EFFECT OF YELLOW MOSAIC VIRUS ON RHIZOSPHERE AND RHIZOPLANE MYCOFLORA OF *ACALYPHA INDICA*

R. R. MISHRA and V. B. SRIVASTAVA 1)

Department of Botany, University of Gorakhpur, Gorakhpur, U.P., India.

Little work has been done on the rhizosphere mycoflora of virus infected plants, though microflora associated with the rhizosphere of diseased plants with bacteria and fungi has been studied extensively. Recently SADASIVAN (1963) and his students, LAKSHMI KUMARI (1964), MISHRA and KAMAL (1970) and MISHRA *et al* (1970) have studied the rhizosphere fungal flora of certain virus infected plants and obtained variation in the fungal flora of virus infected plants as compared to healthy ones.

The present study was undertaken to examine the rhizosphere and rhizoplane mycoflora of virus infected and healthy plants of *Acalypha indica.*

Material and Methods

Plants of *Acalypha indica* growing luxuriantly in Gorakhpur University campus were severely infected with a strain of yellow mosaic virus which is transmitted by white flies (CHENULU and PHATAK, 1965).

The complete root system of diseased and healthy plants were taken out carefully by a sterilized spatula and the rhizosphere soil was inoculated by the dilution plate method as described earlier MISHRA and SRIVASTAVA, 1970). The samplings were done when plants were 30, 60, and 90 days old i.e. in young, flowering and post-flowering stages. Methods used for the determination of rhizosphere and rhizoplane fungi were as described by the authors in a previous pullication (MISHRA and SRIVASTAVA, 1969).

Plates were incubated at 25 ± 1°c for 5–6 days and fungi appearing in them were recorded.

Results

The experimental findings are set in Tables I - III.

There was a remarkable variation in the fungal flora of the diseased (D) and healthy (H) set of the plants. Fungi per gram of dry soil and number of species were more in healthy set except in young stage when the case was vice-versa. Quantitatively the fungal flora was least in young stage and the maximum at the flowering stage followed by a decline during post-flowering stage. Generally fungi per gram of dry soil were more in healthy set than diseased ones except at the post-flowering stage where the case was just the reverse.

1) V.B. Sriyastava, Pilot Plant Laboratories, IDPL, Vierbhadra, Rishikesh, Dehradun, U.P., India.

In the rhizosphere region *Rhizopus stolonifer, Aspergillus niger, A. flavus, Fusarium* spp. were present in both the sets throughout the sampling periods. *Phoma* sp. was dominant in D and *Rhizopus stolonifer* and *Aspergillus flavus* in H young stage. During flowering stage the dominant forms were *Asperigillus flavus* in D and *Rhizopus stolonifer* and *Aspergillus niger* in H set. *Fusarium* spp. and *Aspergillus niger* were recorded as dominant in D and *A. niger* in H at the post-flowering stage. Other forms showed restricted occurrence.

Rhizoplane region exhibited lesser number of fungi. In this region the number of species and average colony per plate were more in D and lesser in H sets. *Rhizopus stolonifer* which showed continuous occurrence throughout the course of investigation were dominant in young and post-flowering of D stage, and only in post-flowering stage of H. *Aspergillus niger* was always present as dominant in healthy sets. In the healthy plant *Trichoderma viride* was dominant at the time of flowering. *Aspergillus flavus* was another codominant in diseased plant at post-flowering stage. Fusaria were recorded only during Post-flwering stage of plants'growth.

Discussion

There was a variation in the rhizosphere mycoflora of the two sets of plants. The diseased plants showed lesser fungal population in comparison to healthy sets. This change may be due to the changes in host plant physiology and morphology for which the strain of virus is responsible. As reported by the various workers the physiology and morphology of the virus infected plants become changed. Most of the workers while studying the effect of virus on the metabolism of the host plants observed the changes in carbohydrate/nitrogen ratio. DUNLAP (1930), CORDINGLEY *et al.* (1934) and STANLEY (1937) reported an increase in the C/N ratio due to virus infection. This changed C/N ratio may also fluctuate the production of metabolites which consequently effect the rhizosphere mycoflora.

The variation in the mycoflora of the 2 sets may also be due to differences in R/Q (respiratory quotient) ratio of the two plants. It is because of the alteration in respiration of leaves (DUNLAP, 1930). This difference may also be due to the alteration in the soil moisture and season (LAKSHMI KUMARI, 1964).

LAKSHMI KUMARI (1964) while investigating the rhizosphere microflora of *Dolichos lablab* infected by Dolichos enation mosaic virus, reported the differences in the healthy and diseased plants, in the rate of accumulation of organisms and the time of manifestation of maximum rhizosphere effect. Evidence suggests that the altered host parasite interaction causes soil moisture and season to have an effect on the rhizosphere pattern of infected plant.

MISHRA and KAMAL (1970) and MISHRA *et al.* (1970) while studying the rhizosphere mycoflora of various virus infected plants, observed the same trend.

The highest mycoflora was observed during the flowering stage when the plants exhibited maximum vegetative growth. Due to more photosynthesis at this stage the root system also possibly secrete more root leakage which directly affects the surrounding soil fungi, and hence there is an increase in the mycofloral population during this stage.

Cladosporium herbarum, Fusarium spp., black sterile colonies and other dematacious forms appeared during post-flowering stage when the roots were older. *Penicillium* and *Cladosporium* were recorded during last sampling period when the season was getting colder (MISHRA and SRIVASTAVA, 1970). The number of species, however, exhibited an irregular trend.

Summary

The effect of yellow mosaic of *Acalypha indica* on its rhizosphere mycoflora has been described. The fungal flora was higher in the healthy plant than in the diseased. Quantitatively, fungi was the maximum during flowering stage. There was a marked difference in the rhizosphere and rhizoplane fungi, both in quality and quantity, in the 2 sets. These changes may be due to the changed physiological and morphological nature of the virus infected plants.

The authors are thankful to Prof. K. S. Bhargava, Head of the Botany Department, Gorakhpur University, Gorakhpur (India), for providing laboratory facilities.

Table 1

Percentage distribution of fungi in rhizospheres of healthy and diseased plants of *A. indica* at different stages of growth

Isolates	Young		Flowering		Post-flowering	
	D	H	D	H	D	H
Rhizopus stolonifer	4	34	6	28	4	6
Mucor luteus	2				3	
Neocosmospora vasinfecta	2					
Aspergillus nidulans	2					
Phoma sp.	58					
Aspergillus flavus	9	46	40	14	7	3
A. niger	13	8	24	22	34	45
A. aculeatus				5		
A. lanosus		2				
A. sydowi				6		
A. candidus					4	
Trichoderma viride			22	10		5
Penicillium humicola						5
P. oxalicum			4		3	
Cladosporium herbarum						10
Humicola fuscoatra					10	
Curvularia spp.	6			5		2
Fusarium spp.	4	4	4	10	31	12
Myrothecium roridum					4	5
Hyaline sterile colony		6				5
Black sterile colony						2
Number of species:	9	6	6	8	9	11

Table 2

Rhizoplane fungal flora of virus infected and healthy plants of *A. indica* at different stages of plants growth

Isolates	Young		Flowering		Post-flowering	
	D	H	D	H	D	H
Rhizopus stolonifer	60	14	20	20	38	54
Aspergillus nidulans	9	10	10			
A. niger		66		46	14	36
A. ochraceous	5					
A. sydowi	15			18		
A. flavus				16	30	
Trichoderma viride			70			
Curvularia spp.	11					
Fusarium spp.					10	5
White sterile colony		10			8	5
Number of species	5	4	3	4	5	4

Table 3

Fungal population in Rhizosphere and Rhizoplane region of *A. indica*.

	Diseased				Healthy			
	RS		RP		RS		RP	
	Fungi gm. of dry soil	No. of species	Av. Cols plate	No. of spp.	Fungi gm. of dry soil	No. of spp.	Av. cols plate	No. of spp.
Young stage	39000	9	5	5	42100	6	4	4
Flowering stage	77272	6	5	3	92307	8	3	4
Post-flowering stage	75675	9	6	5	74385	11	3	4

RS = Rhizosphere region

RP = Rhizoplane region

References

CHENULU, V.V. and PHATAK, H.C. (1965): Yellow mosaic of *Acalypha indica* L. A new white Fly Transmitted Virus Disease from India. Curr. Sci., **34**: 321–322.

CORDINGLEY, H., CRAINGER, J., PEARSALL, W.H. and WRIGHT, A. (1934): The effect of mosaic disease upon certain metabolic products in the Tobacco Plant. Ann. Appl. Biol., **21**: 78–89.

DUNLAP, A.A. (1930): The total nitrogen and carbohydrates and the relative rates of respiration in virus infected plants. Amer. Jour. Bot., **17**: 348–357.

LAKSHMI KUMARI, M. (1964): Rhizosphere microflora of Dolichos infected with DEMV. Proc. Natl. Acad. Sci., Sect. B. **60** (2): 116–127.

MISHRA, R.R. and KAMAL, (1970): Rhizosphere mycoflora of virus infected plants. Indian Phytopathology, **23** (1): 27–31.

MISHRA, R.R. and SRIVASTAVA, V.B. (1970): Variation in the rhizosphere mycoflora of certain crop plants. Nat. Acad. Sci. India, **40**: 195–202.

MISHRA, R.R. and SRIVASTAVA, V.B. (1969): Rhizosphere fungal flora of certain Legumes. Ann. Inst. Pasteur **117**; 717–723.

MISHRA, R.R., SRIVASTAVA, V.B. and TIWARI, J.P. (1970): Comparison of rhizosphere mycoflora of virus infected and healthy plants of Cucurbita maxima Dusch. Nat. Acad. Sci. India, **40 B**: 292–296.

SADASIVAN, T.S. (1963): Physiology of virus-infected plants. Jour. Indian Bot. Soc., **62**: 339–357.

STANLEY, W.M. (1937): A comparative study of some effects of several different viruses on Turkish Tobacco plants. Phytopathology, **27**: 1152–1160.