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Studies on *Phyllosphere mycoflora* of healthy and virus infected tomato plants

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ABSTRACT

Phyllosphere mycoflora of healthy and virus infected tomato plants has been studies. About four variety of healthy and virus infected tomato plants leaves of Laxmi (NP-5005), Kranti, Priya and Sartaj-Plus were collected from field at 15, 30 and 45 days after infection. The number of phyllosphere mycoflora (fungi) was increased in beginning at 15 days on all the variety of virus infected tomato plant leaves as compared to healthy tomato plant leaves. And decreased in virus infected leaves later on when the severity of disease increased at 45 days of infection as compared to healthy plants.

Keywords: Healthy and Virus infected tomato leaves

INTRODUCTION

Phyllosphere Last [1] introduced term Phyllosphere to denote the leaf surface of the plants. He further advocated that Phyllosphere region is similar to rhizosphere in that it is also nutritionally rich, microhabitat and provide suitable (host) substrate for the colonization and multiplication of micro-organism. The report of the intensive investigations of leaf surface mycoflora has been reported by Last and Deighton [2]. The host pathogen interactions in plant virus diseases are known to bring about considerable changes in the metabolism of the infected plant. The phylloplane, the surface of plant leaves is a complex terrestrial habitat that is characterized by a variety of microorganisms including bacteria, filamentous fungi and yeast. Phylloplane fungi are the mycota growing or the surface of leaves [3].

These metabolic changes are expected to alter the quality and/or quantity of leaf exudates, which in turn will be reflected on the phyllosphere microflora of such plants. The effect of certain trace elements on phyllosphere mycoflora, virus multiplication and also the mutual interaction between virus and the phyllosphere population. Virus in the inoculums deposited on the upper leaf surface is exposed to direct solar radiation and possible to inactivation, while mechanically injured cells into which virus has already gained entry may be killed by desiccation; plant tissues subjected to reduced light intensity on the lower surface of leaves become more susceptible to virus infection and differences in the anatomy of the two leaf surfaces seem to favors the lower surface for virus entry during mechanical inoculation. Mishra and Srivastava (4a-d) reported the phyllosphere and phylloplane microflora of some important crop plants and observed that bacterial population mostly have suppressing effect on fungal flora of leaf. In the present investigation an attempt was made to study the microbial population in the phyllosphere of virus infected tomato plants in comparison with that of the healthy tomato plants.

MATERIALS AND METHODS

Collection of leaves

The leaves of four variety of healthy and virus infected tomato plant variety Laxmi (NP-5005), Kranti, Priya and Sartaj-Plus were collected from field at 15, 30 and 45 days after virus infection and placed in pre-sterilized polythene bags.

Isolation and Identification of phyllosphere mycoflora

A modified leaf washing technique was adopted Dickinson [5] to estimate phylloplane mycoflora of healthy and virus infected tomato plants. Disc of 3 mm diameter were cut randomly from leaves of each variety with sterile cork borer. Fifty disc were placed in 250 ml conical flask containing 100 ml sterile distilled water and shake for 20 minutes to get a homogenous suspension. One ml suspension was pipette out in to sterilized petriplates. The plates were poured with peptone dextrose agar medium containing rosebegal and streptomycin Martin [6] medium (For Fungi) and mixed thoroughly and kept undisturbed in dust free chamber at room temperature for 7 days. On incubation, the fungal colonies were observed and identified on the basis of morphological and reproductive characters [7-9].

$$\text{Total number of microbes} = \frac{\text{Total number of microbes in 1ml x 100}}{\text{Total area of 50 disc x 2}}$$

(Area of one disc = πr^2, where 'r' is the radius of disc in cm)

RESULTS AND DISCUSSION

In the present study, totally 15 fungal species were isolated from phyllosphere mycoflora of healthy and virus infected tomato plant. The infected tomato plant leaves total microbial population of fungi was higher than that of healthy tomato plants leaves, throughout the period of 15 days after virus infection and 45 days after virus infection the microbial population was decreased on the diseased leaves and as compared to the healthy leaves of all variety of tomato plants. Healthy leaves of Laxmi (NP-5005) variety at 15 days infection of phyllosphere mycoflora of 0.53 per cm^2 and on diseased leaves phyllosphere mycoflora 0.60 per cm^2, healthy leaves of Kranti variety phyllosphere mycoflora of 0.44 per cm^2 and on diseased leaves 0.45 per cm^2, on healthy leaves of Priya variety phyllosphere mycoflora of 0.28 per cm^2 and on diseased leaves 0.32 per cm^2 and on Sartaj-Plus variety healthy leaves phyllosphere mycoflora of 0.24 per cm^2 and on diseased leaves 0.42 per cm^2. Most dominant fungi were found at 15 days of infection *A. niger*, *A. fumigates*, *Fusarium oxysporum* and *Penicillium citrinum.* At 45 days of virus infection the fungal population was increased on healthy leaves and decreased on diseased leaves. Healthy leaves of Laxmi (NP-5005) variety phyllosphere mycoflora of 0.62 per cm^2 and on diseased leaves 0.55 per cm^2, on healthy leaves Kranti variety phyllosphere mycoflora of 0.48 per cm^2 and on diseased leaves 0.46 per cm^2, on healthy leaves Priya variety phyllosphere mycoflora of 0.39 per cm^2 and on diseased leaves 0.36 per cm^2 and on healthy leaves of Sartaj-Plus variety phyllosphere mycoflora of 0.45 per cm^2 and on diseased leaves 0.42 per cm^2. Most dominant fungi were recorded *A. niger*, *A. terrus*, *Alternaria solani*, *Penicillium citrinum* and *Fusarium oxysporum*. Mishra and Srivastava [10] reported that the population of fungi on the leaves of croton and petunia infected with *cucumber mosaic virus* decreased with increasing virus intensity.

Table 1: Phyllosphere mycoflora of healthy and virus infected tomato plant (per cm^2 of leaf) isolated at 15 days of infection

Sr. no.	Fungi	Plant Variety							
		Laxmi (NP-5005)		Kranti		Priya		Sartaj-Plus	
		Healthy	Disease	Healthy	Disease	Healthy	Disease	Healthy	Disease
1	*A. niger*	3.66	7.00	3.00	4.66	4.00	7.66	4.33	4.66
2	*A. fumigates*	---	4.00	---	1.66	4.66	3.00	2.66	5.33
3	*A. flavus*	---	---	---	2.00	---	---	2.33	---
4	*A. parasitious*	---	---	---	0.33	---	---	0.66	1.33
5	*A. terrus*	4.66	---	2.66	2.66	---	---	---	3.00
6	*Alternaria*	2.66	2.66	---	4.00	---	---	---	---
7	*Cladosporium*	---	---	1.33	---	---	1.66	0.33	---
8	*F. oxysporum*	5.33	3.00	4.00	3.66	3.00	3.33	3.33	2.66
9	*Mucor*	---	4.66	5.00	---	4.33	---	---	---
10	*Penicillium citrinum*	5.00	5.66	4.33	---	---	0.66	---	---
11	*Penicillium Sp.*	3.00	---	---	4.33	---	---	---	1.66
12	*Rhizoctonia*	2.33	5.33	5.00	---	---	---	---	1.33
13	*Rhizopus*	---	---	---	---	---	---	---	---
14	*White sterile*	3.33	1.66	---	2.66	---	2.33	---	4.33
Total		29.97	33.97	25.32	25.96	15.99	18.64	13.64	24.30
Phyllosphere mycoflora (per cm^2 of leaf)		0.53	0.60	0.44	0.45	0.28	0.32	0.24	0.42

Note: (---- = not found)

Table 2: Phyllosphere mycoflora of healthy and virus infected tomato plant (per cm^2 of leaf) isolated at 30 days of infection

Sr. no.	Fungi	Plant Variety							
		Laxmi (NP-5005)		Kranti		Priya		Sartaj-Plus	
		Healthy	Disease	Healthy	Disease	Healthy	Disease	Healthy	Disease
1	*A. niger*	4.66	5.33	2.66	3.33	3.00	---	5.00	3.66
2	*A. fumigates*	---	3.00	---	---	---	2.00	4.33	---
3	*A. flavus*	2.33	---	3.00	---	2.00	5.66	---	2.33
4	*A. parasitious*	---	---	---	1.66	---	---	---	3.00
5	*A. terrus*	7	4.33	2.33	---	---	---	---	1.66
6	*Alternaria*	---	---	1.66	0.66	5.33	1.33	1.66	---
7	*Cladosporium*	---	---	---	---	---	0.50	3.33	4.33
8	*F. oxysporum*	1.66	2.66	1.33	---	---	---	0.66	1.33
9	*Mucor*	---	---	1.66	4.66	---	4.66	---	---
10	*Penicillium citrinum*	1.33	---	4.66	---	---	---	2.33	2.00
11	*Penicillium Sp.*	0.33	---	---	---	---	---	---	---
12	*Rhizoctonia*	---	---	0.50	2.00	2.33	---	---	0.50
13	*Rhizopus*	0.66	---	---	---	0.50	1.66	---	0.50
14	*White my*	---	---	4.33	---	1.33	2.33	4.00	2.00
15	*Trichoderma*	---	---	---	---	---	---	0.50	1.66
Total		17.97	15.32	22.13	12.31	14.49	18.14	21.81	22.97
Phyllosphere mycoflora (per cm^2 of leaf)		0.271	0.317	0.217	0.391	0.256	0.321	0.385	0.405

Note: (---- = not found)

Table 3: Phyllosphere mycoflora of healthy and virus infected tomato plant (per cm^2 of leaf) isolated at 45 days of infection

Sr. no.	Fungi	Plant Variety							
		Laxmi (NP-5005)		Kranti		Priya		Sartaj-Plus	
		Healthy	Disease	Healthy	Disease	Healthy	Disease	Healthy	Disease
1	*A. niger*	6.66	5.66	4.00	3.33	1.33	3.33	2.00	---
2	*A. fumigates*	3.00	3.33	1.33	4.00	---	4.33	---	---
3	*A. flavus*	---	---	3.00	2.00	---	4.00	---	---
4	*A. parasitious*	2.00	0.50	1.66	---	---	0.66	---	3.33
5	*A. terrus*	3.66	3.00	0.66	---	4.33	3.66	0.66	4.66
6	*Alternaria*	4.33	3.33	2.00	3.33	2.00	0.50	3.00	3.33
7	*Cladosporium*	4.33	3.66	2.33	3.00	2.33	---	4.66	---
8	*F. oxysporum*	4.00	2.00	5.00	1.66	3.33	3.00	3.33	2.33
9	*Mucor*	---	4.00	---	---	---	---	---	---
10	*Penicillium citrinum*	2.00	---	2.33	---	2.33	1.33	2.33	2.00
11	*Penicillium Sp.*	3.33	---	---	0.50	1.33	---	2.33	3.00
12	*Rhizoctonia*	---	---	---	2.33	3.00	---	4.00	---
13	*Rhizopus*	---	4.33	2.00	0.66	1.66	---	3.66	4.00
14	*White my*	1.33	---	---	3.33	---	---	---	---
15	*Trichoderma*	0.50	1.66	3.33	2.33	0.50	---	---	1.33
Total		35.14	31.47	27.64	26.47	22.14	20.81	25.97	23.98
Phyllosphere mycoflora (per cm^2 of leaf)		0.621	0.556	0.489	0.468	0.391	0.368	0.459	0.424

Note: (---- = not found)

Mayeaux and Colmer [11] noted that as the carbohydrate content of the leaf sheath water of sugarcane increased, there was a corresponding increase in the total number of microorganisms present therein even though the leaf exudates of healthy banana plants contained higher concentrations of glucose and sucrose than those of the bunchy top virus infected plants. Ruinen [12] reported that different leaves of one and the same plant showed variation in the phyllosphere microbial population depending on the position and age of the leaf. Mishra and Tewari [13] observed large number of fungi on the leaves of cassia plants at a height of 6 inches than at 12 and 18 inches from the ground level and opined that plant height was an important factor in the incidence of fungi on the leaf surface. Fungi are important pathogens of plants cause more significant yield losses than bacteria or viruses [14].

CONCLUSION

Based on the above research work it can be concluded that, in the beginning phyllosphere mycoflora was increase but later on it was decrease in virus infected tomato plant, because due to virus infection carbohydrates content was reduced in infected leaves. The healthy tomato leave content higher concentration of carbohydrate therefore the microbial pollution on the healthy leaf surface was found to be more than that of infected tomato plant.

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