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INTERACTION EFFECT OF INCORPORATION OF PLANT LEAF RESIDUES ON MICROBIAL COUNT AT DIFFERENT INTERVALS ON GLADIOLOUS CULTIVARS

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ABSTRACT

The pot culture experiment was conducted in *rabi* season of 2015-16 to study the effect of plant leaf residues on microbial population of gladiolous rhizosphere soil. Experiment was carried out with two main treatments i.e. cultivars (American Beauty, Psittacenus Hybrid) and five sub treatments i.e. plant leaf residues viz.,*Lantana camera* (Ghanari), *Ipomoea carnea* (Besharm), *Parthenium hysterophorus* (Parthenium), *Annona innoxia* (Sitaphal) and *Azadiracta indica* (Neem). CFU g^{-1} count of *Fusarium*, bacterial and actinomycetes was maximum in American beauty cultivar i.e. 4.53×10^4, 5.14×10^7 and 6.17×10^8 at 30, 60, 90 and 120 DAP respectively as compared to the Psittacenus hybrid i.e. 4.19×10^4, 4.44×10^7 and 5.72×10^8 respectively and the CFU g^{-1} count was minimized in all treatments compared to the control. Minimum CFU g^{-1} count was observed with *Ipomea carnea* i.e. 2.90×10^4, 3.72×10^7 and 4.73×10^8, whereas maximum CFU g^{-1} count was revealed with the *Annona innoxia* i.e. 5.1×10^4, 5.41×10^7 and 6.7×10^8 at 30, 60, 90 and 120 DAP respectively.

INTRODUCTION

Gladiolus is a tender herbaceous perennial. It is indeed a boon to a florist. It is popular for its attractive spikes having florets of huge form, dazzling colours and spikes with long keeping quality. The soil biota plays an important role in decomposition and mobilization of organic matter in the soil that affects crop performance. Soil organisms maintain soil health which in turn influences crop management practices and input use required proper plant growth and development. The plant leaf residues incorporated in soil which is decomposed by soil microorganisms and mobilize plant nutrients. The interaction of soil microorganisms and plant residues incorporated in the soil help to improve the ecosystem of rhizoshpere improving the physical and chemical properties of the soil. The plant leaf residues incorporated in soil could reduce nutrient loss to the environment because of the slower nutrient releasing mechanism compared with the chemical fertilizers.

MATERIALS AND METHODS

The pot culture experiment was conducted in factorial randomised block design with two main treatments viz., gladiolus cultuivar American Beauty (V_1) and Psittacenous Hybrid (V_2) and eight sub treatments i.e. *Lantana camera* (B_1), *Ipomoea carnea* (B_2), *Parthenium hysterophorus* (B_3), *Annona innoxia* (B_4) and *Azadiracta indica* (B_5) and uninoculated treatment served as control (B_6). Field soil and the green plant leaf residues used in this experiment were collected from the experimental field of College of Agriculture, Nagpur. Corms with symptoms of wilt were procured Plant Pathology Section, College of Agriculture Nagpur. The pure culture of *Fusarium* was prepared and maintain on PDA. The mass multiplication of *Fusarium oxysporum* f. sp. *gladioli* was multiplied on sorghum grain medium. Flasks were incubated at room temperature for 15 days and added in pot soil seven days before sowing.

Soil treatment with green plant leaf residues

The plant leaves were washed with water and cut into small pieces (about 1 cm^2) and this plant residues were incorporated in sterile soil. The plant leaves mixed in the pot @ $4g^{-100\,g}$ of soil. Pots were inoculated as per treatment details and incubated for 15 days to allow the decomposition of the plants materials. Then corm was sown in the pot.

Microbial population at 30, 60, 90 and at harvesting

A serial dilution technique was used for isolation of microbes. In this technique, a sample suspension was prepared by adding 1.0 gm soil sample to 9 ml distilled water and shake it to made a suspension. Immediately afterwards, each suspension was serially diluted to 10^{-3} for fungi, 10^{-6} for bacteria and 10^{-8} for actinomycetes. From this 1ml was pipetted onto plates with PDA for *Fusarium*, NA for Bacteria and Kenknight media for Actinomycetes for the respective microbial population. Each colony that appeared on the plate was considered as one colony forming unit (CFU). The CFU count can be calculated by using the formula (Vincent, 1970)

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$$CFU = \frac{\text{Number of colonies formed}}{\text{Volume of culture plate}} \times \text{Dilution factor}$$

RESULTS AND DISCUSSION

1. Effect of cultivars and plant leaf residues on *Fusarium* population

Effect of fungal population were tested by collecting the soil from pots containing sick soil by serial dilution technique and observations were recorded on number of colony forming units as CFU g^{-1} of soil and the results are presented in table 1.

Effect on variety

The results revealed that the effect due to variety on CFU count of gladiolus plant was found to be significant at 30, 60, 90 and 120 DAP. Maximum CFU ($x10^4$) count was noticed in cultivar American Beauty (5.8, 7.84, 4.87 and 4.53 at 30 60 90 and 120 DAP, respectively) as compared with Psittacenus Hybrid (5.6, 7.21, 4.69 and 4.19 at 30, 60, 90 and 120 DAP, respectively.)

Effect of plant leaf residues

The data presented in table 1 shows that colony forming units of wilt causing pathogen was observed under different plant leaf residues added in soil by serial dilution technique at 30, 60, 90 and 120 DAP. Minimum CFU ($x10^4$) count was observed with *Ipomea carnea* (4.87, 6.06, 3.18, 2.90) at 30, 60, 90 and 120 DAP over control. *Ipomea carnea* plant residues was most effective against *Fusarium oxysporum* f. sp. *gladioli* in gladiolus and other crops has been reported by Singh *et al.* (2012). Khan and Mustafa (2005), Vieira and Nahas (2005), Blok *et al.* (2000) and Chhogyel *et al.* (2015) also reported that the CFU g^{-1} count of the wilt fungus was significantly increased at vegetative stage and declined at harvest.

Interaction effect

The data presented in table 1 revealed that, interaction effect on *Fusarium* population of gladiolus was found to be non significant at all the intervals.

2. Effect of cultivar and plant leaf residues on bacterial population in soil at various interval

Effect on cultivar

The data presented in table 2 revealed that, the effect due to variety on CFU count of gladiolus plant was found to be significant after 30, 60, 90 and 120 DAP. Minimum bacterial population was observed in Psittacenus Hybrid (5.97, 8.48, 6.93 and 4.44 after 30, 60, 90 and 120 DAP) when compared with American Beauty (6.48, 9.09, 8.13 and 5.14 after 30, 60, 90 and 120 DAP).

Effect of plant leaf residues

The data presented in table 2 shows that, colony forming units was observed under different plant leaf residues added in soil. Minimum CFU ($x10^7$) count was observed with *Ipomea carnea* (5.15, 7.18, 6.45 and 3.72) at 30, 60, 90 and 120 DAP in both the cultivars over control of gladiolus. Plant residues effect on CFU count of gladiolus and other crops has been reported by Chhogyel *et al.* (2015), Singh *et al.* (2012), Khan and Mustafa (2005), Vieira and Nahas (2005) and Blok *et al.* (2000). They reported that the CFU/g count of bacteria causing wilt was significantly increased at vegetative stage and decline at harvest.

Interaction effect

The data presented in table 2 revealed that, the interaction effect on bacterial population of gladiolus was found to be non significant at all the intervals viz., 30, 60, 90 DAP and significant in 120 DAP. It is revealed from the data that the variety American Beauty recorded maximum bacterial count by the treatment B_2 (4.28×10^7). However, for Psittacenous Hybrid the treatment B_2 (3.17×10^7) recorded minimum bacterial count suggesting that *Ipomea carnea* reduced bacterial count. Arora *et al.* (2013) studied the antibacterial activity of leaves and flower of *Ipomea carnea* using methanol extract against bacterial and fungal strains as compared to chloramphenicol and ketoconazole.

3. Effect of cultivars and plant leaf residues on Actinomycetes population

Effect on cultivars

The data presented in table 3 revealed that, the effect due to variety on CFU count of gladiolus plant was found to be significant after 30, 60, 90 and 120 DAP. Maximum CFU ($x\ 10^8$) count for actinomycetes was noticed in the cultivar of American Beauty (7.55, 9.33, 8.18 and 6.17 after 30, 60, 90 and 120 DAP) as compared to Psittacenus Hybrid (7.22, 8.56, 7.08 and 5.72 after 30, 60 ,90 and 120 DAP) and both the cultivars American Beauty and Psittacenus Hybrid were found at par with each other at all the intervals under study.

Effect of plant leaf residues

The data presented in table 3 shows that the colony forming units were observed under different plant leaf residues added soil *viz.,* by serial dilution technique at 30, 60, 90 and 120 DAP and at harvest. Minimum CFU ($x10^8$) count was observed with *Ipomea carnea* (7.22, 8.48, 7.20 and 5.53) at 30, 60, 90 and 120 DAP in both the varieties over control of gladiolus. Plant residues effect on CFU count of gladiolus and other crops has been reported by Chhogyel *et al.* (2015), Singh *et al.* (2012), Khan and Mustafa (2005), Vieira and Nahas (2005). They also reported that the CFU/g count of the wilt bacteria was significantly increased at vegetative stage and decline at harvest.

Interaction effect

The data presented in table 3 revealed that, interaction effect on actinomycetes population of gladiolus was found to be non significant at all the intervals.

Table 1. Effect of *Fusarium* population (CFU (x10^7) at various intervals as influenced by different treatments

Cultivar / Treat.	30 DAP			60 DAP			90 DAP			120 DAP		
	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean
B_1	5.65	5.50	5.57	7.51	6.57	7.04	4.33	4.37	4.35	4.12	3.75	3.93
B_2	4.95	4.80	4.87	6.30	5.82	6.06	3.32	3.05	3.18	2.98	2.82	2.90
B_3	5.92	5.57	5.75	7.65	7.11	7.38	4.79	4.65	4.72	4.55	4.65	4.60
B_4	6.27	5.90	6.08	8.31	7.75	8.03	5.80	5.47	5.64	5.25	4.95	5.10
B_5	5.05	5.05	5.05	6.98	6.23	6.61	3.60	3.50	3.55	3.31	3.10	3.20
B_6	7.47	7.00	7.23	10.32	9.82	10.07	7.42	7.10	7.26	7.02	5.92	6.47
Mean	5.88	5.63		7.84	7.22		4.88	4.69		4.54	4.20	
	V	B	...	V	B	V × B	V	B	V × B	V	B	V × B
SE ± (m)	0.03	0.07	0.10	0.05	0.10	0.15	0.03	0.05	0.08	0.03	2.79	0.09
CD (P=0.05)	0.18	0.21	-	0.15	0.30	-	0.09	0.14	-	0.09	7.98	-

Table 2. Effect of bacterial population (CFU (x10^7) at various intervals as influenced by different treatments

Cultivar / Treat.	30 DAP			60 DAP			90 DAP			120 DAP		
	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean
B_1	6.27	5.87	6.07	8.88	7.92	8.40	7.97	6.62	7.29	4.52	3.95	4.23
B_2	5.35	4.95	5.15	7.42	6.95	7.18	7.10	5.81	6.45	4.28	3.17	3.72
B_3	6.60	6.00	6.30	9.08	8.40	8.74	8.02	6.50	7.26	4.85	4.77	4.81
B_4	6.82	6.40	6.61	9.66	9.10	9.38	8.78	7.71	8.25	5.70	5.12	5.41
B_5	5.67	5.17	5.42	8.28	7.73	8.01	7.75	6.06	6.90	4.46	3.45	3.95
B_6	8.17	7.45	7.81	11.24	10.82	11.03	9.15	8.91	9.03	7.05	6.17	6.61
Mean	6.48	5.97		9.09	8.48		8.13	6.93		5.14	4.44	
	V	B	V × B	V	B	V × B	V	B	V × B	V	B	V × B
SE ± (m)	0.08	0.07	0.21	0.07	0.13	0.18	0.17	0.32	0.45	0.05	0.10	0.15
CD (P=0.05)	0.23	0.21	-	0.20	0.38	-	0.49	0.91	-	0.16	0.30	-

Table 3. Effect of actinomycetes population (CFU (x10^7) at various intervals as influenced by different treatments

Cultivar / Treat.	30 DAP			60 DAP			90 DAP			120 DAP		
	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean
B_1	7.14	7.03	7.22	8.93	8.02	8.48	7.75	6.66	7.20	5.78	5.27	5.53
B_2	6.27	5.91	6.09	7.62	7.12	7.37	7.07	6.21	6.64	4.86	4.60	4.73
B_3	7.81	7.57	7.69	9.18	8.50	8.84	8.32	7.10	7.71	6.32	5.90	6.11
B_4	8.31	7.91	8.11	10.10	9.12	9.61	8.80	7.32	8.06	7.02	6.37	6.70
B_5	6.57	6.15	6.36	8.41	7.68	8.05	7.85	6.41	7.13	5.46	4.86	5.16
B_6	8.93	8.8	8.86	11.74	10.92	11.33	9.33	8.81	9.07	7.60	7.35	7.47
Mean	7.55	7.23		9.33	8.56		8.18	7.08		6.17	5.72	
	V	B	V × B	V	B	V × B	V	B	V × B	V	B	V × B
SE + (m)	0.06	0.11	0.16	0.07	0.13	0.18	0.18	0.34	0.49	0.05	0.09	0.13
CD (P=0.05)	0.17	0.33	-	0.20	0.38	-	0.53	0.99	-	0.14	0.27	-

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