Assessing the hydrogen cyanide potential of forage sorghum

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Interest in developing cultivars of forage sorghum with low hydrogen cyanide potential (HCNp) is increasing. We have re-examined the possibility of using the HCNp of the youngest fully open leaf (YFOL) to predict HCNp of entire sorghum plants and to rank breeders' lines (1). The method we use to determine HCNp relies on an enzyme to release HCN from the glucoside in the tissue. Preliminary studies had indicated that fresh tissue of all common forage sorghums contains sufficient endogenous enzyme to ensure complete release of HCN, e.g., mean HCNp of 9 registered cultivars and 8 breeders' lines was 355ppm, (SEM 140) without added enzyme, and 351 (141) with 1 mg 8-glucosidase added/1 g fresh sample. We have repeated this comparison and present the data below from which we draw the opposite conclusion.

Methods

Three replicates of 7 forage sorghums were grown under irrigation at Tamworth, NSW and whole plants were sampled twice. Five randomly selected plants were divided into leaves and stem + sheath. The YFOLs, leaves and stems were subsampled. HCNp was determined by a picrate paper method using 1 mg 3- glucosidase/1 g chopped fresh tissue. In a second study, whole plant-HCNp was determined on these and 14 other forage sorghums using 0 or 1 mg 8- glucosidase/1 g tissue.

Results and discussion

The mean HCNp (ppm of DM) of YFOL, all leaves, and whole plants and the variance accounted for by regressing whole plant on YFOL HCNp are:

Line/ cultivar	YFOL (X)	Leaf (Y1)	Whole plant (Y2)	R^2 (Y1 on X)	R^2 (Y2 on X)
#081	148	141	134	38.2	46.2
#106	130	146	159	75.9	72.3
Sudax 6+	226	212	218	62.1	61.4
Trudan	208	223	190	50.1	38.3
Zulu	289	316	317	58.9	61.7
Jumbo	325	399	408	42.5	47.7
Magic	579	591	596	6.0	12.7
LSD(05)	62	48	44		

The slopes of both sets of regressions differed significantly between cultivars (P>.001)and had very high RSDs. We conclude that YFOL HCNp cannot be used reliably to predict leaf or whole plant HCNp although, with caution, it may be used to broadly rank cultivars.

In the second study, mean HCNp without added enzyme was 89 ppm, and with enzyme, 132 (SED 8). Interactions between enzyme and cultivar or sampling were not significant on angular or logit transformed data. A similar effect was subsequently obtained with 7-day seedlings. We cannot explain the discrepancy but the use of an exogenous enzyme is strongly recommended.

1. Benson, J.A., Gray, E. and Fribourg, H.A. 1969. Agron. *J.* 61 223-4.