



Effect of Different Varieties and Establishment Methods on Growth and Yield of Finger Millet [*Eleusine coracana* (L.) Gaertn.] under Konkan Condition

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The present investigation on response of finger millet [*Eleusine coracana* (L.) Gaertn.] varieties to different establishment methods was conducted at Konkon region of Maharashtra during *Kharif* season of 2014. The experiment was laid out in a strip plot design with three replications. The main plot treatments were four varieties namely, Dapoli safed, Dapoli 1, Phule nachani and PR-202. The sub plot treatments comprised four establishment methods viz. transplanting, line sowing, awatni (a traditional method of finger millet cultivation in which seedling are uprooted from nursery and planted by throwing it randomly) and broadcasting. Dapoli safed variety of finger millet produced maximum and significantly higher grain yield (2.33 t ha^{-1}) and straw yield (3.21 t ha^{-1}) over other three varieties. This variety also recorded higher growth and yield attributes viz. number of functional leaves sq m^{-2} , number of tillers sq m^{-2} , dry matter accumulation sq m^{-2} , number of ear heads sq m^{-2} , number of fingers earhead⁻¹, weight of earhead (g) and grain weight ear head⁻¹ than other three varieties. Transplanting of finger millet produced significantly higher grain (2.36 t ha^{-1}) and straw yield (3.33 t ha^{-1}) over rest of the establishment methods followed by awatni. Maximum grain and straw yield with higher net returns and B:C ratio were obtained when Dapoli safed variety of finger millet was sown under transplanting method.

(**Key words:** Varieties, Growth, Yield and Finger millet)

Finger millet (*Eleusine coracana* G.) is an important food grain crop of semi-arid tropics particularly of India and East Africa. It is staple food of lower income class people of in Konkan region of Maharashtra. This crop is generally grown on the moderate hill slope where rice cultivation is not possible. Finger millet is high in dietary fiber and calcium. It also has medicinal attributes and used by diverse communities for making special foods for diabetics, gluten free food for people suffering from celiac disease and weaning food for infants (Anonymous, 1996). Finger millet contain nutritionally important starch fraction, which are slowly digested and absorbed and favorable in diet pattern for metabolic disorders such as diabetes, hypertension, and obesity. The grain contain 9.2% proteins, 1.29% fats, 76.32% carbohydrates, 2.2% mineral, 3.90% ash, and 0.33% calcium.

In Konkan region, finger millet plays an important role in agriculture with an area of 471 hundred ha with an annual production 480 hundred tonnes (Deshmukh, 2007). The secret of boosting its yields mainly lies in methods of establishment and use suitable high yielding

varieties. At the time of transplanting, availability of labours is the main constraint in the region. Under the scarcity of labours, farmer gives priority for transplanting of rice. Hence, usually transplanting of finger millet is done after rice. Method of sowing is important agronomic factor affecting the productivity of crop. Proper sowing method is the important non-monetary input in crop production, which affects the crop growth, yield and quality to greater extent. Method of establishment play important role to fully exploit all available resources for growth as it provides optimum growing condition. Usually transplanting of finger millet is done after rice by "awatni", a traditional method of finger millet cultivation in which seedling are uprooted from nursery and planted by throwing it randomly in Konkon region. Therefore, the establishment of crop is very slow in awatni method. As a result, the yield of crop is reduced to greater extend. In other part of the country, mostly finger millet is grown by drilling the seeds. Though transplanted crop give higher yield over the direct sown crop, it is realized that, transplanted crop require more labours for uprooting and transplanting of

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seedling which are extremely time consuming. The scarcity of labour is being felt for quite some time in the rural area, which leaves no option other than direct sowing of finger millet which is quicker and may become economically viable method. In the broadcasting method initial growth rate is very slow, higher competition for nutrient which is the major characteristic of broadcast method of planting. The systematic study on the performance of finger millet grown by direct seed sowing in comparison with *awatni* (Farmers practice), broadcasting and recommended transplanting is not conducted in the region.

Varieties play an important role in crop production and the potential yield of a variety within genetic limit is determined by its environment. The release of high yielding varieties has contributed a great deal toward the improvement of finger millet yield. The yield of any crop depends on the production potential of the cultivar and climatic, edaphic and management practices to which the cultivar is exposed. The cultivar recommended earlier in the region or in different agro-climatic condition be tested with newly introduced or developed cultivar so as to understand the production potential of different cultivar to that region. Accordingly, it was considered necessary to test the cultivar namely Dapoli safed and Dapoli 1 developed by Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, along with Phule nachani developed by M. P. Krishi Vidyapeeth, Rahuri and PR-202 from Andhra Pradesh.

MATERIALS AND METHODS

The field experiment was conducted at Agronomy farm, College of Agriculture, Dapoli. Dist. Ratnagiri during *Kharif* season 2014. The soil of the experimental plot was sandy clay loam in texture, moderately acidic in pH and very high in organic carbon content. The field experiment was laid out in a strip plot design. The main plot treatment comprised four varieties and sub plot treatment consisted of four methods of establishment. Seed rate used for direct seeded method were 8 kg ha⁻¹ and for transplanting it was 5.0 kg ha⁻¹. Seeds were treated with thiram @ 3 g kg⁻¹ of seeds, before sowing in order to protect the crop against seed and soil borne fungal diseases.

Finger millet nursery was manured with FYM and it was mixed thoroughly in soil at the time of seedbed preparation. Then nursery bed of 3 m x 1 m size was prepared in well tilled plot. Seed was sown shallow and thin. After sowing, seed was covered with soil. The RDF

(Recommended dose of fertilizer) for finger millet is 80:40:0 kg NPK ha⁻¹. The half dose of nitrogen and full dose of phosphorus not applied were applied at the time of sowing/transplanting. Remaining half dose of nitrogen was applied at 30 DAS/DAT. The other common package of practices was followed time to time and periodical growth observations were recorded.

RESULTS AND DISCUSSION

Effect of finger millet varieties on growth parameters

Maximum and significantly higher growth parameters of finger millet such as number of functional leaves sq m⁻², number of tillers sq m⁻², dry matter accumulation sq m⁻² except plant height were observed in Dapoli safed followed by phule nachani, Dapoli 1 and PR-202 which were at par within themselves (Table 1). PR-202 recorded significantly lower growth parameter than variety Dapoli safed except plant height observed. The reason of high dry matter accumulation in Dapoli safed and Phule nachani may be traced to the increase in morphological parameters which are responsible for the photosynthetic capacity of the plant thereby increasing the yield. The increase in growth observations *viz.*, number of tillers m⁻², dry matter accumulation m⁻², plant height (cm) in finger millet were also reported by Nagarju and Mohan kumar (2009), Mishri *et al.* (2005) in rice, Senthilkumar *et al.* (2007) in hybrid rice varieties, respectively.

Effect of finger millet varieties on yield attributes and yield

The yield per unit area in finger millet is a function of yield attributes of an individual plant *viz.*, number of earheads sq m⁻², number of fingers earhead⁻¹, weight of earhead (g), grain weight earhead⁻¹, length of finger (cm) and ultimately the grain yield obtained from the plant. It is due to the better performance of varieties in terms of yield attributing characters. The result revealed that significantly higher yield attributes were observed in Dapoli safed and their by grain yield ha⁻¹ (Table 2) over Phule nachani, Dapoli 1 and PR-202.

Dapoli safed recorded significantly higher grain yield ha⁻¹ over other three finger millet varieties which could be attributed to the appreciably higher yield contributing characters, namely, number of earheads sq m⁻², number of fingers earhead⁻¹, weight of earhead (g), grain weight earhead⁻¹, length of finger (cm) and test weight (Table 2). The increased in grain yield recorded by Dapoli safed over Phule nachani, Dapoli 1 and PR-202 was 10.17, 14.11 and 23.17 per cent, respectively.

Table 1. Effect of different varieties and establishment methods on growth of finger millet crop

Treatments	Plant height (cm)	No. of leaves m ⁻²	Number tillers m ⁻²	Dry matter accumulation (g m ⁻²)
Varieties				
V ₁ . Dapoli safed	100.65	331.08	106.92	586.67
V ₂ . Dapoli 1	105.87	310.67	102.17	546.00
V ₃ . Phule nachani	101.03	320.17	105.00	566.00
V ₄ . PR-202	103.46	304.75	97.17	523.25
F. test at 5%	Sig.	Sig.	Sig.	Sig.
S.Em. ±	1.94	1.75	0.44	2.49
C.D. at 5%	6.71	6.06	1.54	8.62
Establishment methods				
M ₁ . Transplanting (20×15 cm)	101.92	344.75	109.33	762.25
M ₂ . Line sowing	102.60	300.92	100.42	365.83
M ₃ . Awatni	101.19	330.25	103.92	747.50
M ₄ . Broadcasting	105.29	290.75	97.58	346.33
F. test at 5%	Sig.	Sig.	Sig.	Sig.
S.Em. ±	1.27	1.55	0.89	2.25
C.D. at 5%	3.76	4.62	2.65	6.68
Interaction effect				
F. test	N.S.	N.S.	N.S.	NS.
S.Em. ±	6.18	7.76	7.03	5.8
C.D. at 5%	—	—	—	—
General mean	102.75	316.67	102.81	555.48

These results are in confirmation with those obtained from Mishri *et al.*, (2005) in rice and Senthilkumar *et al.*, (2007).

Effect of establishment methods on growth parameters

Transplanting and awatni methods of crop establishment increased the growth and development parameter of finger millet such as plant height, number of functional leaves sq m⁻², number of tillers sq m⁻², dry matter accumulation sq m⁻² as compared to line sowing of seeds and broadcasting of seeds. However, line sowing and broadcasting of seeds did not differ significantly with each in most of these growth and development parameters. The increased growth parameters may be attributed to the fact that each individual plant in transplanting got the advantages of more and liberal nutrients, space and other growth resources due to less competition of lower plant population in transplanting followed by awatni.

Effect of establishment methods on yield attributes and yield

The grain yield per unit area in finger millet is a function of yield attributes of an individual plant viz.

number of ear heads m⁻², number of fingers ear head⁻¹, weight of ear head (g), grain weight ear head⁻¹, length of finger (cm). The result revealed that transplanting method of establishment higher than *awatni* in some these yield contributing characters and improved the yield attributes and thereby grain yield ha⁻¹ (Table 2) over line sowing and broadcasting of seeds. However, line sowing and broadcasting of seeds were at par with each other in some of the yield attributes.

Transplanting was significantly superior over *awatni* in respect of number of ear heads m⁻², number of fingers ear head⁻¹, ear head weight (g), grain weight ear head⁻¹, length of finger (cm) and thereby the grain yield ha⁻¹. The increase in grain yield recorded under transplanting over *awatni*, line sowing and broadcasting of seeds were 10.44, 19.15 and 24.23 per cent, respectively. Similarly, increase in grain yield recorded in *awatni* over line sowing and broadcasting of seeds was 7.88 and 12.48 per cent respectively. The result clearly showed that transplanting method of establishment was superior followed by *awatni* for obtained higher grain and straw yield ha⁻¹ from finger millet.

Table 2. *Effect of different varieties and establishment methods on yield attributes and yield of finger millet crop*

Treatments	No. of earheads m ⁻²	No. of fingers earhead ⁻¹	Weight of earhead (g)	Grain wt. earhead ⁻¹ (g)	Length finger ⁻¹ (cm)	Test wt. (1000 grains)	Grain yield (t ha ⁻¹)	Straw yield (t ha ⁻¹)
Varieties								
V ₁ Dapolisafed	95.00	8.35	8.40	7.00	7.14	2.76	2.33	3.21
V ₂ Dapoli 1	90.17	7.31	7.72	5.95	9.98	2.51	2.04	2.88
V ₃ Phulenachani	92.25	7.34	7.63	6.16	6.58	2.63	2.11	3.00
V ₄ PR-202	87.83	6.38	7.48	5.93	8.15	2.55	1.89	2.72
F. test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
S.Em. ±	1.65	0.29	0.19	0.20	0.27	0.10	0.019	0.034
C.D. at 5%	5.71	0.99	0.64	0.70	0.95	0.36	0.065	0.117
Establishment methods								
M ₁ Transplanting	98.25	7.67	8.58	6.74	8.49	2.73	2.36	3.33
M ₂ Line sowing	91.42	7.33	7.41	6.10	7.78	2.58	1.98	2.79
M ₃ Awatni	88.00	7.41	7.78	6.13	7.84	2.64	2.13	3.01
M ₄ Broadcasting	88.33	6.98	7.47	6.06	7.73	2.49	1.90	2.68
F. test	Sig.	N.S.	Sig.	Sig.	Sig.	N.S.	Sig.	Sig.
S.Em. ±	1.78	0.60	0.16	0.24	0.20	0.15	0.069	0.066
C.D. at 5%	5.30	—	0.48	0.72	0.59	—	0.206	0.196
Interaction effect								
F. test	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
S.Em. ±	10.30	1.38	1.08	1.01	1.02	0.67	0.231	0.272
C.D. at 5%	—	—	—	—	—	—	—	—
General mean	91.50	7.35	7.81	6.26	7.96	2.61	2.09	2.95

CONCLUSIONS

From the results of the present investigation, it can be concluded that for obtaining higher yield from finger millet variety Dapoli safed be sown under transplanting method during *Kharif* season under South Konkan conditions.

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