

## Agronomic manipulations for enhancing productivity of finger millet based on intercropping system

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**ABSTRACT :** Field experiments were conducted for three years during *Kharif* 2008 to 2010 at the Zonal Agricultural Research station, Shenda Park, Kolhapur (Maharashtra) to study the performance of different pulses grown as intercrop with finger millet (*Eleusine coracana* L.) in different row proportions. The result revealed that the blackgram or mothbean is recommended as an intercrop in 8:2 or 4:1 row proportion in finger millet under sub-montane zone situation in rainfall zone IX with shallow and lighter type of soils for obtaining maximum grain and straw yield as well as net profit. The grain equivalent yield was increased in the tune of 42 to 57 per cent over sole cropping.

**Key Words :** Pulse, Finger millet, Row proportion, Intercropping, Equivalent yield

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The significant beneficial effects of green revolution have been confined only to irrigated crops. The productivity of rainfed areas is still very low. The studies on cropping system shown that intercropping with specific plant geometry and selection of compatible crop with suitable varieties is profitable practice and to make proper use of available soil moisture and nutrients more efficiently and thus improving productivity of rainfed crops (Kujur *et al.*, 2010). Finger millet crop is grown during *Kharif* season on very shallow and light soil on sloppy lands under rainfed condition. Finger millet is grown as sole crop by transplanting as well as drilled method in sub-montane zone and ghat zone of Maharashtra. Intercropping is a potential system for maximizing crop production under rainfed condition in terms of space and time in subsistence farming situation (Mitra *et al.*, 2001). The low productivity is due to a number of factors and combination there off. To overcome this situation intercropping of pulses in finger millet is to be helpful to increase the production per unit area and time, and additional returns of legume and also helpful to improve soil health. The stability of yield is greater with intercropping than sole crop (Rao and Willey, 1980). Keeping these views, the present investigation was planned.

### RESEARCH PROCEDURE

Field experiments were conducted for three seasons during

*Kharif* 2008 to 2010 under rainfed conditions at the Zonal Agricultural Research Station, Shenda Park, Kolhapur (Maharashtra). The experimental site was sandy loam with pH 7.20, E.C. 0.10 dSm<sup>-1</sup>, organic carbon 0.96 per cent, available N 101.0, P<sub>2</sub>O<sub>5</sub> 10.6 and K<sub>2</sub>O 198.0 kg<sup>-1</sup>. The pulse crop of black gram (TPU 4) and moth bean (MBS 27) were taken as intercrop in finger millet (GPU 28). The intercrops were sown in finger millet in different row proportions of 2:1, 4: 1 and 8: 2. The row spacing of 30 cm was maintained for all the crops. The pulse crops were sown by dibbling method. The treatment of farmers' practice which includes growing of finger millet crop without any fertilizer with mixture of other millets. The thinning of pulse crop was done at 15 days after sowing and only one healthy plant was kept per hill by maintaining the 15 cm spacing between the two plants. The experiment was laid out in randomized block design with three replications. Eight treatments were studied *viz.*, T<sub>1</sub> - Sole crop of finger millet, T<sub>2</sub> - Finger millet + Blackgram (2:1), T<sub>3</sub> - Finger millet + Blackgram (4:1), T<sub>4</sub> - Finger millet + Blackgram (8:2), T<sub>5</sub> - Finger millet + Mothbean (2:1), T<sub>6</sub> - Finger millet + Mothbean (4:1), T<sub>7</sub> - Finger millet + Mothbean (8:2) and T<sub>8</sub> - Farmers practice. The gross plot size was 7.20 x 5.40 m and net plot of 6.50 x 5.40 m. The 5.0 tones of FYM ha<sup>-1</sup> with recommended dose of fertilizers (60: 30: 00 kg NPK ha<sup>-1</sup>.) was given to the finger millet crop which was applied through urea and single super phosphate. Half

dose of N was applied at sowing along with full dose of  $P_2O_5$  and the remaining N was top dressed at 25 days after sowing. The crops were sown during the first week of July in every year. Necessary plant protection measures were taken to protect the crop from pest and diseases. The intercultivation two weedings were followed by one hoeing. The economics of the various treatments was worked out considering the prevailing market prices of grain and straw.

## RESEARCH ANALYSIS AND REASONING

The data recorded during the course of investigation were tabulated, statistically analysed and results are interpreted here under appropriate heads:

### Growth parameters:

The data presented in Table 1, revealed that, the significantly highest plant height (95.2 cm), no of tillers (3.2), no of fingers (6.7) and thousand grain weight (3.464 g) were recorded by the sole crop of finger millet except treatment finger

millet + black gram 8:2 ( $T_4$ ), finger millet + mothbean 8:2 ( $T_7$ ) which was at par. Similar findings were also reported by Ramamoorthy *et al.* (2004).

### Grain and straw yield:

The sole crop of finger millet recorded the highest grain and straw yield (27.19 and 38.23 q ha<sup>-1</sup> respectively) which was significantly superior over rest of the treatments except treatment  $T_4$  and  $T_7$ , i.e. finger millet with black gram and moth bean as intercrop with 8:2 row proportion which were at par. The grain and straw yield reduced considerably when intercropped with legumes compared to sole crop of finger millet as reported by Singh and Arya (1999) and Mitra *et al.* (2001). Amongst the intercrop treatments, the maximum yield of blackgram (4.26 q ha<sup>-1</sup>) was recorded in the treatment of finger millet + black gram (8:2) followed by in finger millet + black gram (4:1). (3.61 q ha<sup>-1</sup>)

### Grain equivalent yield of finger millet:

As regards the finger millet grain equivalent yield,

Sr. No.	Treatments	Plant height (cm)	Productive tillers/plant	Ear length (cm)	No. of fingers/ear	1000 grain weight (g)
1.	Sole crop of finger millet	95.2	3.2	7.4	6.7	3.464
2.	Finger millet + Blackgram (2:1)	84.2	2.3	7.4	5.8	3.159
3.	Finger millet + Blackgram (4:1)	86.8	2.9	7.6	6.1	3.165
4.	Finger millet + Blackgram (8:2)	88.7	3.2	7.5	6.4	3.259
5.	Finger millet + Mothbean (2:1)	84.1	2.2	7.3	5.6	3.145
6.	Finger millet + Mothbean (4:1)	83.4	3.0	7.5	6.2	3.283
7.	Finger millet + Mothbean (8:2)	89.6	3.4	7.8	6.4	3.296
8.	Farmers practice	78.9	2.2	6.6	5.4	2.784
	S.E. $\pm$	1.24	0.11	0.15	0.16	0.05
	C.D. (P=0.05)	3.77	0.34	0.46	0.48	0.15
	C.V. %	9.49	6.95	8.52	7.49	6.64

Sr. No.	Treatments	Grain yield (q/ha)	Straw yield (q/ha)	Inter crop yield (q/ha)	Gross monetary returns (Rs./ha)	Net monetary returns (Rs./ha)	B:C ratio	FMGEY (q/ha)
1.	Sole crop of finger millet	27.19	38.23	--	28101	15124	2.16	28.24
2.	Finger millet + Blackgram (2:1)	19.87	29.21	1.200	25171	12048	1.90	26.80
3.	Finger millet + Blackgram (4:1)	23.42	34.44	3.613	37809	25242	2.86	40.13
4.	Finger millet + Blackgram (8:2)	25.56	37.78	4.266	42131	29008	3.18	44.36
5.	Finger millet + Mothbean (2:1)	20.61	30.50	1.034	26212	13096	1.99	27.98
6.	Finger millet + Mothbean (4:1)	23.15	34.14	2.499	33941	20837	2.61	36.18
7.	Finger millet + Mothbean (8:2)	24.97	36.86	3.041	38869	25746	2.94	41.27
8.	Farmers practice	14.71	21.56	1.244	16417	6533	1.67	17.32
	S.E. $\pm$	0.57	1.13	--	1358.70	1409.6	0.09	1.23
	C.D. (P=0.05)	1.74	3.42	--	4121.2	4275.4	0.29	3.72
	C.V. %	9.43	8.95	--	7.57	13.23	6.88	6.48

significantly highest yield, (44.36 q ha<sup>-1</sup>) was observed by the treatment T<sub>4</sub> where blackgram was taken as intercrop in finger millet in 8:2 row proportion. But it was at par with the treatment T<sub>7</sub> where mothbean was taken as an intercrop in finger millet in 8:2 row proportions (41.27 q ha<sup>-1</sup>). Similar results were also reported by Thorat *et al.* (1986), Mahadkar and Khanvilkar (1988), Shankarlingappa and Hegade (1992) and Ramamoorthy *et al.* (2004). It indicates that it is beneficial to raise the finger millet with intercrops rather than sole crop alone.

#### Economics:

The highest gross monetary returns of Rs. 42,131/- ha<sup>-1</sup> and net monetary returns of Rs. 29,008/- ha<sup>-1</sup> was recorded by the treatment of finger millet + black gram (8:2) which was significantly superior over rest of the treatment except treatment of finger millet + mothbean (8:2) which was at par. The significantly highest B: C ratio (3.18) was also observed by the treatment T<sub>4</sub> where finger millet + blackgram 8:2 and followed by T<sub>7</sub> finger millet + mothbean 8:2 proportion. Ramamoorthy *et al.* (2004) also reported similar observations.

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