Indian J. Genet., **58**(2): 233-235 (1998)

Short Communication

A NEW SPECIES OF BARNYARD MILLET (ECHINOCHLOA CRUSGALLI SPP. UTILIS) FOUND SUITABLE FOR THE GARHWAL HILLS

B. B. BANDYOPADHYAY

G. B. Pant University of Agriculture and Technology, Hill Campus, Ranichauri, Tehri Garhwal, 249 199

(Received: December 26, 1996; accepted: May 5, 1998)

ABSTRACT

Heterogeneity of environments and exposure to low temperature at higher elevations in hills cause economic losses in both grain and fodder yield of barnyard millet (*Echinochloa frumentacea*) cultivars at Garhwal in U.P. Relative advantage to temperature acclimation were assessed among a set of germplasm lines collected from ICRISAT, India and U.A.S., Bangalore for grain and fodder production. Three lines showed superiority in grain and fodder production at higher altitudes (2100 m and above) over the local cultivars. Information received from ICRISAT revealed that these three lines belonged to a separate species *Echinochloa crusgalli* ssp. *utilis* and originated in Japan.

Key words: Barnyard millet, germplasm, grain and fodder yield, high altitude

Barnyard millet (*Echinochloa frumentacea*) is one of the most popular small millet crops and grown extensively in about 75 thousands hectares of land in the hills of U.P. It is being cultivated for both grain and fodder. The grain productivity of the crop at hills (12 q/ha) is, however, much below the national average. The prime factor associated with the low productivity of the crop is the heterogeneity of environments which change with variation in altitudes in the hills. The plants are poikilotherms, as a result the productivity of crop gradually decreases with exposure to low temperatures at higher elevations. It is presumed that low temperatures produce physiological starvation of the plant at high altitudes of hills. Relative change in photosynthesis and respiration rate and/or inhibition in translocatory pathways within the plant body may be responsible for producing this physiological starvation [1], which in turn reduces grain productivity of the crop at high hills. The influence of low temperature stress on grain filling period and grain yield of different crops have been reported by several researchers [2-6], however relevant information on barnyard millet is lacking. In the absence of wide genetic diversity among local cultivars the prospects of selection for acclimiation for cold temperature are

discouraging [7]. In order to explore the superior genetic potential for both grain and fodder yield a set of germplasm lines of barnyard millet cultivars were collected from ICRISAT, India and U.A.S., Bangalore in 1994 and a comparison to temperature acclimation [8] was made by growing the germplasm materials at an altitude of

Table 1. Quantitative estimates of different plant characters among 3 selected germplasm lines of barnyard millet and local cultivars

	PRB 9402	PRB 9403	PRB 9404	Local cultivar
Plant height in cm (with head)	104.50	214.66	192.80	180.33
Diameter of stem in cm (at central part)	2.77	3.55	4.12	2.85
Number of leaves per plant	8.33	11.00	7.75	10.00
Leaf length (cm)	32.30	55.14	59.66	37.62
Leaf breadth in cm (at middle part)	5.00	5.40	4.53	2.26
Flag leaf area (sq.cm)	66.33	93.81	151.21	104.63
Total leaf area (sq.cm.) of a single plant	638.12	1041.09	980.42	840.11
Length of leafsheath (cm)	9.80	14.27	15.79	14.35
Length of internodes (cm)	11.09	19.23	21.09	18.57
Days to 50% flowering (Days)	135.00	135.00	116.00	145.00
Length of head (cm)	11.33	18.50	21.80	21.33
Circumference of head (cm) at central part	9.90	15.33	10.20	5.80
Number of fingers on each head	32.66	44.66	41.00	36.66
Length of lower finger (cm)	3.60	5.26	5.05	3.00
Fresh weight (g) of leaves of a single plant	13.33	41.66	33.33	8.33
Dry weight (g) of leaves of single plant	3.33	16.66	10.00	1.66
Fresh weight (g) of stalk of a single plant	40.00	143.33	133.33	23.33
Dry weight (g) of stalk of a single plant	8.33	38.33	26.66	5.00
Seed size (number of seeds in 1 cm^2 of area)	31.53	25.13	24.53	31.80
Seed weight (100 grain weight in gm)	0.30	0.48	0.36	0.30
Grain yield (q/ha)	17.00	34.33	35.00	12.50
Fodder yield (t/ha)	1.70	12.33	8.73	7.40
Harvest index	0.50	0.21	0.30	0.14
Disease reaction (on grain smut and mold)	Nil	Nil	Nil	Black smut
Reaction to insects and pests	Nil	Nil	Nil	Nil
Resistance to lodging	Resistant	Resistant	Resistant	Susceptible
Days to harvest (days)	174.00	178.00	162.00	203.00

2100 m above mean sea level of hill at Ranichauri, Garhwal. The introductions and local cultivars were sown in the month of June in 1994. The result revealed that except for four germplasm lines from ICRISAT, all other lines failed to produce seeds in the cool climatic conditions at this elevation. These lines were identified as PRB 9401, PRB 9402, PRB 9403 and PRB 9404. Among these, PRB 9402, PRB 9403 and PRB 9404 were superior to PRB 9401 in grain and fodder production. These three lines were sown along with the local cultivars in the month of April, 1995 and 1996, the traditional season of barnyard millet cultivation at Garhwal hills as it promotes the vegetative growth and produces greater quantity of fodder yield for cattle feed. The other major advantage of April sowing is that it vacates in time the space for cultivation of wheat in rabi season. These lines started flowering by the end of July and harvesting was completed by October. The reaction to cold temperatures was measured by comparing the relative difference on morphological characters among these lines (Table 1). The three barnyard millet lines collected from ICRISAT were superior to the local cultivars in grain and fodder yield and reaction to diseases and insect pests. These selected lines also showed superiority in other characters like stem, leaves, inflorescence, seed size, seed weight etc. over the local cultivars. Information received from ICRISAT, India, revealed that these lines originated in Japan and belonged to a separate species *Echinochloa crusgalli* ssp *utilis*. These three exotic germplasm lines exhibited wide differences in morphological characters among themselves. It may be suggested that two entries viz. PRB 9403 and PRB 9404 are suitable for cultivation at higher elevation of hills (2100 m and above) of Garhwal, Himalayas under rainfed condition for both grain and fodder yield.

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