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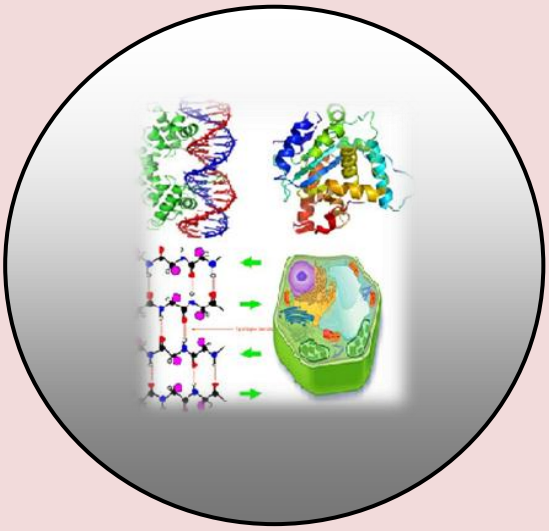

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Effect of Kankar Lime Fly-Ash on Phyllosphere Mycoflora of the Mustard

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ABSTRACT
The present communication deals with the study of leaf surface mycoflora (Phyllosphere) of mustard at Darshan Nagar (Faizabad) with reference to the effects of Kankar lime fly-ash. Seventy three fungal species were isolated from fly-ash polluted site however; only 48 fungal species could be isolated from control site. The members of Deuteromycetes were comparatively high at both control and polluted sites (As data was taken between Nov. 15, 1991 to Jan. 15, 1992). The maximum numbers of fungal species were found during flowering time or maturity of the crop at later stage of experiment.
Keywords: Kankar Lime Fly-Ash, Mycoflora, Mustard Disease and Phyllosphere.

INTRODUCTION
Air pollution is one of the most important problem not only national but global. One of the important particulates dispersed in the air by many factories is fly-ash. In U.P. there are large number of kankar lime factories situated in cities and small towns. These factories produced kankar lime by burning the pebbles in furnaces and their after grinding and filtering which is aired as substitute of cement. The kankar lime fly-ash gets ample opportunities to settle on nearby crops and possibly influences the incidence of various diseases of mustard plant. It has been observed in kankar lime factory hit area that the oil crop generally fails and sometimes the losses amount to 100%. Whether the fly-ash of kankar lime has some direct influence on oil crop or it reduces the resistance of the host against various diseases or it provide some physical, mechanical and/or chemical support for the growth of the pathogen, are yet to be known in Indian Agriculture. Last (1955) introduced the term "Phyllosphere" to denote the leaf surface of plants. Later on Dickingson (1965) used the term phylloplance for the phyllosphere.

Little is known about the effects of dust deposits on the incidence of foliar disease. It has been reported that sugar-beet leaves dusted with cement-kiln dust were more susceptible to a leaf spot disease caused by the fungus *Cercospora beticola* (Schonbeck 1960). Pretreatment of leaves of Viciafaba with foliar spray and dusting, changes its permeability and its susceptibility to *Borrytis fabae* (Sol, 1966).

MATERIALS AND METHODS

The Kankar lime factory situated at Faizabad_Akbarpur road, near Darshan Nagar (U.P.) town has been selected for the present study. The experimental site is located at the vicinity of river Ghaghra (Saryu) at $20^{0}47'$ N latitude and $82^{0}13'$ E longitude. The experimental fields were situated 50 meter (R1), 100 meter (R2), 150 meter (R3) and 200 meter (R4) away from the factory. The control plants were planted 5 km away from the factory. Green leaves of *Brassica, Campestris var. Sarson* were selected for the study of leaf surface mycoflora. The study was made at polluted as well as control site. Equal amount of leaves after cutting into small pieces kept in 250 ml flask and shaken vigorously by hand for 20 minutes. The water of flask having spore suspension was inoculated into petri-dishes containing P.D.A. medium for isolation of phyllosphere fungi. The plates were inoculated for seven days at room temperature and the fungal colonies appearing therein were recorded.

For qualitative study of phyllosphere mycoflora the cellophane tapes were sticked on leaf surface and then removed from leaf surface and studied under microspore after sticking on glass slides.

RESULTS AND DISCUSSION

Seventy three fungal species were isolated from leaf surface of the *Brassica campestris* at polluted site. The abundance of fungal species were comparatively less in control site than polluted sites. Two fungal species from Myxomycetes, 6 from Phycomycetes, 11 from Ascomycetes, 6 from Basidiomycetes and 45 species from Deuteromycetes were isolated from polluted sites. However, only 1 species of Myxomycetes, 5 species of Phycomycetes, 6 species of Ascomycetes, 5 species of Basidiomycetes and 31 species of Deuteromycetes were isolated from control site (Table-1).

Table 1. Different fungal species isolated from leaf surface of *B. campestris var*. 'Sarson' at control and polluted sites.

Fungal species	Control site (C)			Polluted site (R)		
	Nov.	Dec.	Jan.	Nov.	Dec.	Jan.
Myxomycetes						
Physarum cinereum	-	-	+	-	-	+
*Stemonitis*species	-	-	-	-	-	++
Phycomycetes						
Albugo candida	-	-	+	-	-	+++
Chanephoracucurbitarum	+	+	-	+	++	
Cunninghamellaechinulata	-	-	-	-	-	+
Mucor hiemalis	-	-	+	-	+	+
Peronospora species	-	+	+	-	+	++
Rhizopus nigricans	+	+	+	+	+	++
Ascomycetes						
*Bombardia*spore	-	-	+	+	++	+++
Chaetomium species	-	+	+	+	+	+
Daldinia concentric	+	+	+	++	+++	+++
Didymospharia	-	-	-	+	++	+++
Erysiphe polygoni	-	-	+++	-	-	+++
*Emericella*species	+	+	+	++	+++	+++
*Eurotium*species	-	-	+	-	-	+
*Hysterium*species	+	+	+	+	+	+
Leptosphaeria species	-	-	-	-	-	-
*Nodulisphoreria*speices	-	-	+	+	+	+
*Rosellina*spores	-	-	-	-	+	+
Basidiomycetes						
Puccinia graminis	-	+	+	+	+	++
Puccinia butleri	-	-	+	-	-	++
Puccinia (uredospre)	-	-	+	+	+	+
Ravenelia(spore)	-	-	-	-	+	+

Uromycespisi	-	-	-	-	+	+
*Ustilago*spore	-	-	-	-	-	-
Deuteromycetes						
Aspergillus fumigatus	-	-	+++	+++	+++	+++
Alternaria brassicae	+	+++	+++	+++	+++	
Alternaria brassicola	-	+	+++	+++	+++	
Alternaria alternate	++	+++	+++	++	++	+++
Alternaria tenuis	+	+++	+++	+++	+++	+++
Alternaria solani	+	+++	+++	+++	+++	+++
Acremonium vitis	-	-	-	+	+	++
*Beltrania*species	-	-	-	-	+	-
*Botryodiplodia*species						
*Bispora*species	-	+	+	+	++	+++
Brachysporiellagayana	-	-	-	+	+	+
Cladosporium herbarum						
Cladosporium olivacem	+++	+++	+++	+++	+++	+++
Cladosporium cldosporoids	++	+++	+++	++	+++	+++
Curuvularialurata	+	+	+	+	+	+
*Curvularia*species	-	+	+	+	+	+
Curvulariatetramera	-	+	++	+	+	++
Cercospora species	++	++	++	++	+++	
*Cercosporella*species	-	-	++	++	++	++
*Coniosporium*species	-	-	-	+	+	++
*Dictyosporium*species	+	+	+	+	++	+++
Epicoccumpurpurescenece	+	++	++	++	+++	+++
Fusarium monilifporme	-	-	-	-	-	-
*Gilmaniella*species	++	++	++	+++	+++	+++
*Hendersonia*species	-	-	-	-	+	+
*Helminthosporium*species	-	+	+	++	+++	+++
*Lacenllina*species	-	-	+	-	-	+
Nigrosporasphaerica	+++	+++	+++	+++	+++	+++
Oidium species	+++	+++	+++	+++	+++	+++
Penicillium chrysogenum	-	-	-	+	+	++
Penicillium species	+	+	++	++	++	++
Periconiabyssoides	-	-	-	-	+	+
*Phoma*species	+	+	+	++	++	++
Septoria spore	-	-	-	-	-	+
Stigminafici(spore)	-	-	-	-	+	+
Stigmella(spore)	-	-	+	+	+	+
Stemphylum(spore)	+	+	+	+	++	++
Trichotheceumroseum	-	-	-	-	+	+
Torulaherbarum	-	-	-	-	+	+
Triposporium(spore)	-	-	-	-	+	+
Tetrapoa(spore)	-	-	-	+	+	+
Mycelia sterilea						
Rhizoctonia solani	+	+	+	+	+++	+++
White sterile fungus	-	-	+	+	++	++
Black sterile fungus	-	+	+	++	++	++

++ or +++ = dominant
+ = present
- = absent

It was observed that *Albugo candida* was abundant in polluted site, however, it was also found at control site. Similarly, *Daldinia concentric, Emericella* species, *Erysiphe polygoni* (Basidiomycetes); *Aspergillus fumigates, Alternaria brassicae, A. tenuis, A. solani, Cladosporium olivaccum, Curvularia pallescens, Cercospora* species, and *Penicillium* species (Deuteromycetes) were found to be dominated at polluted sites in second week of January, all the above mentioned species were also observed in second week of January at control sites but their abundance was comparatively less.

Quantitative study of leaf surface mycoflora has been also performed and it was noticed that average colonies per plate and number of fungal species per plate were high in polluted sites but it was successively decreased in control plants (Table-2).

The influence of pollutants on leaf surface mycoflora of potato plants have already been reported by Rai and Pathak (1981) and similar type of results have been observed. Similar observations have also made by different workers on different plant (Sanders 1973, Manning 1971, Kumar and Patra 2012). According to Jacobson (1968) air born dust (fly-ash) can serve as a vehicle to disseminate the micro-organism. Air mycoflora was also found to be changed in fly-ash polluted site. This suggests that the mustard plant at polluted site were exposed to microbial flora different from those at the non polluted site. According to Khanna (1986) this might be a reason for altera in fungal population of phyllosphere. Thus it is clear that changing in fungal spectrum in the phyllosphere at the polluted site were due to the fly-ash in which they existed.

Table 2. Fungal population on leaf surface of *B. campestris var.sarson*.

Sampling Sites	*B. campestris var. sarson*	
	No. of species	**Av. Colonies/plate**
R1	74 (45.09)	142
R2	63 (23.50)	112
R3	62 (21.56)	72
R4	54 (5.80)	89
Control	51 (0.00)	69

Note: Figure in parentheses represent the percentage increase in number of fungal species.

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