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EFFECT OF ORGANIC AND BIOFERTILIZERS ON GROWTH PARAMETERS IN BLACK PEPPER (*PIPER NIGRUM* L.)

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ABSTRACT

India is known as the "Land of spices" from time immemorial and emerged as a leading country in respect of area, production and export of spices in the world. Black pepper (*Piper nigrum*), known as "king of spices", is a perennial export cash crop in India. An experiment was conducted at Horticultural Research Station, Yercaud, Tamil Nadu Agricultural University, Coimbatore with an objective to study the effect of organic and biofertilizers on growth parameters in Black Pepper. Experiment was laid out with six treatments replicated four times in a randomized block design. Among the treatments of organic manures and biofertilizers viz., vine lengths were recorded at initial stage (before the commencement of trial), flowering stage and harvesting stage. Internodal length and leaf area were recorded at flowering stage and harvesting stage, the vine length (8.91,9.01 & 9.12 m), internodal length (5.11 & 5.20 cm) and leaf area (88.17 & 89.35 cm^2) was higher in the combined application (T_3) of FYM, Neem Cake, *Azospirillum* and Phosphobacteria compare to over control.

Keywords: FYM, Neem Cake, *Azospirillum,* Phosphobacteria, Growth parameters,Black pepper.

INTRODUCTION

Black pepper renowned as the 'King of Spices' and also termed as 'Black gold' is one of the most important spices contributing to commerce and trade in India since pre historic period. It is a perennial climbing vine grown for its berries, mainly used as spices and condiments. Black pepper is also known as one of the oldest and most popular spices in the world. Black pepper is gaining worldwide for its flavour, taste and pungency alongwith the wide medicinal uses (Sharangi and Kumar, 2011). Kerala accounts for 80-90% of the total black pepper production in the country. The demand of organic spices throughout the world provides ample scope to go for organic substitution in black pepper (Stephen and Nybe, 2003).

Black pepper is a crop responding to heavy dozes of organic manures. Biofertilizers can supplement the chemical fertilizers for meeting the nutrient needs and help in improving growth, yield and quality of crop plants. The present study was, therefore, undertaken to evaluate the effect of organics and biofertilizers (*Azospirillum*, Phosphobacteria and Neem Cake) on growth parameters in black pepper.

MATERIALS AND METHODS

An experimental study on "Standardization of organic practices in black pepper cv., Panniyur - 1" was carried out at the Horticultural Research Station, Yercaud, Tamil Nadu Agricultural University, Coimbatore. There were six treatments namely T_1- FYM 10 Kg + 5 Kg Coir Compost + 50 g Phosphobacteria + 50 g *Azospirillum*, T_2 - FYM 10 Kg + 1 Kg Vermi Compost + 50 g Phosphobacteria, T_3 - FYM 10 kg + 1 Kg Neem Cake + 50 g Phosphobacteria + 50 g *Azospirillum*, T_4 - FYM 10 Kg + 50 g *Azospirillum* + 50 g Phosphobacteria, T_5 - FYM 10 Kg + 50 g *Azospirillum* + 50 g Phosphobacteria + 200 g VAM and T_6 - 100 g of N + 40 g of P_2O_5 + 140 g of K_2O (Recommended dose for Package of Practices - Control) replicated four times in a randomized block design.

The observations on growth parameters viz., vine length, internodal length, leaf area were recorded at initial stage (before the commencement of trial), flowering stage and harvesting stage respectively.

RESULTS AND DISCUSSIONS

Vine length (m)

The vine length was measured in the initial stage, flowering stage and at harvesting stage. In the initial stage, the difference among the treatments was minimal. The combined addition of FYM, *Azospirillum*, Phosphobacteria and Neem Cake (T_3) was found to have the highest value (9.01 m) at flowering stage which is on par with T_5 (8.82 m) and T_1 (8.51 m). The lowest value (8.11 m) was recorded in control (T_6). (Table 1)

Table 1: Effect of organic practices on the vine length (m)

Tr. No	Treatments	Initial stage	Flowering stage	Harvesting stage
T_1	FYM 10 Kg + 5 Kg Coir Compost + 50 g Phosphobacteria + 50 g *Azospirillum*	8.47	8.51	8.59
T_2	FYM 10 Kg + 1 Kg Vermi Compost + 50 g Phosphobacteria	8.35	8.38	8.47
T_3	FYM 10 kg + 1 Kg Neem Cake + 50 g Phosphobacteria + 50 g *Azospirillum*	8.91	9.01	9.12
T_4	FYM 10 Kg + 50 g *Azospirillum* + 50 g Phosphobacteria	8.18	8.21	8.28
T_5	FYM 10 Kg + 50 g *Azospirillum* + 50 g Phosphobacteria + 200 g VAM	8.77	8.82	8.92
T_6	100 g of N + 40 g of P_2O_5 + 140 g of K_2O (Recommended dose for Package of Practices - Control)	8.09	8.11	8.17
SEd		**0.1219**	**0.1225**	**0.1235**
CD (0.05)		**0.2599**	**0.2611**	**0.2633**

Table 2: Effect of organic practices on the Internodal length (cm)

Tr. No	Treatments	Flowering stage	Harvesting stage
T_1	FYM 10 Kg + 5 Kg Coir Compost + 50 g Phosphobacteria + 50 g *Azospirillum*	4.95	5.07
T_2	FYM 10 Kg + 1 Kg Vermi Compost + 50 g Phosphobacteria	4.90	4.99
T_3	FYM 10 kg + 1 Kg Neem Cake + 50 g Phosphobacteria + 50 g *Azospirillum*	5.11	5.20
T_4	FYM 10 Kg + 50 g *Azospirillum* + 50 g Phosphobacteria	4.82	4.91
T_5	FYM 10 Kg + 50 g *Azospirillum* + 50 g Phosphobacteria + 200 g VAM	5.05	5.12
T_6	100 g of N + 40 g of P_2O_5 + 140 g of K_2O (Recommended dose for Package of Practices - Control)	4.75	4.83
SEd		**0.0714**	**0.0719**
CD (0.05)		**0.1521**	**0.1532**

Table 3: Effect of organic practices on the Leaf area (cm2)

Tr. No	Treatments	Flowering stage	Harvesting stage
T_1	FYM 10 Kg + 5 Kg Coir Compost + 50 g Phosphobacteria + 50 g *Azospirillum*	4.95	5.07
T_2	FYM 10 Kg + 1 Kg Vermi Compost + 50 g Phosphobacteria	4.90	4.99
T_3	FYM 10 kg + 1 Kg Neem Cake + 50 g Phosphobacteria + 50 g *Azospirillum*	5.11	5.20
T_4	FYM 10 Kg + 50 g *Azospirillum* + 50 g Phosphobacteria	4.82	4.91
T_5	FYM 10 Kg + 50 g *Azospirillum* + 50 g Phosphobacteria + 200 g VAM	5.05	5.12
T_6	100 g of N + 40 g of P_2O_5 + 140 g of K_2O (Recommended dose for Package of Practices - Control)	4.75	4.83
SEd		**0.0714**	**0.0719**
CD (0.05)		**0.1521**	**0.1532**

The vine length as recorded at harvesting stage also revealed similar trends. The differences in height among the treatments were significant and T_3 had the highest vinelength (9.12 m) which is on par with T_5 (8.92 m) and T_1 (8.59 m).

The combined application of FYM, *Azospirillum*, Phosphobacteria and Neem Cake promoted an increase the vine length, both in flowering stage (0.1 m) and harvesting stage (0.11m). Better vine growth in this combination might be due to the increased availability of N due to N fixation and also the production of phytohormones like IAA, GA and Cytokinins like substances (Reynders and

Vlanak, 1982). The increased growth on vine length due to combined application of FYM and *Azospirillum* has also been reported in black pepper (Harris et al 1992, Kanthaswamy *et al.*, 1995 and Thanuja, 2002) in ginger (Hussain *et al*., 2001) and in turmeric (Velmurugan, 2002). The findings of the present study are in accordance with results of literature.

FYM with narrow CN ratio, produce more humic acid and the humic substances contained in it form chelates with phosphorous. The chelated phosphorous has been reported to be more soluble in water, which could make it easily available to the crop. This might have aided the vine growth.

Internodal length (cm)

Significant variation was recorded among the six treatments studied for internodal length (Table 2). It varied from 4.75 cm to 5.20 cm with a mean of 4.98 cm. The internodal length was high in T_3 (5.11 and 5.20 cm) in both flowering and harvesting stage and it was on par with T_5 (5.05 and 5.12 cm) followed by T_1 (4.95 and 5.07 cm). The internodal length was lowest in T_6 (4.75 and 4.83 cm) and it was on par with T_4 (4.82 and 4.91 cm).

An increase in the internodal length was also observed in the treatment combination FYM + *Azospirillum* + Phosphobacteria + Neem Cake with an increase (0.36 cm) at flowering stage and (0.29 cm) in harvesting stage over control. This may be ascribed to the fact that FYM and Neem Cake has the optimum CN ratio, which on decomposition releases nitrogen in the form of usable nutrient ions such as ammonium nitrate. Allen *et al.,* (1982) also reported that effective promotion of internode elongations indicate a change in the hormonal balance induced by mycorrhizal symbiosis. The present study also reveals, the same phenomenon have operated, resulting in the release of growth promoting hormones, which in turn might have contributed to the increase in the inter nodal length.

Leaf area (cm^2)

The area of leaf was found to have substantial influence by treatments applied at progressive stages of crop growth. The area of standard leaf measured at different stages differed significantly among the treatments (Table 3). The treatment T3 recorded significantly higher leaf area (88.17and 89.35 cm2) at both the stages of observations (flowering stage and harvesting stage respectively). This was followed by T5 which recorded the leaf area of 86.98 and 87.91 cm2 at both the stages respectively. The control treatment T6 produced lesser leaf area of 80.12 and 81.25 cm2 at both the stages respectively.

Increase in the leaf area was attributed to the combined application of FYM, *Azospirillum*, Phosphobacteria and Neem cake (T_3) along with organic manures with a pronounced difference between flowering stage to harvesting stage (1.15 cm^2) over the control. Generally, organic manures improved the nutrient status of soil due to slow release of nutrients, thereby preventing wastage. Such manures increase the humus content in the soil. Apart from this, addition of organic manures improves the soil fertility and the physical condition and subsequently the water holding capacity. The application of Neem Cake and FYM along with optimum soil moisture retention facilitated by them might have favoured the microbial population to solubilise the available nutrients in soil and uptake by plants. This probably might have led to the increase in the leaf area. Increased leaf area due to combined application of biofertilizers along with inorganic fertilizers has been reported in banana (Jeeva, 1987), in onion (Gurubathan *et al*., 1989) clove (Sathya, 1995) papaya (Annesa Rani, 1995) black pepper (Kanthaswamy, 1995) and turmeric (Velmurugan, 2002). These results support the findings obtained in this study.

CONCLUSION

Hence, from the present investigation it can be concluded that among the different organic manures and bio-fertilizers, the growth characters was higher in the combined application (T_3) of FYM, Neem Cake, *Azospirillum* and Phosphobacteria. Simultaneously, the organic manures are locally available, eco-friendly and helpful in sustaining the soil health.

REFERENCES

Allen,M.F., T.S.F.R.Moore and M.Christensen. (1982). Phytohormone changes in Bouteloua gracilis infected by vermicular arbuscular mycorrhizae. II Altered levels of gibberellins-like substances and abscisic acid in the host plant. *Canadian J. Bot*., 601 (60):.468-471.

Aneesa Rani, M.S. (1995). Integrated nutrient management of nitrogen and phosphorous in CO 6 papaya. M.Sc. (Hort.) Thesis, *Tamil Nadu Agric. Univ*., Coimbatore.

Gurubatham,J.R.J., S.Thamburaj and D.Kandaswamy. (1989). Studies on the effect of biofertilizers on the bulb yield of bellary onion (*Allium cepa* L.) *South Indian Hort*., 37 : 150-153.

Harris, C.V. V.Kanthaswamy, R.Arulmozhiselvan, P.Rangaswamy and O.A.Pillai. (1992). Nutrient management in black pepper. *TNAU News letter*. 22(3) : 2.

Hussain, S.I., K.M. Khokar and Amanullah Jan. and M. Farooq. (2001). Effect of various mulches and soil amendments on germination, growth and fresh rhizomes yield of ginger. *Sarhad J. Agl.,* 17(1): 87-89.

Jeeva,S. (1987). Studies on the effect of *Azopsirillum* on growth and development of banana cv. Poovan (AAB) M.Sc.(Hort.), Thesis, *Tamil Nadu Agric. Univ*., Coimbatore.

Kanthaswamy,V., V.Subramaniam, K.Arulmozhiselvan, O.A.Pillai and C.Vijilan Harris. (1995). Biofertilizers for black pepper. *National Symposium on Organic Farming*, Oct.27-28, Agricultural College and Research Institute, Madurai.

Kanthaswamy, V., Pillai, O.A., Natarajan, S. and Thamburaj, S. (1995). Studies on the nutrient requirement of black pepper (var. Panniyur-1) *Ph.D. Thesis*, submitted to Tamil Nadu Agricultural University, Coimbatore.

Reynders,L. and K. Vlanak. (1982). Physico-ecological aspects and agricultural importance of *Azospirillum* plant root associations. In : *Azospirillum* : Genetics, Physiology, Ecology, W.Klingmuller (Ed.), Brikhauser, Basel.

Sathya,V. (1995). Studies on the efficacy of *Azospirillum* and Phosphobacteria and graded levels of N and P on germination growth performance of clove. M.Sc. (Hort.), Thesis, *Tamil Nadu Agric. Univ*., Coimbatore.

Sharangi.A.B. and R. Kumar. (2011). Performance of rooted cuttings of black pepper (*Piper nigrum* L.) with organic substitution of nitrogen. *Int. J. Agric. Res.,* 6(9): 673-681,2011

Stephen and Nybe. E.V. (2002). Organic manures and biofertilizers on nutrient availability and yield in black pepper. *M.Sc. (Hort.), Thesis,* Kerala Agric. Univ., Vellanikkara.

Thanuja, T.V. (2002). Arbuscular Mycorrhiza : A low cost technology for pepper nurseries. *Spice India,* 15(7): 10-14.

Velmurugan, M. (2002). Effect of organic manures and biofertilizers on growth, yield and quality of turmeric (C*urcuma longa* L.) cv. BSR 2. *M.Sc (Hort) Thesis,* submitted to Tamil Nadu Agricultural University, Coimbatore-3.