

SADGA /SAGIT RESEARCH PROJECT

Project Aims

The project aims to develop a new and integrated approach to improve grass weed control in durum wheat by developing a set of agronomic management protocols that improve the effectiveness and net benefit of commonly used herbicides and the herbicide safety of currently grown durum varieties.

Progress against the Key Performance Indicators of the project

In 2013 field trials were planned and conducted at four locations (Hart, Tarlee, Turretfield, and Paskeville). All trials were successful, sites were harvested, ryegrass, crop growth measurements taken throughout the season. The ryegrass seed bank and selected grain quality data is still currently being processed. A small extension trial at Paskeville suffered from a seeding issue that influenced some of the treatments; as a result this experiment was repeated at the Turretfield research station to ensure reliable data could be produced.

Results are currently being summarised and only in the preliminary stages but findings will be presented to the DGA committee on the 30th of Feb, and published into relevant farming system magazines including the HART field site group, Crop Science Society, and presented to growers at the annual durum growers forums.

Conclusions reached / Discoveries made

2013 was the second year of a series of experiments aimed to help develop and understand the agronomic factors that may improve grass weed control in durum wheat. Outlined below is a very brief summary of some of the findings from the individual experiments; however a full detailed statistical analysis of the data is still being finalised. Based on the data from both the 2012 and 2013 the building blocks for a stronger agronomic system for weed control in durum can begin to be developed for the approaching durum forums and the 2014 cropping program. The following **key messages** for growers have already been established with a more detailed summary of some 2013 results attached.

- New durum cultivars are equally susceptible to crop damage from Sakura compared to older durum varieties; therefore Sakura is not likely to be registered in Durum in the near future.
- The foliar application of trace elements did not improve crop safety or recovery from herbicide damage in both 2012 & 2013.
- Sowing seed deeper below the herbicide band and using larger seed improved the safety of current pre emergent herbicide options
- Durum varieties differed in their ability to compete with ryegrass both in terms of tolerance (yield in presence of weeds) and suppression (weed set)
- Saintry has demonstrated a level of competitive ability more similar to bread wheat (Mace) when grown under the same conditions and seeding rate.
- The combination of a competitive cultivar and increased seeding rates improved weed control both in the presence and absence of current herbicides
- The combination of BoxerGold at 2.5L/ha and 2L/ha Avadex was the safest and effective herbicide option for control of ryegrass in Durum in 2013

Improving the Improving Crop Safety of current herbicides:

Given Sakura is not likely to be registered growers should focus on improving the net benefit of current herbicide options (ie BoxerGold) through robust agronomic systems. The *Paskeville* field trial evaluated the potential for crop recovery from herbicide damage using improved plant nutrition (Trace elements). At this site there was significant herbicide damage from BoxerGold applied at the recommended and double recommended rate in terms of plant establishment, growth, and yield however the addition of an improved nutrition strategy containing trace elements did not offer any enhanced crop safety or growth recovery compared to the unfertilised treatments. *These 2013 results are consistent with 2012 in that the foliar application of trace elements did not improve crop safety or recovery from herbicide damage in durum wheat.*

An additional trial at both Paskeville and Turretfield showed the potential to improve crop safety by using larger seed, maintaining higher seeding rates, and sowing slightly deeper (40-50mm) than the herbicide band (0-30mm). In a weed free environment BoxerGold sprayed at the recommended rate has the potential to significantly reduce yield but in these trials BoxerGold treated plots yielded similar to the nil herbicide control when combined with larger seed, increased seeding rates and deeper sowing, whereas shallow sown small seed suffered yield penalties consistent with 2012 results. Most yield responses are explained largely by the differences in plant density and therefore growers are encouraged to maintain high seeding rates. Shallow sown smaller seed suffered the largest establishment losses from herbicide. Damage from BoxerGold reduced plant numbers but growth effects were recovered by spring, and therefore depending on the season the initial damage may or may not result in yield penalties. *However, any factor such as lower seeding rates, or poor seed quality significantly weakens the agronomic system and leaves durum more sensitive to increased competition from weeds and increases the likelihood of yield loss from herbicide damage.*

Improving the net benefit of current herbicides:

The trials at Hart and Tarlee focused on agronomic management to reduce weed seed set using competitive varieties, seeding rates, and other management strategies such as row spacing and seed bed utilisation. The results from both 2013 trials are consistent with 2012 findings and *suggest there are significant differences in varietal weed competitiveness.* Tjilkuri and Tamaroi have been consistently identified as moderate to poor weed competitors, Yawa, Hyperno, and WID802 as poor and Saintly as one of the better competitors. Durum has a reputation for being less competitive than bread wheat so therefore it is useful to use bread wheat as the benchmark level of competition that durum growers should aim to achieve. *Saintly has demonstrated a level of competitive ability more similar to bread wheat (Mace) when grown under the same conditions and seeding rate.* At Tarlee in 2013, the new durum variety UAD096 sown at the current practice of 200seeds/m² also showed improved competitiveness similar to Saintly (figure 1). The variety differences in weed suppression were less pronounced with of the pre-emergent herbicide BoxerGold, however the relative rankings of varieties still held a similar pattern and the more competitive varieties still performed better than non- competitive varieties.

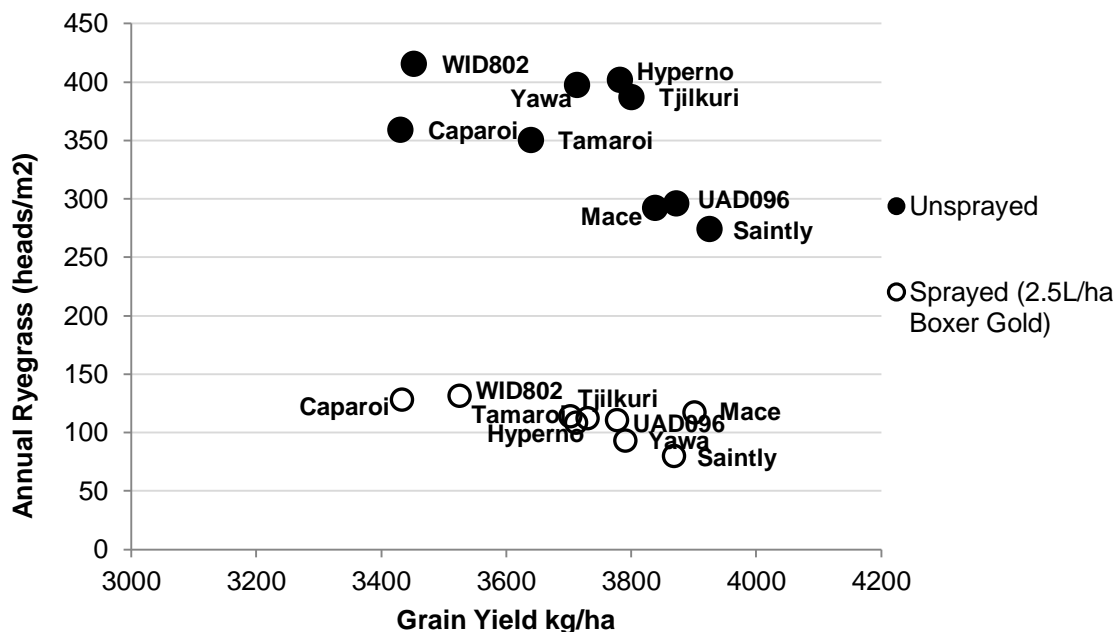


Figure 1. The grain yield of durum varieties in the presence of Annual Ryegrass (ARG) when left unsprayed, and sprayed with a pre-emergent herbicide BoxerGold at 2.5L/ha plotted against the amount of ARG heads/m² at Tarlee, 2013.

Since varieties like Tjilkuri are poorer competitors the purpose of a trial at Hart in 2013 was to demonstrate simple agronomic practice changes that will a) improve the suppression of ryegrass, and b) maintain a high grain yield. A selection of the treatments applied to Tjilkuri at this site are represented in table 1 below. The results showed that although bread wheat was slightly higher yielding than durum at Hart, Saintly suppressed ARG to similar levels as both Scout and Mace bread wheat (figure 2). The Hart data in figure 2 also demonstrates Tjilkuri yielding less than Saintly and resulting in poorer suppression of ARG. Increased seeding rates to 300seeds/m² (treatments 2 and 6) resulted in the best suppression of ryegrass (figure 2) compared to the current standard practice of 200seeds/m² in Tjilkuri. In other treatments increasing the seed bed utilisation and using larger seeded grain also proved successful in achieving similar suppression to bread wheat and Saintly. The improved weed competition has come from a number of factors in these treatments but mostly can be explained by an increase in plant density and seed bed utilisation. Lowering seeding rates both reduced weed suppression and resulted in a greater yield penalty (T1,T3). *These*

results highlight simple steps growers can take such as maintaining higher seeding rates, sowing plump seed that has been well graded to increase grain size, and improving the seed bed utilisation to improve the competitiveness of a crop without a likely yield penalty.

Table 1. Treatments applied to Tjilkuri durum wheat when sown into pre spread annual ryegrass at Hart, 2013.

Practice Change treatment no.	Seeding Rate (seeds/m ²)	Seeding Boot	Practice Change relative to control
Standard Practice Control (Tjilkuri)	200	Standard	Nil (Control)
T1	100	Standard	decreased seeding rate
T2	300	Standard	increased seeding rate
T3	100	Spreader	decreased seed rate + increased seed bed utilisation
T4	200	Spreader	increased seed bed utilisation
T5	300	Spreader	Increased seeding rate + seed bed utilisation
T6	200	Standard	Large Seeded Grain (graded over 2.5mm sieve)
T7	200	Standard	Small Seeded Grain (<2.5mm)
T8	200	Standard	narrow row spacing 11.4cm (4")

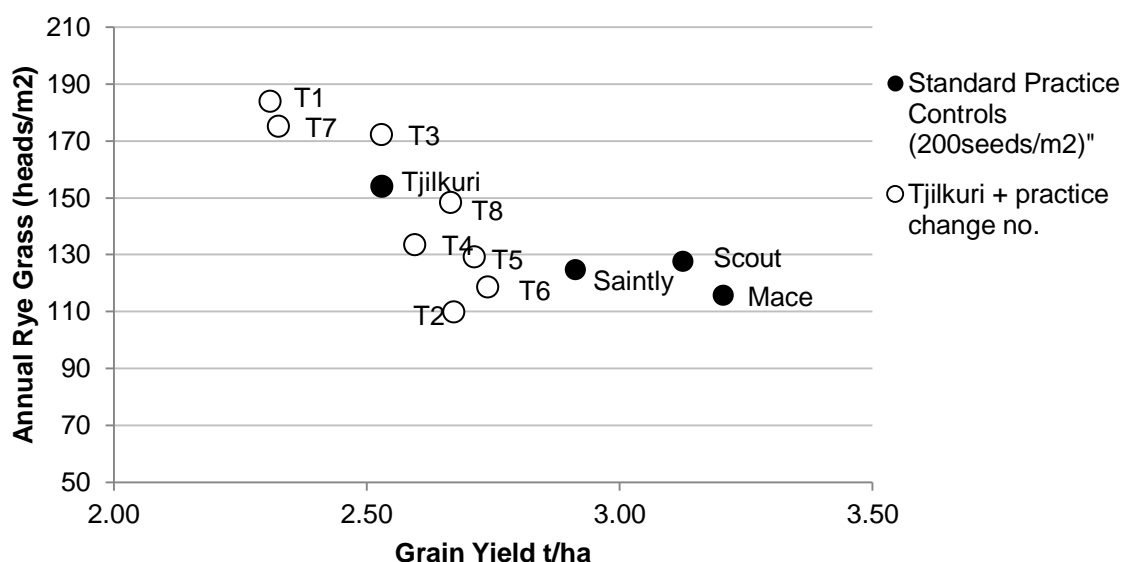


Figure 2. The grain yield of selected varieties, and Tjilkuri with additional changes in agronomic practices (T1-8) when sown in the presence of Annual Ryegrass (ARG) and left unsprayed plotted against the amount of ARG heads/m² at Hart, 2013.

The level of control achieved with these methods outlined above alone is not sufficient enough for an acceptable level of ryegrass control, and growers will obviously need to use pre-emergent herbicide applications to improve weed control. The application of BoxerGold on top of these treatments offered far superior ryegrass control at Hart in all treatments but did not result in improved yields. While the herbicide application improved ryegrass control, the same treatment trends were evident (figure 3). Increased seeding rate and seed bed utilisation still offered superior weed control. *These results are encouraging for growers as optimal combinations of variety, and seeding rate can take considerable pressure of pre-emergent herbicides and be a useful IWM strategy.*

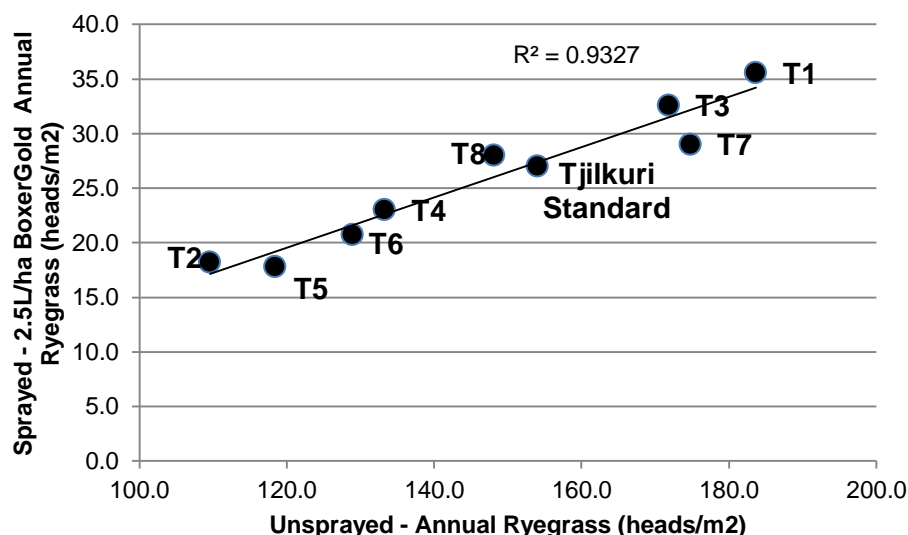


Figure 3. The fitted relationship between Tjilkuri and agronomic treatments on annual ryegrass suppression when sprayed and left unsprayed with a pre-emergent herbicide at Hart 2013.

Durum growers are often reluctant to increase seeding rate because of the fear of elevating small grain screenings and subsequent quality downgrading. The trial at Hart showed the effect of the treatments on small grain screenings were significant but did not result in any negative implications. In fact the highest yielding treatments offering superior weed suppression (T2, T5, T6, & T4) all resulted in screening levels less than the 5% required for DR1 grade (Table 2). These results are consistent with previous durum work, higher seeding rates need to be maintained to optimise yield and maintain grain quality.

Table 2. The effect of agronomic treatments on the small grain screenings achieved in Tjilkuri Durum at Hart, 2013.

Treatment No.	Screenings %<2.0mm
<i>Standard Practice Control</i>	5.2
T1	5.1
T2	3.3
T3	4.2
T4	4.3
T5	4.6
T6	4.1
T7	5.6
T8	4.5
LSD	1.1

The trial at Turretfield (2013) investigated a number of the best herbicide options (previously identified as the safest and effective in 2012) in durum in conjunction with crop density. *The results found that of the current available herbicides the combination of BoxerGold at 2.5L/ha and 2L Avadex was the safest and most effective option in Durum.* In almost all of the herbicide combinations increasing seeding rates from 200seeds/m² to 300seeds/m² improved ryegrass control and had no adverse effects on grain yield (figure 4).

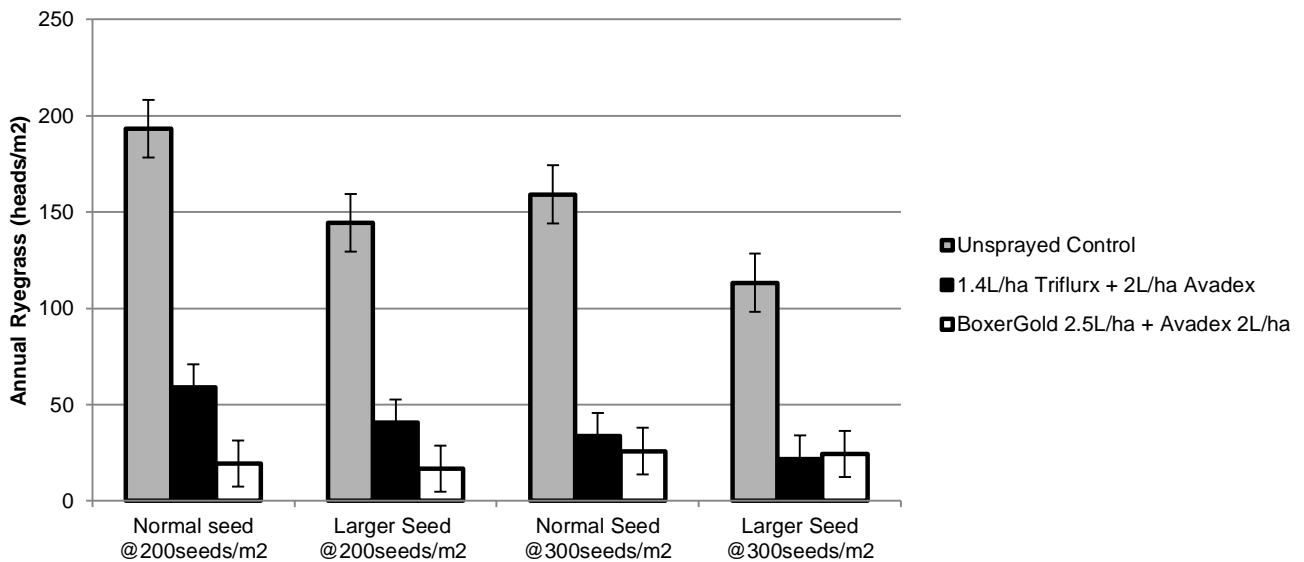


Figure 4. The effect of herbicide treatments, seeding density, and grain size on the production of annual ryegrass in Tjilkuri plots at Turretfield 2013.

Plans for the coming year

The plans for the coming year will continue as outlined in the research proposal with a focus in the final year to present more demonstration type trials to farming system groups. Based on the data from both the 2012 and 2013 the building blocks for a stronger agronomic system for weed control in durum can begin to be developed and showcase the research in demonstration trials.

These trials will ultimately highlight the most effective weed control options for integrated grass control in durum, including the optimum combinations of crop densities, herbicide dose and time of application, variety choice, and crop nutrition. This year will see the introduction of a demonstration trial in the emerging durum district of the South East at Bordertown.

Additional trials will aim to answer any research questions or fill gaps that may be missing from the previous seasons work. Given there was little varietal differences identified in tolerance to both BoxerGold and Sakura in the current commercial varieties there is potential to conduct a more extensive screening process instead of the current field based approach. A lab based screening trial will be conducted on a wider number of parentages from the Adelaide Uni Breeding program to identify if there is any genetic variation in a wider range of germplasm.

SADGA would like to acknowledge their Sponsors:

