The Scientific Temper
VOL.-IV & V, 2013-2014
ISSN 0976 8653, E ISSN 2231 6396
e-mail : letmepublish@rediffmail.com
Web : www.scientifictemper.com

EFFECT OF BIOFERTILIZERS AND GROWTH REGULATOR ON GROWTH AND YIELD OF OKRA

Arvind Kumar
Department of Ag. Chemistry, R.K. (P.G.) College, Shamli - 247 776 (U.P.).

ABSTRACT

An experiment was conducted at college in faculty of Agriculture, Shamli during *kharif* season of 2003-2004 with objectives to find out the suitable combination of biofertilizers (Inoculation with Azotobacter and Phosphate Solubilizing Bacteria each for 10 kg seeds and growth regulator Cycocel 500, 700, 1000 ppm). Okra var. PusaMakhmali. Considering the growth, yield and other quality perameters data revealed that significantly minimum height of plant was recorded by the foliar application of 1000 ppm cycocel. In respect of number of branches, number of leaves, number of internodes, number and weight of fruits, length of third internodes, yield of fruits plant^{-1} and ha^{-1} were significantly maximum in the plant receiving Azotobacter + 1000 ppm cycocel with good quality fruits of okra.

Key words : Growth regulator, Cycocel, Biofertilizers, Okra.

INTRODUCTION

Vegetables has a vital contribution in balance diet by providing all the essential nutrients. Regular consumption of vegetables, provides many of most essential helath building and protective substances, which are needed for proper growth and development of human being. Okra posses sixth position among the vegetables grown commercially in India.

Now-a-days nitrogen requirement in agriculture are met mainly by biological nitrogen fixation with the help of biofertilizers as huge amount of nitrogen present in atmosphere can be effectively used to supplement the nitrogen requirement there by reducing the use of chemical fertilizers.

Azotobacter fixes atmospheric nitrogen, non symbiotically and phosphate solubilising bacteria solubilizes insoluble form of phosphate to soluble form by producing organic acids. Therefore, combination of Azotobacter and phosphate solubilising bacteria is of considerable economic importance as they play important role in supply of N and P.

Growth regulator like cycocelare used for increasing the production and quality of okra because it helps to reduce the vegetative growth and increase the number of branches by shortening their internodes which finally leads to the quantitative yield of okra with better quality. Keeping this view an experiment was conducted to study the effect of biofertilizers and plant growth regulator forgetting higher yield and quality of okra var. PusaMakhmali.

METERIALS AND METHODS

The present investigation was carried out during the *kharif* season of the year 2002-2003 at college. The experiment was carried out in a RBD with eight treatments consisting of combination of biofertilizersand growth regulator with reduced doses of NPK. The treatment combinations are as follows :

T_1 - F(50:50:00 kg NPK ha^{-1})

T_2 - 50%F +Azotobacter+PSB

T_3 - 50%F +500 ppm cycocel

T_4 - 50%F +700 ppm cycocel

T_5 - 50%F +1000 ppm cycocel

T_6 - 50%F +Azotobacter+PSB+500 ppm cycocel

T_7 - 50%F +Azotobacter+PSB+700 ppm cycocel

T_8 - 50%F +Azotobacter+PSB+1000 ppm cycocel

Completely decomposed FYM @ 10 t ha^{-1} was applied before preparation of beds and it was evenly mixed in the soil. The beds and it was evenly mixed in the soil. The basal dose of 25 kg N + 50 kg P_2O_5 h^{-1} was applied at the time of sowing and remaining half dose of nitrogen (25 kg N ha^{-1}) was given one month after sowing. Before sowing the seeds of okra was inoculated with Azotobacter + PSB @ 200 g each for 10 kg seeds. Cycocel solution of required concentration was prepared by dissolving appropriate quantity of cycocel in desired volume of distilled water and prepared the solution of 500, 700, 1000 ppm concentrations respectively, which were applied as a foliar spary at 30 days after sowing.

The observations regarding growth *viz*., height of plant (cm), leaves plant^{-1}, length of third internode (cm), number of days for first flower initiation, fruit quality and yield of fruits included number of fruits plant^{-1} (g) and yield of fruits hectare^{-1} (q) were recorded and statistically analysed.

RESULTS AND DISCUSSION

Growth parameters

The data on plant height, number of leaves plant^{-1}, number of branches plant^{-1}, number of internode on main stem and length of third internode are presented in table 1. The results indicated that reduced application of inorganic fertilizers with biofertilizers and growth regulator significantly increased the vegetative growth parameters under study except height of plant and length of third internodes. Significantly maximum plant height (86.02cm) and longer length of third internode (3.88 cm) was obtained by the application of F 50:50:0 kg NPK ha^{-1}, followed by application of 50% F + Azotobacter+ PSB (82.12 cm, 3.65 cm) and 50% F+500 ppm cycocel (54.10 cm, 2.79 cm). Among the treatments, 50% F + 1000 ppm cycocel produced minimum pant heiht (45.41 cm) and third internode (2.60 cm) and found statistically at par with 50% F + Azotobacter + PSB + 1000 ppm cycocel (45.47 cm, 2.62 cm). These treatments produced lowest height which may be due to the fact that cycocel being growth retardant relarded the stem elongation by preventing cell division in the sub apical meristematic zone of the stem (Cathey, 1964). The findings were closely in confirmation with the results obtained by Gowda and Gowda (1983) in okra.

Significantly highest number of leaves plant^{-1} (33.81) and maximum number of branches plant $^{-1}$, (3.98) were recorded by 50% F + Azotobacter + PSB + 1000 ppm cycocel (33.75 and 3.90) and 50% F + Azotobacter + PSB + 700 ppm cycocel (32.17 and 3.86). However, significantly minimum number of leaves plant^{-1}, (27.02) and minimum number of branches plant^{-1}, (2.86) were recorded by 50% F + Azotobacter + PSB. Significantly highest internodes plant^{-1} was recorded by 50% F Azotobacter + PSB + 1000 ppm cycocel (27.05) followed by 50% F + 1000 ppmcycocel (26.87) and 50 % F + Azotobacter + PSB + 700 ppm cycocel (25.18). Whereas, significantly, minimum number of intermodes plant^{-1} was observed by the treatment receiving 50% F + Azotobacter + PSB (20.18). This might be due to the effect of cycocel being a growth retardant,cycocel may have produced effect on formation of more number of primary branches, more leaves and produced more internodes on plant. These results are in close conformity with the results of Arora and Dhankher (1992), Rathod and Patel (1996) in okra.

Flowering and fruit quality

The data on flowering and fruit quality of okra have indicated significant variation among the treatments under study (Table 2). The number of days required for first flower initiation in different treatments were statistically non significant. Effect of biorertilizers and growth regulator with reduced dose of F significanatly influenced the length and diameter of fruit. Significantly lnger fruits with maximum diameter were produced in the plot treated with F (10.72 cm and 1.73) followed by 50% F + Azotobacter + PSB (9.88 cm and 1.70) and 50% F + 500 ppm cycocel (8.79 cm and 1.49 cm). Whereas, significantly minimum length and diameter of fruit were obtained by 50% F + Azotobacter + PSB + 1000 ppm Cycocel (8.44 cm and 1.45 cm), which was at par with treatments 50 % F + 1000 ppm cycocel (8.50 cm and 1.45 cm) and 50% F + Azotobacter + PSB + 700 ppm Cycocel (8.68 cm and 1.45 cm). The length and diameter of fruits were significantly reduced at all concentrations of cycocel. This may be due to inhibitory effect of cycocel retarded the stem elongation, cell division and thereby producing short fruit with reduced diameter. Similar

Table 1 : Effect of biofertilizers and reduced doses of NPK on growth of okra when applied with growth regulator.

Treatments	Plant height (cm)	Number of leaves plant^{-1}	Primary branches plant^{-1}	Intermodes on main stem plant^{-1}	Length of third internode (cm) at final harvest
T_1 - F(50:50:00 kg NPK ha^{-1})	86.02	29.25	3.14	22.14	3.88
T_2 - 50%F +Azotobacter+PSB	82.12	27.12	2.86	20.18	3.65
T_3 - 50%F +500 ppm cycocel	54.10	30.03	3.17	23.91	2.79
T_4 - 50%F +700 ppm cycocel	49.93	31.93	3.84	25.18	2.72
T_5 - 50%F +1000 ppm cycocel	45.41	33.75	3.90	26.87	2.60
T_6 - 50%F +Azotobacter+PSB+ 500 ppm cycocel	54.61	30.62	3.80	24.50	2.76
T_7 - 50%F +Azotobacter+PSB+ 700 ppm cycocel	50.57	32.17	3.86	25.51	2.69
T_8 - 50%F +Azotobacter+PSB+ 1000 ppm cycocel	45.47	33.82	3.96	27.05	2.60
SE (m) ±	0.326	0.016	0.012	0.020	0.014
CD at 5%	0.987	0.050	0.037	0.060	0.043

Table 2 : Effect of biofertilizers and reduced doses of NPK on yield and quality of okra when applied with growth regulator.

Treatments	Days required for first flower initiation	Length of fruit (cm)	Diameter of fruit (cm)	Number of fruits plant^{-1}	Weight of fruits plant^{-3} (g)	Yield (fruits qha^{-1})
T_1 - F(50:50:00 kg NPK ha^{-1})	42.00	10.52	1.73	25.60	178.32	66.03
T_2 - 50%F +Azotobacter+PSB	42.33	10.06	1.69	24.90	176.97	32.55
T_3 - 50%F +500 ppm cycocel	44.33	8.79	1.49	20.43	155.09	57.45
T_4 - 50%F +700 ppm cycocel	45.33	8.72	1.46	21.40	166.39	61.62
T_5 - 50%F +1000 ppm cycocel	46.66	8.50	1.54	23.23	172.09	63.72
T_6 - 50%F +Azotobacter+PSB +500 ppm cycocel	45.00	8.75	1.48	26.70	188.45	69.77
T_7 - 50%F +Azotobacter+PSB +700 ppm cycocel	45.66	8.68	1.46	27.80	196.22	72.67
T_8 - 50%F +Azotobacter+PSB +1000 ppm cycocel	46.66	8.44	1.44	29.33	199.41	73.87
SE (m) ±	1.109	0.113	0.0072	0.255	0.498	0.183
CD at 5%	-	0.343	0.022	0.774	1.501	0.555

results have been found by Marisiddiah and Gowda (1978), Singh and Rajput (1983) in cluster bean.

Fruit yield

Biofertilizers and growth regulator with reduced dose of F had significant influence on marketable green yield of okra (Table 2). Significantly higher number of fruits plant^{-1}were obtained with 50% F + Azotobacter + PSB + 1000 ppm cycocel (29.33) followed by 50% F + Azotobacter + PSB + 700 ppm cycocel(27.80) and 50% F + Azotobacter + PSB + 500 ppm cycocel (26.70). However, significantly minimum number of fruits plant^{-1}were obtained by the treatments 50% F, 500 ppm cycocel (20.43). Significantly maximum marketable green fruit yield plant^{-1} (199.41 g) and hectare^{-1} (73.87 q) were recorded by 50% F + Azotobacter + PSB + 1000 cycocel followed by 50% F + Azotobacter + PSB + 700 ppm cycocel and 50% F + 500 ppm cycocel (155.09 g plant^{-1} and 57.45 q ha^{-1}). A combination of PNK + Azotobacter + PSB + cycocel may have increased the yield of fruits hectare^{-1}. This might be due to favourable cumulative action of biofertilizers and inorganic compound which provided nutrients in proportion and increasing the availability of P_2O_5 in soil through PSB and suppress the excessive height by appropriate use of cycocel tended the plant with more internode, more branches and more fruits plant^{-1} thereby ultimately increased total green fruits yield plant^{-1} and hectare^{-1}. Similar results have been found by Ramprakash and Prasad (2000) and by Kumar *et al*. (2001) in potato and Gowda and Gowda (1986) in okra.

REFERENCES

Arora S. K. and Dhankher B. (1992). Effect of seed soaking and foliar spray of cycocel on germination, growth, flowering, fruit-set and yield of okra (*Aelmosches esculentuss* (L.) Moench). *Veg. Sci*., **19 (1)** : 78-85.

Cathey H. M. (1964). Physiology of growth retarding chemicals - A. Rev. *PI. Physiol*., **15** : 271.

Kumar V., Jaiswal R. C. and Singh A. P. (2001). Effect of biofertilizers on growth and yield of potato. *Indian Potato J*., **28(1)** : 60-61.

Marisiddaish M. and Gowda P. M. (1978). Effect of SADH and CCC on certain growth and yield contributed of hybrid tomato. *Madras Agric. J*., **12** : 229-233.

Ramprakash and Prasad Mangal (2000). Effect of nitrogen, chlorpmequat chloride and FYM applied to cotton (*G. hirsutum*) and their residual effect on succeeding wheat (*T. aestivum*) crop. *Indian. J. Agron*., **45(2)** : 263-268.

Rathod R. R. and Patel C. L. (1996). Effect of irrigation and cycocel on growth and yield of summer okra, (*Abdomschus esculentus* (L.) Moench). *GAU. Res. J*., **22 (2)** : 109 - 111.

Singh S. J. P. and Rajput C. B. S. (1983). Effect of nitrogen, phosphorus and cycocel on physiochemical characters of cluster bean vegetable (*Cyamopsistetra gonoloba* L) Cv. PusaNavbahar. *Prog. Hort*., **17(3)** : 181-184.

http://www.scientifictemper.com/