Selection for Low Oxalic Acid Content on Three *Setarias phacelata* 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	Agronomic traits			Seed parameters		
	status	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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