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Effect of compost derived from decomposed kitchen waste by microbial decomposers on biotic stress management of crops

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Abstract
In the present study, the effect of compost derived from decomposed kitchen waste by microbial decomposers *viz. Pseudomonas sp, T. viride* 1, 2, 3, *T. harzianum* and TV on biotic stress management of crops *viz.* wheat, Chickpea, Safflower and cowpea discussed. Kitchen waste compost was significantly reduced the plant mortality of crops in comparison to control. No plant mortality was recorded by T3 and T4 treated crops and minimum mortality was recorded in T1 (1.44%) treated crops.

Keywords: Kitchen waste, compost, microbial decomposers, biotic stress, *Pseudomonas, Trichoderma*

Introduction
Kitchen waste is defined as left-over organic matter from restaurants, hotels and households (Li *et al*., 2009). Kitchen waste forms a significant part of domestic waste. Tons of kitchen wastes are produced daily in highly populated areas. An Indian city produces about 0.8 to 1 kg solid wastes per capita per day (Sarkar *et al*., 2011). Compost can be defined as solid particulate organic material that is the result of composting, that has been sanitized and stabilized, and that confers beneficial effects when added to soil and/or used in conjunction with plants. Compost used to improve soil physical and biological properties *i.e.*, water retention capacity, drainage, pH, better availability of soil micro-organism and reducing the negative impact of chemical based pesticides and fertilizers in the ecosystems. Organic matter is rich in compost, which plays a crucial role in improving physical, chemical and biological properties of the soils. As a result of these improvements, soil: (i) becomes more resistant to stresses such as drought, diseases and toxicity, (ii) helps the crop in uptake of plant nutrients and (iii) possesses an active nutrient cycling capacity because of vigorous microbial activity.The application of composts to soils has been shown to alter the balance of soil microflora and suppress some soil-borne diseases in field crops (Hoitink and Fahy, 1986; Hoitink *et al*., 1997). According to many authors, compost applied to soil increases total pore volume, facilitates the penetration of water and increases soil water holding capacity (Jamroz and Drozd, 1999). Several mechanisms involved in the antagonistic activity of beneficial microbes from compost including competition for nutrients, site exclusion, production of inhibitory metabolites, and parasitism (Elmer and Reglinski, 2006). The effects of compost application either as extracts to the foliage or as soil amendments on plant disease control may be due to direct antifungal or resistance inducing/plant strengthening effects. Thus a study was formulated on the effect of compost derived from decomposed kitchen waste by microbial decomposers on biotic stress management of crops.

Materials and methods
The present experiment was conducted at the Department of Plant Pathology, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, (C.G.) and field studies were conducted in the Research Farm of the University in the year of 2015-16.

Sample Collection
Kitchen waste was collected from girls hostel (Mandakani, Kadambari and Sarswati), Indira Gandhi Agricultural University, Raipur (C.G.).

Microbial decomposers
Microbial decomposers such as one isolate of *Pseudomonas sp*, three isolates of *Trichoderma viride* 1, 2, 3 and one isolate of *T. harzianum* were isolated from decomposed kitchen waste which was procured from residential area of Professor Colony, Krishak Nagar Jora, Raipur

(C.G.) and maintained on NAM and PDA slants respectively. One isolate of *Trichoderma viride* (TV) was procured from Biocontrol Lab, IGKV, Raipur (C.G.) used as a test.

Preparation of kitchen waste compost

PP bags (13"x6" size) were used for compost preparation. Kitchen wastes were cut into small pieces (1–1.5 cm), mixed thoroughly and used as a raw material. Each PP bags was 2/3 filled with 1 kg of kitchen wastes and was inoculated with 100 ml inoculums of microbial decomposers (*Pseudomonas sp, T. viride* 1, 2, 3, *T. harzianum* and TV) and added 200 ml water by evenly mixing the inoculums with the wastes. It was kept under natural condition to observe the visual rate of degradation by gradual decrease in the volume of the waste pile. Only water was added and without inoculums serve as control. After 24 hours, shaked the PP bags and required daily till the rotting. Each treatment was replicated three times. After 5-7 days kitchen waste was decomposed and after decomposition it was air dried for 24-48 hours then mixed with sand in 1:3 ratio (1 part KWC and 3 part sand) and left for 2-3 days for pulverized. Thus it was used as compost.

Evaluation of biotic stress management: To evaluate the effect of kitchen waste compost on biotic stress management of crops *in vivo* four crops *viz*. wheat (GW-366), Chickpea (Vaibhav), Safflower (Manjira) and cowpea (Arka Garima) were used as test crop. The treatments were: (T1) kitchen waste compost (KWC) decomposed by *Pseudomonas sp.*, (T2) kitchen waste compost (KWC) decomposed by *Trichoderma* viride 1, (T3) kitchen waste compost (KWC) decomposed by *T.* viride 2 (T4) kitchen waste compost (KWC) decomposed by *T. viride* 3, (T5) kitchen waste compost (KWC) decomposed by *T. harzianum* (T6) kitchen waste compost (KWC) decomposed by TV, (T7) Farm Yard Manure (FYM), (T8) control kitchen waste compost (decomposed naturally) and (T9) control (without compost). All KWC and farmyard manure (FYM) were separately incorporated into the soil at the rate of 7.5 ton ha-1 and uniformly mixed with a hand spade in 2×1 m plots size at the time of land preparation. The seeds of each crop were sown at alternate rows in plots for each treatment and all the recommended agronomic package and practices (no chemical fertilizers, no weedicides and no pesticides used) were followed and experiment was conducted in Randomized Block Design with 2x1 m size. Two replications were maintained for each treatment. The observation was recorded for plant mortality after 20 days after sowing (DAS), 35 DAS and 50 DAS. Mortality percent was calculated by the following formula:

Mortality percent (%) = (number of dead plant / total no of plant observed) X 100

Results and Discussions

The effect of kitchen waste compost prepared by different isolates of microbial decomposers (*Pseudomonas sp, T. viride* 1, 2, 3, *T. harzianum* and TV) and naturally decomposed KWC on plant mortality of different crops was studied. The mean of two replications have been presented in table 1 and fig.1, which revealed that among the crops, the minimum mortality percent was recorded on wheat (0.00 %) followed by cowpea (5.55 %), safflower (6.04 %). The maximum mortality percent was recorded on gram (12.62 %) and all crops showed significant difference with each other. Among the treatments, the minimum and equal mortality percent was showed by T3 and T4 (0.00 %) followed by T1 (1.44 %), T5 (3.05 %). The maximum mortality percent was showed by T9 (16.21 %). T3, T4 (0.00 %) and T1 (1.44 %) were *at par* with each other. Plant mortality percent of wheat was zero for all the treatments. That means, no any mortality was recorded in all treatments. Plant mortality percent of gram was recorded minimum and equal in T3 and T4 (0.00 %) followed by T5 (5.95%), T1 (5.76 %) and maximum in T9 (28.95 %). T3, T4 (0.00 %) and T5 (5.95 %) were *at par* with each other. Plant mortality percent of safflower was recorded minimum and equal in T1, T3 and T4 (0.00 %) followed by T2 (7.14 %) and maximum in T9 (17.65 %). T1, T3 and T4 (0.00 %] were *at par* with each other. Plant mortality percent of cowpea was recorded minimum and equal in T1, T3, T4 and T5 (0.00 %) followed by T2 (2.78 %), T7 (5.56 %) and maximum in T9 (18.25 %). When compared with each other T1, T3, T4 and T5 (0.00 %), T2 (2.78 %), T7 (5.56 %) were *at par* with each other.

The result indicated that kitchen waste compost prepared by different isolates of microbial decomposers (*Pseudomonas sp, T. viride* 1, 2, 3 and *T. harzianum*) reduced the plant mortality of crops in comparison to control. No plant mortality was recorded by T3 and T4 treated crops and minimum mortality was recorded in T1 treated crops.

The present findings are supported by Bareja *et al*. (2010) who recorded the lowest mortality in cowpea plants amended with residual of tree compost while the highest plant mortality from charcoal rot occurred in the unamended control. Similar work was done by Raja Namasivayam and Bharani (2012) found that the plant growth parameters such as shoot length, leaf surface area, and total chlorophyll, height of the plant, total leaves and branches emerged in the plant, total foliage density/plant was increased in fruit waste compost treated plants and distinct reduction in pest infestation and disease spots. Hoitink *et al*. (1997) was also found that the application of composts to soils has been shown to alter the balance of soil microflora and suppress some soil-borne diseases in field crops.

Conclusion

The effect of kitchen waste compost prepared by different isolates of microbial decomposers and naturally decomposed KWC on plant mortality of crops *viz*., wheat, gram, safflower and cowpea *in vivo* was studied. Kitchen waste compost prepared by different isolates of microbial decomposers reduced the plant mortality of crops in comparison to control under natural condition. No plant mortality was recorded by T3 and T4 incorporated crops and minimum mortality was recorded in T1 incorporated crops.

Table 1: Effect of kitchen waste compost on plant mortality (%) of different crops

Treatment	Mortality percent (%)				
	Wheat	Gram	Safflower	Cowpea	Mean(A)
T1	0.00 (0.00)*	5.76 (13.81)*	0.00 (0.00)*	0.00 (0.00)*	1.44 (3.45)*
T2	0.00 (0.00)	16.67 (23.65)	7.14 (11.1)	2.78 (6.81)	6.65 (10.39)
T3	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
T4	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
T5	0.00 (0.00)	5.95 (10.09)	6.25 (13.99)	0.00 (0.00)	3.05 (6.02)
T6	0.00 (0.00)	13.16 (21.17)	6.67 (14.66)	8.33 (16.77)	7.04 (13.15)
T7	0.00 (0.00)	20.00 (26.55)	12.50 (20.7)	5.56 (9.73)	9.51 (14.25)
T8	0.00 (0.00)	23.08 (28.70)	4.17 (11.78)	15.00 (22.49)	10.56 (15.74)
T9	0.00 (0.00)	28.95 (32.33)	17.65 (24.53)	18.25 (25.01)	16.21 (20.47)
Mean(B)	0.00 (0.00)	12.62 (17.37)	6.04 (10.75)	5.55 (8.98)	

	SEm±	CD at P(0.05)
Factor A	1.89	5.44
Factor B	1.26	3.62
Factor (AXB)	3.77	10.87

*Data in parenthesis shows Arc sine transformation

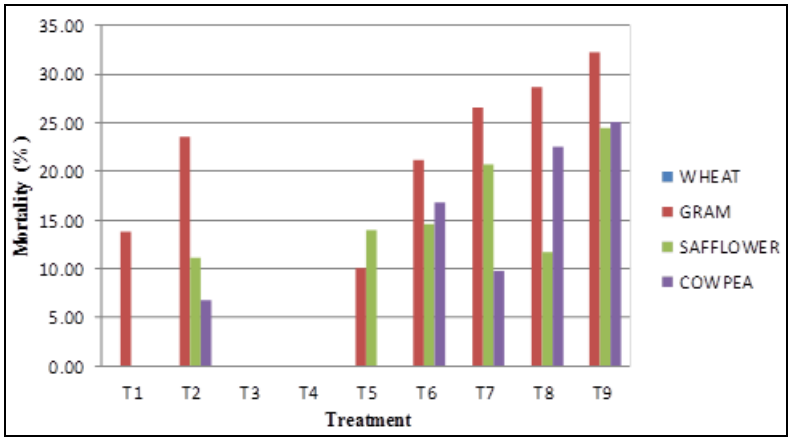

Fig 1: Effect of kitchen waste compost on plant mortality (%) of different crops.

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References

1. Hoitink HAJ, Fahy PC. Basis for the control of soil borne plant pathogens with composts. *Annu. Rev. Phytopathol*. 1986; 24:93-114.
2. Hoitink HAJ, Stone AG, Han DY. Suppression of plant disease by composts. Hort Science, 1997; 32:184-187.
3. Li R, Chen S, Li X, Lar JS, He Y, Zhu B. Anaerobic Codigestion of Kitchen Waste with Cattle Manure for Biogas Production. Energy and Fuels, 2009; 23:2225-2228.
4. Raja Namasivayam SK, Bharani RSA. Effect of Compost Derived from Decomposed Fruit Wastes by Effective Microorganism (EM) Technology on Plant Growth Parameters of *Vigna mungo*. J. Bioremed. Biodeg. 2012; 3(11):167.
5. Sarkar P, Meghvanshi M, Singh R. Microbial consortium: A new approach in effective degradation of organic kitchen wastes. International Journal of Environmental science and Development. 2011; 2(3):5.
6. Bareja Meenu, Kumar Praveen, Lodha Satish. Effect of composts on microbial dynamics and activity, dry root rot severity and seed yield of cowpea in the Indian arid region. Phytopathol. Mediterr. 2010; 49:381-392.
7. Elmer PAG, Reglinsk T. Biosuppression of *Botrytis cinerea* in Grapes. Plant Pathology, 2006; 55(2):155-177.
8. Jamroz E, Drozd J. Influence of applying compost from municipal wastes on some physical properties of the soil. International Agrophysics. 1999; 13:167-170.