International Journal of Agricultural Sciences
Volume **10** | Issue 1| January, 2014 | 322-328

RESEARCH PAPER

Influence of biofertilizer application methods and inorganic fertilizers on growth, seed yield and economics cost of okra [*Abelmoschus esculentus* (L.) Moench] under sub-tropical irrigated area of Jammu

INDER JEET SHARMA, R.K. SAMNOTRA[1] AND VIJAY KUMAR*
Division of Soil Science and Agricultural Chemistry, S.K.University of Agricultural Sciences and Technology, Chatha, JAMMU (J&K) INDIA (Email : vijaykumar.1144@yahoo.com)

Abstract : The investigation was carried out to find out the effect of biofertilizer application methods and inorganic fertilizers on the growth, seed yield and economics of okra under sub-tropical irrigated area of Jammu at Vegetable Research Farm, FOA, and SKUAST- Jammu, Main Campus Chatha during the spring- summer seasons. The experiment was laid out in split plot design with five levels of inorganic fertilizers *i.e.* 0%, 25%, 50%, 75% and 100% of recommended dose of fertilizers (60:30:30:: N: P: K) and two methods of biofertilizers application *i.e.* seed and soil application with three biofertilizers, *Azospirillum*, *Azotobacter* and Phosphorus solubilizing bacteria. The treatments C_4- 100 % recommended dose 60: 30: 30 kg NPK per ha significantly increased plant height (55.34 cm), stem diameter (5.43 cm), number of branches per plant (5.65), number of fruit (12.29), fruit size, diameter (2.10 cm) and length (20.37cm) and seed yield per quintal (12.01 q /ha.). The economic cost was highest C_3 treatments RDF gross return (Rs. 97840.00), net return (Rs. 66201.00) and B: C ratio (2.09). In biofertilizer application methods T_2 (seed application of *Azospirillum*) significantly recorded highest plant height (55.75 cm), stem diameter (5.29 cm), number of branches per plant (5.90), number of fruit (12.34), fruit size, diameter (2.15 cm) and length (20.46 cm) and seed yield per quintal (11.87 q /ha.) and economic cost was also highest gross return (Rs. 94920.00), net return (Rs. 64355.00) and B: C ratio (2.11) as compared to other treatments. The interaction between fertilizers x biofertilizers was found some significant and non significant growth attributes and seed yield.

Key Words : *Rhozobium, Azotobacter,* PSB, Growth, Yield, Economics, Okra

View Point Article : Sharma, Inder Jeet, Samnotra, R.K. and Kumar, Vijay (2014). Influence of biofertilizer application methods and inorganic fertilizers on growth, seed yield and economics cost of okra [*Abelmoschus esculentus* (L.) Moench] under sub-tropical irrigated area of Jammu. *Internat. J. agric. Sci.*, **10** (1): 322-328.

Article History : Received : 20.08.2013**; Revised :** 01.11.2013**; Accepted :** 28.11.2013

INTRODUCTION

Vegetables play a vital role in the improvement of the diet of mankind. Ladies finger [*Abelmoschus esculentus* (L.) Moench] is one of the most important edible and nutritious vegetable crops in India. It belongs to the family Malvaceae, originating from tropical and subtropical Africa. The nutritional constituents of ladies finger include carbohydrate, protein, phosphorus, calcium, magnesium, iron, vitamin A and C with traces of vitamin B. Okra is an important fruit vegetable of high commercial and food values. It is primarily valued for its tender, immature green pods in fresh form, however its curry, soups, stews and edible young leaves are also popular. To a limited extent it finds use in canned, dehydrated or frozen forms for off-season consumption by the army at high altitudes and export. High iodine content of fruit helps to control goiter, while leaves used in inflammation and dysentery. The fruits also help in cases of renal colic, leucorrhoea and general weakness. Decline in

*** Author for correspondence**
[1]Division of Vegetable Science and Floriculture, S.K. University of Agricultural Sciences and Technology, JAMMU (J&K) INDIA

soil nutrient is one of the major constraints of crop production. Use of inorganic fertilizers can improve crop yields and soil pH, total nutrient content, and nutrient availability, but its use is limited due to scarcity, high cost, nutrient imbalance and soil acidity. Mixing organic and inorganic fertilizers may be a sound soil fertility management strategy in many countries. Apart from enhancing crop yields, the practice has a greater beneficial residual effect that can be derived from use of either organic or inorganic fertilizers applied alone. In the past years, inorganic fertilizer was advocated for crop production to ameliorate low inherent fertility of soils in the tropics. Nutrient imbalance and soil physical degradation hinder sustainable use of inorganic fertilizers in the tropic. In order to sustain soil fertility over a long period of time the use of organic manure is been advocated. Biofertilizer increases soil fertility and crop yield by rendering unavailable sources of elemental nitrogen bound phosphate and decomposed plant residue into available form in order to facilitate the plant to absorb the nutrients of these bio fertilizers. *Rhizobium* inoculants specific for different crops are the most important in India. Other bacterial fertilizers produced are *Azotobacter*, *Azospierillum* and phosphate solubilizer bacteria etc. Keeping in view of the above facts, the present investigation was to evaluate the effect of biofertilizer application methods and inorganic fertilizers on the growth, seed yield and economics of okra under sub-tropical irrigated area presented in this communication.

MATERIAL AND METHODS

The present investigation was conducted to study influence of biofertilizer application methods and inorganic fertilizers on growth, seed yield and economics cost of okra was conducted at Vegetable Research Farm, Division of Vegetable Science and Floriculture, Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences and Technology, Main Campus Chatha during the spring- summer seasons of 2008 and 2009. Chatha (Jammu) is situated at 33^{O}-55'N latitude and 74^{O}-58' East longitude with altitude of 332 meters above mean sea level. The climate of Vegetable Research Farm at Chatha is subtropical with hot dry summer, hot humid rainy and cold winter months. The experiment was laid out in Split plot design with two methods of biofertilizers application *i.e.* seed and soil application with three biofertilizers, *Azospirillum*, *Azotobacter* and phosphorus solubilizing bacteria. and five levels of inorganic fertilizers *i.e.* 0%, 25%, 50%, 75% and 100% of RDF (60:30:30:: N: P: K) *i.e.* in summer 2008 and 2009 having three replications with spacing 45 x 30 cm, plot size 4.05 x 2.70 m comprising of 81 number of plants per plot. Inorganic fertilizers sources of NPK was urea, diammonium phosphate and muriate of potash. The biofertilizers seed treatment before sowing was done for 30 minutes using 25g respective biofertilizers in 25 ml. gur jaggery. Seed was dried in shade. The soil was inoculated with respective biofertilizers using 5 kg/ha mixing with 40 kg FYM/ha. The observation regarding growth parameters and yield *i.e.* plant height, stem diameter, internodal length, number of branches per plant, number of fruit, average fruit weight, marketable yield per plant and seed yield per plot per hectare. The plant height was recorded at the time of maturity. The height was measured from the ground level to the axil of the last leaf on the main shoot. Stem diameter was measured at base. Number of branches was recorded from selected plants in each treatment and then average per plant basis was worked out in each treatment. Number of fruits was recorded at each picking from selected plants in each treatments and average per plant was worked out. Seed yield from the net plot area was recorded in kg/ plot and then converted into q ha^{-1}. The observation related to growth and yields was recorded and were subjected to statistical analysis. The treatments details as given below:

Biofertilizers:

T_1- Seed application of *Azotobacter.*
$T_{2\text{ -}}$ Seed application of *Azospirillum.*
$T_{3\text{-}}$ Seed application of PSB.
T_4 - Soil application of *Azotobacter*
$T_{5\text{ -}}$ Soil application of *Azospirillum.*
$T_{6\text{ -}}$ Soil application of PSB.

Inorganic fertilizers:

C_0-0 % recommended dose 60: 30: 30 kg NPK per ha
C_1-25 % recommended dose 60: 30: 30 kg NPK per ha
C_2-50 % recommended dose 60: 30: 30 kg NPK per ha
C_3-75 % recommended dose 60: 30: 30 kg NPK per ha
C_4-100% recommended dose 60:30:30 kg NPK per ha

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Plant height:

Plant height is one of the indices determining growth of the plant. The data presented in Table 1, revealed that treatment in soil application of chemical fertilizers significantly affected the height of the plant. A maximum plant height of (55.34 cm) was recorded with C_4 treatment (100 per cent RDF). This was significantly closely followed by C_3 treatment. The minimum plant height (50.49cm) was observed with C_0 (control) treatment. The increase in plant height may be due to the fact that application of NPK showed synergestic effect upto 100 per cent RDF by exclerating the synthesis of chlorophyll and amino acids which are

Table 1 : Growth parameters, fruit size and seed yield as influenced by different treatments (pooled data for 2 years)

Treatments	Plant height	Stem diameter (cm)	Number of branches per plant	Number of fruits per plant	Fruit size		Seed yield (q /ha)
					Fruit length (cm)	Fruit diameter (cm)	
Chemical fertilizers							
C_0	50.49	3.04	3.53	9.96	16.81	1.85	10.31
C_1	51.98	3.80	4.33	11.30	18.76	1.90	10.92
C_2	54.15	4.10	4.64	11.51	19.27	1.95	11.44
C_3	54.58	4.94	5.04	12.06	20.11	2.03	11.71
C_4	55.34	5.43	5.65	12.29	20.37	2.10	12.01
C.D.(p=0.05)	1.46	1.42	1.23	0.71	1.08	0.07	0.54
Biofertilizers							
T_1	54.02	4.45	4.42	11.58	19.38	1.91	11.34
T_2	55.75	5.29	5.90	12.34	20.46	2.15	11.87
T_3	55.29	4.95	5.37	12.03	20.11	2.11	11.69
T_4	50.58	3.20	3.79	10.46	17.44	1.85	10.64
T_5	53.60	3.98	4.40	11.72	19.18	1.89	11.28
T_6	50.61	3.69	3.96	10.41	17.82	1.87	10.85
C.D.(p=0.05)	1.36	0.48	1.39	0.60	0.75	0.03	1.19
Interactions							
C_0 X T_1	51.60	3.23	2.97	10.78	15.75	1.70	10.07
C_0 X T_2	53.45	4.01	6.24	11.10	18.21	2.05	10.91
C_0 X T_3	52.11	3.77	4.30	11.29	18.57	2.03	11.13
C_0 X T_4	45.73	1.65	2.12	8.17	14.96	1.72	9.45
C_0 X T_5	51.95	2.76	3.13	11.13	18.17	1.82	10.41
C_0 X T_6	48.12	2.83	2.46	7.29	15.21	1.77	9.88
C_1 X T_1	52.75	3.87	4.27	11.25	19.29	1.87	11.14
C_1 X T_2	53.28	4.78	5.14	12.18	20.18	2.08	10.90
C_1 X T_3	55.46	4.29	4.97	11.64	19.66	2.03	11.18
C_1 X T_4	49.09	3.13	3.70	10.58	17.22	1.79	10.56
C_1 X T_5	52.31	3.63	4.10	11.38	18.59	1.82	11.01
C_1 X T_6	49.00	3.12	3.83	10.79	17.63	1.80	10.75
C_2 X T_1	54.96	4.29	4.52	11.26	19.91	1.92	11.85
C_2 X T_2	55.82	5.01	5.72	12.32	20.80	2.13	12.13
C_2 X T_3	57.00	4.77	5.21	11.84	20.28	2.09	11.51
C_2 X T_4	51.63	3.11	3.95	10.98	17.84	1.84	11.17
C_2 X T_5	52.85	3.79	4.35	11.78	19.21	1.88	11.26
C_2 X T_6	52.85	3.62	4.07	10.87	17.58	1.86	10.73
C_3X T_1	54.22	5.27	4.68	11.97	20.96	2.01	11.12
C_3X T_2	57.07	6.27	6.22	13.27	21.92	2.22	13.35
C_3X T_3	55.59	5.72	6.04	12.33	20.66	2.18	11.72
C_3X T_4	52.55	3.76	4.11	11.29	18.22	1.93	11.17
C_3X T_5	54.77	4.45	4.96	12.13	19.60	1.92	11.63
C_3X T_6	53.27	4.18	4.23	11.39	19.30	1.93	11.27
C_4X T_1	56.59	5.61	5.65	12.66	21.02	2.07	12.54
C_4X T_2	59.12	6.38	6.18	12.83	21.19	2.28	12.05
C_4X T_3	56.30	6.23	6.34	13.06	21.39	2.24	12.93
C_4X T_4	53.93	4.33	5.08	11.30	18.95	1.99	10.86
C_4X T_5	56.15	5.30	5.48	12.15	20.33	2.03	12.08
C_4X T_6	49.98	4.72	5.20	11.74	19.37	2.01	11.62
C.D.(p=0.05)	NS	NS	NS	0.43	0.69	NS	0.45

NS = Non-Significant

associated with major plant process. Similar, findings have been reported by Agrawal *et al.* (2004) and Dar *et al.* (2010).

It is evident from the seed application of biofertilizers showed superiority over soil application. The seed treatment with *Azospirillum* (T_2) recorded the maximum plant height (55.75cm). The seed treatment with PSB (T_3) and *Azotobacter* (T_1) were significantly at par with T_2 treatment. The increase in plant height due to biofertilizers could be ascribed to the fact that the biofertilizers are known to synthesize the growth promoting substances besides N-fixation as a result of this could have grown luxuriously. These findings are in close conformity with Prabhu *et al.* (2003), Ray *et al.* (2005) and Dar *et al.* (2010). The interaction between fertilizers x biofertilizers showed non-significant effect on plant height in okra.

Stem diameter:

There was a linear increase in stem diameter from 0 to 100 per cent RDF. The maximum stem diameter (5.43cm) was recorded in C_4 treatment and the thinnest stem diameter was found in C_0 treatment (3.04cm). The increase in stem diameter of plants might be due to better utilization of NPK by okra plants, resulting in better growth indices due to efficient utilization of nutrients by the crop. This result is in close conformity with those of Singh and Mohan (2007) in pointed gourd and Sharma *et al.* (2010) in okra.

The application of biofertilizers to the seeds of okra showed significant response towards the stem diameter. The maximum stem diameter was recorded with T_2 treatment (5.29cm) and the thinnest plant diameter was recorded in T_4 treatment (3.20cm). The increase in stem diameter might be attributed to improved vegetative growth which resulted in better availability of nutrients at vital growth period, greater synthesis of carbohydrates and their proper translocation, improved water status of plants. This result is in concurrence with findings of Bahadur and Manohar (2001) and Nurruzzaman *et al.* (2003). The interaction between inorganic fertilizer x biofertilizers showed non-significant effect on stem diameter in okra.

Number of branches per plant:

The data in Table 1 indicated that application of chemical fertilizers increased the number of branches per plant. There was a linear increase from 0 to 100 per cent RDF. The maximum number of branches per plant (5.65) was recorded with C_4 treatment. While as minimum (3.53) were recorded with C_0 treatment. The increase in number of branches per plant might be due to increase in plant height and thereby more number of leaves per unit area which might have increased the sufficient and readily availability of N, P and K fertilizers during crop growth. Similar results have been reported by Naidu *et al.* (1999).

The seed application of different biofertilizers *viz*., *Azospirillum*, *Azotobacter* and PSB significantly increased the number of branches per plant as compared to soil application of these biofertilizers. The seed application of *Azospirillum* (T_2) recorded the maximum number of branches per plant (5.90). The increase in number of branches per plant might be due to the role of *Azospirillum* apart from its higher nitrogen-fixing potential produces plant growth hormones. The increase in activity of plant growth substances like GA and IAA might be responsible for increase in number of branches per plant inoculated with *Azospirillum*. The results are in line with those of Prabhu *et al.* (2003) and Dar *et al.* (2010).

The interaction between inorganic fertilizers x biofertilizers showed non-significant effect on number of branches per plant.

Table 2 : Effect of fertility levels and biofertilizer application methods on economics of seed yield of okra (pooled data for 2 years)

Treatments	Cost of cultivation (N/ha)	Gross return (N/ha)	Net return (N/ha)	B:C ratio
	Mean	Mean	Mean	Mean
Fertility levels				
Control	30460.00	82440.00	51980.00	1.71
25% * RDF	30853.00	87360.00	56507.00	1.83
50% RDF	31246.00	91520.00	60274.00	1.93
75% RDF	31639.00	97840.00	66201.00	2.09
100% RDF	32032.00	91920.00	59888.00	1.87
Biofertilizer application methods				
Seed treatment with *Azotobactor*	30565.00	90760.00	60195.00	1.97
Seed treatment with *Azospirillum*	30565.00	94920.00	64355.00	2.11
Seed treatment with PSB	30565.00	93520.00	62955.00	2.06
Soil treatment with *Azotobactor*	30600.00	85120.00	54520.00	1.78
Soil treatment with *Azospirillum*	30600.00	90200.00	59600.00	1.95
Soil treatment with PSB	30600.00	86800.00	56200.00	1.84

*Recommended dose of fertilizer for okra: 60kg N, 30 kg P_20_5 and 30 kg K_20/ha

Number of fruits per plant:

The number of fruits per plant was significantly increased as the dose of NPK was raised from 0 to 100 per cent RDF. The highest number of fruits per plant (12.29) was observed with C_4 treatment and lowest (9.96) were observed with C_0 treatment. The highest number of fruits per plant seemed to be the result of increased number of branches per plant which gave rise to more number of nodes wearing profused flowering under the influence of optimum level of chemical fertilizers. These results are in close conformity with the findings of Selvi and Perumal (2000) and Swain *et al.* (2003). The seed treatment with all the biofertilizers significantly influenced the number of fruits per plant as compared to soil treatment. The T_2 treatment yielded the highest (12.34) number of fruits per plant. While as T_3 (seed treatment with PSB) was statistically at par with T_2 treatment. The increase in number of fruits per plant might be attributed to improved vegetative growth which resulted in better availability of nutrients at vital growth period, greater synthesis of carbohydrates and their proper translocation, improved water status of plant and increased nitrate reductase activity. The results are in concurrence with the findings of Nurruzzaman *et al.* (2003).

The interaction effect of chemical fertilizers x biofertilizers was statistically significant for this trait. The highest number of fruits per plant (13.27) was recorded with C_3T_2 treatment combination. The probable reason for increase in number of fruits per plant might be due to the favourable nutritional environment in the root zone created by addition of chemical fertilizers and biofertilizers which resulted in increased absorption of nutrients from the soil solution and the uptake of these nutrients were responsible for increased number of fruits per plant. The application of treatment combination C_3T_2 saved about 25 per cent of nitrogen through chemical fertilizers when the seeds were inoculated with *Azospirillum* probably inoculation of seed along with 75 per cent of nitrogen supplemented by chemical fertilizers, the total requirement of crop growth fulfilled. These results have the support of findings of Kumar and Sharma (2006), Chaurasia *et al.* (2007) and Dar *et al.* (2010).

Fruit length:

The data presented in the Table 1 revealed that statistically higher values (20.37cm) were obtained for fruit length with C_4 treatment. While the treatment C_3 (75 per cent RDF) was statistically at par with C_4 treatment for fruit length. The improvement in fruit length with C_4 treatment might be due to application of balanced fertilization which built up adequate food reserve for formation and alongation of cells and enhanced photosynthetic activity by increasing rate of photosynthesis. The synthesized photosynthates might have translocated in growing fruits having more demand of assimilates, which consequently led to greater length. Similar, findings have been reported by Sharma *et al.* (2010).

In case of biofertilizers, treatment T_2 produced maximum fruit length (20.46cm), where as treatment T_3 (Seed treatment with PSB) as at par to T_2 treatment. While as minimum (17.82) fruit length was recorded with T_6 treatment. The fruit length was significantly increased by the application of biofertilizers to the seed as compared to soil treatment. However, the maximum value for fruit length was recorded with treatment T_2 and the treatment T_3 was at par with it. The favourable effect of *Azospirillum* application might be attributed to the production of growth promoting hormones, N-fixation and solubulization of phosphates which have increased the uptake of different nutrients to the plant and enhanced the length of fruit. Similar, findings have been given by Singh and Singh (2005), Singh and Kushwah (2006) and Pandey *et al.* (2008).

The interaction between inorganic fertilizers x biofertilizer was founds statistically significant. The treatment combination C_3T_2 (Seed treatment with *Azospirillum* + 75 per cent RDF) recorded the maximum fruit length (21.92cm) and the treatment combination C_4T_3 (Seed treatment with PSB + 100 per cent RDF) was at par with C_3T_2 treatment combination. However, the minimum fruit length (14.96cm) was recorded in treatment combination C_0T_4. The probable reason for enhancement of fruit length might be due to improvement towards the physical properties of the soil and thereby improving water and nutrient holding capacity of soil, thereby proper translocation of food material and nutrients to the fruit, enhanced the fruit length.

Fruit diameter:

The data given in Table 1 showed that the application of different levels of inorganic fertilizers showed significant effect on fruit diameter. The soil application of 100 per cent RDF (C_4) recorded the maximum (2.10cm) fruit diameter and was closely followed by treatment C_3 (75 per cent RDF). The minimum fruit diameter (1.85cm) was recorded with C_0 treatment. This may be due to the better utilization of NPK by okra plants due to split application in the sandy loam soils resulting in better growth indices due to efficient utilization of nutrients by the crop. Similar, findings have been reported by Singh and Mohan (2007) in pointed gourd and Sharma *et al.* (2010) in okra.

The application of biofertilizers to the seeds of okra showed significantly positive response towards the fruit diameter in comparison to soil treatment. The best result for this trait was observed when the seed were inoculated with *Azospirillum*. The maximum value (2.15cm) was recorded with T_2 treatment. The increase in fruit diameter can be attributed to the release of bioactive substances having similar effect as that of growth regulators besides enhancement of nutrient absorption. These results are in close conformity with those of Ganeshe *et al.* (1998), Naidu *et al.* (1999) and Narayanamma *et al.* (2005).

While studying the interaction effect of inorganic fertilizers x biofertilizers it was observed that none of the treatment combination responded to this trait. However, maximum values (2.28cm, 2.24cm and 2.22cm) were recorded in treatment combinations C_4 T_2, C_4 T_3 and C_3 T_2, respectively.

Seed yield:

The data in Table 1 depicted that fertilizer treatments had significant effect on seed yield (q/ha). The mean values indicate that C_4 treatment resulted in maximum seed yield followed by C_3 treatment and both these treatments behaved statistically alike. These two treatments differed significantly from other treatments. Minimum seed yield quintal per hectare was obtained from C_0 treatment. It was observed that the seed yield increased with the increase in fertilizer dose. It is an established fact that nitrogen promotes vegetable growth consequently resulting in more yields. P and K are also responsible for better growth, maturity seed yield and quality of the seed. All these three nutrients affected positively on the performance of plant and yield contributing traits which resulted in higher seed yield. Similar findings have been reported by Omotoso and Shittu (2007) and Dalal and Nandkar (2010).

The biofertilizer application in both seed and soil treatment had significant effect on the seed yield of okra. The T_2 treatment significantly affected the seed yield per plot per hectare and gave the highest value (11.87q/ha). The treatments T_3, T_1 and T_5 were closely at par with this treatment. The increase in seed yield per plot per hectare might be due to enhanced cell division and meristematic cell division in apical meristem resulted in higher vegetative growth which accumulated more photosythates in the plants and those resulted into seed yield contributing traits. Similar, findings have been reported by Pandey *et al.* (2008), Vannila and Jayanthi (2008) and Dalal and Nandkar (2010).

The interaction effect of chemical fertilizers x biofertilizers was observed for maximum seed yield in okra. The data revealed that maximum seed yield (13.35q/ha) with C_3T_2 treatment combination and lowest seed yield (9.45q/ha) was recorded with C_0 T_4 treatment combination. The increase in seed yield might be attributed with improved soil physical structure, soil fertility and soil microbial properties which ultimately responded to the higher seed yield per plot per hectare. Similar, findings have been reported by Shaheen *et al.* (2007), Pandey *et al.* (2008), Dalal and Nandkar (2010) and Chattopadhyay *et al.* (2011). While studying, the interaction effect of inorganic fertilizer x biofertilizers observed that the combination C_3 T_2 (Seed treatments with *Azospirillum* + 75 per cent RDF) produced maximum seed yield (13.35 q/ha). This treatment was closely followed by C_4 T_3 treatment combination. The minimum (9.45 q/ha) seed yield was recorded with C_0 T_4 treatment combination.

Economics of seed yield:

The data presented in Table 2 indicated that fertility levels and biofertilizers when applied individually or in combination gave significantly highest net returns as well as B: C ratio. The treatment C_3 (75 % NPK) recorded maximum seed yield (12.23 q/ha), thereby gave gross income to the tune of Rs. 97840.00 and net income Rs. 66201.00 and cost: benefit ratio 1:2.09. In biofertilizers, T_2 (Seed treatment with *Azospirillum*) recorded the maximum seed yield (11.87q/ha) thereby gave gross income to the tune of Rs. 94920.00, net income Rs. 64355.00 and cost: benefit ratio 1: 2.11. Whereas C_0 (control) recorded the minimum seed yield with cost: benefit ratio 1: 1.71. Both these treatments gave highest B: C ratio. Similar, findings have been reported by Sharma and Bhalla (1995) and Sharma *et al.* (2010).

Conclusion:

This study was conducted on the effect of biofertilizer application methods and inorganic fertilizers on the growth, seed yield and economics cost benefit ratio of okra under sub-tropical irrigated area of Jammu. The best application of C_4 (100 % recommended dose) significantly influenced plant height, stem diameter, number of branches per plant, number of fruit, fruit size and seed yield. The economic cost was highest C_3 treatments RDF gross return, net return and B: C ratio. In biofertilizer application methods T_2 (seed application of *Azospirillum*) was significantly superior to other treatments. Seed inoculation of *Azospirillum* significantly recorded highest plant height, stem diameter, number of branches per plant, number of fruit, fruit size, seed yield and economics cost. The interaction between fertilizers x biofertilizers was found for significant number of fruits per plant, fruit length and seed yield and other are non-significant. Optimum nutrition is a key to achieve maximum crop production yield is considered as a goal. Thus it may be concluded that the results the seed inoculation with *Azospirillum* is the best performance particularly with respect to growth attributes, seed yield and economic cost of okra in the inorganic fertilizers and biofertilizers application methods have potential to be used practically as a natural nutrition sources in agricultural products under sub-tropical condition.

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