PEARL MILLET: A POTENTIAL CROP FOR THE SOUTHWEST

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Pearl millet (Pennisetum americanum (L.) K. Schum) is extensively grown in arid and semi-arid regions of the world as a dry land crop. It is known to be well adapted to conditions of light soil, high temperature, and high solar radiation, and can have very high rates of growth and water use efficiency under favorable rainfed conditions. Furthermore, once the millet crop has been established, it has a marked degree of drought tolerance.

Being one of the most drought tolerant crops, pearl millet has great economic potential for grain production in the semi-arid southwestern United States. Unfortunately, there is little research on drought resistance characteristics and water stress responses in millet. Much of the work that has been published concerns the use of pearl millet as a forage crop. The objective of this work is to study the response of pearl millet to water stress.

Material and Methods: Physiological responses to moisture stress of two millet parents and a hybrid were evaluated under field conditions at the Campus Agricultural Center, 1983. The entries were supplied by Dr. W. G. Stegmier, Kansas State University.

The crop was planted on April 26, 1983, and the field was flooded twice before the sprinkler line gradient was set parallel to the rows. There were 14 rows each side of the line with four replications. After the stress was imposed, physiological measurements were made at weekly intervals. Heights of the main stem were taken every other week throughout the growing season for two plants in each plot in the two rows near the line (high water level), at the middle two rows (medium water level), and at the last two rows away from the source (low water level).

Plant samples were taken three times each month to measure the leaf area per plant. The specific leaf area (cm^2 leaf area per gram dry leaf weight) and the fraction of the dry weight composed of leaves were determined for a representative plant in each sample. The leaf area of the sample was calculated as the product of the sample dry leaf weight and the specific leaf area. At the end of the growing season, yield and yield components were evaluated.

Results and Discussions: There is no significant difference between entries for the height, but there is a significant difference between water levels. Water stress reduced the height 56 percent, 62

percent, 82 percent for the female, male and hybrid, respectively (Table 1). The hybrid had the highest leaf area at high water level, and at low water level early in the season, but the male exceeded the hybrid later in the season (Fig. 1).

There is no significant difference between entries or water levels for the number of leaves in main stem or number of tillers (Table 2). However, there is a significant difference between water levels for number of productive tillers, head exertion, number of dead leaves per plant, length of head, number of seeds per head, and grain size (Table 2). Stress reduced most of these parameters, but the number of dead leaves per plant was increased by stress.

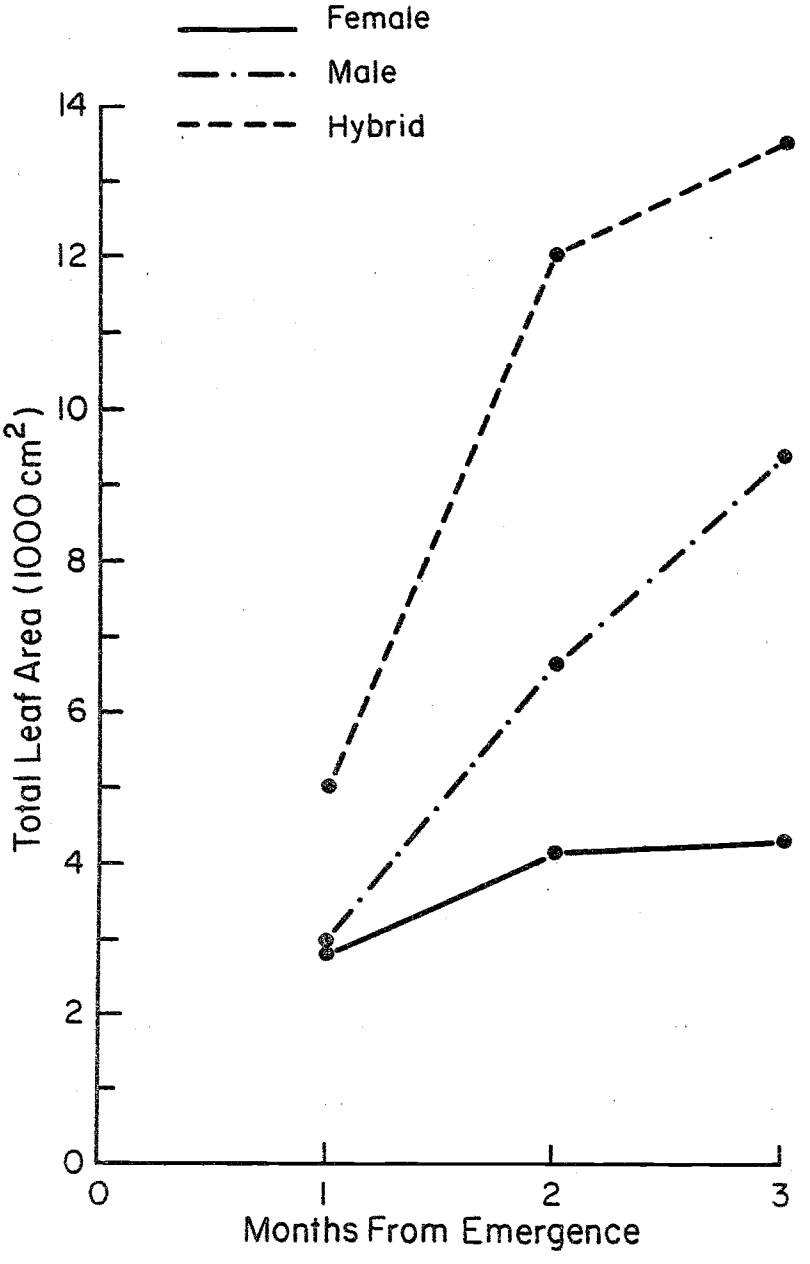

Fig. 1. Total leaf area of 3 millet entries at high water level of the sprinkler gradient line in 1983.

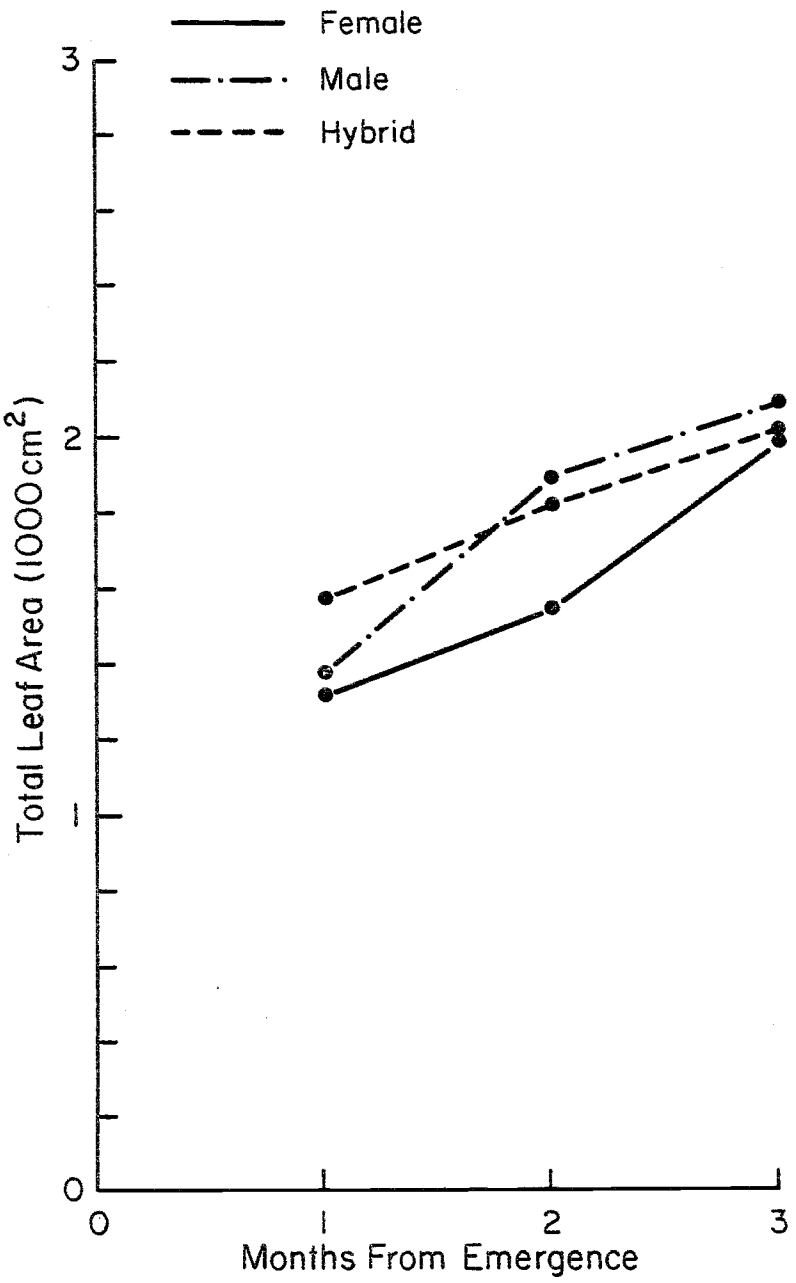

Fig. 2. Total leaf area of 3 millet entries at low water level of the sprinkler gradient line in 1983.

Table 1. Height of main stem to flag leaf collar for 3 millet entries grown under sprinkler gradient line during 1983 and 1984.

Entries	1983 Height (cm)		
	Water levels		
	High	Medium	Low
Female 81-1014	51.27a*	34.34a	22.47a*
Male Senegal Bulk	55.67a*	40.76a	20.85a*
Hybrid 81-1014 x Senegal Bulk	58.01a*	36.44a	21.56a*

Means followed by the same letter within each column are not significantly different at the 5% level according to the SNK Method.

*Treatments are significantly different at the 5% level according to the SNK Method.

Table 2. Yield and yield components for 3 millet entries grown under sprinkler gradient line in 1983.

Entries	Water treatment	Number of leaves in main stem	Number of dead leaves per plant	Number of tillers per plant	Number of productive tillers per plant	Head exersion (cm)	Length of head (cm)	Number of seeds per head	Number of seeds per plant	Size of grain (gm 1000 seeds)
Female 81-1014	High	10.13a	4.63a	7.13a	6.00a	3.89a	16.40a	338.13a	502.88a	11.06b
	Medium	11.00a	4.88b	5.50a	3.75a	1.44b	17.12a	109.38d	--------	6.26a
	Low	7.00a	9.00c	4.50a	0.25c	0.24c	8.11d	12.17e	12.17c	1.21a
Male Senegal bulk	High	12.00a	5.13a	6.38a	2.50b	1.64a	32.84c	1584.13c	2684.00b	9.48a
	Medium	11.62a	5.88b	6.25a	1.13b	0.84b	31.65c	291.63d	--------	7.87a
	Low	8.25a	7.25c	5.75a	0.08c	0.04c	10.18d	32.63e	33.13c	2.27a
Hybrid 81-1014 x Senegal bulk	High	11.50a	4.75a	7.13a	4.63ab	3.39a	27.91b	831.63b	2224.13b	12.18b
	Medium	11.75a	5.38b	6.50a	2.25ab	0.85b	23.96b	341.38d	--------	8.51a
	Low	7.00a	8.63c	6.50a	0.50c	0.20c	10.25d	113.75e	113.75c	9.73c

Means followed by the same letter within each column are not significantly different at the 5% level according to the SNK method.