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Susceptibility of chickpea varieties to seed markings – Tamworth and Trangie 2013–2015

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Agronomy

Key findings

- The 2013 Tamworth and 2014 Trangie environments were not conducive to high levels of seed markings, with all varieties having <5% tiger stripe/blotches.
- The later sown chickpeas had a lower incidence of seed markings in two of the three environments.
- The 2015 Tamworth experiment was conducive to seed markings for the first sowing date (SD1). In this case, the most susceptible commercial varieties were PBA Pistol⦶ and PBA Boundary⦶, with 9.7% and 6.7% of individual seeds having tiger stripe/blotches respectively.
- All five kabuli varieties did not display any seed markings in any of the three environments.
- All desi varieties showed at least low levels of tiger stripe/blotch type markings in one or more of the three environments and two sowing dates.

Introduction

Any blemish or mark on chickpea seeds detracts from their visual appeal to consumers and processors. This can negatively affect export prices and market access. At a grower level, seed can be downgraded or rejected depending on the cause of the blemish, such as ascochyta blight; less serious seed markings can be mistaken for ascochyta. For this reason, pre-emptive research is being conducted to minimise the risk of seed markings becoming a future issue in the Australian chickpea industry. There is a range of different seed markings that can occur as blemishes on chickpea seeds. This project is examining the most common one, known as tiger striping or blotching (Figure 1). Research suggests that the blotch-type marking is a more severe tiger stripe, so we now include both in the same classification as they can often occur together on a single seed.

This experiment aimed to compare the incidence of seed markings (tiger stripe/blotch) for a range of commercial chickpea varieties and advanced breeding lines sown on two sowing dates on the central western and north-western slopes of NSW. This information will be used to advise the Pulse Breeding Australia (PBA) chickpea breeding program of genetic susceptibilities. It will also be used to understand environmental triggers, potentially enabling agronomic strategies to be developed to mitigate seed marking incidence in the future.

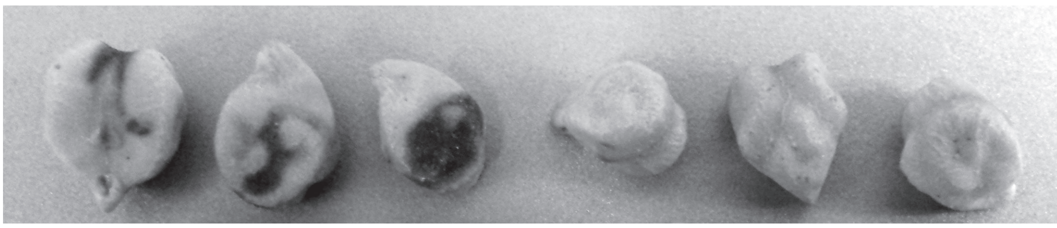

Figure 1. Tiger stripe/blotch type markings of desi chickpea (left) compared with clean seed of the same sample (right).

Site details

Location and years	Tamworth Agricultural Institute, Tamworth NSW – 2013, 2015 Trangie Agricultural Research Centre, Trangie NSW – 2014
Experiment management	Each experiment followed standard agronomic practices. Seeds were treated with label rates of P-Pickel T® (360 g/L thiram, 200 g/L thiabendazole) and metalaxyl (250 g/L) and sown with a minimum of 50 kg/ha of Granulock 12 Zn plus water furrow injected rhizobia. Each experiment was managed for disease, weeds and insects following recommended agronomic practices.

Plant population	Target 30 plants/m^2

Treatments

Varieties and advanced breeding lines (20)

Desi (15): PBA Seamer$^{\phi}$, PBA Slasher$^{\phi}$, PBA Boundary$^{\phi}$, PBA Striker$^{\phi}$, PBA HatTrick$^{\phi}$, PBA Pistol$^{\phi}$, Genesis 509$^{\phi}$, Kyabra, Genesis 836$^{\phi}$, Howzat, Gully, Jimbour, line 1, line 2, line 3.

Kabuli (5): PBA Monarch$^{\phi}$, Genesis Kalkee$^{\phi}$, Genesis 090$^{\phi}$, Genesis 079$^{\phi}$, Almaz.

Sowing date (SD)

Sowing date	Location, year		
	Tamworth, 2013	Trangie, 2014	Tamworth, 2015
SD1	22 June	29 May	18 May
SD2	26 July	19 June	15 June

Results

Seed marking incidence

The 2013 Tamworth and 2014 Trangie environments were not conducive to high levels of seed markings with all varieties having < 5% tiger stripe/blotches (figures 2 and 3, respectively).

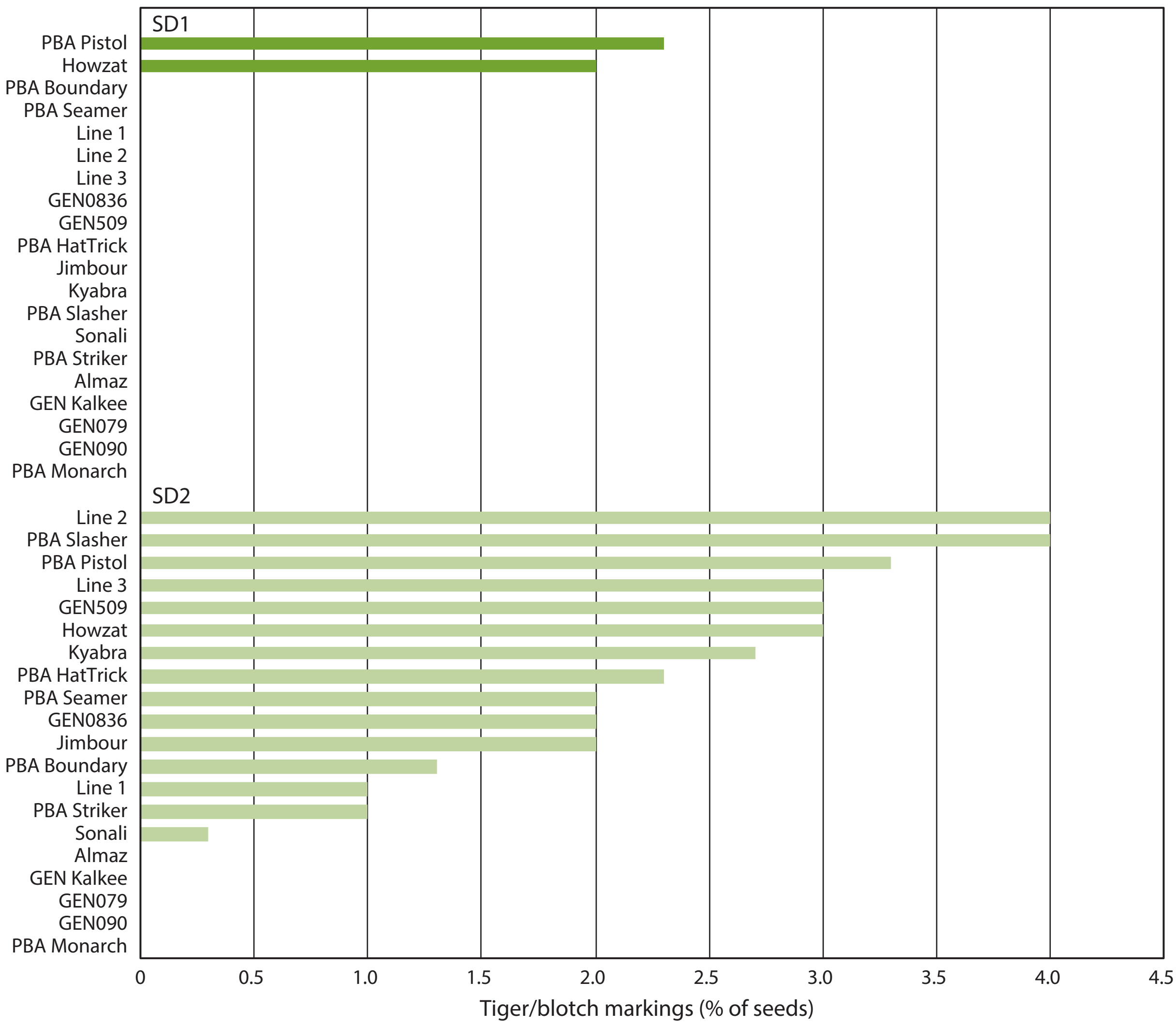

Figure 2. Tiger stripe/blotch type markings (%) of 20 chickpea entries sown at two dates at Tamworth in 2013.

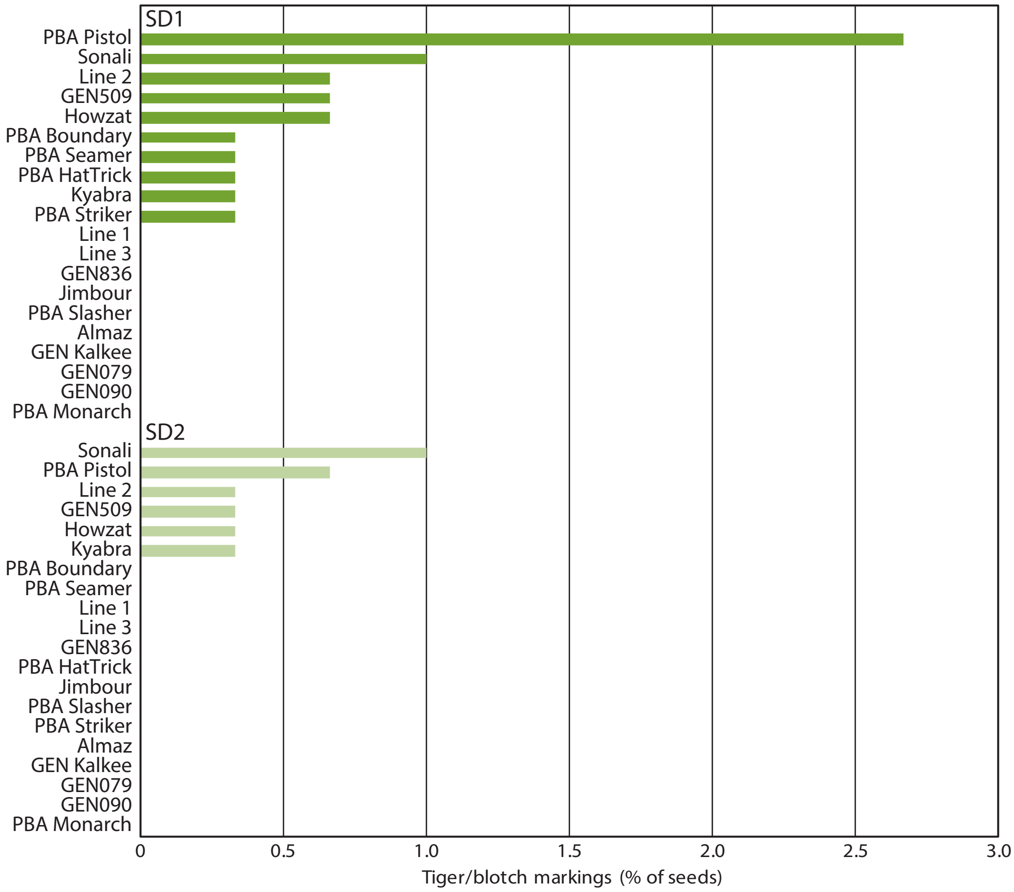

Figure 3. Tiger stripe/blotch type markings (%) of 20 chickpea entries sown at two dates at Trangie in 2014.

The 2013 Tamworth experiment showed a higher incidence of markings for SD2, while the 2014 Trangie experiment showed a higher incidence of markings for SD1. In both cases, the June sowing date had the lower incidence of markings, as the 2013 Tamworth experiment was sown later than normal.

The 2015 Tamworth experiment was conducive to seed markings for the first sowing date (SD1). In this case, the most susceptible commercial varieties were PBA Pistol(b) and PBA Boundary(b), with 9.7% and 6.7% of individual seeds having tiger stripe/blotches respectively, and breeding line 1, with 7.7% markings (Figure 4).

No kabuli chickpeas were affected in any of the experiments or sowing dates, presumably because their seed coats contain no phenolic compounds. Certain phenolic compounds are known to be responsible for flowers, fruit and seeds colour. All the desi varieties showed the ability to produce at least low levels of tiger stripe/blotch-type markings in one or more of the three experiments and two sowing dates.

experiments and sowing dates. Nevertheless, several desi varieties did appear to be generally more susceptible to the tiger stripe/blotch-type marking defect across these environments, particularly PBA Pistol(b), line 2, PBA Boundary(b) and Howzat.

Tiger stripe/blotching appears to have a genetic basis that is triggered by certain environmental conditions in the field. The results of these experiments will be used, in combination with other experiments, to determine the environmental conditions that trigger seeds to mark in this way. This particular set of experiments suggest that sowing in mid June around the Central West and North West Slopes could reduce the percentage of seeds with tiger stripe/blotch-type markings in susceptible desi chickpea varieties.

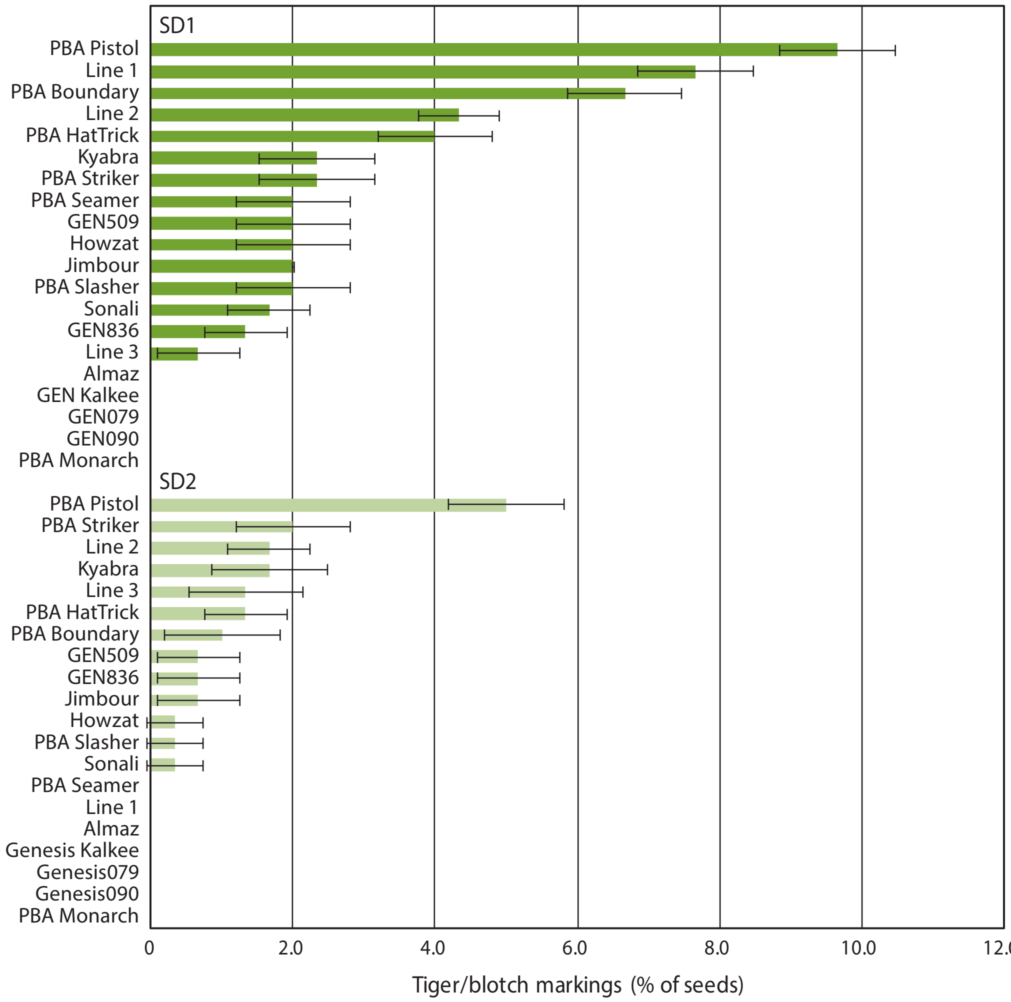

Figure 4. Tiger stripe/blotch type markings (%) of 20 chickpea entries sown at two dates at Tamworth in 2015.

The ranking of desi varieties for tiger stripe/blotch-type markings was not consistent across Conclusions Time of sowing and variety influence the amount of seeds showing tiger stripe/blotching-type markings in chickpeas. Kabuli chickpeas do not suffer from this defect. Desi chickpeas sown in mid June at Tamworth and Trangie had a lower incidence of this type of seed marking.

Research is ongoing to identify both the genetic basis and environmental triggers of tiger stripe/blotch-type markings in desi chickpeas to minimise any potential marketing risk to the Australian chickpea industry.

Acknowledgements

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