International Journal of Forestry and Crop Improvement
Volume 6 | Issue 2 | December, 2015 | 90-95 | Visit us : www.researchjournal.co.in
e ISSN-2230-9411

RESEARCH ARTICLE

DOI: 10.15740/HAS/IJFCI/6.2/90-95

Fodder production potential of pearl millet cultivars under marginal environments of Gujarat

K.K. DHEDHI, V.V. ANSODARIYA, N.N. CHAUDHARI AND J.S. SORATHIYA

ABSTRACT : Field experiments were carried out at Pearl millet Research Station, Junagadh Agricultural University (JAU), Jamnagar and Grassland Research Station, JAU, Dhari during *Kharif* 2014, to know the performance of 17 cultivars of fodder pearl millet under marginal environments of Gujarat. Significant differences were observed among the cultivars for days to 50 per cent flowering, days to maturity, grain yield and green fodder yield while differences for plant height, plant population and dry fodder yield were non-significant. The locations differences were found significant for all the characters except days to 50 per cent flowering and days to maturity. The cultivars x locations differences were reflected non-significant for all the traits except plant height and plant population. Days to 50 per cent flowering ranged from 55 days (IP 20611) to 78 days (IP 14753). Days to maturity varied between 84 days (DFMH 30) to 100 days (IP 14294, IP 19415). The cultivar IP 19415 (294 cm) was the tallest cultivar, while, IP 14753 (223 cm) was the shortest cultivar. Grain yield was observed between 5.34 q/ha (IP 20577) to 16.68 q/ha (check PAC 981). Dry fodder yield ranged from 72 q/ha (IP 20611) to 131 q/ha (IP 10437). The cultivar IP 10151 (238 q/ha) produced the highest green fodder yield among all the cultivars followed by IP 20577 (236 q/ha) and IP 10437 (234 q/ha). Thus, these three cultivars *viz.*, IP 10151, IP 20577 and IP 10437 may be considered for general cultivation under marginal environments of Gujarat.

KEY WORDS : Pearl millet, Cultivar, Green fodder yield, Gujarat

HOW TO CITE THIS ARTICLE : Dhedhi, K.K., Ansodariya, V.V., Chaudhari, N.N. and Sorathiya, J.S. (2015). Fodder production potential of pearl millet cultivars under marginal environments of Gujarat. *Internat. J. Forestry & Crop Improv.*, **6** (2) : 90-95.

ARTICLE CHRONICAL : Received : *14.07.2015;* Revised : *03.11.2015;* Accepted : *17.11.2015*

INTRODUCTION

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is predominantly grown as the dual purpose crop, grain as well as fodder in marginal lands under erratic and poor rainfed conditions and is amazingly tolerant to adverse environmental conditions. Shashikala *et al*. (2013) mentioned that the green fodder of bajra is leafy, palatable and very nutritious feed stock for cattle ensuring good milk yield. Being any time forage, pearl millet, unlike sorghum, can be grazed, or cut and fed at any growth stage, as it has no HCN content. Pearl millet is excellent for producing silage, particularly in regions with dry spells during the rainy season. Pearl millet can produce higher silage yields with higher protein than sorghum. Its green fodder is a valuable feed for livestock. To meet the growing demand of green fodder for livestock, it is

MEMBERS OF RESEARCH FORUM

Address of the Correspondence : **K.K. DHEDHI,** Pearl Millet Research Station (J.A.U.) JAMNAGAR (GUJARAT) INDIA
Email: kkdhedhi@rediffmail.com

V.V. ANSODARIYA, Grassland Research Station (J.A.U.) DHARI (GUJARAT) INDIA

Address of the Coopted Authors : N.N. CHAUDHARI AND J.S. SORATHIYA, Pearl Millet Research Station (J.A.U.) JAMNAGAR (GUJARAT) INDIA

essential to develop high fodder yielding varieties of pearl millet. Being a C_4 species, it has tremendous potential for biomass production, most of which is accumulated in its vegetative parts (Appa, 1999). It is considered as a high quality forage crop in USA and Australia and is being experimented as a new forage crop in South America and Korea (Khairwal *et al*., 2007). The objective of the present study was therefore, to identify high green fodder yielding varieties of pearl millet under marginal environments of Gujarat, India.

EXPERIMENTAL METHODS

Two seed set of 17 cultivars of fodder pearl millet (Table 1) including two checks *viz.*, DFMH 30 and PAC 981 were supplied by ICRISAT, Patancheru, Hyderabad. Field experiments were conducted at Pearl millet Research Station, Junagadh Agricultural University, Jamnagar and Grassland Research Station, Junagadh Agricultural University, Dhari, during rainy season of 2014, to know the performance of fodder pearl millet cultivars under marginal environments of Gujarat (India). The design of the trail was Randomization Complete Block Design with two replications at both the locations. Each plot consisted of four rows of 4.0 m long and 60 cm apart in both locations. Middle two rows were considered for all the observations. Thus, the net plot size was 4.0 x 1.20m^2. The trial was planted on 24th July, 2014 and 25th July, 2014 at Jamnagar and Dhari centre, respectively. While, the trial was harvested on 31st October, 2014 and 13th November, 2014 at Jamnagar and Dhari centre, respectively. The crop was supplied with recommended dose of fertilizer 80-40-00 NPK kg per ha at both locations. Nitrogen was given in two splits, half as basal and the remaining half at 30 days after sowing. Observations on days to 50 per cent flowering, days to maturity, plant height (cm), plant population per plot, grain yield (kg/plot), dry stalk yield (kg/plot) and fresh stalk yield (kg/plot) were recorded. Days to 50 per cent flowering and days to maturity was recorded on plot basis. The plant height in centimeter was recorded from the base of the plant to the tip of the panicle at harvesting stage. Five randomly selected plants from each plot were used to record the plant height. The data of grain yield, dry stalk yield (dry fodder yield) and green stalk yield (green fodder yield) from net plot were recorded and computed as in q/ha. and plant population were converted into hectare basis. The data were statistically analyzed using analysis of variance technique and treatment means were compared by using least significant differences at 5 per cent probability level (Steel and Torrie, 1984).

EXPERIMENTAL RESULTS AND ANALYSIS

The results presented in Table 1 revealed that the pearl millet cultivars differed significantly for days to 50 per cent flowering, days to maturity, plant height, plant population, grain yield and green fodder yield at Jamnagar, and for days to 50 per cent flowering, days to maturity, grain yield and green fodder yield pooled over the locations. The cultivars differences were non-significant for dry fodder yield at Jamnagar and for all the characters at Dhari, whereas, it was non-significant for plant height, plant population and dry fodder yield pooled over locations. The locations differences were significant for all the characters except days to 50 per cent flowering and days to maturity. The cultivars x locations differences were significant for plant height and plant population and it was non-significant for days to 50 per cent flowering, days to maturity, grain yield, dry fodder yield and green fodder yield.

Days to 50 per cent flowering ranged from 52 days (DFMH 30) to 76 days (IP 10151, IP 14753) at Jamnagar, whereas, it was varied from 57 days (IP 20611) to 79 days (IP 14753) at Dhari. The genotype IP 20611 was the earliest flowered (55 days), while IP 14753 was the latest flowered (78 days) amongst all the cultivars under studied over the locations. The genotype IP 20611 manifested as the earliest flowered cultivar amongst all the cultivars under studied at Dhari and over the locations. Days to maturity varied from 81 days (check DFMH 30) to 98 days (IP 14294, IP 19415) at Jamnagar. IP 6193 and check DFMH 30 were the earliest maturing cultivars (86 days), while, the cultivars IP 14294 and IP 19415 were the lateness (102 days) amongst all the cultivars at Dhari. Days to maturity ranged from 84 days (check DFMH 30) to 100 days (IP 14294, IP 19415) pooled over locations. The check DFMH 30 was the earliest maturing cultivar, while, the cultivars IP 14294 and IP 19415 were the lateness maturing cultivars amongst all the cultivars at Jamnagar, Dhari and over locations. It is interesting to note that the late maturing cultivars were, in general, produced the high green fodder yield.

Table 1 : Mean of different parameters of fodder pearl millet cultivars at individual and pooled over locations

Sr. No.	Cultivar	Days to 50 % flowering			Days to maturity			Plant height (cm)			Plant population/ha			Grain yield (q/ha)			Dry fodder yield (q/ha)			Green fodder yield (q/ha)		
		J	D	P	J	D	P	J	D	P	J	D	P	J	D	P	J	D	P	J	D	P
1.	IP 10437	73	78	76	97	99	98	229	320	275	108333	77083	92708	13.02	2.78	7.90	163	99	131	313	155	234
2.	IP 14776	71	61	66	97	94	96	247	245	246	86458	83333	84896	9.74	4.85	7.30	115	66	91	265	133	199
3.	IP 20577	72	61	67	97	90	94	241	243	242	93750	86458	90104	7.45	3.23	5.34	124	85	105	325	147	236
4.	IP 10151	76	63	70	96	97	97	239	273	256	94792	72917	83855	8.33	3.60	5.97	144	87	116	323	152	238
5.	IP 14753	76	79	78	97	98	98	226	220	223	86458	93750	90104	10.26	3.02	6.64	94	112	103	223	134	179
6.	IP 14294	75	73	74	98	102	100	238	230	234	67708	88542	78125	9.69	7.51	8.60	119	97	108	244	160	202
7.	IP 20929	64	73	69	90	90	90	227	255	241	67708	78125	72917	6.67	5.05	5.86	100	105	103	229	162	196
8.	IP 5957	68	77	73	97	94	96	235	263	274	60417	73958	67188	9.32	4.79	7.06	81	81	81	191	130	161
9.	IP 3642	57	59	58	85	90	88	206	258	232	91667	70833	81250	7.92	4.48	6.20	118	99	109	237	173	205
10.	IP 20409	67	73	70	95	89	92	232	280	281	78125	82292	80209	10.57	3.13	6.85	119	100	110	263	163	213
11.	IP 19415	71	69	70	98	102	100	282	305	294	71875	76042	73959	11.62	4.39	8.01	88	93	91	224	142	183
12.	IP 17396	60	68	64	89	86	88	251	305	278	43750	72917	58334	6.20	5.56	5.88	63	94	79	141	155	148
13.	IP 20611	53	57	55	88	89	89	257	225	246	71875	94792	83334	11.82	7.63	9.73	82	62	72	193	110	152
14.	IP 11010	55	66	61	85	93	89	272	298	285	26042	81250	53646	4.58	7.51	6.05	91	65	78	116	112	114
15.	IP 6193	62	67	65	91	86	89	264	275	270	43750	85417	64584	14.06	7.50	10.78	94	86	90	234	148	191
16.	DFMH 30 (c)	52	62	57	81	86	84	256	218	237	63542	83333	73438	15.05	8.33	11.69	92	57	75	228	97	163
17.	PAC 981(c)	67	61	64	93	96	95	274	278	276	86458	85417	85938	17.34	16.01	16.68	89	74	82	206	131	169
Mean		66	67	67	93	93	93	252	264	258	73100	81556	77329	10.21	5.85	8.03	104	86	96	233	141	187
Cultivar. S.E. ±		0.95	5.83	3.31	0.64	5.74	2.67	11.44	20.86	17.06	10770	7165	11252	1.57	2.20	1.43	22.5	17.2	13.7	33.0	29.8	23.6
C. D. (P=0.05)		2.84	NS	9.41	1.92	NS	7.59	34.30	NS	NS	32290	NS	NS	4.70	NS	4.08	NS	NS	NS	99.0	NS	67.0
C. V. (%)		2.04	12.29	8.90	0.98	8.76	6.25	6.42	11.18	9.22	20.84	12.43	16.73	21.70	53.32	33.68	30.4	28.3	29.7	20.1	29.8	23.8
Loc. S.E. ±		-	-	1.01	-	-	0.99	-	-	4.08	-	-	2218	-	-	0.46	-	-	4.85	-	-	7.63
C. D. (P=0.05)		-	-	NS	-	-	NS	-	-	11.80	-	-	6417	-	-	1.33	-	-	14.0	-	-	22.1
Cult. x Loc., S. E. ±		-	-	4.18	-	-	4.09	-	-	16.82	-	-	9147	-	-	1.91	-	-	20.0	-	-	31.5
C.D. (P=0.05)		-	-	NS	-	-	NS	-	-	48.48	-	-	26361	-	-	NS	-	-	NS	-	-	NS

Where: J=Jamnagar centre, D=Dhari centre, P=Pooled data, NS=Non-significant, Cult.=Cultivar, Loc=Location

The highest plant height recorded in IP 5957 (285 cm) amongst all the genotypes followed by IP 20409 (282 cm) and IP 19415 (282 cm); while, the lowest plant height observed in IP 3642 (206 cm) at Jamnagar. The cultivar IP 10437 was the tallest (305 cm), while, the check DFMH 30 was the shortest (218 cm) amongst all the cultivars at Dhari. Plant height ranged from 223 cm (IP 14753) to 294 cm (IP 19415) pooled over the locations. The cultivar IP 19415 was the tallest at Jamnagar, Dhari and over locations, which was reflected the lateness in maturity amongst all the cultivars at Jamnagar, Dhari and pooled over locations. It was observed that the tall cultivar was produced high green as well as dry fodder yield. The maximum number of plant per hectare was recorded in IP 10437 (108333), while, the minimum number of plant per hectare was counted in IP 11010 (26042) at Jamnagar. The plant population varied from 70833 (IP 3642) to 94792 (IP 20611) at Dhari. The minimum and maximum number of plant per hectare was recorded in IP 11010 (53646) and in IP 10437 (92708), respectively, over locations.

The check PAC 981 produced the highest grain yield (17.34 q/ha) among all the cultivars followed by check DFMH 30 (15.05 q/ha) and IP 6193 (14.60 q/ha) at Jamnagar. The cultivar IP 11010 recorded the lowest grain yield (4.58 q/ha) at Jamnagar. The grain yield ranged from 2.78 q/ha (IP 10437) to 16.01 q/ha (check PAC 981) at Dhari. The check PAC 981 (16.68 q/ha) ranked top in grain yield among all the cultivars followed by check DFMH 30 (11.69 q/ha) and IP 6193 (10.78 q/ha) pooled over locations. The cultivars IP 20577 produced the lowest grain yield (5.34 q/ha) among all the cultivars pooled over locations. IP 10437 produced the maximum dry fodder yield (163 q/ha) among all the cultivars followed by IP 10151 (144 q/ha) and IP 20577 (124 q/ha) at Jamnagar. The cultivar IP 17396 produced the lowest grain yield (63 q/ha) at Jamnagar. Dry fodder yield ranged from 57 q/ha (check DFMH 30) to 112 q/ha (IP 14753) at Dhari. IP 10437 produced the highest dry fodder yield (131 q/ha) among all the cultivars followed by IP 10151 (116 q/ha) and IP 20409 (110 q/ha) over the locations. The cultivar IP 20611 produced the lowest dry fodder yield (72 q/ha) pooled over the locations.

IP 20577 produced the highest green fodder yield (325 q/ha) among all the cultivars followed by IP 10151 (323 q/ha) and IP 10437 (313 q/ha) at Jamnagar. Green fodder yield varied from 116 q/ha (IP 11010) to 325 q/ha (IP 20577) at Jamnagar. IP 3642 (173 q/ha) ranked top in green fodder yield among all the cultivars followed by IP 20409 (163 q/ha) and IP 20929 (162 q/ha) at Dhari. IP 10151 produced the maximum green fodder yield (238 q/ha) among all the cultivars followed by IP 20577 (236 q/ha) and IP 10437 (234 q/ha) pooled over the locations. IP 11010 produced the minimum green fodder yield (114 q/ha) among all the cultivars over the locations. The cultivars *viz*., IP 10151, IP 20577 and IP 10437 produced the high green fodder yield among all the cultivars at Jamnagar and over the locations. These three cultivars also produced high dry fodder yield at Jamnagar and over the locations. Eleven cultivars produced higher green fodder yield than the best check PAC 981 over the locations. Out of 11 cultivars, only one IP 10151 (238 q/ha) produced significantly higher green fodder yield than the best check PAC 981 (169 q/ha).

Rao *et al.* (1986) observed considerable variation for days to 50 per cent flowering and plant height among 260 cultivars of pearl millet. Majority of accessions flowered in 70 days and grew very tall. Byregowda (1990) depicted that fresh fodder yield varied from 15.7 to 22.2 t/ha among 13 pearl millet genotypes. Naeem *et al.* (1991) studied the performance of seven pearl millet varieties for green fodder yield. The variety C 47 (15.08 t/ha) produced the highest green fodder yield followed by Y 84 (13.58 t/ha) and ICMS 7704 (13.38 t/ha). Akmal *et al*. (1992) reported the fodder yield ranged from 12.50 (ICMV 87902) to 20.28 t/ha (ICMVF 84400) in their studied of nine varieties of pearl millet. Ugandi was the tallest variety with a plant height of 259 cm followed by ICMV 84108 (256 cm) and ICMS 7704 (252 cm). Naeem *et al*. (1993) evaluated the performance of seven varieties of pearl millet for grain and fodder yields. They reported that the fodder yield ranged from 12.76 (ICTP 8203) to 20.85 t/ha (MP 155). The cultivar Ugandi was the tallest having a plant height of 256 cm followed by ICMS 7703 (254 cm). Mohammad *et al.* (1993) evaluated six varieties of pearl millet and found that green fodder yield ranged between 28.47 to 42.01 t/ha. Mohammad *et al.* (1994) noted that MB 87 and Synthetic 1/79 proved superior to all the other cultivars in respect to fodder yield, plant height and leaf area in pearl millet. Naeem *et al.* (1994) in another study observed the performance of 10 varieties of pearl millet. They narrated that fodder yield varied from 8.89 (B-18) to 17.11 t/ha (PARC-MS-1). Plant height ranged from 232 (IC 8206) to 267 cm (New Composite, C-47 and Y-72). Naeem *et al.* (2002)

evaluated nine varieties of pearl millet for green fodder yield. They noted significant differences for plant height. Green fodder yield ranged from 73.15 to 82.23 t/ha. Plant height varied from 148.11 to 233.78 cm. Naeem *et al*. (2003) studied another nine varieties of pearl millet for green fodder yield and its component traits. They observed that the variety Tandojam Millet selection (76 t/ha) ranked top in green fodder yield followed by NARC-1 (74.62 t/ha) and Tift-383 (73.87 t/ha). Plant height ranged from 151.39 (Check MB-87) to 232.00 cm (Tandojam Millet selection). Khan *et al*. (2004) evaluated six fodder pearl millet cultivars. They noted that the check variety MB-87 was the shortest (139.89 cm), while the BS-2000 was the tallest (207.33 cm). The maximum (56.66 t/ha) and minimum (45.18 t/ha) green fodder yield was recorded from W. Raj and MB-87, respectively. Chohan *et al*. (2006) study the performance of six varieties of pearl millet for green fodder yield at Faisalabad. They observed that plant height ranged from 248.66 (check 18BY) to 291.42 cm (AF-POP). Green fodder yield was varied from 60.00 (N-6) to 80.55 t/ha (AF-POP). Genotypic variations in forage pearl millet were reported by Pathan and Bhilare (2009). Hassan *et al*. (2014) evaluated nine pearl millet varieties at Faisalabad, Pakistan. They noted that the variety 86-M-52 proved better for getting higher forage yield followed by Sargodha Bajra-2011 than all other varieties.

Conclusion :

The study revealed significant variation among the pearl millet genotypes for days to 50 per cent flowering, days to maturity, grain yield and green fodder yield. The pearl millet genotypes IP 10151, IP 20577 and IP 10437 exhibited high green fodder yield, dry fodder yield and plant height. Thus, these three cultivars may be considered for general cultivation under marginal environments of Gujarat.

REFERENCES

Akmal, M., Naeem, M., Nasim, S. and Shakoor, A. (1992). Performance of different pearl millet cultivars under rainfed conditions. *J. Agric. Res.*, **30**: 53-58.

Appa, Rao S. (1999). *Genetic resources.* Pages 49-81 In : *Pearl Millet Breeding* (Khaiwal IS, Rai KN, Andrews DJ and Harinarayana G Eds.). Oxford & IBH Publishing Co. Pvt. Ltd., NEW DELHI, INDIA.

Byregowda, M. (1990). Performance of fodder bajra cultivars under rainfed conditions. *Curr. Res. Univ. Agric. Sci.*, Bangalore, **19**: 128-129.

Chohan, M.S.M., Naeem, M., Khan, A.H. and Kainth, R.A. (2006). Performance of pearl millet (*Pennisetum americanum* L.) varieties for green fodder yield. *J. Agric. Res.*, **44**(1): 23-27.

Hassan, M. U., Ahmad, A. H., Zamir, S. I., Haq, I., Khalid, F., Rasool, T. and Hussain, A. (2014). Growth, yield and quality performance of pearl millet (*Pennisetum americanum* L.) varieties under Faisalabad conditions, Pakistan. *American J. Plant Sci.*, **5**: 2215-2223.

Khairwal, I.S., Yadav, S.K., Rai, K.N., Upadhyaya, H.D., Kachhawa, D., Nirwan, B., Bhattacharjee, R., Rajpurohit, B.S., Dangaria, C.J. and Srikant (2007). Evaluation and identification of promising pearl millet germplasm for grain and fodder traits. *SAT J.*, **5**(1): 1-6.

Khan, A.H., Naeem, M., Chohan, S.M. and Kainth, R.A. (2004). Fodder yield potential of pearl millet cultivars under irrigated conditions. *Internat. J. Agric. Biol.*, **6**(4): 749-750.

Mohammad, D., Hussian, A., Khan, S. and Bhatti, M.B. (1993). Site variation in forage yield, dry matter, crude protein and crude fibre content of pearl millet cultivars. *Pakistan J. Sci. Indian Res.*, **36**: 261-263.

Mohammad, D., Hussian, A., Khan, S. and Bhatti, M.B. (1994). Forage yield and quality potential of pearl millet cultivars under rainfed conditions. *J. Agric. Res.*, **32**: 383-388.

Naeem, M., Chohan, M.S.M., Khan, A.H. and Din, S.S. (2003). Study of green fodder yield potential and its components of different pearl millet (*Pennisetum americanum*) varieties under irrigated conditions of Faisalabad. *Asian J. Plant Sci.*, **2**(1): 74-76.

Naeem, M., Chohan, M.S.M., Khan, A.H. and Salahuddin, S. (2002). Evaluation of different varieties of pearl millet for green fodder yield potential. *Asian J. Plant Sci.*, **1**: 326-327.

Naeem, M., Nasim, S. and Shakoor, A. (1993). Performance of new pearl millet varieties under rainfed conditions. *J. Agric. Res.*, **31**: 295-298.

Naeem, M., Nasim, S., Shakoor, A. and Akmal, M. (1991). Performance of pearl millet cultivars under rainfed conditions. *J. Agric. Res.*, **29**: 191-196.

Naeem, M., Qadir, G., Hussain, M., Nasim, S. and Shakoor, A. (1994). Yield potential of pearl millet cultivars under rainfed conditions of Pakistan. *FLCG News letter*., **29** : 2-3.

Pathan, S.H. and Bhilare, R.L. (2009). Growth parameters and seed yield of forage pearl millet varieties as influenced by nitrogen levels. *J. Maharashtra Agric. Univ.,* **34**(1): 101-102.

Rao, S.A., Mengesh, M.H., Sibale, P.K. and Reddy, C.R. (1986). Collection and evaluation of pearl millet germplasm from Malavi. *Econ. Bot.,* **40**: 27-37.

Shashikala, T., Rai, K. N., Balaji Naik, R., Shanti, M., Chandrika, V. and Loka Reddy, K. (2013). Fodder potential of multicut pearl millet genotypes during summer season. *Internat. J. Bio-resource & Stress Mgmt.*, **4**(4) : 628 - 630.

Steel, R.G.D. and Torrie, J.H. (1984). *Principles and procedures of statistics*. A Biometrical *Approach,* pp: 172-178. Mc Graw Hill Book Co. Inc., SINGAPORE.