

Effect of Organic Manures and Nitrogen Levels on Seed Yield and Seed Quality of Okra (*Abelmoschus esculentus* L. Moench) under Middle Gujarat Conditions

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Okra is an important fruit vegetable crop of India. Gujarat covers an area of 41000 hectares with a production of 350340 tonnes and productivity 8.14 t/ha [1]. Production of the vegetable okra often suffers a setback due to unavailability of high yielding good quality seeds in the market. Amongst the several factors responsible for better crop production, good seed is perhaps the most important and essential prerequisite. Hence, it is necessary to make an attempt to increase the seed production of okra by adopting suitable agronomic practices. The integrated nutrient management approach is indispensable for sustaining high quality vegetable production without detrimental effects on soil caused by inorganic fertilizer application. The present study was undertaken to find out the effect of organic manures and nitrogen levels on seed yield and quality of okra seeds.

An experiment was carried out at the Regional Research Station, Anand Agricultural University, Anand during *kharif* 2006. The soil was loamy sand with low organic carbon (0.39%) and high in available P_2O_5 (88.3 kg/ha) and K_2O (289 kg/ha). The okra crop was sown during last week of June. Fifteen treatment combinations comprising of 5 levels of organic manures (No organic manure, FYM @ 10 t/ha, vermicompost @ 2 t/ha, FYM @ 10 t/ha + *Azotobacter* seed treatment and vermicompost @ 2 t/ha + *Azotobacter* seed treatment) and 3 levels of nitrogen (75, 100 and 125 kg/ha). The

experimental plots of 4.05 x 6.00m were laid out in randomized block design (factorial) with four replications. The okra variety Gujarat okra-2 was used in the experiment. The recommended dose of 50 kg P_2O_5 and 50 kg K_2O per hectare was applied before sowing as basal and nitrogen was applied in two equal split (basal and 45 DAS) as per treatments. The dried matured fruits were harvested and threshed manually and weighed (kg/ha). Seeds were dried to 8-9 per cent moisture content. The yield attributes like length and girth of dry pod, weight of dry pods per plant, no. of seeds per pod, weight of 1000 seeds, seed yield, harvest index, germination percentage and net realization of harvested seeds etc. were assessed.

Significantly higher seed yield was recorded under application of either FYM @ 10 t/ha or vermicompost @ 2 t/ha alone or in conjunction with *Azotobacter* seed treatment as compared to no organic manure (Table 1). Among the various organic manures, application of FYM @ 10 t/ha along with *Azotobacter* seed treatment (M_3) registered significantly the highest seed yield (1666 kg/ha). Maximum values for length of dry pod, weight of dry pods/plant and seeds/pod were also recorded with the said treatment. The higher values for these characters may be due to atmospheric nitrogen fixing in soil with use of *Azotobacter* coupled with FYM or vermicompost increased the available nitrogen. Prabu *et al.* [2] and Dademal and Dongale [3] also reported

increase in seed yield of okra with the use of organic manures. The germination percentage of harvested seeds did not show any significant effect. However, addition of organic manures showed numerically higher germination percentage in harvested seeds than no organic manure.

Nitrogen levels had significant influence on yield attributes and seed yield of okra (Table 1), wherein, increase in each successive nitrogen level gradually increased seed yield and yield attributes, and the highest values for the same were recorded with the highest level of nitrogen

Table 1. Effect of organic manures and nitrogen levels on seed yield and quality of Gujarat okra-2

Treatment	Length of dry pod (cm)	Girth of dry pod (cm)	Weight of dry pod (g)	No. of seeds/pod	Weight of 1000 seed (g)	Seed yield (kg/ha)	Harvest index (%)	Net realization (Rs./ha)	BCR	Germination % of harvested seeds
Organic manure (M)										
M ₀ -No organic manure	16.55	4.53	65.89	55.18	62.27	1095	38.03	85365	4.54	80.99
M ₁ -FYM @10t/ha	17.52	4.92	76.88	62.77	63.62	1491	42.93	121465	5.40	82.55
M ₂ -VC @2t/ha	17.22	4.76	74.44	58.27	63.20	1365	42.30	106365	4.53	83.77
M ₃ -FYM @10t/ha + Azo.	18.43	5.08	85.95	64.21	65.22	1666	43.99	138865	6.01	85.38
M ₄ -VC @2t/ha + Azo.	17.63	4.88	82.70	61.62	63.71	1513	43.18	121065	5.00	83.75
S. Em.±	0.25	0.13	2.02	1.30	1.31	38	1.65	-	-	1.92
CD (P=0.05)	0.72	NS	5.74	3.69	NS	108	NS	-	-	NS
Nitrogen level (N)										
N ₁ - 75 kg/ha	16.80	4.48	68.23	55.64	61.33	1209	40.30	95930	4.84	82.40
N ₂ - 100 kg/ha	17.42	4.84	78.10	60.93	63.83	1396	41.77	114352	5.53	83.39
N ₃ - 125 kg/ha	18.19	5.19	85.18	64.66	65.67	1673	44.19	141774	6.55	84.07
S. Em. ±	0.20	0.10	1.56	1.01	1.05	29	1.27	-	-	1.50
CD (P = 0.05)	0.56	0.28	4.45	2.86	2.89	83	NS	-	-	NS
M x N	NS	NS	Sig.	Sig.	NS	Sig.	NS	-	-	NS
CV%	5.01	9.24	9.07	7.45	7.14	9.24	13.70	-	-	8.02

VC = Vermicompost; Azo. = Azotobacter seed treatment; Sig. = Significance; NS = Not significance

Input cost

FYM @ Rs. 350/tonne

Vermicompost @ Rs. 3000/tonne

Urea @Rs. 5.12/kg

Azotobacter @ Rs. 100/ha

Selling price

Seed@Rs. 100/kg

(125 kg/ha). The highest seed yield at the highest level of nitrogen might be due to more vegetative growth resulted in increase of metabolic activities and translocation toward yield contributing characters. These results are in conformity with findings of those reported by Prasad and Singh [4] and Sajjan *et al.* [5] in okra. There was no significant response of nitrogen levels on harvest index and germination percentage of harvested seeds.

The interaction effect between organic manures and nitrogen levels was found to be significant with respect to seed yield (Table 2), wherein, treatment combination M_3N_3 (1838 kg/ha) being at par with M_4N_3 (1807 kg/ha) produced significantly higher seed yield than rest of the treatment combinations. Per cent increase in seed yield under treatment combinations M_3N_3 and M_4N_3 was 122.78 and 119.03, respectively over treatment combination M_0N_1 . The higher seed yield under treatment combinations M_3N_3 and M_4N_3 might be due to interactive effect of organic manure and nitrogen levels. Organic manure helps to reduce leaching losses, denitrification and volatilization losses of nitrogen and helps in availability of nutrients in adequate amount to increase growth and yield attributing characters. Similar observations were reported by Prabhu *et al.* [2], Dademal and Dongale [3] and Subbiah [6].

Table 2. Seed yield and net realization as influenced by M x N interaction

Treatments	Seed yield (kg/ha)			Net realization (Rs./ha)		
	N_1	N_2	N_3	N_1	N_2	N_3
M_0	825	968	1492	57530	71552	123674
M_1	1355	1490	1629	106930	120252	133874
M_2	1138	1361	1596	82830	104852	128074
M_3	1524	1634	1838	123830	134552	154674
M_4	1203	1527	1807	89230	121352	149074
S.Em. +	66					
CD (P = 0.05)	186					

Economic analysis of different treatments (Tables 1 and 2) indicated that treatment involving application of FYM @ 10 t/ha + Azotobacter seed treatment (M_3) registered the highest net realization (Rs. 1,38,865/ha) and BCR value (6.01) closely followed by FYM @ 10 t/ha (M_1) which accrued net realization of Rs. 1,21,465/ha with the 5.40 BCR. Increase in nitrogen level tended to increase net realization and the highest level of nitrogen (N_3) recorded maximum net realization of Rs. 141774/ha with 6.55 BCR value. Treatment combination M_3N_3 realized net return of Rs. 154674/ha with 6.31 BCR closely followed by treatment combination M_4N_3 with net return of Rs. 149074/ha and BCR value of 5.71.

It indicated that for getting remunerative higher seed yield from *kharif* okra cv. Gujarat Okra-2, the seeds should be treated with *Azotobacter* and crop should be fertilized with 10 t FYM/ha in conjunction with 125 kg N/ha.

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