Received: 02 Mar 2022 | Revised: 17 Sep 2022 | Accepted: 21 Sep 2022

Electronic Journal of Plant Breeding

Research Article

Dapoli 3: A high yielding variety of finger millet

S. S. Desai*, V. V. Dalvi, R. L. Kunkerkar, R. T. Gawade and U. B. Pethe

Department of Agricultural Botany, College of Agriculture, Dr.B.S.K.K.V.Dapoli 4157125(M.S) India
***E-Mail:** suchitradesai77@gmail.com

Abstract
A high yielding mid-late duration culture DPLN 2 was developed at the Department of Agriculture Botany, College of Agriculture, Dapoli and released as Dapoli 3 during 2020 at the state level and notified by the ministry of Agriculture and farmer welfare, Department of Agriculture and farmer welfare with notification number CG-DL-E-04012022-232406 extraordinary part-II-section 3-subsection (ii) dated 24th Dec. 2021. Dapoli 3 has developed through pure line selection from local germplasm. Out of twenty one culture, the culture DPLN 2 was found promising in respect of yield over check Dapoli 1, Dapoli 2 and PR 202 in station, multilocation and adaptive research trials. It yields an average of 2405 kg/ha of grain under rainfed conditions. Besides high yield culture has semi compact earhead, uniform maturity, non-lodging, continuous spikelets, non-shattering with moderate protein (7.52 %) and calcium (264 ppm) content. The weight of earhead of culture is 8.9 g as compared to 7.2 g of Dapoli 1. The culture recorded a grain yield of 2405 kg/ha which was 26.64 per cent increase over the check Dapoli 1 (1899 kg/ha) in station trails. It recorded a grain yield of 2014 kg/ha which was 13.78 per cent increase over the check Dapoli 1 (1770 kg/ ha) in multilocation trials conducted during *Kharif* 2016 and 2017 at 13 locations whereas the mean grain yield recorded by culture DPLN 2 (was 1518 kg/ha) which was 12.19 per cent increase over check Dapoli 1(1353 kg/ha) in adaptive research trial conducted in Konkan and Goa region during *Kharif* 2019. It has given the mean yield of 3228 kg/ha which was 5.76 per cent increase over the national check GPU 45 (3052 kg/ha) and 12.98 per cent increase over the VL 376 (2857 kg/ha) in all India co-ordinated trails tested during *kharif,* 2019.

Keywords: Finger millet, yield, Semi compact, new variety

INTRODUCTION

Finger millet (*Eleusine coracona* (L.) Gaertn) belongs to the family Poaceae and is more commonly known as *ragi* or madua in India. Globally, 12% of the total millet area is under finger millet cultivation, covering more than 25 countries in Africa and Asia. In India, finger millet is cultivated on an area of 1.26 million hectares with a production of 1.79 million tonnes. (Anonymous, 2017-18). In Maharashtra, Finger millet occupies an area of about 80,130 hectares with a production of 84850 tonnes (Anonymous, 2018-19). The 30,200 hectares area is found in the Konkan region of Maharashtra comprising Raigad, Thane, Palghar, Sindhudurg and Ratnagiri districts with a production of 33,200 tones with a productivity of 1100 kg /ha.

From the nutritional perspective, finger millet is considerably rich in minerals and its micronutrient density is higher than at of the world's major cereal grains; rice and wheat (Antony and Chandra, 1998; Vadivoo *et al.,* 1998). Specifically, it is the richest source of calcium among cereals with up to 10-fold higher calcium content than brown rice, wheat or maize and three times than that of milk. It is also rich in iron and fiber, making this crop more nutritive as compared to other most commonly used cereals. Considering the nutritional value of finger millet its conservation, cultivation and improvement is necessary. At present, area under finger millet crop is declining year by year due to poor productivity. Therefore, to maintain production level, it is necessary to provide

high yielding varieties to compensate for area and fulfil the increasing demand of the processing industries and people. Hence, efforts were made to develop a high yielding variety of finger millet. Out of twenty one promising types identified from 70 germplasm tested, the mid late culture (120 - 122 days) DPLN 2 i.e. Dapoli 3 was found promising in respect of yield and moderately resistant to leaf blast.

MATERIALS AND METHODS

Breeding programme to develop high yielding finger millet genotypes suitable for the Konkan region of Maharashtra was under taken at Educational and Research farm, Department of Botany, College of Agriculture, Dr.B.S.K.K.V. Dapoli from *kharif* 2015 to 2020. Out of twenty one promising types identified from 70 germplasm tested, the mid late culture DPLN 2 has been identified and developed as Dapoli 3 variety of finger millet by pureline selection method. The variety is suitable for cultivation in the Konkan region of Maharashtra.

RESULTS AND DISCUSSION

The culture recorded a grain yield of 2562 kg/ha which was 21.07 per cent increase in yield over the check Dapoli 1(2116 kg/ha) in an initial varietal trial. During the year 2016, the culture DPLN 2 recorded a grain yield of 2248 kg/ha which was 33.57 per cent increase over the check Dapoli 1(1683 kg/ha) in an advanced varietal trial. The culture recorded an average grain yield of 2405 kg/ha which was 26.64 per cent increase over the check Dapoli-1(1899 kg/ha) (**Table 1**). This culture recorded a grain yield of 2014 kg/ha which was 13.78 per cent increase over check Dapoli 1 (1770 kg/ha) when tested in a multilocation trial over 13 locations (Table **2**). In the farmers field, it was tested in five districts in 25 locations and recorded yield of 1518 kg/ha which was 12.19 per cent over check Dapoli 1 (1353 kg/ha) (**Table 3**). It has given a mean yield of 3228 kg/ha which was 5.76 per cent increase over the nation check GPU 45 (3052 kg/ha) and 11.5 per cent increase over the VL-376 (2857 kg/ha) in All India Coordinated Trials tested during *kharif*, 2019 over 26 location (**Table 4**).

The culture was moderately resistant to leaf blast and moderately susceptible to neck and finger blast compared to that of local check Dapoli 1 (**Table 5**). The culture was also tested in the AICRP trial in six locations and the data was given in **Table 6**. The incidence of pest was relatively low as compared with a national and local check (**Table 7 & 8**).

In an agronomic experiment, it recorded the highest grain yield of 1815 kg/ha at 20 cm x 15 cm spacing with a fertilizer dose of 80 N+ 40 P + 40 K kg/ha. It is resistant to lodging, fertilizer responsive and suitable for *kharif* season (**Table 9**).

Besides high yield and uniform maturity, it contains protein 7.52 per cent, carbohydrate 86 per cent, calcium 264 ppm and Iron 121 ppm. Overall acceptability of Dapoli 3 for colour, texture and flavour are also good (**Table 10 & 11**).

Finger millet variety Dapoli 3 is a midlate duration variety maturing 120-122 days suitable for traditional finger millet growing areas during *kharif* season and 3.5% sloppy

Table 1. Grain yield performance (kg/ha) of DPLN 2 culture in station trial

S.No.	Name of the trial	Year	DPLN-2	Dapoli 1 (check)	% increase over check
1	IVT	2015	2562	2116	21.07
2	AVT	2016	2248	1683	33.57
	Mean		2405	1899	

Table 2. Grain yield performance (kg/ha) of the DPLN 2 culture in multi-location trial

S. No.	Name of Trial	Year	Locations	DPLN-2	Dapoli 1 (check)	% increase over check
1	MLT	2016	6	1962	1746	11.22
2	MLT	2017	7	2067	1794	15.21
	Mean			2014	1770	13.78

Table 3. Grain yield performance (kg/ha) of DPLN 2 culture in adaptive trial during 2019

Number of trials	Number of districts	DPLN 2	Dapoli 1 (check)	% increase over check
25	5	1518	1353	12.19

Table 4. Yield performance (kg /ha) of DPLN 2 in All India Coordinated finger millet Initial varietal trial conducted during *kharif* 2019

S.No.	State	Location	DPLN-2 (FMV-1174)	GPU-45 (check)	VL-376 (check)	CD at 5%	CV (%)
1	Andrapradesh	Perumallapalle	3637.57	3320.11	3842.59	1795.59	29.02
		Vizianagaram	2943.10	2982.8	2169.3	605.17	12.84
		Chintamalli	2435.85	2556.22	2383.6	1046.4	24.2
		Peddapuram	2833.33	2888.89	3611.11	779.85	17.28
		Andrapradesh	**2737.43**	**2809.33**	**2721.34**	**621.74**	**18.39**
2	Assam	Gossaegoan	3012.35	2123.46	3604.76	1416.12	30.41
3	Bihar	Dholi	3888.89	3148.15	3395.06	903.21	15.02
4	Chhatisgarh	Jagadalpur	3112.7	3166.67	2351.85	782.59	16.3
5	Gujarat	Dahod	1884.57	2400.00	3314.81	662.95	16.66
		Waghai	4318.78	2900.00	2738.1	874.2	18.2
		Gujarat	**3101.68**	**2650.00**	**3026.46**	**1565.9**	**17.66**
6	Karnataka	Bengaluru	2858.02	3094.44	3803.09	893.86	15.4
		Hageri	2703.7	3425.93	4314.81	1124.21	17.77
		Hanumanmatti	3460.65	3466.44	2777.78	549.07	9.97
		Mandya	3012.35	3456.79	3637.53	1134.92	19.4
		Karnataka	**3008.68**	**3360.9**	**3633.3**	**583.37**	**16.27**
7	Madhya Pradesh	Dindori	3359.79	3466.61	3353.17	405.01	7.58
		Rewa	4327.16	2067.9	1635.8	849.27	22.00
		Madhya Pradesh	**3843.47**	**2766.75**	**2494.49**	**1061.91**	**14.44**
8	Maharashtra	Dapoli	687.04	471.11	507.41	269.93	29.93
		Igatpuri	1789.51	1344.44	1490.12	349.2	15.52
		Kolhapur	1725.59	1932.8	2086.84	559.67	19.84
		Maharashtra	**1757.55**	**1638.62**	**1788.48**	**383.2**	**18.4**
9	Orissa	Berhampur	2182.72	1229.63	1343.21	629.27	27.42
10	Tamilnadu	Athiyandal	3332.67	3461.64	3712.3	424.63	7.41
11	Tripura	Agartala	1966.67	2183.39	2166.72	910.96	26.11
12	Uttarakhand	Almora	1298.51	1805.97	3714.43	963.9	27.13
		Gaja	885.6	2289.71	3066.67	1157.09	51.28
		Majhera	933.33	1081.48	1466.67	939.58	46.48
		Ranichauri	610.29	1614.88	2078.14	868.68	55.38
13	Pondicherry	Karaikkal	2378.11	2218.91	2199.00	644.21	16.42
		Zone I	2684.33	2721.92	2955.05	339.95	17.42
		Zone II	**3772.17**	3354.85	2759.52	620.55	15.48
		Average of all locations	**3228**	**3052**	**2857**	**283.63**	**16.14**

Table 5. Score of DPLN 2 culture against disease at Dapoli during *kharif* 2018 and *kharif* 2019

S. No.	Culture	Name of disease	% incidence of disease			Remark
			2018	2019	Mean	
1	DPLN 2	Leaf blast	1.26	1.76	1.51	Moderately Resistant
		Neck blast	8.0	16.0	12.00	Moderately Susceptible
		Finger blast	16.00	16.0	16.00	Moderately Susceptible
2	Dapoli 1	Leaf blast	25.00	37.50	31.25	Susceptible
		Neck blast	24.00	24.00	24.00	Susceptible
		Finger blast	25.00	26.31	25.65	Susceptible

Table 6. Disease reaction of Finger millet genotype DPLN 2 (FMV-1174) in ICAR IVT trial conducted during *kharif* 2019

S. No.	State	Location	Leaf blast (G)			Finger blast (%)			Neck blast (%)		
				(R)	(S)		(R)	(S)		(R)	(S)
			DPLN - 2	GE 4449	UDURU MALIGE	DPLN-2	GE 4449	UDURU MALIGE	DPLN - 2	GE 4449	UDURU MALIGE
1	Tamilnadu	Athiyandal	3.67	1	7.33	7.42	1.68	25.18	9.65	4	29.33
2	Karnataka	Bengaluru	2	1.33	4	9.43	16.3	47.93	5.97	13.27	17.12
3	Chatisghad	Jagdalpur	2.33	2	4.33	38.61	3.44	25.4	9.44	6.25	40.44
4	Uttarkhand	Almora	6.67	5.33	8	0.88	2.54	8.23	10.06	6.31	40.71
		Ranichauri	5.33	2.33	6.67	21.07	11.1	25.84	-	-	-
		Rewa	4	4	7.33	5.92	1	17	2.66	1.9	38
		Average	**4**	**2.6**	**6.27**	**13.88**	**6.01**	**24.93**	**7.55**	**6.34**	**33.12**

Table 7. Score of DPLN 2 culture against pests at Dapoli during *kharif* 2018 and *kharif* 2019

S. No.	Culture	Pest	Average population per plant		Period
			2018	2019	
1	DPLN-2	Aphids	3.5-3.8	1.5-2.0	August-September
2	Dapoli-1	Aphids	1.8-2.0	1.0-2.0	August-September

(Minor incidence of aphids was observed during August-September. Any other pest was not observed during the period.)

Table 8. Performance of Finger millet genotype DPLN 2 in ICAR Initial varietal trial against pests during *kharif*, 2019

S. No.	Location	Myllocerus weevil (Number/meter row)	
		DPLN-2	GPU-28
1	Banglore	2	1.56
2	Ranchi	0	2.87
3	Ranichauri	0	0
	Grand mean	0.67	1.48

S. No.	Location	Earhead caterpillar (number/ten panicle)	
		DPLN-2	GPU-28
1	Ranchi	0	3.65
2	Ranichauri	5.55	0
	Grand mean	2.78	1.83

S. No.	Location	Plants affected by shoot aphid	
		DPLN-2	GPU-28
1	Berhampur	9.7	9.57
	Grand mean	9.7	9.57

Table 9. Interaction effect of fertilizer doses x spacing on grain yield (q/ha.) of DPLN 2 genotype of finger millet

Spacing/Fertilizer dose	S4:25x15 cm	S3:25 x 10 cm	S2 : 20 x15 cm	S1: 20x10 cm	S5:20x20 cm	Mean
F1-60 kg N + 40 kg P +40 kg K/ha	14.15	15.1	14.2	13.45	14.15	14.21
F2 - 80 kg N + 40 kg P +40 kg K/ha	15.01	**18.15**	15.8	14.92	15.01	15.77
F3 - 100 kg N + 40 kg P +40 kg K/ha	14.80	15.00	14.69	13.26	14.8	14.51
F4 -120 kg N +40 kg P +40kg K/ha	13.05	13.78	13.36	12.69	13.05	13.18
F5-Control	12.12	13.92	11.28	12.98	12.12	12.48
Mean	13.83	15.19	13.87	13.46	13.83	
RESULT		SEM±	CD			
Spacing		0.48	2.14			
Fertilizer		0.36	1.09			
Spacing X Fertilizer		0.90	2.30			

Table 10. Quality characters of Dapoli 3

S. No.	Ingredient	Dapoli 3
1.	Protein Content (%)	**7.52**
2.	Carbohydrate content (%)	**86.00**
3.	Calcium content (ppm)	**264**
4.	Iron content (ppm)	**121**

Table 11. Sensory evaluation score of finger millet bhakari Dapoli 3

S. No.	Quality Attributes	Dapoli 3
1.	Colour	**8.08**
2.	Texture	**8.3**
3.	Flavour	**8.5**

Table 12. Distinguishing agronomical and morphological characters of Dapoli 3

A. Agronomical characters			
Lodging susceptibility (at maturity**)**		Non- lodging	
Main ear head length (cm)		9	
Leaf number(opposite to each other)		25	
Finger number		6	
Days to 50% flowering (days)		94 days	
Days to maturity (days)		120-122 days	
B. Morphological characters			
Plant height (cm)	96	Finger branching	Absent
Growth habit	Erect	Discontinuity of spikelet's on finger	Absent
Culm branching	Absent	Spikelet shattering	Absent
Plant pigmentation	Absent	Synchrony of ear maturity	Synchronous
Productive tillers per plant	3	Grain covering	Enclosed
Ear shape	Semi-compact	Grain Colour	Moderate reddish brown
Ear size	Large	Grain shape	Reni form
Weight of earhead (g)	8.9	Grain surface	Smooth
Number of fingers/ earhead	6	Grain uniformity	Uniform

Fig. 1. FIELD VIEW OF DAPOLI 3

upland rainfed ecosystem of konkan region. Culture attains 50% flowering in 94 days after sowing. Medium tall with erect growth habit and larger with semi compact ear shape, finger branching absent are the distinguishable morphological characteristic of the culture (**Table 12 & Fig.1**).

Because of the superior performance of Dapoli 3 (DPLN 2) in a station, multi-location, adaptive and All India Coordinated trials over check Dapoli 1 and national check GPU 45 it was identified as a new variety and recommended for large cultivation in Maharashtra during 2020 by state variety release committee.

REFERENCES

Anonymous, 2017-18. Annual progress report, ICAR-AICRP on small millets, Bengaluru. Page 1-3.

Anonymous, 2018-19. Statistical data on field crops, Maharashtra Statistics Department, Pune.

Antony, U. and Chandra, T. S. 1998. Antinutrient reduction and enhancement in protein, starch and mineral availability in fermented flour of finger millet (*Eleusine coracana*). *J. Agric. Food Chem.,* **46:** 2578-25. [Cross Ref]

Vadivoo, A. S., Joseph, R. and Ganesan, N. M. 1998. Genetic variability and diversity for protein and calcium contents in finger millet (*Eleusine coracana L. Gaertn*) in relation to grain colour. *Plant foods for human nutrition,* **52:** 353-364. [Cross Ref]