

Intraspecific Differentiation in *Sporobolus diander* Beauv : Variation in Free Amino Acid Composition within a Population

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Variation in free amino acid composition has been considered to be associated with genetic and adaptational variation within a population (Choudhri & Joseph 1986). Salt stress decreases synthesis of protein and steps up their degradation through proteolysis, resulting in an increase in the level of free amino acids and their derivatives in plants (Flower *et al.* 1977, Storey & Wyn Jones 1975, Choudhri & Joseph 1986).

Sporobolus diander Beauv., a perennial graminoid, in the Indo-Gangetic plains, was studied to evaluate the intraspecific differences, if any in *S. diander* on the basis of variation in free

amino acids within a population of normal and saline-sodic habitats.

Ripe seeds of *S. diander* were collected from populations occurring on normal and saline sodic habitats. The populations were raised in pot-soil culture (earthen pots, volume 5 m³) also reciprocally (in three replicates), on normal sandy loam soil (60.48% sand, 24.22% silt and 15.30% clay) with field capacity 21.25%, pH 7.5, ECe 2.00 dSm⁻¹ at 25⁰C, organic matter 0.46% and total N 0.08% and saline sodic sandy loam soil (58.5% sand, 26.21% silt and 16.36% clay) with field capacity 17.12%, pH 8.5- 10.5, ECe 4.02-7.25 dSm⁻¹ at 25⁰C,

Table 1 Free amino acid composition ($\mu\text{g g}^{-1}$ fresh weight) of normal population of *S. diander* grown on normal and saline-sodic soils.

Amino acids	Normal population grown on normal soil			Normal population grown on saline-sodic soil		
	Vegetative stage	Flowering stage	Post-flowering stage	Vegetative stage	Flowering stage	Post-flowering stage
Alanine	7.60±0.05	24.65±0.05	13.95±0.05	5.60±0.04	15.76±0.06	12.20±0.07
Arginine	3.85±0.03	12.06±0.06	7.80±0.04	9.50±0.05	21.50±0.10	12.20±0.08
Asparagine	18.65±0.07	26.23±0.11	16.57±0.07	30.46±0.12	46.34±0.14	27.60±0.12
Aspartic acid	10.26±0.06	8.38±0.06	8.95±0.05	6.70±0.03	3.00±0.02	4.52±0.02
Glutamine	15.35±0.08	10.64±0.05	6.50±0.03	9.74±0.04	5.26±0.03	5.26±0.04
Glutamic acid	13.30±0.05	15.50±0.07	11.22±0.04	7.12±0.04	3.65±0.03	1.50±0.01
Glycine	9.10±0.04	13.65±0.05	13.65±0.04	16.90±0.10	23.05±0.10	11.28±0.05
Histidine	2.57±0.02	5.25±0.03	2.65±0.01	6.30±0.03	13.15±0.07	7.10±0.04
Isoleucine	5.67±0.03	14.15±0.04	12.35±0.05	8.67±0.06	21.00±0.10	10.32±0.04
Leucine	6.76±0.03	11.00±0.04	16.56±0.06	3.40±0.02	6.00±0.04	13.00±0.08
Lysine	5.86±0.02	10.25±0.05	7.62±0.03	3.65±0.03	19.26±0.08	10.30±0.06
Phenylalanine	6.92±0.04	9.36±0.06	4.27±0.03	2.35±0.01	5.00±0.03	2.20±0.02
Proline	6.50±0.05	10.52±0.06	16.67±0.08	36.00±0.19	46.60±0.22	65.00±0.26
Serine	5.45±0.03	8.30±0.03	4.65±0.03	22.10±0.08	30.00±0.12	17.00±0.10
Threonine	4.90±0.02	6.74±0.04	4.90±0.02	16.00±0.07	26.00±0.10	12.40±0.08

± Standard deviation

Table 2 Free amino acid composition ($\mu\text{g g}^{-1}$ fresh wt.) of saline-sodic population of *S. diander* grown on normal and saline-sodic soils

Amino acids	Saline-sodic population grown on normal soil			Saline-sodic population grown on saline-sodic soil		
	Vegetative stage	Flowering stage	Post-flowering stage	Vegetative stage	Flowering stage	Post-flowering stage
Alanine	2.12±0.07	6.50±0.05	3.25±0.04	4.35±0.05	13.75±0.07	11.50±0.05
Arginine	5.00±0.10	17.62±0.18	8.00±0.10	9.20±0.04	19.30±0.08	10.25±0.05
Asparagine	13.40±0.18	16.52±0.12	10.25±0.10	15.65±0.07	18.50±0.06	12.10±0.06
Aspartic acid	6.85±0.08	3.35±0.05	4.60±0.03	7.10±0.05	3.36±0.03	4.50±0.03
Glutamine	23.20±0.20	18.60±0.20	13.00±0.11	20.00±0.14	16.20±0.07	8.65±0.04
Glutamic acid	16.00±0.20	10.00±0.08	17.20±0.15	3.20±0.03	1.20±0.01	—
Glycine	6.35±0.05	9.00±0.07	4.60±0.05	15.00±0.06	26.00±0.16	9.20±0.05
Histidine	11.50±0.12	20.00±0.21	14.50±0.10	7.30±0.04	15.00±0.10	7.10±0.03
Isoleucine	5.00±0.05	14.33±0.13	13.50±0.08	8.00±0.04	20.50±0.10	13.25±0.05
Leucine	3.35±0.04	9.66±0.06	22.00±0.16	3.00±0.02	4.67±0.03	17.25±0.07
Lysine	2.65±0.04	6.80±0.06	5.10±0.04	5.60±0.04	15.00±0.08	10.30±0.06
Phenylalanine	1.10±0.03	1.90±0.02	—	1.85±0.02	3.56±0.02	—
Proline	12.16±0.14	18.00±0.10	27.20±0.14	32.00±0.15	65.15±0.25	80.04±0.26
Serine	16.50±0.10	30.50±0.22	18.00±0.12	14.00±0.10	25.60±0.09	16.50±0.10
Threonine	13.60±0.08	14.80±0.16	5.20±0.03	15.50±0.05	21.00±0.10	8.00±0.04

± Standard deviation

organic matter 0.12-0.17%, total-N 0.013-0.03%, C/N ratio 2.28-7.50, ESP 38.36-54.00) in glass house, under controlled temperature ($35 \pm 3^{\circ}\text{C}/29 \pm 3^{\circ}\text{C}$ day/night). The leaves were separated at three different stages of plant growth viz., vegetative stage (at 20 days of age), flowering stage (at 60 days of age) and at post flowering stage (at 90 days of age) for determination of free amino acids. Free amino acids in the leaves were extracted following procedure of Bensen *et al.* (1950) and qualitative and quantitative determination following Randerath (1964). For quantitative estimation of free amino acids, spots were eluted in 80% ethanol and measured its adsorbence by spectronic colorimeter and calibrated with standard calibration curve of known amino acids.

Composition of free amino acid pool in the leaves of *S. diander* grown under normal and saline-sodic conditions varied both qualitatively and quantitatively at different stages of growth (Tables 1 & 2) which indicated that population occurring on diverse edaphic environments showed different levels of amino acids. Among all estimated free

amino acids in leaves of *S. diander*, salt stress induces a characteristic change in the levels of proline, glycine and amines viz., asparagine, and glutamine. This could be attributed either to the enhancement of proteolysis or to a failure of new protein synthesis under salt stress (Frote & Tucker 1978, Greenway & Munns 1980, Choudhri & Joseph 1986). Proline accumulation was relatively higher in saline sodic population (Table 2) than normal population (Table 1) at all stages. This is in conformity with Storey and Wyn Jones (1975), Greenway and Munns (1980) and Choudhri and Joseph (1986) who reported that amongst different amino acids which get accumulated to a greater or lesser degree in plants under salt stress, proline is the dominant one. Consistently higher proline accumulation in the saline-sodic population, even under reciprocal transplantation is indicative of the heritable nature of this adaptation. Differences in free amino acid composition in normal and saline sodic populations even under reciprocal transplantation, reflects the intraspecific differentiation in *S. diander*.

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