CHICKPEA SEED TESTS FROM 2010 HARVEST EXPLAIN ESTABLISHMENT PROBLEMS IN 2011 CROPS

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Take home message: Seed test results from the 2010 season help explain why many 2011 chickpea crops had problems with establishment and seedling disease. More than half the seed lots were infected with Botrytis and 89% were colonised by other fungi.

Fungal infection, weathering of seed and inadequate seed treatment were the major causes of poor emergence and seedling blight.

Growers who use correctly treated seed in 2012 are more likely to have profitable chickpea crops.

BACKGROUND: The 2010 chickpea season in the GRDC Northern region was the wettest on record with substantial rain falling during grain development and maturity. Diseases were common, crops lodged and grain was severely weather damaged. Testing seed from the 2010 harvest was incomplete when papers for the 2011 Updates were due. The results are presented here to help growers and agronomists understand better why 2011 crops planted with seed harvested from the 2010 season encountered establishment problems.

METHODS: Eighty one seed lots from north central NSW, northern NSW and southern QLD were processed at Tamworth Agricultural Institute. Each was subjected to emergence (vigour), germination and pathology tests.

Emergence (Emerg%): The percentage of seedlings that emerged after 2 weeks when 120 seeds were buried 5cm in potting mix in trays in the glasshouse. A pilot experiment comparing potting mix, soil and 50:50 potting mix:soil showed little difference among the three media. Seedlings emerged fastest in potting mix so we chose that.

Germination (Germ%): 100 seeds were wrapped in double paper towels, soaked in tap water for 20-30 mins, drained for 30 mins and incubated in plastic food containers with loose fitting lids at 21C for 8 days. A seed was deemed germinated if it produced a radicle (the root).

Pathology (Clean%, Botrytis%, Other%): Two hundred seeds (200) were surface sterilised to kill micro organisms on the seed coat, rinsed in sterile water, put on one quarter strength potato dextrose agar plus sodium novobiocin (to inhibit bacteria) in 9cm diameter Petri dishes and incubated at 24C. This medium encourages growth of fungi that have colonised the seed coat, cotyledons or embryo. Note: This method does not detect organisms, including pathogens like Botrytis and Ascochyta, that are on the seed surface – in commercial crops, surface borne pathogens can initiate infections unless controlled by seed treatment. There were 10 seeds per dish. After 5 days the number of seeds with no fungal growth was recorded (Clean%). After 10-12 days the number of seeds from which *Ascochyta rabiei* (cause of Ascochyta blight), *Botrytis cinerea* (cause of Botrytis grey mould and Botrytis seedling disease, Botrytis%), or other fungi (Other%, saprophytes that do not normally attack healthy chickpeas but can colonise weather damaged seed) was recorded. Note: this test does not quantify how much fungus is in the seed – it simply tells us if there was any fungus present. Determining the extent of colonisation requires a DNA test which we

are not set up to do at Tamworth. Note: *Ascochyta rabiei* is relatively slow growing compared with *B. cinerea* and the many saprophytic fungi that colonise chickpea seed. Thus, a seed infected with *A. rabiei* (as we suspect many were), may not give rise to a discernable *A. rabiei* colony (this is supported by the isolation data – only one sample yielded *A. rabiei* and only 1% infection; data not shown). Detecting *A. rabiei* in seed from the 2010 season is best done with a DNA test. For identification details see footnote.

Establishment and Pathology of 2011 crops: 2011 crops sown with seed tested in the survey were inspected monthly from June to November. In June and July, the number of plants (alive and dead) in paired one metre lengths of row at several locations in the paddock, was recorded to provide an estimate of plant population. At the same time, the total number of plants plus those with Botrytis seedling disease along at least three transects at different locations in the crop were recorded using tally counters. A plant was deemed to have Botrytis seedling disease if it was wilting and/or dying/dead and had evidence of Botrytis sporulating on the roots or collar.

RESULTS:

Emergence, Germination and Pathology: Data for the 81 seed lots was sorted on percent emergence as this is of most interest. The lots were arbitrarily assigned a number to enable tracking for the other variables measured (see Figures). Emergence ranged from zero to 93%. Half the seed lots had less than 50% emergence and only 26% of seed lots met the Pulse Australia recommended minimum emergence of 70%. Germination in paper towels in the lab was a poor predictor of emergence in the glasshouse. Regression analysis showed germination accounted for only 60.7% the variability in emergence. Normally, germination is a very good indicator of emergence; however repeated wetting and drying of seed has had a bigger effect on emergence than on germination.

There was no correlation between Emergence and the percentage of seed that yielded either: no fungi (Clean%, R squared = 13.4%), Botrytis (Botrytis%, R squared = 9.3%), saprophytic fungi (Other%, R squared = 3.9%) or Ascochyta (R squared = 0.0% - data not shown).

Colonisation of seed by *B. cinerea* ranged from zero to 45%. Twenty seven (42%) seed lots yielded no Botrytis; 25 (31%) had less than 10% Botrytis; 13 (16%) had between 10-20% Botrytis and nine lots had more than 20% of their seed infected internally with Botrytis.

With the exception of nine lots (not necessarily the same lots that had >20% Botrytis), 30% or more seed in 89% of seed lots had internal saprophytic fungi. Note: This does not mean the seed would be assessed visually as mouldy; likewise a seed that yielded *B. cinerea* may not be assessed visually as having Botrytis. On the other hand (for the reason outlined above), a seed from the 2010 season with an obvious Ascochyta lesion (which would be assessed as such by a seed quality lab) is unlikely to give rise to a discernable *A. rabiei* colony on agar.

How can Emergence be greater than Germination? Some seed lots (numbers 74, 75, 77) had more plants emerging than germinated. This reflects the variability in the seed lots and experimental conditions. Only 120 and 100 seeds are used in the emergence and germination tests, respectively. They can't be the same seeds, so it is not surprising that minor differences arise.

Establishment and Pathology of 2011 crops: Plant populations varied widely from crop to crop ranging from 5 to over 30 plants per square metre. Botrytis seedling disease varied from crop to crop and from transect to transect within the same crop, ranging from undetectable to 12%. Note: the assessment method does not detect seedlings that fail to emerge and thus can underestimate the actual level of Botrytis seedling disease. The primary infections (ie originating from infected seed), led to secondary spread resulting in more seedling disease or collar rot. Secondary spread continued into September. The most striking observation from the crop inspections was the importance of proper seed treatment. Without exception, the highest levels of seedling disease were in crops sown with seed treated on farm, either with inadequate coverage or below the label rate. This was clearly demonstrated in two crops sown with the same seed lot but treated by

different operators – in one crop, Botrytis seedling disease was undetectable, in the other 4.5% of plants had Botrytis seedling disease.

CONCLUSION: This work helps explain why many 2011 chickpea crops had establishment and seedling disease problems, with fungal infection, weathering of seed and inadequate seed treatment the major causes of poor emergence and seedling blight. The work also highlights the importance of proper seed treatment.

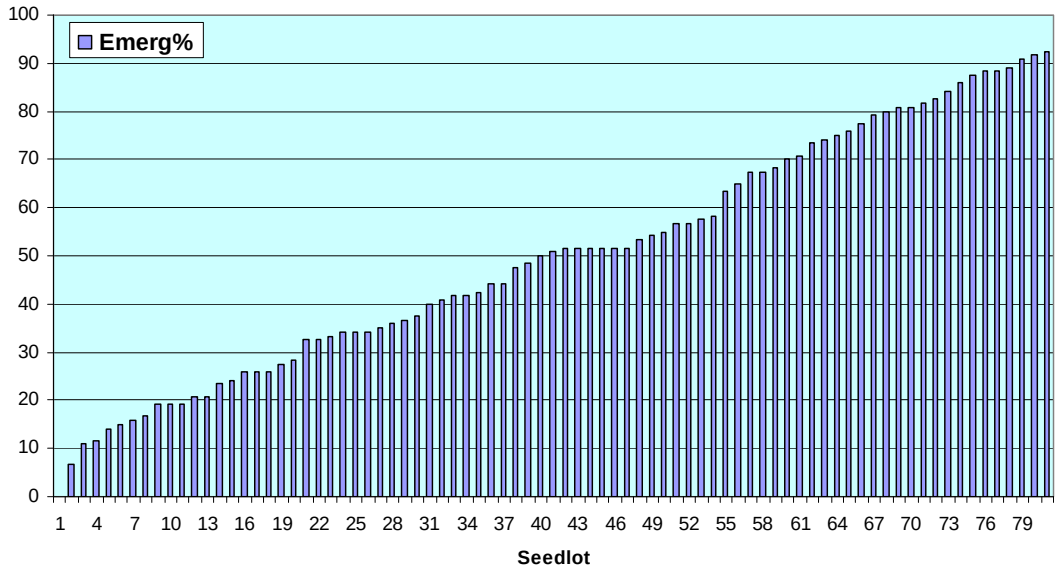

Figure 1 Emergence (%) of 81 seed lots after 2 weeks in potting mix.

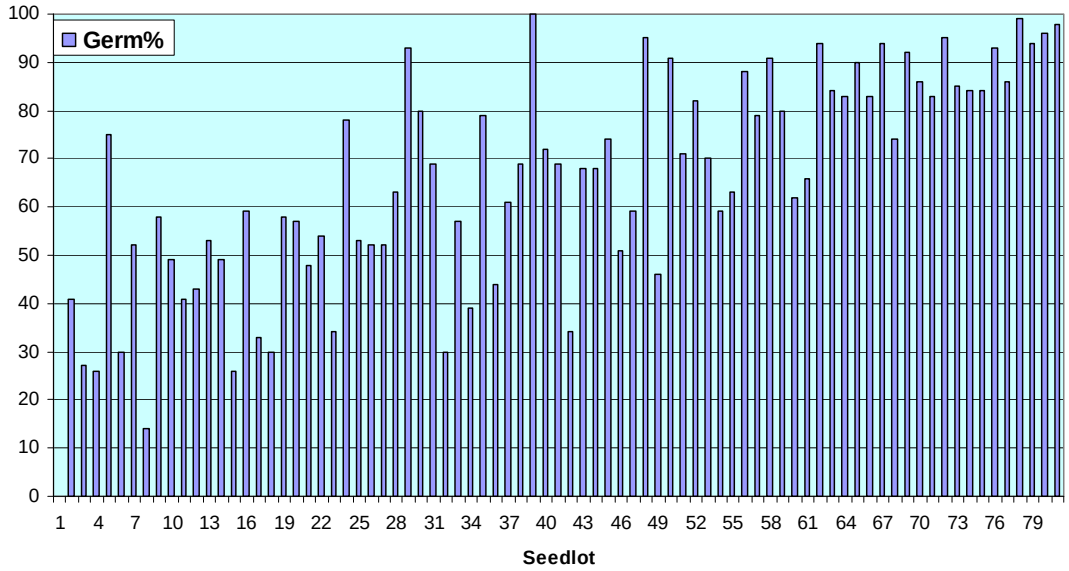

Figure 2 Germination (%) of in moist paper towels after 8 days at 21C.

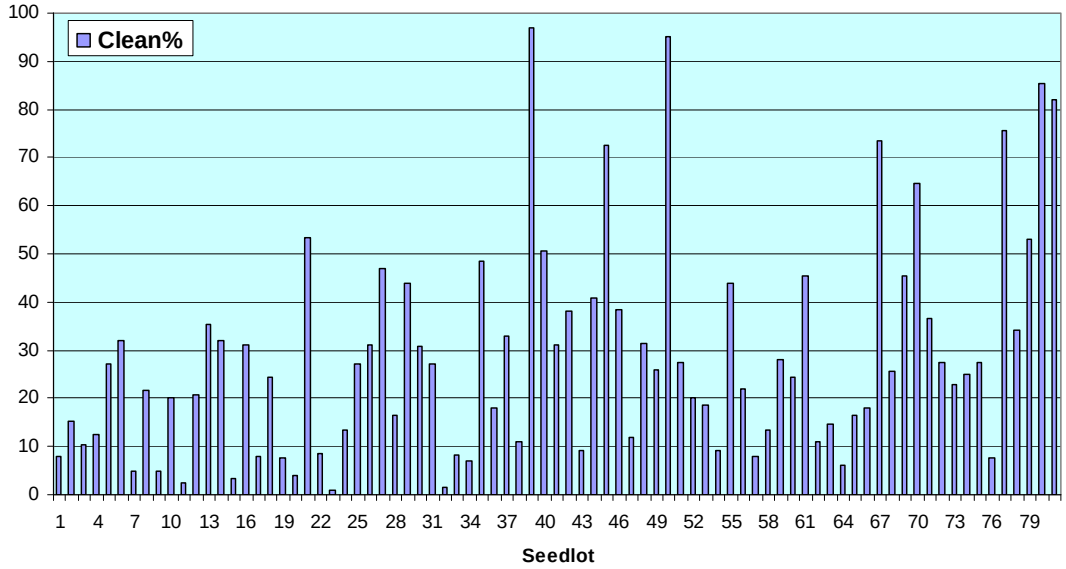

Figure 3 The percentage of seed with no fungal growth on isolation media after 5 days at 24C.

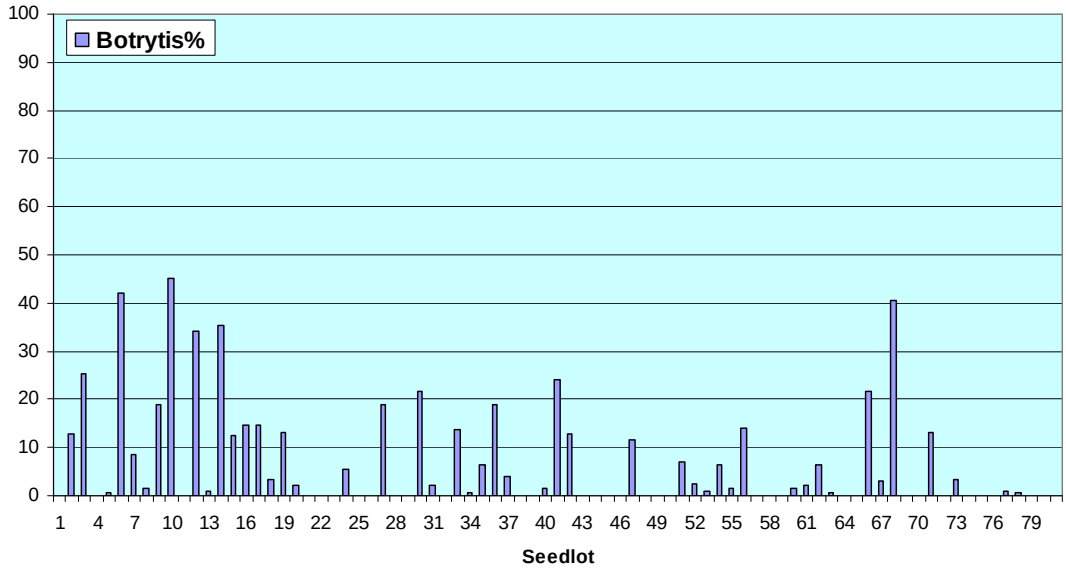

Figure 4 The percentage of seed yielding *Botrytis cinerea* after 10-12 days at 24C.

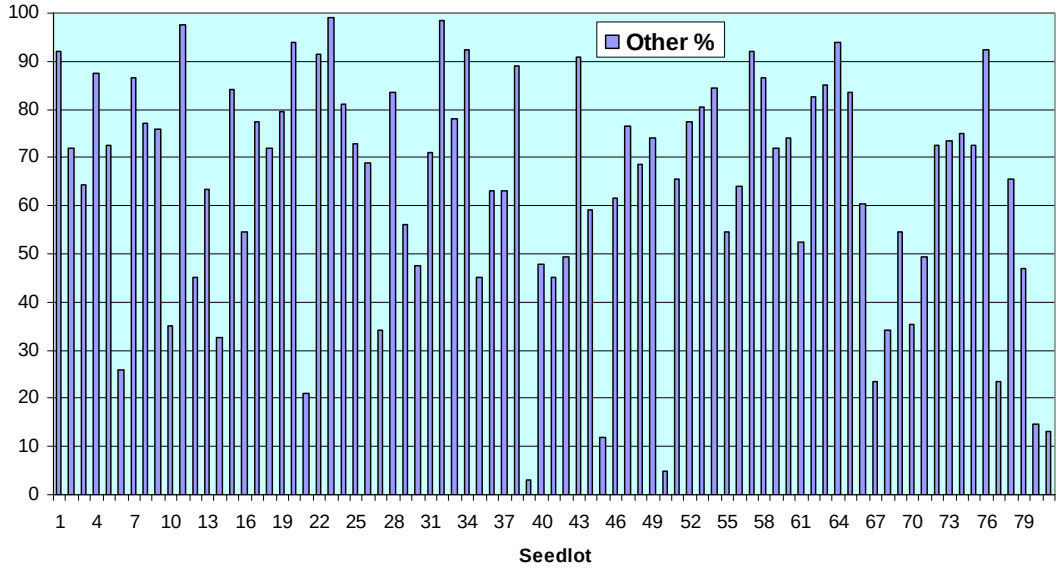

Figure 5 The percentage of seed yielding fungi other than Botrytis after 10-12 days at 24C.

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Footnote: Identification of fungi isolated from seed. *Ascochyta rabiei* was identified by colony type, conidiogenesis and conidial shape, size and septation as observed under a compound microscope. *Botrytis cinerea* was identified by colony type, conidiophore length and colour, conidiogenesis and conidial shape and size as observed under a compound microscope. No attempt was made to identify "other" fungi apart from examination under a dissecting microscope, which together with colony type and colour indicated that the predominant "other" fungi were dematiaceous hyphomycetes (mostly *Alternaria spp*) and yeasts. One seed lot (number 46) had no dematiaceous hyphomycetes or yeasts – all 84% "other" fungi in that lot were considered to be Fusarium species.

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