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Presenter Information

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Selection for low oxalic acid content on three *Setaria sphacelata* segregating populations

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Key words: *Setaria sphacelata* segregating populations, oxalic acid content, plant breeding

Introduction *Setaria sphacelata* is a cross-pollinated forage grass species, mostly used in Brazilian pastures with poorly drained soils. Its best known cultivars (Nandi, Narok and Kazungula) reveal different flowering cycles as well as variable morpho-agronomic, forage and seed traits (Hacker, 1991; Jank *et al.*, 2007). Though presenting good nutritive values, all of them cause nutritional problems to animals, mostly due to the presence of high oxalic acid contents in the forage (Schenk *et al.*, 1982). The main aim of this research work has been to identify low oxalic acid individuals in three sub-populations (derived from the cultivars above cited) and try to correlate chosen agronomic (plant height, tiller number and flowering cycle) and seed traits (overall seed yield, seed physical purity and number of pure seeds/gram) to the desired character. In case of any success, the development of new low-oxalic acid cultivars would become faster and easier.

Materials and methods Three *Setaria sphacelata* cultivars (Nandi, Narok and Kazungula) were placed in a poly-cross plot in the field and allowed to freely intercross, in the growing season 2005/2006. At the seed harvesting time, the best forage producer female plants of each cultivar were identified, seed samples picked up and taken to the lab to be scored for three seed parameters (overall seed yield, seed physical purity and number of pure seeds/gram). In the next growing season (2006/2007), seeds of the selected female plants were mixed, giving rise to three sub-populations, which were sown in the field in isolated plots. Three agronomic traits were scored (plant height, tiller number and flowering cycle), leaf and seed samples picked up from all individuals, in each sub-population and analyzed for oxalic acid content and the above cited seed traits, respectively. Knowing that forage samples with oxalic acid contents below 4.0% do not cause any nutritional problem, low and high oxalic acid genotypes were identified and selected in each sub-population, based on mean standard deviations. Finally, linear correlations were estimated among agronomic/seed traits and oxalic acid contents, in selected and unselected sub-populations.

Results and discussion Sub-populations have shown marked differences as to their average oxalic acid contents (OAC) as well as to the frequencies of selected individuals (OAC ≤ 4.0) (Table 1). On the other hand, there has been no significant linear correlations either among agronomic traits or among seed parameters and OAC. Low OAC individuals appear to occur at random in any sub-populations (Table 2). The best option in this case, is the inter-crossing of selected genotypes, for several generations, hopefully expecting a significant increase in frequency of the desired character.

Table 1 Average oxalic acid contents and frequencies of selected individuals observed in three segregating sub-population of *Setaria sphacelata*.

Segregating sub-population	Average oxalic acid content (OAC)	Frequency(%) of selected individuals (OAC ≤ 4.0)
Nandi (unselected)	4.97	12.8
(selected)	3.33	—
Narok (unselected)	6.45	0.6
(selected)	5.31	—
Kazungula(unselected)	8.23	0.0
(selected)	6.34	—

Table 2 Linear correlations among oxalic acid levels, agronomic traits and seed parameters in segregating sub-populations of *Setaria sphacelata*.

Segregating sub-populations	Oxalic acid status	Agronomic traits			Seed parameters		
		PH	TN	FC	OSP	SPP	NS/g
Nandi	Unselected	0.20	0.15	0.07	0.31	0.06	-0.29
	Selected(+)	0.14	0.18	0.12	-0.23	-0.19	-0.17
	Selected(-)	0.09	0.16	0.10	0.02	0.23	-0.20
Narok	Unselected	0.18	0.12	0.11	0.23	0.18	-0.12
	Selected(+)	0.23	0.20	0.17	-0.17	-0.24	0.32
	Selected(-)	0.20	0.22	0.15	-0.07	0.15	-0.14
Kazungula	Unselected	0.15	0.20	0.08	0.30	0.07	0.16
	Selected(+)	0.12	0.18	0.10	0.02	0.02	-0.18
	Selected(-)	0.10	0.15	0.13	0.09	0.09	-0.04

Obs: PH=Plant height; TN=Tiller number; FC=Flowering cycle; OSP=Overall seed production; SPP=Seed physical purity; NS/g=Number of seeds/g.

Conclusions Selection of new low oxalic acid cultivars is highly dependent on the presence of higher frequencies of individuals, in any population, carrying the desired characters.

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