Multiplication of bio-control agents on locally available organic media

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Abstract

Crop protection in organic farming is done by using plant extracts, bio-pesticides, bio-control agents, local preparations like panchagavya, jeevamrutha etc. Bio-control agents such as Trichoderma, Verticillium, Nomuraea etc., are used in control of soil borne diseases and some insect pests. An attempt was made to multiply these micro organisms with the objective of evaluating the suitability of locally available organic materials for multiplication of micro organisms and to compare the growth in different media. It was observed that, only jeevamrutha alone, without glucose supported the growth of all the bio-control agents and their growth was better when 1 per cent glucose was used with all media substrates except panchagavya. The results indicate that these micro-organisms can be multiplied by farmers on their farm using locally available material at a very low cost.

Introduction

Crop protection in organic farming involves use of many naturally occurring plant extracts such as neem, pongamia, vitex etc., and preparations like panchagavya, jeevamrutha. Micro organisms such as *Trichoderma, Verticillium, Neumoria* etc., are important bio-control agents in controlling soil borne plant diseases and some of the insect pests. The commercial biocontrol agents available in market are expensive and are not available to farmers easily. Formulations based on the agricultural waste products, *viz.,* bran of grains, oil cakes, farmyard manure etc.., are found to support microbioal growth and storage media (Patibanda *et al. 2003).* Application of *T.harzianum* colonized on wheat bran to soils infested with *Rhizotonia solani* and *S.rolfsii* reduced the incidence of diseases in beans and mungbean (Haidar *et al.* 1979). In order to know the feasibility of these bio-inoculants using locally available organic materials by the farmers themselves on their farm, a laboratory study was conducted to evaluate the suitability of locally available organic materials for multiplication of micro organisms and also to compare the growth of micro organisms.

Material and Methods

The experiment was conducted at Organic Farming Research Centre (OFRC), Zonal Agricultural Research Station, Navile, Shivamogga, India. The nutrient materials tested were: digested bio-gas slurry, compost, press mud, jeevamrutha and panchagavya. Six micro organisms were used as bio-control agents and tested for their growth and development on locally available natural media substances. The micro-organisms tested were: *Pseudomonas florescence, Metarhizium anisopliae, Nomuraea rileyii, Verticillium lecanni, Fusarium* – 15 and *Trichoderma viride.* As a control treatment, the bacterial cultures were inoculated on nutrient agar and fungal cultures on potato dextrose agar. The experiment was conducted with and without 1 per cent glucose to know carbon source supplementation.

The test organisms were isolated locally from the organic plots of OFRC. Test materials used were: digested bio-gas slurry, compost, press mud, Jeevamrutha and panchagavya. They were mixed in 1:1 proportion with sterilized distilled water, soaked overnight and the extract was filtered. The extrantant was sterilized along with 20 g agar as a solidifying agent. About 15-20 ml of sterilized media was then transferred to each Petri plate and the bio control agents were inoculated under aseptic condition. The inoculated plates were incubated under room temperature and observations were recorded after 48 hours for bacteria and seven days for fungal inoculants. Growth observations were recorded for three days for bacteria and seven days for fungal inoculants. Growth was compared with the growth in control plates and they were scored as average (+), good (++), better (+++) and Nil(–). The treatment combinations of the experiment conducted were: T_1 -Compost extract, T_2 - Digested biogas slurry (DBS), T_3 – Panchagavya, T_4 – Jeevamrutha, T_5 -

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Press mud, T_6 Control, T_7 – Compost extract +DBS + Panchagavya + Jeevamrutha + Pressmud (1:1), T_8 – Compost extract + panchagavya (1:1), T_9 – Digested Biogas Slurry + panchagavya (1:1), T_{10} – Digested Biogas Slurry + Jeevamrutha (1:1), T_{11} – Compost extract + Jeevamrutha (1:1), T_{12} – Press mud + Panchagavya (1:1), T_{13} – Press mud + Jeevamrutha (1:1), T_{14} – Digested Biogas Slurry + compost extract (1:1) and T_{15} – Digested Biogas Slurry + press mud (1:1).

Results

The observations recorded on growth of different bio control agents on locally available natural media and their combinations with and without glucose supplementations are presented in table 1 to 4. Among the different basal materials, jeevamrutha has supported maximum growth of the bio control agents (Table 1).

Table 1: Growth of bio-control agents on locally available natural nutrient media without glucose supplementation

Organisms	T_1	T_2	T_3	T_4	T_5	T_6
Pseudomonas florescence	+	+	-	++	+	++
Metarhizium anisopliae	+	-	+	++	-	++
Nomuraea rileyii	-	+	-	++	-	++
Verticillium lecanni	-	+++	+	++	-	++
Fusarium – 15	+	++	+	++	+	++
Trichoderma viride	++	+	+	++	++	++

Performance of micro organisms did not follow a definite trend when the combinations of basal media were used without 1 per cent glucose supplementation (Table 2). Growth of *Trichoderma* was good with compost extract, digested biogas slurry and Press mud when used either with Jeevamrutha or Panchagavya. When the media was supplemented with 1 Per cent glucose as an additional carbon source, growth and development of all the bio control agents were better except in panchagavya (Table 3). Better growth may be attributed to the readily available source of carbon for growth of micro organisms. Higher growth in control plates indicated that there is a need to supplement media with initial nutrient source for multiplication of bio-control agents.

Table 2: Growth of bio-control agents as influenced by combinations of locally available natural nutrient media alone without glucose supplementation

Organisms	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}	T_{15}
Pseudomonas florescence	++	+	-	++	+	++	+	+	++	++
Metarhizium anisopliae	++	+	-	+	+	-	+	+	+	+
Nomuraea rileyii	++	+	+	+	+	-	+	+	++	+
Verticillium lecanni	++	+	+	++	++	+	++	-	+	-
Fusarium – 15	++	+	+	+	+	-	+	-	-	-
Trichoderma viride	++	+	++	++	++	++	+	++	++	+

Table 3: Growth of bio-control agents on locally available natural nutrient media alone with glucose supplementation

Organisms	T_1	T_2	T_3	T_4	T_5	T_6
Pseudomonas florescence	+	++	-	++	++	+++
Metarhizium anisopliae	++	++	+	++	++	+++
Nomuraea rileyii	++	++	-	++	++	+++
Verticillium lecanni	++	++	-	++	++	+++
Fusarium – 15	++	++	-	++	++	+++
Trichoderma viride	++	++	+	++	++	+++

Growth of micro-organisms was uniform and better (Table 4) when 1 Percent glucose was added to the combination of materials viz; Press mud + Panchagavya, digested biogas slurry + Press mud followed by fairly good growth in digested biogas slurry + Panchagavya (1:1) and digested biogas slurry + Compost extract (1:1). This clearly shows presence of readily available nutrients in digested bio gas slurry and uneven growth pattern observed with different combinations of materials was due to non availability of nutrients.

Table 4: Growth of bio-control agents as influenced by combinations of locally available natural nutrient media with glucose supplementation

Organisms	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}	T_{15}
Pseudomonas florescence	+++	++	+	++	++	+	++	+	++	++
Metarhizium anisopliae	+++	++	+	++	++	+	++	+	++	++
Nomurea rileyii	+++	+	+	++	+	+	++	+	++	++
Verticillium lecanni	+++	+	+	++	+	+	++	+	+	++
Fusarium – 15	+++	+	+	+	+	+	++	+	+	++
Trichoderma viride	+++	+	+	++	++	+	++	+	+	++

Discussion

Growth of *Trichoderma* was good in compost extract and press mud, while growth and performance of *Verticillium lecani* was better in digested biogas slurry, and performance of all bio-control agents was good in control plates. In compost extract, available nutrients might have encouraged the growth of *Trichoderma* compared to other bio-control agents. Growth of *Verticillium lecani,* was maximum in digested biogas slurry and it might be due to the fact that the digested biogas slurry contained nutrients in readily available form also in a balanced proportion. Jeevamrutha supported growth of all the bio-control agents and it might be due to the higher content of nutrients and lower pH of jeevamrutha as compared to other natural media. Jeevamrutha with a pH 4.8 to 5.2 has more beneficial micro organisms and also contains higher amounts of other metabolites for supporting growth of micro organisms (Devakumar *et al*. 2008).Similarly, application of jeevamrutha to sunflower crop increased the activity of soil microbes, solubalisation and uptake of nutrients, synchronizing with crop growth and sustained productivity of sunflower (Manjunatha *et al*. 2009). Panchagavya alone failed to support growth of micro organisms and this might be due to the presence of many fatty acids and other biochemicals present in panchagavya have intribited the growth of biocontrol agents (Selvaraj et.al. 2006). It was also observed that it contained many beneficial micro organisms. The microbial population count increased up to 21st day of its preparation. Hence, it may be also due to the presence of micro-organisms in panchagavya which might have also acted as antagonistic to the inoculated micro-organisms. Further, these results are corroborating with Natarajan (2002) and Balasubramanian *et al*. (2009) who have also obtained similar results. However, Natarajan (2002) reported that, microorganisms present in Panchagavya not only enhance the microbes in the environment but also act as catalysts with a synergistic effect to promote all the useful microbes. Thus, the soil micro flora and fauna change from a disease inducing soil to a disease suppressive soil.

Conclusions

Multiplication of micro organisms used as bio control agents is possible using locally available organic materials viz., compost extract, Jeevamrutha, Press mud, digested biogas slurry. Performance of bio control agents was better with the combination of digested biogas slurry+ Panchagavya; Press mud + Panchagavya and digested biogas slurry + Press mud. Bio-control agents can be multiplied locally with low cost by adding Jaggery solution.

References

Balasubramanian A.V, Nirmala Devi T.D & Merlin Franco M (2009): Use of animal products in traditional agriculture. A Pilot Project in Southern India Editors Centre for Indian Knowledge Systems, Chennai. Chapter 5 pp 55- 56

Devakumar N, G.G.E Rao, Shubha S, Imrankhan, Nagaraj & Gowda S.B (2008): Activates of Organic Farming Research Centre. Navile, Shimoga, University of agriculture sciences Bangalore. P 12

Haidar Y, Chet & Hennis Y (1979): Biological control of *Rhizoctonia Solani* damping off and whet bran culture of *Trichoderma harzianum, Phytopathology* 60 :64-8

Manjunatha G. S, Upperi S. N, Pujari B. T, Yeledahalli N. A & Kuligod V. B (2009): Effect of farm yard manure treated with *jeevamrutha* on yield attributes, yield and economics of sunflower *(Helianthus annus* L.*) Karnataka J. Agric. Sci.,* 22 : 198-199

Natarajan, K (2002): Panchagavya- A manual. Mother India Press, Mapusa, Goa, India. pp. 33.

Patibandha A. K, Upadhyay J, Mukhopadhyay A. N (2003): Efficacy of *Trichoderma harzianum* Rifai alone or in combination with fungicides against sclerotium wilt of groundnut, *Journal of Biological Control* 17: 57-4