SRA'S IMPROVED DISEASE RATING SYSTEM

Sugar Research Australia

By Dr George Piperidis, Variety Development Manager, Central

Disease screening of varieties in the selection program is an important part of the decision-making process for advancement of clones through the program and release of new varieties to industry. For many years, disease ratings were given on a 1-to-9 scale based on the recommended International Society of Sugarcane Technologists method for assigning disease resistance ratings. This 1-to-9 scale can be further categorised as Resistant (1-3), Intermediate (4-6) and susceptible (7-9). However, this system didn't take into account the precision of the rating for any given clone or variety.

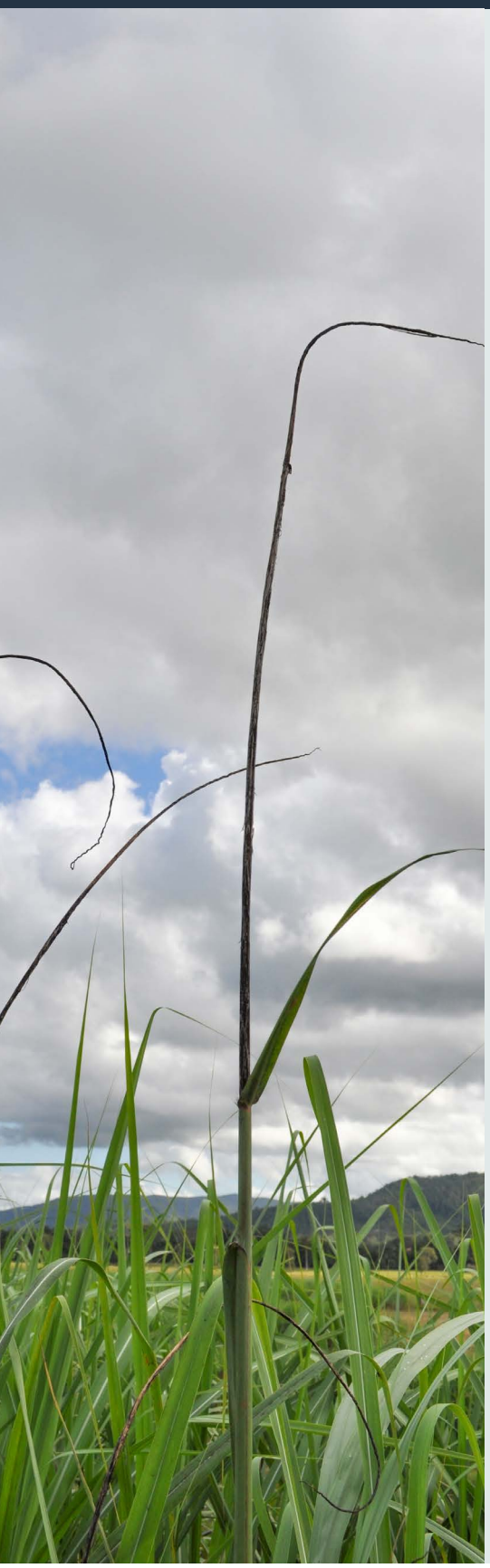
Providing a single number for disease ratings, without any indication of the precision or accuracy of that rating, inevitably led to situations where ratings changed as more resistance data were generated. This was confusing when there was a belief that ratings were fixed and should not change once a rating had been applied. Significant angst was experienced by both industry staff and growers who had relied on a specific rating for a commercial variety.

Disease screening trials are a complex biological system and expression of disease symptoms depends on a range of factors including inherited nature of the clones, age and quality of the planting material, variability in pathogen population, environmental conditions at the time, and quality of inoculum. As more resistance data are generated for each clone, there is a greater level of confidence in the actual resistance of that clone – and the rating precision improves.

Pachymetra root rot greatly reduces root growth and yields in susceptible varieties.

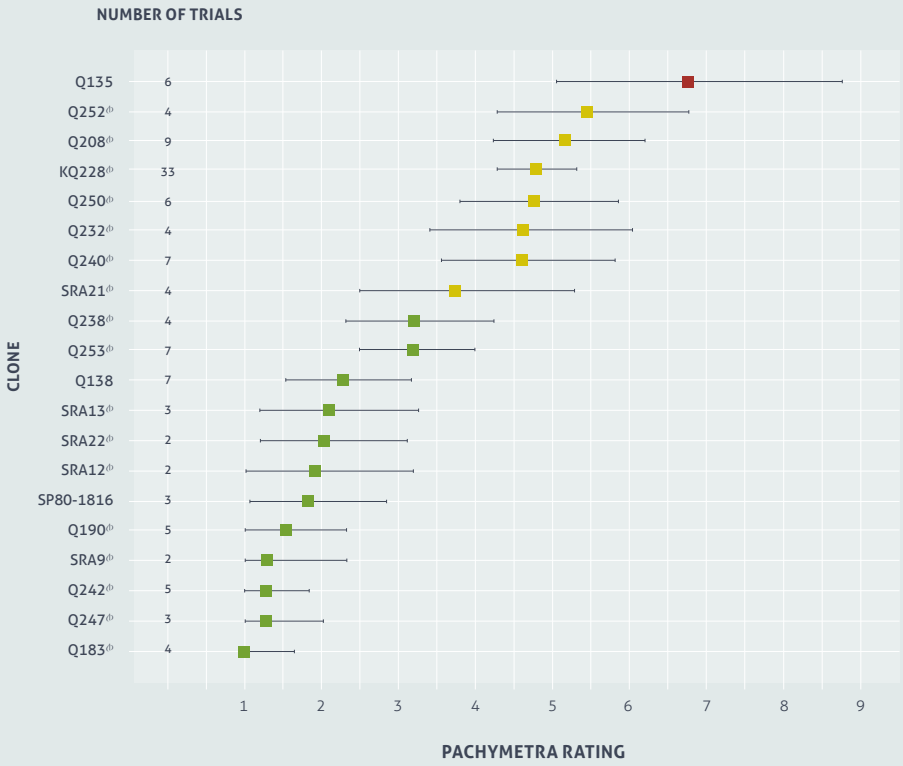
In 2019, SRA reviewed the approach for providing disease ratings to address the concerns outlined above. The revised rating system provides a confidence interval instead of a single number for the resistance of each clone. The confidence interval provides an indication of how precisely SRA is able to predict the true resistance of that variety. Those viewing the new type of rating then immediately gather the general resistance in each clone and also the precision of that rating. In practical terms the confidence interval can be interpreted by considering if the disease screening was repeated 100 times, then 95 of the results would be within the interval. As more data are generated, the level of precision improves, and the confidence interval becomes narrower.

This improved rating system was introduced at the 2020 Regional Variety Committee meetings and SRA Grower Updates. It was implemented in the 2020 Variety Guides for smut and Pachymetra and has received positive feedback. Disease rating categories are still provided in the Guides but for smut and Pachymetra these rating categories should be considered in the context of the confidence intervals provided. The ratings of clones with broad confidence intervals should be held lightly until the rating becomes more precise (as more resistance trial data are generated for that variety).



In some cases, the general disease rating for a variety will change as more tests are conducted. For example, the Pachymetra rating for Q253$^{\Phi}$ was initially Intermediate, but as more tests were conducted its rating was revised to Resistant with a confidence interval from 2.5 to 4.0. Similarly, the Pachymetra rating for Q250$^{\Phi}$ has been revised from Intermediate-Susceptible to Intermediate with a confidence interval from 3.8 to 5.8, and Q226$^{\Phi}$ has been revised from Intermediate-Resistant to Intermediate-Susceptible with a confidence interval from 4.3 to 7.3.

The improved rating system provides a realistic view of how well we can predict the actual disease resistance for that variety, given the data on-hand. SRA will continue working towards providing the best available disease ratings information to assist growers in making informed decisions on variety choices.



Sugarcane smut symptoms on sugarcane.

References
Bhuiyan, S. A., Deomano, E., Stringer, J., Magarey, R., Eglinton, J., Wei, X., and Piperidis, G. 2020. Development of a new variety rating system for sugarcane smut using improved statistical methods. Proc. Aust. Soc. Sugar Cane Technol. 42: 223 – 228.

FOR FURTHER INFORMATION ON DISEASE RATINGS PLEASE CONTACT:

Shamsul Bhuiyan **SRA Plant Pathologist** **E** sbhuiyan@sugarresearch.com.au **M** 0400 771 304
Rob Magarey **SRA Pathologist** **E** rmagarey@suggarresearch.com.au **M** 0407 061 760
Jason Eglinton **SRA Executive Manager Variety Development** **E** jeglinton@sugarresearch.com.au **M** 0459 888 628

Sugar Research Australia