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Effect of Integrated Nutrient Management on Growth and Yield of Spinegourd (*Momordica dioica* Roxb.)

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ABSTRACT

Present study was conducted during *kharif* 2008 at the site allocated for Network Project on Bio-fertilizers in Orissa University of Agriculture and Technology with the sole purpose of studying the effect of bio-fertilizers, inorganic fertilizer levels and amendment on growth and yield of spinegourd. Results revealed that application of different levels of inorganic fertilizer recommended dose (70:40:60 kg/ha) in combination with bio-fertilizers (azotobacter + azospirillum + phosphate solubulizing bacteria + arbuscular mycorrhiza @ 6 kg/ha before transplanting) and amendment (lime @ 20% LR i e 1 t/ha applied to the soil) increased the vine length, number of branches per plant, vine girth, number of leaves per plant, leaf area, yield and yield attributing components. The highest yield of 53.43 q/ha was also recorded in the same treatment.

Key words: Spinegourd, Integrated nutrient management, Growth, Yield

Spinegourd (*Momordica dioica* Roxb.) is a dioecious, climbing cucurbit mainly grown in Orissa, Bihar and West Bengal of India. It is a very nutritious crop having medicinal value. It is one of the most important underexploited cucurbitaceous vegetable crops. Spinegourd is a remunerative crop which can boost the economic condition of the farmers. Spinegourd is propagated through seeds and by tuberous roots. Seed germination is comparatively low due to seed dormancy and availability of tuberous roots is also a problem. The research work on the crop in Orissa is scanty. No systematic guideline has been developed for its propagation. The use of expensive commercial fertilizer as per the requirement of the crop is not much affordable to the average farmers. The application of chemical fertilizers, pesticides, herbicides improved the production but may have adverse effect on the soil health and environment. INM system has become an efficient way to improve the soil quality and also safeguards the environment (Rekha and Gopalkrishnan 2001). Present study was conducted to find out the most appropriate integration of bio-fertilizer, chemical fertilizer for increasing growth and yield of spinegourd.

MATERIALS AND METHODS

The experiment was conducted at the site allocated for Network Project on Bio-fertilizers in Orissa University of Agriculture and Technology, BBSR during *kharif* 2008 and laid out in a randomized block design with six treatments and four replications. The soil of the experiment plot was sandy loam of *p*H 5.9 having 6.48 g/kg of organic carbon, 217 kg/ha of available N, 45 kg/ha of available P_2O_5 and 275 kg/ha of available K_2O. The treatments consisted of control (T_1), recommended dose of fertilizers (T_2), recommended dose of fertilizers with lime(T_3), recommended dose of fertilizers with bioinoculants (T_4), recommended dose of fertilizers + lime + bioinoculants (T_5) and 75% recommended dose of fertilizers + lime + bioinoculants as (T_6). Twenty kg of well decomposed FYM were applied just before last ploughing. The total amount of P_2O_5, one-fourth amount of N as well as half of potash were applied as basal dressing before transplanting of the rooted cuttings. Twenty four days after transplanting half of N and rest of potash were applied as first top dressing. Remaining portion of nitrogen was applied 30 days after 1st top dressing. Bio-fertilizers were given as a soil application. Recommended package of practices were followed to raise the crop under rainfed conditions. The growth and yield observations were recorded and analyzed statistically.

RESULTS AND DISCUSSION

Results revealed that there were significant differences on the vine length due to the application of recommended dose + lime + bioinoculants. Application of only bio-fertilizer or 100% chemical fertilizer alone could not influence significantly than the combined application. Bio-fertilizers might have attributed to longer amount of sustainable supply of nutrients during the growth period. Significant increase in vine length might also be due to production of different phytohormones like IAA, GA and cytokinin produced by bio-fertilizers (Meerabai *et al*. 2007). Chemical fertilizer particularly nitrogen along with lime and FYM after being taken up during the growth period resulted quicker cell formation and elongation leading to increase in the vine length (Das *et al*. 1987). 100% N, P, K with bio-fertilizers along with amendment have a cumulative effect in association with nitrogen thus the use efficiency of nutrients

increased resulting in production of more number of branches (Kumar *et al*. 1990). Vine girth was also influenced by the application of chemical fertilizers, bioinoculants and lime, increase in vine girth in a positive manner helps in giving strength to the plants for trailing. It is well known that leaves are the major site of photosynthesis and act as the major "sources" for the "sink". Similarly, leaf area expansion is one of the indications of response of growth factor and is also a direct indication of photosynthetic potentially of a plant.

Table 1 Plant height (cm), number of branches per plant, vine girth (cm), number of leaves per plant, leaf area (cm^2) as influenced by integrated nutrient management in spine gourd

Treatments	Plant height (cm)	No. of branches/ plant	Vine girth (cm)	No. of leaves / plant	Leaf area (cm^2)
T_1: Control	80.33	6.5	2.55	153.67	50.58
T_2: Recommended dose	104.06	7.37	2.80	219.08	69.12
T_3: Recommended dose + lime (0.2 LR)	91.87	6.87	3.03	194.58	76.01
T_4: Recommended dose + bioinoculants	91.37	7.75	3.17	216.37	76.43
T_5: Recommended dose + bioinoculants (Azot. + Azs. + PSB + AM)	110.56	8.81	3.20	249.34	75.63
T_6: Recommended dose + lime + BI	103.37	8.18	3.25	238.50	72.06
SE (m) ±	0.218	0.163	0.156	0.217	0.333
CD (0.05)	0.656	0.492	0.470	0.653	1.00

Table 2 Height at which 1st flower appeared (cm), days taken to flowering, total chlorophyll (mg/g) as influenced by integrated nutrient management in spine gourd

Treatments	Height at which 1st flower appeared (cm)	Days taken to flowering	Total chlorophyll (mg/g)
T_1: Control	25.80	21.85	1.59
T_2: Recommended dose	42.10	24.70	1.89
T_3: Recommended dose + lime (0.2 LR)	28.12	24.53	1.95
T_4: Recommended dose + bioinoculants	30.45	23.69	2.18
T_5: Recommended dose + bioinoculants (Azot. + Azs. + PSB + AM)	20.36	20.13	2.29
T_6: Recommended dose + lime + BI	35.21	22.31	2.08
SE (m) ±	0.237	0.305	0.183
CD (0.05)	0.715	0.918	0.551

Table 3 Number of fruits per plant, length of fruit (cm), fruit girth (cm), fruit weight (g) and yield (q/ha) as influenced by integrated nutrient management in spine gourd

Treatments	No. of fruits per plant	Length of fruit (cm)	Fruit girth (cm)	Fruit weight (g)	Fruit yield (q/ha)
T_1: Control	48.28	4.85	8.08	9.48	30.66
T_2: Recommended dose	54.17	5.17	8.38	10.06	36.51
T_3: Recommended dose + lime (0.2 LR)	45.16	5.20	8.46	12.85	43.30
T_4: Recommended dose + bioinoculants	58.97	5.34	8.58	12.33	48.72
T_5: Recommended dose + bioinoculants (Azot. + Azs. + PSB + AM)	62.06	5.48	8.62	14.31	53.43
T_6: Recommended dose + lime + BI	61.26	5.10	8.39	11.02	45.23
SE (m) ±	0.267	0.141	0.143	0.349	0.149
CD (0.05)	0.803	0.423	0.430	1.05	0.449

The combination of recommended dose with bio-fertilizer with amendment resulted in maximum production of leaves also had significant affect on increasing leaf area. Recommended dose of N, P and K along with bio-fertilizers and amendments influenced flowering at a lower height. The availability of nutrients in case of combination (RD + lime + bioinoculants) of all the sources appears to be more adequate, there by influencing the bud to become a female flower which ultimately appears at a lower height. The quicker the availability of nutrients to the bud sooner is the development of the flower as well as its opening. Earliness or days taken to flowering is a genetically controlled trait also influenced by environment, cultural practices and nutrition. The combined effect of 100% N, P, K along with bio-fertilizers and amendment significantly influenced the appearance of flowers at minimum days after planting than sole application of N, P, K or bio-fertilizer or amendment. The combined effect might have helped the plant to achieve a better nutritional status. Increased production of leaves might help to elaborate more photosynthates and induce

flowering stimulus, thus affecting early bud initiation. The number of fruits per plant is the most important determinant of yield (Goswami and Sharma 1997). The present investigation revealed that maximum number of fruits was obtained in the treatment combination of 100% N, P, K with bio-fertilizers and amendment than other treatments. This increase may be due to the apportioning efficiency i.e. increased allocation of photosynthates towards the economic parts that is the fruits and also the hormone balance in the plant system. Higher number of productive flowers in this treatment may also help in production of higher number of fruits per plant (Tripathy *et al*. 1993). Length, girth and weight of the fruit were also found to be significant with respect to the combined effect of 100% N, P, K along with bio-fertilizers and amendment over the other treatments. However, bigger size fruits with increased weight were recorded by applying full dose of N, P, K with bio-fertilizers as well as amendment which might have favoured the production and accumulation of prepared food, thereby increasing the individual fruit weight. Thus these yields attributes increased in proportion to yield. This is in confirmation with Sharma and Thakur (2001), Subbiah (1990) in tomato.

The treatment RD + lime + bioinoculants resulted in highest yield in terms of yield per plant and yield per hectare. Application of different levels of N,P,K in combination with bio-fertilizers and amendment increased the yield of fresh fruits per plant and ultimately the yield per hectare increases in an increasing order with that of increases in the dose of N,P,K combine with bio-fertilizers and amendments. The yield increase might have been due to the better manifestation of yield attributes on account of application of organic-inorganic combination of manures and fertilizers including bio-fertilizer resulting in better growth indices due to efficient utilization of nutrients by the test crop of spinegourd (Das *et al*. 1993). Another possible reason for the increase in yield may be the solubulization effect of nutrients as well as chelating effect of bio-fertilizers on metals; thus by the availability gets increased.

It may be recommended that application of different levels of inorganic fertilizer recommended dose in combination with bio-fertilizers and amendment increased the vine length, number of branches per plant, vine girth, number of leaves per plant, leaf area, yield and yield attributing components.

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