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COMPARISON OF COPPICING ABILITY OF MEDIUM DURATION AND PERENNIAL PIGEONPEA (*CAJANUS CAJAN* (L.) MILLSP.) GENOTYPES ON ALFISOLS

Introduction. In the semiarid tropics, shortage of fodder is acute during the long dry season when livestock depend almost entirely on dry grasses and crop residues such as rice straw and sorghum and millet stalks, which are low in protein. In dry years moisture is available below the rooting depths (0.8 m) of crops, and only woody perennial species are capable of using this residual moisture. At the International Crops Research Institute for the Semi-Arid Tropics, (ICRISAT), India, a few perennial pigeonpea genotypes which have potential to produce 5-7 t/ha fresh fodder during the dry season (Daniel and Ong 1990) have been identified for use in agroforestry. Studies were restricted to Vertisols with a high water-holding capacity. Comparable studies on Alfisols, which occupy much of the semiarid tropics and have poor water-holding capacity, have not been reported. There is also a need to examine the productivity of a greater number of pigeonpea genotypes. Our objective was to identify genotypes from a wide range of origins which have high potentials for grain and biomass yields.

Materials and methods. Twelve medium- and long-duration pigeonpea genotypes originating from India (Table 1) were grown in a randomized block design with four replications for 14 months from July 1989, to August 1990, at ICRISAT Center, near Hyderabad (latitude 17°30' N, longitude 78°16' E, 549 m elevation). The spacing was 0.6 x 0.6 m in plots 2.4 x 10 m. Soils were shallow Alfisols. A basal fertilizer dose of 100 kg diammonium phosphate per hectare was applied at planting on 1 July 1989. A day later the field was sprayed with prometyrn pre-emergance herbicide at 9.75 kg/ha. Cultivation was done with a Tropicultor, and subsequent weedings were carried out manually. One month after emergence, plants were thinned to the desired population. Pests and diseases were monitored regularly, and the crop was sprayed twice during maturation to control pod borer, *Helicoverpa armigera*. Total annual rainfall (1,050 mm) in 1989 was 31 percent more than the long-term average (800 mm), and heavy storms occurred in July and September. There was only 17.6 mm rain between January and April 1990, but rainfall was 140.7 mm in May and 84.0 mm in June.

At grain harvest, February 1990, the crop was coppiced to 0.75 m height. The regrowth was harvested as fodder in July and the crop thinned to half the original population by removing alternate plants in the row. The experiment was terminated in early September when high mortality caused by paraquat herbicide application was observed.

Results and discussion. The data (Table 1) reveal considerable variation in the numbers of days taken to flower, ranging from 112 days for a medium-duration genotype, ICP 1-6, normally grown as an annual crop, to 140 days for a perennial genotype, ICPL 8398. The differences between the genotypes were also reflected in grain yields. Genotypes ICP 7118 and ICP 11298 produced the highest and lowest grain yields of 1,242 and 818 kg/ha, respectively. The overall mean was 1,024 kg/ha, and only five genotypes yielded more than the mean value.

In a previous study, Laxman Singh (pers. comm.) grew 11 of these genotypes (excluding ICP 1-6 and ICP 8094) under irrigation on a Vertisol to determine productivity. First year grain yields ranged from 1,990 kg/ha for ICPL 8398 to 1,191 kg/ha for ICP 11298. In the present study ICPL 8398 and ICP 11298 produced 58 percent and 69 percent respectively of their potential production. Surprisingly, ICP 7118 produced identical grain yield under rainfed and irrigated conditions in these two different experiments. The overall mean production of these 11 genotypes under rainfed conditions on Alfisols was 71 percent of potential production.

There was less variation in dry fodder production at grain harvest; the exceptions were ICP 1-6 and ICP 7118 which produced lower biomass than other genotypes. The highest fodder production was slightly less than 2 t/ha, excluding litterfall. Nevertheless, these figures were comparable with other results (Ong and Daniel 1990). The prolonged drought between January and April 1990, resulted in considerable pigeonpea mortality, ranging from 27.2 percent observed in ICP 7198 to 37.4 percent in ICP 11298. Laxman Singh (pers. comm.) observed 95 percent and 25 percent mortality in MA 95-2 and ICP 4769, respectively, at the end of the third year. However, in our study genotypes ICP 7118 and MA 95-2 produced the lowest and highest fodder yields of 1,098 and 1,785 kg/ha, respectively. Altogether seven genotypes produced significantly more fodder than genotype ICP 1-6. It is interesting to note that ICP 8094, widely used in agroforestry experiments at ICRISAT, was the second highest in fodder production (1,721 kg/ha) during the dry season. Fodder production at the final harvest was only 31-32 percent of the previous harvests, probably because of the damage caused by herbicide application.

At grain harvest, ICP 1-6 produced the least dry stem biomass of 1184 kg/ha, which was 56 percent of the highest amount (2,112 kg/ha) produced by ICP 10659. By July, all genotypes had produced relatively less stem biomass, ranging from 1,011 kg/ha (ICP 7118) to 1,644 kg/ha (MA 95-2). These low yields were probably caused by the early termination of rain in September 1989.

Table 1. Performance of medium-duration and perennial pigeonpea genotypes during the first 14 months at ICRISAT.

Genotype	Days to flower	Grain yield	Fodder 1	Fodder 2	Fodder 3*	Fodder Total	Stem 1	Stem 2	Stem 3	Stem Total	TDM	Plant mortality
		kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	-%-
Medium duration:												
ICP 1-6	112	1079	1487	1384	327	3197	1184	1274	1972	4430	8707	36.1
Perennial:												
ICPL 8398	140	1151	1721	1627	526	3874	1973	1498	2124	5595	10620	34.3
MA 95-2	131	1060	1703	1785	618	4106	1507	1644	1939	5091	10256	33.4
ICP 10659	138	939	1508	1526	381	3415	2112	1405	2479	5996	10350	29.3
ICP 11291	131	1138	1672	1693	894	4258	1503	1559	1245	4307	9404	31.3
ICP 7118	125	1242	1458	1098	172	2728	1352	1011	2282	4646	8616	33.1
ICP 8860	136	993	1650	1676	907	4233	1834	1543	1425	4802	10028	36.5
ICP 11298	133	818	1796	1691	626	4113	1891	1557	1935	5384	10315	37.4
ICP 7198	133	942	1742	1699	415	3857	1883	1565	2544	5992	10790	27.2
ICP 4769	120	976	1851	1496	349	3695	1965	1377	2499	5841	10513	33.5
MA 165	132	931	1553	1663	594	3811	1830	1532	2071	5432	10173	35.0
ICP 8094	133	1017	1773	1721	392	3886	1793	1584	2593	5971	10874	32.5
S.E.	1.9	55.4	88.2	84.3	94.4	180.3	127.4	77.6	208.8	291.6	349.5	2.77
Mean	121	1024	1659	1588	517	3764	1736	1462	2092	5291	10078	33.3
C.V.%	1.3	18.7	18.4	18.4	63.3	16.6	25.4	18.4	34.6	19.1	12.0	28.8

1, 2, and 3 refer to harvest on 10 February, pruning on 8 July, and final harvest on 5 September 1990, respectively. TDM = Total dry matter

The final stem harvest of fuelwood varied from 1,245 kg/ha for ICP 11291 to 2,593 kg/ha for ICP 8094. Only three genotypes (ICP 1-6, ICP 7118, and ICP 11291) produced less than 10 t/ha total dry matter (TDM), while ICP 8094 produced the highest TDM of 10,874 kg/ha. This production was only 27 percent of the best biomass yield (40 t/ha/yr) of ICP 12005 managed for green leaf manure production in Hawaii (Rosecrance et al. 1989).

Our results confirm that like the medium-duration, perennial pigeonpea genotypes can be grown at high plant population for grain in the first 7-8 months before they are coppiced. In the dry season all but three genotypes tested yielded significantly more dry fodder than the medium-duration genotype ICP 1-6.

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