

YIELD OF LINES BRED TO IMPROVE ANTHRACNOSE RESISTANCE IN *STYLOSANTHES SCABRA*

D.F. Cameron and R.M. Trevorrow

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Abstract

Following three cycles of recurrent selection for partial resistance to anthracnose, 42 F₅ lines of *Stylosanthes scabra* were evaluated in replicated small plots at four sites in north and south Queensland. Overall, the five best lines were at least as productive as the commercial cultivars, Seca and Siran.

Key words Recurrent selection, plant breeding, disease resistance

Strategies for plant improvement in *Stylosanthes scabra* are primarily directed at combating variability in the fungal pathogen *Colletotrichum gloeosporioides*, causal agent of anthracnose. Cultivars with broadly based resistance are required to provide durable resistance to a variable pathogen population. Recent improvement work has utilised recurrent selection for partial resistance to develop broadly-based resistance in a single cultivar entity. Three cycles of recurrent selection have been completed in the program to develop anthracnose resistant lines from initial crosses among 19 parents (1). An undesirable feature of most of the partially resistant parents used in the recurrent selection program has been their lack of vigour as spaced plants and in seeded swards (3). All segregating generations through the three cycles were subjected to selection for increased vigour in addition to selection for anthracnose resistance. In this paper we report on the dry matter production of F₅ lines selected from vigorous, anthracnose resistant F₄ families.

Materials and methods

From the 91 F₄ families of the third selection cycle, elite families were selected on the basis of anthracnose resistance, dry matter yield, leafiness and seed yield. Seed from the best plants of each selected family was bulked to provide sufficient seed for small sward trials of 42 F₅ lines. Replicated plots of the 42 lines were compared with the Seca and Siran cultivars at Southedge and Lansdown in north Queensland and Samford and Narayen in south Queensland. Scarified seed was broadcast at 4 kg/ha on cultivated seed beds in plots of 5m x 4m with 4 replications. The plots were inspected regularly for symptoms of anthracnose disease and rated for leaf disease on a 0(no disease) - 9 (>95% leaf disease) scale when disease was present. Dry matter yields were measured in the second and third years of the trials from one or two harvests per year at each site. Two quadrats, 1m x 0.5 m, were cut from each plot at 10 cm height, the herbage sorted into stylo and other species, and dry weights determined.

Results and discussion

Establishment was good at Samford, variable at Southedge, moderate at Lansdown and poor at Narayen. Slight disease only was recorded at Southedge and Lansdown with no significant difference between lines (Data not presented). Weather over the three years at these two sites was conducive to anthracnose epidemics as evidenced by the occurrence of severe disease in adjacent plots of the susceptible cultivar Fitzroy. No disease was observed at Narayen and Samford. Data on disease reactions of recurrent selection lines in Brazil (2) indicates that lines with high disease resistance in the Southedge breeding plots show moderate to high resistance to high disease pressure in Brazil.

Table 1. Total stylo dry matter yields (kg/ha) at four sites in Queensland

Line/Cultivar	North	South	?
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?	Southedge	Lansdown	Narayen	Samford	Total
96	13790	3350	900	8800	26840
16	11580	2450	1420	8820	24270
93	15210	1690	1000	6300	24200
86	12670	1170	1170	5580	20590
97	10580	1670	820	7430	20500
Seca	7290	1900	1500	9550	20240
Siran	10580	1130	890	7460	20060
LSD (P=0.05)	2878	1447	555	2223	?

Over the second and third years of the trials there were 4 harvests at Southedge, 3 at Samford, 2 at Narayen and 1 (in the third year) at Lansdown. Total stylo yields for these harvests are presented in Table 1 for the five best-performing lines and the Seca and Siran cultivars at the four sites. Significant differences in total stylo yields were recorded at each site. The bred lines were generally comparable in yield to the cultivars and were relatively better performers at Southedge and Lansdown, the two northern sites. At Southedge, the highest yielding site, lines 93 and 96 were significantly higher yielding ($P<0.05$) than Siran which itself was higher yielding than Seca. At Lansdown line 96 was the only line significantly higher yielding ($P<0.05$) than Seca and Siran. At Narayen lines 96 and 97 were significantly lower yielding ($P<0.05$) than Seca (as was Siran), and at Samford lines 86 and 93 were significantly lower yielding ($P<0.05$) than Seca.

Overall, the data at the four sites confirm the success of the selection program in improving yield. All five of the best performing bred lines produced total stylo yields across the four sites equal to or greater than the c. 20,000kg/ha produced by the Seca and Siran cultivars. Hall *et al.* (2) showed that five of the lines with partial resistance that we used as parents in this recurrent selection program produced only 22-66% of the total yield of Seca in 4 years of trials over 5 environments.

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References

1. Cameron, D.F., Boland, R.A., Chakraborty, S., Jamieson, B. and Irwin, J.A.G. 1993. Proc. XVII Int. Grassl. Cong. pp. 2137-2138.
2. Cameron, D.F., Charchar, M.J., Fernandes, C.D., Kelemu, S. and Chakraborty, S. 1997. Trop. Grassl. (in press).

3. Hall, T.J., Edey, L.A., Middleton, C.H., Messer, W.B. and Walker, R.W. 1995. *Trop. Grassl.* **29**, 169-176.