

Evaluation of different microbes in ensuring climate resilient agriculture for production of healthy planting material in Black Pepper

Manju Jincy Varghese¹, Preethu K Paul², Ashiba A³, R. Marimuthu⁴

¹ (Subject Matter Specialist (Soil Science), ICAR-Krishi Vigyan Kendra, Santhanpara, Idukki, India)

² (Subject Matter Specialist (Agricultural Extension), ICAR-Krishi Vigyan Kendra, Santhanpara, Idukki, India)

³ (Subject Matter Specialist (Agronomy), ICAR-Krishi Vigyan Kendra, Santhanpara, Idukki, India)

⁴ (Senior Scientist and Head), ICAR-Krishi Vigyan Kendra, Santhanpara, Idukki, India)

Abstract:

Background: Black Pepper Nursery Trial was conducted at ICAR- Krishi Vigyan Kendra (BSS), Idukki to assess the effect of different microbes in production of healthy black pepper rooted cuttings. The trial was laid down with the key objective of studying the effect of different microbes in reducing the disease incidence in black pepper Nursery. **Materials and Methods:** The trials conducted were T1- Control (Nursery media with soil & FYM in 1 :1 ratio without enrichment), T2- Media enriched with Trichoderma, T3- Media enriched with VAM, T4- Media enriched with PGPR. T5- Media enriched with Trichoderma+ VAM, T6- Media enriched with Trichoderma+ PGPR, T7- Media enriched with VAM+ PGPR, T8- Media enriched with Trichoderma+ VAM+PGPR

Results: Attributes like Days of first sprout, Days of Fifty percent sprouting, first leaf emergence (Days), Number of leaves per cutting, plant height were found significantly higher in T8 treatment (media enriched with different microbes) when compared with the other treatment

Conclusion: Media enriched with Trichoderma+ VAM+PGPR was best when compared with the other treatment.

Key Word: Nursery Media, Trichoderma, VAM, enrichment, microbes, PGPR

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I. Introduction

Climate change is one of the biggest challenges of the twenty first century for sustainable agricultural production. In the last decades, agronomic managements developed through scientific research have focused on increasing crop productivity through intensive use of fertilizers and chemicals, Tilman et al. (2002). Under such situation use of ecofriendly methods for sustainable crop production is need of the hour, Prem et al. (2017). The phenomenon of climate change is real and is starting hard at us. One of the management strategies to deal with the adverse effect of climate is use of microbes. Microbes are important players in making agriculture resilient to climate change, Dey et al. (2018). Microorganisms are endosymbionts residing in the internal plant tissues without any visible effects or harm to the host plants. These microbes benefit their host plants by their plant growth promoting and bio control abilities. Availability of quality healthy planting materials of Black Pepper (*Piper nigrum*. L) is a major constraint in all black pepper growing areas. Thankamani et al. (2007). Due to the increased demand in the global market for Black pepper, there is a need to produce good quality planting material, Divya et al. (2018). Present trial is carried out to assess the rooting behavior of Black pepper in media enriched with microbes as compared to control. Black pepper cuttings grown in media enriched with microbes showed better growth than normal media, Wimalaratne et al. (2014).

II. Material and Methods

Availability of quality healthy planting materials of Black Pepper is a major constraint faced by the farmers of Idukki district. So to assess the feasibility and effect of microbes in producing healthy planting material of black pepper a study was conducted at ICAR-KVK, Idukki. The experiment had eight treatments compared to control. T1- Control (Nursery media with soil & FYM in 1:1 ratio without enrichment), T2- Media enriched with Trichoderma, T3- Media enriched with VAM, T4- Media enriched with PGPR. T5- Media enriched with Trichoderma+ VAM, T6- Media enriched with Trichoderma+ PGPR, T7- Media enriched with VAM+ PGPR, T8- Media enriched with Trichoderma+ VAM+PGPR. The experiment was laid out in Randomized design with three replications.

The observations were recorded daily in the initial stages and thirty, ninety days' interval. Attributes like Days of first sprout, Days of Fifty percent sprouting, first leaf emergence (Days), Number of leaves per cutting, Number of roots per cutting, plant height.

III. Result

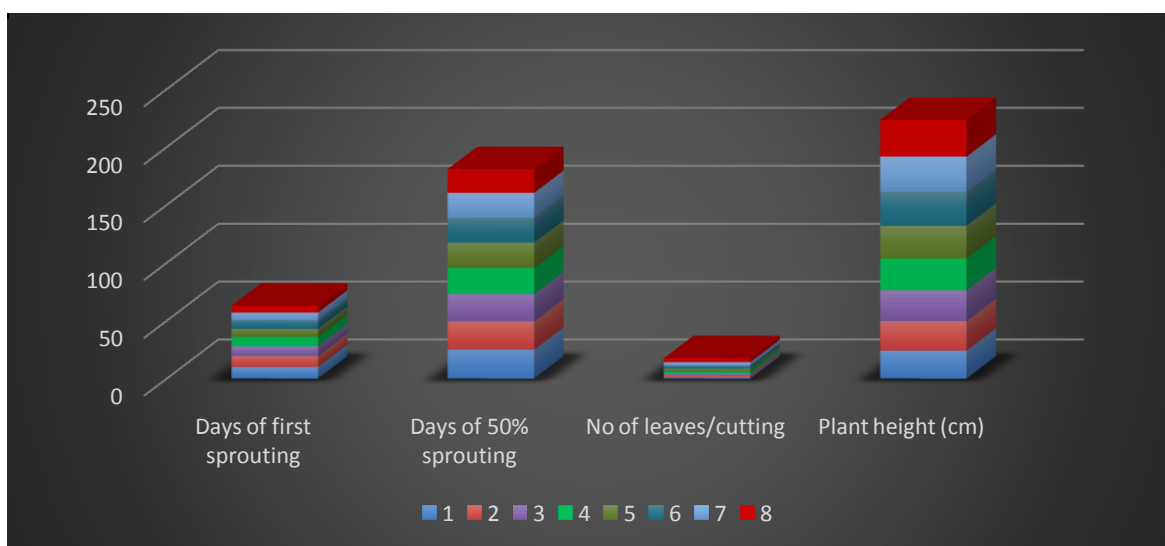
The presence of Trichoderma, VAM and PGPR supplied good amount of nutrients and growth promoting substances to the cuttings. The presence of VAM and PGPR may increase plant acquisition of P & N thereby increasing the growth & yield of the plants (Tilak, 1995). The presence of VAM has increased plant acquisition of Phosphorus and Nitrogen thereby increasing growth and Number of leaves. The plant height and 50% sprouting were more in treatment with Trichoderma + VAM+ PGPR due to combined effect of VAM, Trichoderma and PGPR that helped in taking up of more nutrients and hence earlier growth and development (Kandiannan et al., 2000). Treatment eight showed improvements in root development and less incidence of fungal infections. Microbes also reported to enhance the growth and uptake of nutrients. These findings are in line with the studies in Black Pepper by (Srinivasa et al., 2015).

Days of first sprouting, Days of 50% sprouting were earlier and Number of leaves/cutting, Plant Height were more in Media enriched with Trichoderma+ VAM+PGPR (Table -1).

Table-1- Effect of media enriched with microbes on sprouting and leaf emergence.

Sl. No	Treatments	Days of first sprouting	Days of 50% sprouting	No of leaves/cutting	Plant height (cm)
1.	T ₁	10	25	1.0	24.12
2.	T ₂	9.5	24.5	1.5	25.60
3.	T ₃	8.5	23.5	1.67	26.66
4.	T ₄	8.0	22.5	2.0	27.33
5.	T ₅	7.0	22.0	2.5	28.4
6.	T ₆	7.5	21.5	2.5	29.2
7.	T ₇	6.5	21.5	3.0	30.5
8.	T ₈	6.0	20.5	3.5	31.68

Fig. 1 : Effect of media enriched with microbes on sprouting and leaf emergence.



IV. Discussion

Black pepper plants responded well to the combined inoculation of biofertilizers. Days of first sprouting, Days of 50% sprouting were earlier and Number of leaves/cutting, Plant Height were more in Media enriched with Trichoderma+ VAM+ PGPR. Growth was significantly higher when all the biofertilizers were inoculated compared to individual inoculation and control. This could be due to the collective effect of biofertilizers.

It is attributed to the presence of Trichoderma and VAM which supplies good amount of nutrients and growth promoting substances to the planted cuttings, so that it can easily absorb the nutrients available in the nursery media compared to the nursery media. Presence of VAM may increase plant acquisition of phosphorus and nitrogen thereby increasing the growth and yield of the plants. Higher number of leaves and roots were also obtained in fortified nursery It may be due supplement of more nutrients the presence of VAM. It must have increased plant acquisition of phosphorus and nitrogen thereby increasing the growth and number of leaves.

Combined effect of Vesicular Arbuscular Mycorrhizae (VAM) and Trichoderma helped in taking up of more amount of nutrients and hence the earlier growth and development. Treatment with VAM significantly improved the root characteristics and phosphorous uptake of pepper variety. For better root and root characteristics, growing of black pepper in fortified nursery media enriched with bioagents is found to be beneficial.

V. Conclusion

Attributes like Days of first sprout, Days of Fifty percent sprouting, first leaf emergence (Days), Number of leaves per cutting, plant height were found significantly higher in T8 treatment (media enriched with different microbes) when compared with the other treatment. Our results show that the application of bio-products containing a combination of Trichoderma+ VAM+PGPR increased health and yield of black pepper cuttings. In our experiment, less fungal infections were found in treatment inoculated with Trichoderma+ VAM+PGPR. Moreover, treatments significantly reduced yellowing symptoms and increased the yield. Thus the Potting mixture enriched with Trichoderma+ VAM+PGPR are promising candidates to support sustainable and efficient black pepper cuttings in Black Pepper nursery.

Nursery trial showed that the integrated application of Trichoderma+ VAM+PGPR are the best options for the proper nutrient management of pepper seedlings. The application influenced the growth rate of the length of the shoot, the number of leaves, and the emergence time of the shoot of black pepper seedlings under nursery conditions. There was a positive effect of the pepper seedling for the application of Trichoderma+ VAM+PGPR which was clearly reflected in the results.

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