extension publication: Bruce J, Aggarwal N, Trengove S, Sherriff S and Roberts P (2023). Broadleaf weed control and crop safety in lentils. 2023 GRDC Grains Research Update – Adelaide, pp 79-88.
- Extension publication: Bruce J, Aggarwal N, Trengove S, Sherriff S and Roberts P (2023). Broadleaf weed control and crop safety in lentils. 2023 GRDC Grains Research Update – Bute, pp 17-26.
- Results communicated through AIR EP and NSS group publications.

POSSIBLE FUTURE WORK

Improved weed control in crop row

- From previous SAGIT funded projects we concluded that using diflufenican post-emergent can give excellent in-row weed control. However, the logistics of applying diflufenican post-emergent can be challenging for growers as diflufenican needs to be applied at an interval from the grass spray plus Intercept application, post-emergent rolling and any frost events that occur. To add to the challenges, the timing of application is very important to ensure target weeds are small. The use of diflufenican IBS or PSPE is not included on the Brodal Options label. However, a limited number of growers have demonstrated this use pattern can be safely used on certain soil types and are achieving good levels of residual weed control. Investigation is required to determine the suitability of this use pattern across different soil types to understand any crop safety concerns and to determine the level of weed control.

Strategic use of new metribuzin tolerant lentil technology

- Research work funded by GRDC investigated new metribuzin usage patterns at highest labels rates either as post-sowing pre-emergent or post-emergent at 5-6 crop node stage in new metribuzin tolerant lentil. The research work showed new herbicide usage patterns provide effective control of broadleaf weeds such as bifora, Indian Hedge Mustard, common sowthistle, prickly lettuce, including weeds that were not controlled effectively with IMI herbicides. Increasingly, growers are raising concerns of poor control for other broadleaf weeds including capeweed, medics, tares, and marshmallow. For these weed species there are few herbicide control options in the lentil phase of the crop rotation. The poor weed control leads to grain yield losses and grain contamination. Therefore, further research is needed on the strategic use of metribuzin tolerant lentil technology for overcoming hard to control populations of broadleaf weeds and delaying herbicide resistance build up to a particular mode of action. Additionally, this research work is needed to better understand how improved broadleaf weed control can offset the fitness penalty associated with metribuzin tolerant lentil technology on different soil types. This would also enable growers to make more informed decisions for adopting this technology and to realise the associated benefits of using this.