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CHARACTERIZATION AND FODDER PRODUCTION POTENTIAL OF LOCAL COWPEA GERMPLASM

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ABSTRACT

In order to improve the acute scarcity of fresh fodder in the country, four local fodder legumes (cowpea) namely CP-1, CP-8, CP-31 and CP-801 were compared for plant characteristics and fresh fodder production potential at NWFP Agricultural University, Peshawar. CP-1 required minimum days to emergence (4.7 days), flowering (87 days) and pod formation (94.7 days) and the shortest plant length (235 cm). CP-8 produced the longest plants (382 cm) though statistically not different than CP-31 and CP-801. CP-8 gave the maximum grain yield (969lg.ha^{-1}); seeds pod^{-1} (11.3) and 100 seed weight (11.4g). The pods plant^{-1} and grain yield ha^{-1} produced by CP-1 were significantly lower than the other three germplasms. Generally the fresh fodder yield in all germplasms gradually increased from 14 ton ha^{-1}, 50 days after emergence to 64.2 ton ha^{-1},125 days after emergence. However, slight decline was observed with further interval of 25 days. CP-8 produced 30-40 percent more fresh fodder than the other germplasm, and accumulated 638 kg ha^{-1} fresh fodder compared with CP-1 (460 kg ha^{-1}). It is concluded that maximum fresh fodder can be obtained 125 days after emergence and CP-8 gave the maximum grains as well as fresh fodder yield among the germplasms tested.

Keywords: fodder production, cowpea, germplasm, plant characterization, yield.

INTRODUCTION

Although livestock is one of the major component of sustainable agriculture in NWFP particularly in mountainous areas, yet the scarcity of fodder is the major constraint in livestock production. The deficiency in nutrient supply has been estimated as 40.57 % in dry matter, 52.95 % in crude protein and 38.75 % in TDN, which will grow further due to increase in livestock population and diminishing trend in feed supply. The area occupied by fodder crops (6.84 %) supplies only 6.8 % of the feed resources of the province. Development in fodder and forages could be achieved through development in fodder research. Although Cowpea (*Vigna ungiculata* (L) Walp) is a minor component of sustainable agriculture, grown for its mature seeds, immature fruits and leaves and as feed for livestock, yet its potential as a quality fodder has not been explored. The present study aimed to characterize and determine the fodder production potential of local cowpea germplasm, while evaluating seventeen cowpea genotypes for forage production in potwar rainfed area. Bhatti *et al*. (1983) reported 27.25 t ha^{-1} fresh fodder and 5.7 t ha^{-1} DM for the top ranking genotype with the highest number of branches and leaves. Similarly Jatasra, (1983) testing twenty cowpea cultivars in semi arid tract of Havyana, India reported 5 t ha^{-1} fresh fodder and 1 t DM ha^{-1} for the two top varieties. Khan and Stoffella evaluated nine cultivars of cowpea in 1985 and ten in 1989 in Florida and Oklahoma, USA. Forage yields were high in Florida due to high nitrogen fertilization and seed yield and size was higher in Oklahoma. Generally 50 % of the seed came from main stem and 50 % form the branches with variable proportion in cultivars. Kohli (1990) reported that cultivar Kohinoor which is 55-70 cm tall, matures in 100-110 days and has 15-30 cm long pods and 15-20 bold seeds pod^{-1} produced 5-6 t DM ha^{-1}, higher than the other five cultivars for three consecutive years. Thawave *et al.* (1992) listed UPC-9021 on top of the 28 cowpea cultivars, regarding green fodder yield. Sharma and Singhania (1992) recommended seven cowpea germplasm producing 62.8-65g greed fodder plant^{-1} to be used for breeding high yielding forages. Amanullah and Hatam (2000) while testing three forage cowpea germplasm reported maximum fresh fodder yield of 57.8 t ha^{-1} 45 days after emergence and Naeem *et al.* (2000) obtained 5.3 to 9.1 t DM ha^{-1} as the maximum biological yield.

MATERIALS AND METHODS

Local germplasm of cowpea namely, CP-1, CP-8, CP-31 and CP-801 collected from Swat and Mansehra areas were planted at Livestock Research and Development Station, Surizai, Peshawar, Pakistan during first week of May, 2007. Seeds were planted at proper soil moisture condition in 3x10m plots in 1m apart rows at the seed rate of 30 kg ha^{-1}. Each treatment was replicated three times in randomized complete blocks. A starter doze of 25 kg N and 60 kg P_2O_5 ha^{-1}was applied at the time of sowing. Data was collected on ten plant samples randomly collected. Fresh fodder yield was determined by harvesting two rows two meter long at 25 days interval, 50, 75, 100, 125 and 150 days after emergence. Data was statistically analyzed and means were compared using least significant difference test.

RESULTS AND DISCUSSIONS

The plant and agronomic characteristics of the local cowpea germplasm are presented in Table-1. The differences in the number of days to emergence were

significant and ranged from 4.7 days in CP-1 to 6.7 days in CP-8. However the difference in the number of days to emergence between CP-31 (6 days) and CP-801 (5.7 days) were not significant. CP-1 and CP-8 took the minimum and maximum number of days to emergence, respectively. The differences in the number of days to flower initiation among the germplasm were not significant. CP-1 required the minimum number of days (87 days) as compared to CP-801 which took the maximum number (92.7 days). Similarly number of days to pod formation followed the same pattern and ranged from 94.7 days for CP-1 to 100 days for CP-8.1. It is interesting to note that CP-1 required the maximum number of days (171 days) to pod maturity and CP-801 required only 160 days for this purpose. CP-8 and CP-31 matured in 170 and 167 days, respectively. The data revealed that CP-1 initiated flowering and pod formation earlier than others and attained maturity later than the others. It means that the pod filling period was prolonged and the crop remained green for a longer period. This may be considered as a desirable character in selection for green fodder production. Similar behaviour was exhibited by CP-8 but with shorter pod filling period. The other two germplasm namely CP-31 and CP-801 came late into flowering and pod formation, but matured 4 to 11 days earlier than CP-1 and CP-8. It means that they had a short pod filling period as well as short green fodder production period.

All the germplasm under test were trailing type. CP-1 produced significantly the shortest branches (235cm) as compared to the rest of germplasm. There were no significant differences among the branch length of CP-31 (322 cm), CP-801 (364 cm) and CP-8 (382 cm). The number of pods plant^{-1} in CP-1 was significantly lower than CP-8, CP-31 and CP-801. On the average the pods plant^{-1} ranged from 16 to 23.3. CP-8 produced significantly the highest number of seeds pod^{-1} (11.3) as compared with CP-1 (10.3), CP-31 (10.0) and CP-801 (10 seeds pod^{-1}). The differences in 100 seed weight among the germplasm were significant. The largest seeds (15.7 g 100 seed) were produced by CP-1 and smallest (10.6 g 100 seeds) by CP-31. CP-8 and CP-801 produced seeds weighing 11.4 and 11.1 g 100 seeds, respectively.

Although the germplasm under test are not grown for grain purposes, yet the grain yield varied from 656.6 kg ha^{-1} in CP-1 to 969.3 kg ha^{-1} in CP-8. The grain yield produced by CP-8 CP-31 and CP-801 though statistically not different was significantly higher than CP-1.

The fresh fodder yield at different equal intervals of the four germplasms is presented in Table-2. The fresh fodder yield increased from 14 t ha^{-1} on the average to more than 64 t ha^{-1} when growing period extended from 50 to 125 days. However when the growing period was extended to 150 days, slight reduction in the green fodder yield was observed in all germplasm except CP-801 which slightly increased. The reduction in green fodder yield at this stage could be attributed to the diversion of nutrients towards pod formation and seed development. It is evident that maximum green fodder can be obtained 125 days after emergence. Further delay may reduce the green fodder yield. Considering 125 days as the optimum time of green fodder production, CP-8 produced 30-40 percent more green fodder than the three germplasm. On the average the green fodder yield accumulation day^{-1}ha^{-1}was the highest (638 kg) in CP-8 followed by CP-31 (488 kg), CP-801 (470 kg) and CP-1 (460 g). CP-8 maintained its superiority throughout the growth period, which could be attributed to its highest trial length (382 cm) and growing period (170 days). It also produced the highest grain yield (969.3 kg ha^{-1}), although statistically similar to CP-31 and CP-801. It is concluded that maximum green fodder yield is obtained 125 days after emergence and CP-8 gave the highest green fodder as well as grain yield among the present germplasms.

Table-1. Plant and agronomic characteristics of local cowpea germplasm.

Characteristics	Germplasm				LSD (5 %)
	CP-1	CP-8	CP-31	CP-801	
Days to emergence	4.7c	6.7a	6.0	5.7b	0.58
Days to flowering	87.0	91.7	88.7	92.7	NS
Days to pod formation	94.7	99.0	97.1	100	NS
Days to maturity	171a	170a	167ab	160b	7.7
Plant length (cm)	235b	382a	322a	364a	78.8
Pods plant^{-1}	16.0b	22.7a	23.3a	22.3a	2.5
100 Seeds weight (g)	15.7a	11.4b	10.6c	11.1bc	0.80
Seeds pod^{-1}	10.3b	11.3a	10.0b	10.0b	2.9
Grain yield (kg ha^{-1})	656.6b	969.3a	940.1	913.7a	202.4

Table-2. Fresh fodder yield (t ha^{-1}) of cowpea germplasm cut at different intervals.

Germplasm	Days after emergence				
	50	**75**	**100**	**125**	**150**
CP-1	12.8	37.5	53.0	57.5	55.3
CP-8	15.9	38.5	73.3	79.7	77.7
CP-31	13.0	31.8	59.3	61.0	59.7
CP-801	14.1	24.4	57.0	58.7	60.1
Mean	**14.0**	**33.1**	**60.0**	**64.2**	**63.2**
LSD 5 %	**NS**	**NS**	**NS**	**NS**	**NS**

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