Growth factors for a strawberry crop are affected by microalgae and vermicompost

Abstract

A Randomized Block Design (RBD) field experiment was conducted in Central Research Farm (CRF) at Department of Plant Pathology, SHUATS, Prayagraj, U.P. during the Rabi season of 2019-2020 in pots. Growth factors for a strawberry crop are affected by microalgae and vermicompost different dose of microalgae and vermicompost on number of leaves and height per plant of strawberry at 30, 60 and 90 DAT under field condition.

The maximum number of leaves (per plant) was recorded T_9 @ Microalgae 8g + vermicompost (16, 18 and 23.50 per plant, respectively) followed by T_6 @ Microalgae @ 5g/pot + Vermicompost (15.75, 20.00 and 21.50 per plant, respectively) at 30, 60 and 90 DAT, respectively. The treatment T_9 @ Microalgae 8g + vermicompost recorded maximum plant height (cm) (14.80, 23.03 and 28.58 cm, respectively) followed by T_8 @ Microalgae @ 7g/pot + Vermicompost (14.13, 22.23 and 26.43cm, respectively) at 30, 60 and 90 DAT, respectively. shows significant increment in the number of leaves per plant, at different intervals and all the other treatments were non-significate among each other. And all the treatments showed significant result in comparison to control treatment.

Key words: *Alternaria Spp.*, Microalgae, Vermicompost, Plant Height and Leaves

INTRODUCTION

The use of organic amendments, such as traditional thermophilic composts, has long been recognized as an effective means of improving soil structure, enhancing soil fertility (Follet et al., 1981), Strawberry is very susceptible to a number of fungal diseases, which make the defense management practices fundamental to prevent sever economic losses. Fungal pathogens can attack the crop in all cultivation systems and can cause strawberry fruit decay in post-harvest. Among soil-borne fungi that can infect the plant in soil cultivation, *Sclerotinia sclerotiorum, Rhizoctonia solani, Phytophthora spp., Pythium spp., Fusarium oxysporum, Verticillium dahliae, and Macrophomina phaseolina* are the most important. They affect the root system, hindering the nutrient and water absorption from soil increasing microbial diversity and populations (Barakan et al., 1995), microbial activity (Zink and Allen, 1998), improving the moisture-holding capacity of soils and increasing crop yields. these pathogens cause severe symptoms such as yellowing, wilting, damping-off, root rot, and collar rot and, in conventional cultivation systems, they are controlled by synthetic compound applications. Effects on microorganisms have also been associated with their capability to suppress soil-borne plant diseases (Hoitink and Fahy, 1986) plant parasitic nematode populations and increased crop yields (Johnston et al., 1995).

Among foliar pathogens, *Podosphaera aphanis* is responsible for powdery mildew, a severe disease that causes important economic losses requiring several fungicidal treatments **(Romero *et al.* 2007)**.

MATERIALS AND METHODS

Nine treatments were applied to the plots namely vermicompost (T_1), Microalgae @ 1g/pot + vermicompost (T_2), Microalgae @ 2g/pot +Vermicompost (T_3), Microalgae @ 3g/pot + Vermicompost (T_4), Microalgae @ 4g/pot + Vermicompost (T_5), Microalgae @ 5g/pot + Vermicompost (T_6), Microalgae @ 6g/pot + Vermicompost (T_7), Microalgae @ 7g/pot + Vermicompost (T_8), Microalgae @ 8g/pot + Vermicompost (T_9). T_0 was kept as untreated control.

METHODS

Pot filling:

The soil for pot experiments was collected from the university field and brought to the Bio-net. The pots of 15 cm diameter were filled with 250cc of soil and vermicompost used for various experiments.

Application of vermicompost:

4kg vermicompost was applied in my total 40 pots at the @ of 100g per pot, vermicompost was mix with the soil present in the pot manually and then the pot was ready for transplant.

Fig 1 Transplanted plants

Application of microalgae:

Microalgae was applied after 15 days of transplanting on the rhizosphere plants according to the Treatment given in concentration of 1g per pot to 8g per pot, second application of micro algae was done at 30 days after transplanting.

Fig 2 Application of micro algae

RESULTS AND DISCUSSION

Different dose of microalgae and vermicompost on number of leaves per plant of strawberry at 30, 60 and 90 DAT under field condition.

The results presented among all the treatments T_9 shows significant increment in the number of leaves per plant, at different intervals and all the other treatments were non-significate among each other. And all the treatments showed significant result in comparison to control treatment.

Table 1: Effect of micro algae and vermicompost on number of leaves per plant of strawberry at different days of intervals.

Treatments	**30 DAT**	**60 DAT**	**90 DAT**
T_0	12.25	17.00	18.00
T_1	15.25	18.00	20.75
T_2	14.25	18.00	18.50
T_3	14.50	18.50	20.50
T_4	15.25	17.75	18.75
T_5	13.75	18.25	21.00
T_6	15.75	19.00	21.50
T_7	14.75	17.75	19.25
T_8	14.50	15.50	20.75
T_9	16.00	20.00	23.50
F-test	**S**	**S**	**S**
C.D. at 0.5%	**1.088**	**3.285**	**3.776**
S.Ed. (+)	**0.530**	**1.601**	**1.840**

The data presented in table **different dose of microalgae and vermicompost on height of per plant of strawberry** at 30, 60 and 90 DAT under Bio-net condition.

The results presented in indicates that among all the treatments T_9 shows significant increment in the number of leaves per plant, at different intervals and all the treatment were non- significant among each other but significant with control treatment.

This result is in agreement with **Edra *et al.*, (2011)** who found that the brown-alga *Lessonia trabeculata* inhibited bacterial growth and reduced both the number and size of the necrotic lesions in tomato leaves following infection with *Botrytis* *cinerea*. Marine algae represent a great source of a vast variety of complex natural products and could be a promising source of a novel bioactive compound that can help plant survival by offering protection against stress imposed by pathogens. Aqueous and ethanolic extracts from the red-alga *Gracillaria chilensis* prevent the growth of *Phytophthora cinnamomi*.

Wafaa *et al*., (2014) also reported that seeds and foliar application of Blue-green Cyanobacteria Oscillatoria agardhii showed significant effective net blotch, powdery mildew, rust and spot blotch management. Blue-green Algae applied treatments increased antioxidant enzymes as catalase (CAT), peroxidase (POD) and superoxide dismutase (SOD), as well as grain yield, kernel weight in most cases and improved barley yield quality parameters and grain protein. **Burjus *et al*., (2014)** also observed that biomass obtained from cultivation of *N.commune*, Anabaena circinalis in bioreactor to inoculated mature compost was the best way of cultivation of nitrogen fixing cyanobacteria with low cost. The application of cyanobacteria in growth and yield of chickpea plant reduces the need of chemical fertilizers about 30 %-50 % and subsequently reduces environmental pollution compared with other mineral chemical fertilizers.

Table 2 Effect of microalgae and vermicompost on plant height (cm) of strawberry at different days of intervals.

Treatment S	**30 DAT**	**60 DAT**	**90 DAT**
T_0	10.43	18.48	23.18
T_1	11.23	18.83	23.73
T_2	11.75	19.00	23.55
T_3	12.00	18.83	23.85
T_4	12.35	20.03	25.05
T_5	12.90	19.73	25.30
T_6	12.15	19.95	25.98
T_7	13.48	22.15	27.20
T_8	14.13	22.23	26.43
T_9	14.80	23.03	28.58
F-test	**S**	**S**	**S**
C.D. at 0.5%	**1.279**	**1.428**	**1.437**
S.Ed. (+)	**0.623**	**0.696**	**0.700**

DISCUSSION

Vermicompost and microalgae additions gave considerably improved outcomes, as evidenced by the strawberry crop's maximum number of leaves and plant height. Vermicompost and microalgae applications significantly increased strawberry growth and yields, as evidenced by increases of up to 37% in leaf area, 37% in plant shoot biomass, 40% in the number of flowers, 36% in the number of plant runners, and 35% in the weight of marketable fruit. Not nutrients, but the availability of plant development-influencing substances like plant growth regulators and humic acids, created by the much expanded microbial populations as a result of earthworm activity, was what made vermicompost beneficial for plant growth and yield. The availability of macronutrients in soils treated with vermicomposts in our current experiment could not account for the gains in strawberry development and production because they were equalized at transplanting in comparison to the plots treated with microalgae. Analysis of the soil revealed no appreciable differences in the amounts of macronutrients in any of the plots after the addition of vermicomposts and microalgae. It was confirmed in a later green-house experiment that small concentrations of humic acids, extracted from vermicompost and substituted into container media, increased the growth of plants in a similar pattern independent of nutrient supply (Atiyeh et al., 2002a). It has been shown that microorganisms can produce materials that may affect plant growth such as substances acting as plant hormone analogues or growth regulators (Frankenberger and Arshad, 1995; Brown, 1995).

CONCLUSION

A trial was conducted to check the effect of micro algae and vermicompost on **leaf spot (*Alternaria sp.*) disease of strawberry**. The experiment was analysed by using RBD (randomized block design) with 4 replication, 9 treatments along with the control. Observations recorded were disease intensity at 30, 60 and 90 (days after transplanting), plant growth parameters such as plant height at 30,60 and 90 DAT. Among all the treatments T_9 (Microalgae 8g + vermicompost) shows significant increment in the number of leaves, Plant height at different intervals and all the other treatments were non-significant among each other. And all the treatments showed significant result in comparison to control treatment. And treatment T_9 shows least percent disease infestation.

REFERENCES

Atiyeh, R.M., Arancon, N., Edwards, C.A., Metzger, J.D., 2000a. Influence of earthworm-processed pig manure on the growth and yield of greenhouse tomatoes. Bioresource Technology 75 (3), 175– 180.

Barakan, F.N., Salem, S.H., Heggo, A.M., Bin-Shiha, M.A., 1995. Activities of rhizosphere microorganisms as affected by application of organic amendments in a calcareous loamy soil. 2. Nitrogen transformation. Arid Soil Research and Rehabilitation 9 (4), 467– 480.

Brown, G.G., 1995. How do earthworms affect microfloral and faunal community diversity? Plant and Soil 170, 209–231.

Burjus, Sanaa j., Jawad, Abdul latif M. and Al-Ani, Nabeel K. (2014). Effect of Two Species of Cyanobacteria as Biofertilizers on Characteristics and Yield of Chickpea Plant. Iraqi Journal of Science, Vol 55, No.2B, pp:685-696

Edra J, Dorta F, Medina C, Ramírez A, Ramírez I and Peña-Cortés H (2011). Anti-Phytopathogenic Activities of Macro-Algae Extracts Mar Drugs 9: 739-756.

Follet, R., Donahue, R., Murphy, L., 1981. Soil and Soil Amendments. Prentice-Hall, Inc., New Jersey.

Frankenberger Jr., W.T., Arshad, M., 1995. Phytohormones in Soils: Microbial Production and Function. Marcel and Deckker, New York. p. 503.

Hoitink, H.A., Fahy, P., 1986. Basis for the control of soilborne plant pathogens with composts. Annual Review Phytopathology 24, 93– 114.

Johnston, A.M., Janzen, H.H, Smith, E.G., 1995. Long-term spring wheat response to summer fallow frequency and organic amendment in southern Alberta. Canadian Journal of Plant Science 75 (2), 347–354.

M. Haggag, Wafaa, M.M., Hussein Mekhail, E. El-Habbash. 2014, Res. J. Pharmaceutical, Biolo.and Chem. Sci.,3 (11)1530.

Romero,A. J., and Carvajal,S. C.,(2007) Adolescent Bicultural Stress And Its Impact On Mental Well-Being Among Latinos, Asian Americans, And European Americans. *Journal of Community Psychology*, Vol. 35, No. 4, 519–534.

Zink, T.A., Allen, M.F., 1998. The effects of organic amendments on the restoration of a disturbed coastal sage scrub habitat. Restoration-Ecology 6 (1), 52–58.