



Preparation of vermicompost enriched with microbial consortia for pomegranate plant (*Punica Grantum L*) cv Bhagawa

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Abstract:

The present investigation was carried out in pomegranate farm CV Bhagwa during the murg bahar (June 2023- December 2023), nutrient enriched vermicomposting was prepared using plant growth promoting microbes including *Bacillus Subtilis*, *azotobacter species*, *Frateruria Aurantia*, *Bacillus Polymixa*, *Pseudomonas Fluorescens*, *Trichoderma Viride*. These consortia were spraying on heap of vermicompost mixed it and allowed to incubate for 21 day in shady space at aerobic condition, after each fourth day interval spraying of water and mixing were carried out using turning of vermicompost for achieved maximum growth of plant growth promoting microbes in vermicompost, The selected farm of fourth eight plants of pomegranate were treated with three treatments T₁ (Organic manure 15 kg/plant + NPK 2kg/plant), T₂, (Organic manure 15 kg/plant +Vermicompost 2 kg/plant), T₃ (Organic manure 15 kg/plant +Vermicompost 2 kg/plant+ microbial consortia). The T₃ treatment gives significant results of the selected plant and shows that 28 days are required for initiation of the first flower bud as compared to other treatments (decrease day of initiation of bud). The all selected plants of treatment T₃ (Organic manure 15 kg/plant +Vermicompost 2 kg/plant + microbial consortia) gives average weight of fruit is 260 grams, it also shows that plant developed resistance against fungal and nematode infection furthermore required less chemical pesticides as compared to T₁ and T₂. It was concluded that the consortia of microbes in a vermicompost gives plant growth promoting substances and increases plant defence system against plant pathogens, hence this is an alternative and eco-friendly method for increasing soil fertility, maintaining microflora in rhizosphere soil and receiving safe food for human beings.

Key words: Vermicompost, consortia, aerobic, pesticides, rhizosphere

Introduction:

Pomegranate (*Punica granatum* L.) family Punicaceae is a profitable plant, originated in Iran and commercial fruit crop in India. It consists of diploid chromosome number ($2n=18$) (Ramesh chand et al., 2005). In India, Maharashtra is the largest producer of pomegranate fruit as compared to Karnataka, Andhra Pradesh, Gujarat and Rajasthan. (Y. Ahmad seiar 2017) The fruit has a berry-like appearance, with a leathery husk enclosing many seeds surrounded by juicy arils that form the edible part of the fruit. Depending on the cultivar, the arils can range in color from deep red to almost colorless, while the enclosed seeds vary in the amount of sclerenchyma tissue present, which affects their softness (Harnadez et al 2023). Abdul Hakim et al. (2018) study on Bhagwa and Ruby variety of pomegranate plant for effect of different concentration of auxin in combination with bio-fertilizers showed that the treatment had significantly higher values on different shoot and root parameters .in Keiji Jindo et al (2021) reported that, trichoderma (*Trichoderma asperellum*) in vermicompost extract reduces nematode in tomato and bell paper crops, reduces root infection. Boraiah et al. , 2017 studies effect of panchagavya, Jeevamrut and cow urine on capsicum, the study found that jeevamrut promote biological activity in the soil and make the nutrients available to capsicum, Jeevamrut contain plant growth promoting microflora, colonized in soil produce various plant growth promoting substances due to increases soil fertility. In rhizosheric region, plant growth promoting microbes have produce several products like siderophores, phytohormones, nitrogen fixation, phosphate solubilisation, ACC deaminase, it aslo reduces agronomic efficiency by reducing costa and minimum environmental pollution as compared to chemical fertilizers, onces the PGPR have used for plants, its improved the quality, yield and productivity (Rocheli de S. et al 2015)

As the population increasing continuously, to fulfil demand of food of growing population can be resolved through chemical fertilizers for crop production and horticulture, this has led to environmental hazardous and health issues due to accumulation and magnification of agrochemical residues in food, to minimized the use of chemical fertilizers and pesticide need to find eco-friendly methods. Among these, vermicompost is an appealing alternative to conventional chemical fertilizers. Vermicomposting is a non-thermophilic process that transforms organic waste materials into valuable fertilizer through the combined action of worms and mesophilic microbes. Vermicompost (also called worm compost, vermicast, vermicasting, worm humus or worm manure) is the end- product of the breakdown of organic matter by some species of earthworm. Vermicompost is a nutrient rich, organic fertilizer and soil conditioner. The process of producing vermicompost is called vermicomposting, vermicompost enhances levels of soil organic matter, soil microbial biomass, and activities (Chellachamy V et al. 2015, Samiur Rehman et al. 2023, X. Song et al. 2015)

The repeated use of chemical fertilizers and pesticides, for more agricultural production due to creating a huge amount of residues in soil, affects the ecological and environment problem. Hence, the present investigation was performed for preparation of nutrient enrichment vermicompost using consortia of plant growth promoting microbes, the prepared vermicompost were applied in pomegranate farms.

Material Methods

The experiment was designed to study the effect of microbial enriched vermicompost for pomegranate plant cv Bhagawa. The experiment was carried out in a pomegranate cultivated farm.

Selection of plant

A healthy, uniform vigor five-year-old forty-eight plant of pomegranate were selected for study in June 2023-December 2023.

Microbial consortia

The eight plant growth promoting microbial species were selected for preparation of microbial consortia, including *Bacillus Subtilis*, *azotobacter species*, *Fratureia Aurantia*, *Bacillus Polymixa*, *Pseudomonas Fluorescens*, *Trichoderma Viride*.

Preparation of vermicompost with plant growth promoting consortia

A readymade vermicompost prepared from organic waste and animal dung were selected for study. These consortia were spraying on a heap of vermicompost mixed it and allowed to incubate for 21 days in shady space in aerobic condition, after interval of fourth day spraying of water and mixing it using turning of vermicompost manually. The application of prepared vermicompost using a digging method, Both sides of the plant. The selected pomegranate pest management, irrigation was performed using routine agriculture practices

Treatments

Three treatments were selected for T₁ (Organic manure 15 kg/plant + NPK 2kg/plant), T₂, (Organic manure 15 kg/plant +Vermicompost 2 kg/plant), T₃ (Organic manure 15 kg/plant +Vermicompost 2 kg/plant+ microbial consortia)

Result and Discussion

The following image shows flowers T₁, T₂, T₃ plant and fruit of T₃ treatment, it was significant difference was observed fig.1 the initiation of first flower bud and weight of fruits represented in table.1

T₁ TreatmentT₂ TreatmentT₃ TreatmentT₃ Treatment

Images shows flower buds and fruit setting of selected treatments

Treatment	Day required for initiation of first floral bud	Average weight of fruit grams
T ₁	37	180
T ₂	32	210
T ₃	28	260

Table 1, Effect of treatment on day required for initiation of first floral bud, weight of Pomegranate (*Punica granatum* L. cv Bhagwa)

The effect of vermicompost enriched with microbial consortia on flower bud initiation, average weight of fruit and frequency of pesticides used to control diseases in selected treatments, for experiment three treatment were selected for study, the data represented in table1 of T₁, T₂, T₃, for the first floral bud was initiated. The treatment T₃ gives significantly decreased day of initiation of first floral bud (28 days) as compared to other selected treatments and average weight of fruit significantly increased 260 grams. Ramesh et al. 2017 also reported that effect of organic manure on growth and flower characteristics of pomegranate, they performed fourteen treatment consist of variable ratio of organic matter + vermicompost + Jeevamrut, the significant effect on growth characteristics was observed in treatment T₁₃ consist of Jeevamrut 16.8L/P+Vermicompost 24.79 gives increased the plant height (2.62 m.), canopy volume (6.37m³), the first floral bud initiation of fruit set (26.50) day 50 % flowering (35day), duration of fruit set at (31.50day). The similar results were reported S.S. Godage et al. (2023) on guava (*Psidium Guajava* L) twenty-three treatment consist of organic fertilizer, bio fertilizer (Azotobacter, PSB) found significant result maximum tree height (3.8m), maximum per batch flower (25.33), fruit settling per branch (92.96%). The Hasan et al (2022) study

on effect on vermicompost and organic matter gave a significant result for leaf content, fruit yield and fruit physical and chemical characteristics, using 4 Kg vermicompost + 5 Kg organic matter. The vermicompost content of nutrients was higher than that of other traditional fertilizers, and that the use of vermicompost in soil fertilization led to an increase in the leaf content of nutrients and thus improved vegetative growth and crop quantity (Bellitürk et al., 2020). The number of chemical pesticides spray required for control of diseases of pomegranate, it was found that the T₃ treatment plant developed a plant defense system as compared to other treatments, but the number of spray depends on environmental factors, climate, soil parameter and variety of pomegranate. The microbial consortia along with vermicompost increase the plant defence system. Keiji et al 2021 reported that, significantly reduction of nematodes infection to root of tomato and bell pepper crop using trichoderma enriched vermicompost. Hassan et al, 2022 studied effect of vermicompost and organic compost on pomegranate, it was found that height minerals content in leaf, yield of fruit increases and improved the physical and chemical properties of pomegranate plant. Jayshri et al 2020 reported that vermicompost and bio fertilizer effect the different rooting and shooting parameters of pomegranate. The effect of different manure (farm yard manure, vermicompost, poultry manure, green house manure, sheep manure, neem cake) on shoots number, shoot length, plant height, productive flower, fruit set, yield it was found that, recommended dose of nitrogen with poultry manure gives significant results. They concluded that, the nutritional requirement fulfilled with use of organic manure might be without affecting growth and yield characteristics of pomegranate. The use of bio fertilizers and plant growth promoting bacteria significantly increase the fruit weight, volume and amount of vitamin c. (Abdel Salam et al. 2022; Acer et al. 2022).

Conclusion

The present investigation were study the effect of microbial consortia for enriched with vermicompost for pomegranate plant, it was concluded that, the synergic effect (T₃ treatment) of vermicompost and inoculated microbial consortia *Bacillus subtilis*, *azotobacter species*, *Frateriuria aurantia* , *Bacillus plymixa* , *Pseudomonas fluorescens* , *Trichoderma viride* shows significant result in decrease day for initiation off first floral bud, fruit weight and plant exhibit resistant towards diseases, also affect soil fertility and over all maintain the ecosystem. The vermicompost acts as medium for growth of microbial consortia, where it might produce plant growth producing substances. The prepared vermicompost and microbial consortia. can be used as an alternative, eco-friendly, cost effective method for organic pomegranate production. The pomegranate cultivator farmers could use these microbial consortia for better quality production of pomegranate in minimum uses of chemical fertilizers and pesticides.

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