Comparison of measurement methods for determining *Macrophomina phaseolina* isolate aggressiveness

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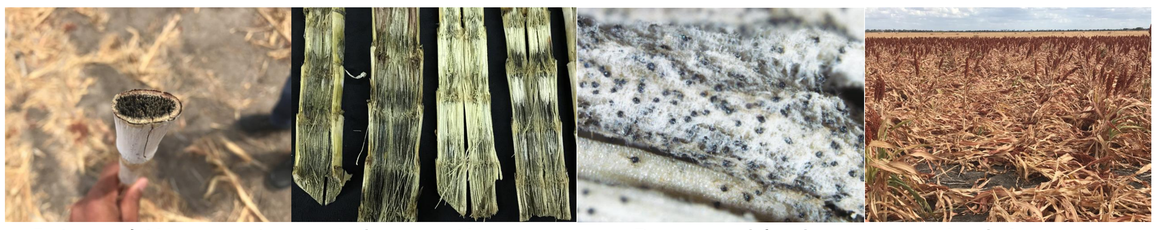
What's the issue?

- *M. phaseolina,* a soilborne pathogen, causing charcoal rot in more than 500 crop species
- Splitting sorghum stalks will show ash grey tissue or microsclerotia, the survival structure of the fungus, giving the internal stalk tissue a peppered look

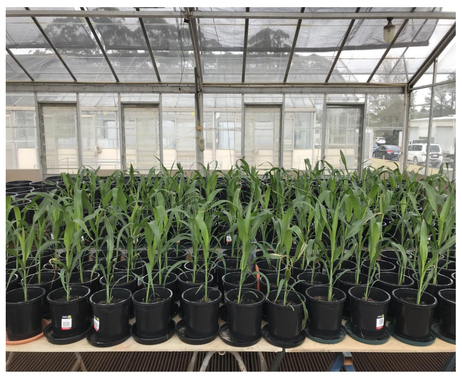


Internal tissue rot | Ash grey tissue | Peppered look | Lodging

- Common during seasons with prolonged hot, dry weather or when other unfavourable environmental conditions stress the plant.
- Despite the lack of formal quantification in Australia, significant yield losses have been associated to prevailing hot dry conditions, resulting to widespread high incidences of charcoal rot and subsequent lodging
- There are few available management strategies to minimise its effect, and so far, no resistance in sorghum has been reported.
- An effective charcoal rot resistance screening method requires both an aggressive isolate, representative of the pathogen population, and a repeatable inoculation method.
- The area under disease progress curve (AUDPC) has been used for identifying disease resistance and can be used in the selection of aggressive plant pathogen isolates for screening purposes.
- This study aimed to investigate if current methods of inoculation and measurements used to determine *M. phaseolina* isolate aggressiveness being used in Australia are effective.

Methodology

Two trials were conducted using 33 isolates from the northern grains region, to study the effect of *M. phaseolina* isolate, the host of origin for the isolate and the geographic region that the isolate was from, on lesion length in sorghum stalks. The first trial used a single point assessment at 28 days after inoculation (DAI). The second trial used four plants per pot to collect four weekly measurements to calculate AUDPC, using a two-point method and all four timepoints for traditional AUDPC. In both trials, sorghum plants were inoculated by inserting *M. phaseolina* infested toothpicks into the stalk ~5 cm above the soil surface. Stalks were split open and lesion length was measured.



Grow sorghum cv. MR-Bazley in sterilised soil, four plants per pot

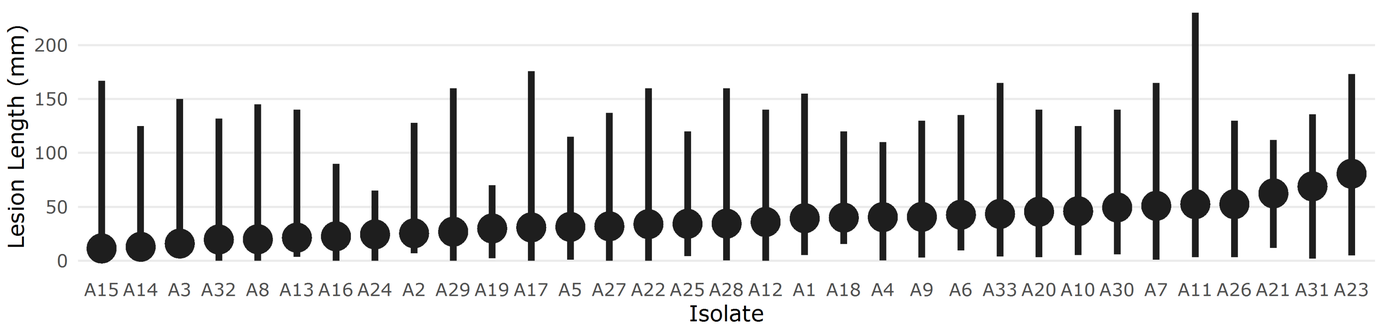
Withhold irrigation at 50% flowering for moisture stress

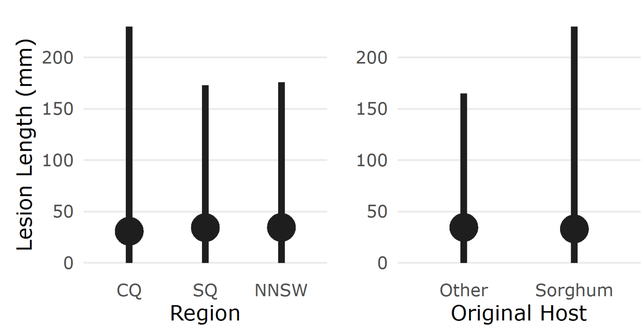
M. phaseolina-infested toothpick inoculation (33 isolates from sorghum and other hosts from CQ, SQ & NNSW) in 4 replications, repeated trial

Scoring at 7, 14, 21 and 28 DAI

Split open each stalk and measure charcoal rot lesion length

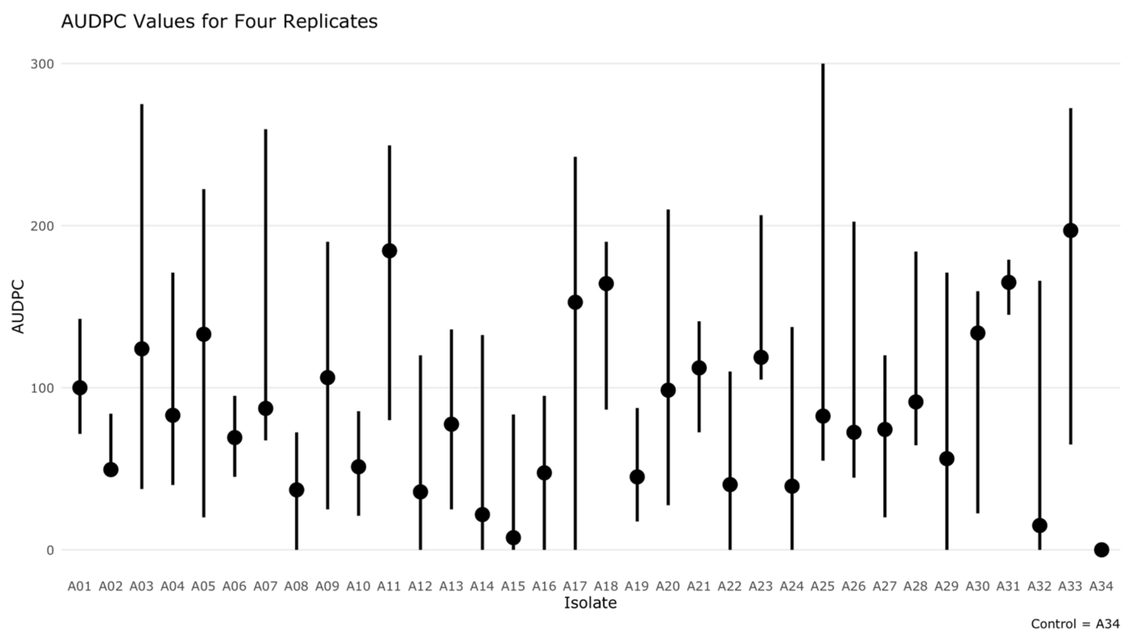
Results





Conclusion

- In both trials, there is no statistically detectable difference in lesion length due to the **effects of**: **Isolate**, **Region** that the isolate originates from, or **Host** that the isolate originates from.
- The single point method for Trial 1 and Trial 2 both were unable to detect differences in the isolates' aggressiveness. The two-point AUDPC method was not feasible due to some measurements not exceeding zero until the final reading, while the four-point AUDPC method showed significant differences via ANOVA at $p > 0.05$, but a Tukey's post-hoc test was unable to determine any groupings.
- The current method of inoculating the lower stalk generated variable lesion lengths and should be re-evaluated to find methods that can generate more consistent results.
- This result has implications in the identification of sources of resistance to the charcoal rot disease, as well as in crop rotation decision-making in an integrated disease management programme.



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