International Journal of Research and Technology (IJRT)

International Open-Access, Peer-Reviewed, Refereed, Online Journal

ISSN (Print): 2321-7510 | ISSN (Online): 2321-7529

| An ISO 9001:2015 Certified Journal |

Studies on The Mycoflora of Phyllosphere of Certain Potato Vegetable Grown In Sendari Village of Bilaspur, Chhattisgarh.

Dr. Moti lal

D.P.Vipra College , Bilaspur (C.G.).

Dr. N.K. Singh

Sant Siromani Guru Ravidas Govt College, Sargaon Mungeli (C.G.).

Lav Raj Vishwakarma

Dr. C V Raman University Kota, Bilaspur (C.G.)

ABSTRACT

A total number of eight fungal species viz., Aspergillus niger , Aspergillus flavus , Aspergillus fumigates, Penicillium chrysogenum, Cladosporium epiphyllum, Cladosporium sp., Rhizopus stolonofir and Curularia lunata werw isolated by leaf impression method from phyllosphere of young to mature to senescent but healthy leaves of potato .

Key Words – Potato phyllosphere ,microorganism

INTRODUCTION

Phyllosphere is the above ground parts of plants. However, in general the sphere occupied by the leaves of a plant is regarded as its phyllosphere. It is very much important for plants life not only due to the reason that being chlorophyllous in nature, it provides organic nutrition to plants rather it also functions as the gate way for interaction between internal and external environment. Moreover, it also provides a plateform for interaction of microbes and the plant body.

The above-ground parts of plants are normally colonized by a variety of bacteria, yeasts, and fungi. While a few microbial species can be isolated from within plant tissues, many more are recovered from the surfaces of healthy plants. The aerial habitat colonized by these microbes is termed as the phyllosphere, and the inhabitants are called epiphytes. While there has been some investigation of the colonists of buds and flowers (Andrews, J.H., and R. F. Harris, 2000., Johnson, K. B., and V. O. Stockwell, 1998.), most work on phyllosphere microbiology has focused on leaves, a more dominant aerial plant structure. Bacteria are by far the most numerous colonists of leaves, often being found in numbers averaging 106 to 107 cells/cm² (up to 108 cells/g) of leaf (Andrews, J.H., and R. F. Harris, 2000; Beattie, G. A., and S.E. Lindow, 1995; Hirano, S. S., and C. D. Upper. 2000.). Many fungal species are also prevalent on phyllosphere but their population is always lower as compared to bacteria. Inspite of that phyllosphere fungi of many angiospermic plants have been investigated by many workers like A. C. Ebenebe, L.D. Erinle, R.C. Wokocha, and V.C. Okercke in tomato. J.H Andrews, and R. F. Harris, G. A. Beattie, and S.E. Lindow, L. L. Kinkel in potato, H.L. Barnett, B.B. Hunter, A. Chevalier ete in brinjal.

Compared to most other bacterial habitats, there has been relatively little examination of phyllosphere microbiology. This is somewhat surprising given the abundance of plants in

the world and the roles of various phyllosphere bacteria in the important processes discussed elsewhere. Leaves constitute a very large microbial habitat. It is estimated that the terrestrial leaf surface area that might be colonized by microbes is about 6.4 x 108 km2 (Morris, C. E., and L. L. Kinkel. 2002). Given the large number of bacteria on leaves in temperate regions of the world and that populations in tropical regions are probably even larger, the planetary phyllosphere bacterial population may be as large as 1026 cells (Morris, C. E., and L. L. Kinkel. 2002). Clearly, in aggregate, these bacteria are sufficiently numerous to contribute in many processes of importance to global processes, as well as to the behavior of the individual plants on which they live.

AIMS AND OBJECTIVES OF THE STUDY

The present investigation aims at finding the compostion of mycoflora of the phylloshere of potato (*Solanum tuberosum*) . Besides screening of fungal flora from the Phyllosphere, the fungal species isolated will also be studied for their monthly prevalence from the month of October 2024 to March 2025. The prevalence shall be studied in terms of relative frequency of each and every fungal species. The isolated fungi shall be identified on the basis of their colony characteristics and morphological features.

REVIEW OF LITERATURE

Surface of leaves being rich in nutrients favor the growth of microbial flora because they contain sufficient moisture on their surface. This is especially true for those plants which are food producing in nature and have large amount of food materials reserved in their cells. Mishra, R.R. and Kanaujia, R. S. (2013). Studies on Phyllosphere Fungi III Leaf Surface fungi of Healthy and Virus Infected Lycopersicum Leaves are completely exposed in air therefore, vulnerable to infestation by a number of microbes including fungi. Microbial infestation on leaves mainly belong to bacteria and fungi(Kinkel, L. L. 1997). Bacteria is not the catchment area of the proposed research work, therefore, we shall concentrate our attestation on possible fungal infestation on phyllosphere of solaneous vegetable potato.

FUNGI OF PHYLLOSPHERE

The phyllosphere refers to the leaf surfaces or total above ground parts of plants which act as habitat of microorganisms. The inhabitants of the phyllospher are termed as epiphytes. These may consists of a variety of bacteria, yeasts or fungi. In most instances, the epiphyte population is dominated by bacteria which can be found in varying density. However, a number of fungi associated with the phyllospher of many plants have also been reported by many workers (Last and Deighton, 1965; Prabakaran et al; 2011; Mishra and Shrivastava, 1968; 1971; Mishra and Tiware, 1969; Vaalapudi and Naidu, (2014) phyllosphere is considard to be a complexterestrial habitat that is characterized by the presence of leaf exudates and a number of microbes (prabhakaran et al., 2011)

PHYLLOSPHERE FUNGI OF POTATO

Potato is a common vegetable crop grown in almost all parts of india including Chhattisgarh. A number of pathogen fungi like Alternaria solani, Fusarium sp. Phoma sp

,Pythium sps Erisiphae sps. And many non pathogenic fungi like Aspergilli and Penicillia have been reported to be associated with this vegetable crop (Baoguo Zhang et al.
Ahmed, A., et al. (2024). This paper in MDPI deciphered the core microbiota in the rhizosphere soil and roots of healthy vs. diseased potatoes, identifying beneficial fungal genera like Aspergillus and Penicillium. Ren, X., et al. (2024). This field survey in Phytopathology Research provided data on common potato pathogens in China

MATERIALS AND METHODS

The phyllosphere mycoflora was isolated by 2 methods i e., dilution plate method and leaf impression method.The medium used for isolating the fungal flora was potato dextrose agar with Rose Bengal and streptomycine (Martin 1950)

LEAF IMPRESSION METHOD

Leaf discs/segments from each age group of the leaves were pressed against the surface of already cooled and solidified medium. Each segment was pressed from dorsal as well as ventral surface separately. In both the cases the Petri plates were incubated at 25 ± 2°C. The isolation of phyllosphere microorganisms made by the two methods described above was then subjected to purifi-cation by hyphal tip method. These purified cultures were then identified up to specific level. PDA medium was used - for screening purposes.

RESULTS AND DISCUSSION.

The growth of microorganism is dependent on the presence of water and a number of nutrients. Being saprophytic in nature, the fungi of phyllosphere require external supply of carbon (mainly in the form of carbohydrates), nitrogen (in the form of amino acids, proteins and other organic materials containing nitrogen) and other elements like P, S, Ca, Cu, Zn, Mg, Mn etc. Different fungi may have slightly different requirements according to their auxotrophic nature.

Leaf surface of angiospermic plants provide space for dwelling of a number of microbes. A number of organic and in organic substances are secreted by leaf cells (Campbell, 1983). These are deposited on the surface of leaves. Fungal Cells/ mycelium dwelling upon the leaves derive their nutrition from these compounds. Moreover, most of the fungi are able to penetrate the leaf surface through the formation of haustoria. Singh, A.; Singh, N. K. and Singh, U. 2014. Mycoflora of Phyllosphere of Solanum melongena L. These help in the absorption of food materials from the internal side of leaves (Gibson, 1984; Manoharanhari et al.,2005). According to their nature fungi may or may not cause disease at the plant surface.

PHYLLOSPHER FUNGI OF POTATO (*S. TUBEROSUM*)

Surface sterilized pieces of leaves collected from potato plants of varying age, ranging from 28 to 63 days were inoculated on petriplates containing PDA and incubated at 30°C for more than 72 hours. Mycelia of different fungi showed growth in the form of colony in which mycelia were radiating towards the periphery. They were purified and identified by the method.

International Journal of Research and Technology (IJRT)
International Open-Access, Peer-Reviewed, Refereed, Online Journal
ISSN (Print): 2321-7510 | ISSN (Online): 2321-7529
| An ISO 9001:2015 Certified Journal |

The results indicated that the number of fungi isolated from the leaf surface of 28 days old potato plants was 04while this figure increased to 08 after 56 days. Prevalence of different fungi obtained from leaf surface of potato has been shown in Table 1.

TABLE -1

FUNGAL SPECISE AND THEIR ISOLATE NUMBER OBTANED FROM PHYLLOSPHERE OF POTATO

S.No.	Isolate No	Identified species	Prevalence of fungal species on plant of different age (in day)					
			28	35	42	49	56	63
1.	Mp 01	*Aspergillus niger*	+	+	+	+	+	+
2.	Mp 02	*Aspergillus flavus*	+	+	+	+	+	+
3.	Mp 03	*Aspergillus fumigatus*	+	+	+	+	+	+
4.	Mp 04	*Penicillium chrysogenum*	+	+	+	+	+	+
5.	Mp 05	*Cladosporium epiphyllum*	-	-	+	+	+	+
6.	Mp 06	*Cladosporium* sp	-	-	-	+	+	+
7.	Mp 07	*Rhizopus stolonofir*	-	-	-	+	+	+
8.	Mp 08	*Curularia lunata*	-	-	-	-	+	+

ECOLOGICAL STUDIES

During present investigation altogether 08 fungal species were isolated from the phyllosphere of potato. The results thus obtained further i ndicated that the number of fungal species obtained from leaves of 42, 49 and 56 days old plants was 05, 07 and 08 respectively. These were identified as *Aspergillus niger, Aspergillus flavus, Aspergillus fumigatus, Penicillium chrysogenum* sp *Cladosporium epiphyllum, Cladosporium* sp., *Rhizopus stolonifer and Curvularia lunata.* Their percentage frequency of occurrence was studied by the formula described in the chapter materials and methods. Out of these 08 species: *Aspergillus niger, Aspergillus flavus, Aspergillus fumigatus and Penicillium chrysogenum* were present in plants of all the age groups studied. However, percentage frequency of these fungal species showed quite variation on plants of different age (Table 2).

TABLE - 2

PERCENTAGE FREQUENCY OF FUNGI OBTAINED FROM PHYLLOSPHERE OF POTATO

S.No.	Fungal species	Percentage frequency at different time (in days)					
		28	35	42	49	56	63

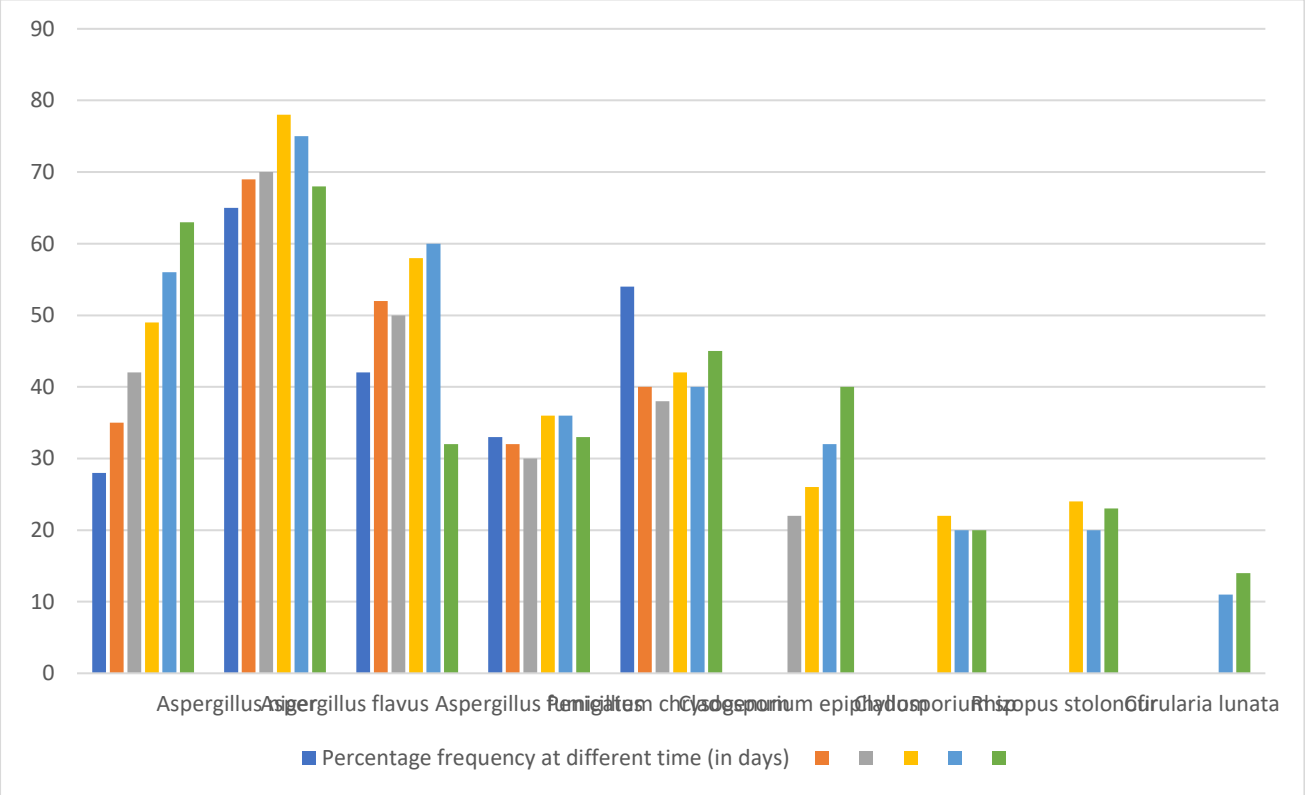
International Journal of Research and Technology (IJRT)

International Open-Access, Peer-Reviewed, Refereed, Online Journal

ISSN (Print): 2321-7510 | ISSN (Online): 2321-7529

| An ISO 9001:2015 Certified Journal |

1.	*Aspergillus niger*	65	69	70	78	75	68
2.	*Aspergillus flavus*	42	52	50	58	60	32
3.	*Aspergillus fumigates*	33	32	30	36	36	33
4.	*Penicillium chrysogenum*	54	40	38	42	40	45
5.	*Cladosporium epiphyllum*	-	-	22	26	32	40
6.	*Cladosporium* sp	-	-	-	22	20	20
7.	*Rhizopus stolonofir*	-	-	-	24	20	23
8.	*Curularia lunata*	-	-	-	-	11	14



Analysis of the results presented in Table 2 illustrates that A. niger is the most frequent fungal species prevalent on phyllosphere of potato. It exhibited 65 to 78 percent of its frequency on potato leaves during the period of 28 to 63 days of its life cycle. On the other hand, Curvularia lunata was least frequent as frequency of this species varied from 11 to 14. Frequencies of other six fungal species were in between the two extremes. After A. niger, A. flavus exihibited highest frequency (32-60%). The frequency of A. fumigatus was 30 to 36% Likewise, Penicillium chrysogenum, Cladosporium epiphyllum, Cladosporium sp. and Rhizopus stolonifer exhibited the frequency of 38-54, 22-40, 20-22 and 20-24%.

Bibliography

1. Andrews, J.H., and R. F. Harris, 2000. The ecology and biogeography os microorganisms on plants surfaces. Annu. Rev. Phytopathol. 38:145-180.
2. Ahmed, A., et al. (2024). This paper in MDPI deciphered the core microbiota in the rhizosphere soil and roots of healthy vs. diseased potatoes, identifying beneficial fungal genera like Aspergillus and Penicillium. Researchgate
3. Atlas, R. M. (1981) Microbial degration of petroleum hydrocarbons: An environmental prespective. Microbiological Review - 45:180
4. Beattie, G. A., and S.E. Lindow, 1995. The secret life of foliar bacterial pathogens on leaves, Annu. Rev. Phytopathol. 33:145-172.
5. Cambell, R.(1996): Microbial Ecology, 2nd edn. Oxford: Blackwell.
6. Hirano, S. S., and C. D. Upper. 2000. Bacteria in the leaf ecosystem with emphasis on Pseudomonas syringe a pathogen, ice nucleus, and epiphyte. Microbiol. Mol. Biol. Rev 64:624-653
7. Jacques, M. A. and C. E. Morris. 1995. A review of issues related to the quantification of bacteria from the phyllosphere. FEMS Microbiol. Ecol. 18:1-14.
8. Johnson, K. B., and V. O. Stockwell, 1998. Management of fire blight:a case study in microbial ecology. Annu. Rev. Phytopathol. 36:227-248
9. Kinkel, L. L. 1997. Microbial population dynamics on leaves. Annu. Rev. Phytopathol. 35:327-347
10. Kulshrestha, A. and Chauhan, S.V.S. 2003. Aeromycoflora around various historical monuments of Agra. Ind. J. Aerobiol. 16:23-27.
11. Manoharanhari, C., Dridhar, K., Singh, R., Adholeya, A., Suryanarayan, T.S., Rawat, S. and Johari, B.N. (2005). Fungal Biodiversity: Distribution, Conservation and prospecting of fungi from India Curr Sci. 89:58-71.
12. Mishra, R.R. and Kanaujia, R. S. (2013). Studies on Phyllosphere Fungi III Leaf Surface fungi of Healthy and Virus Infected Lycopersicum esculentumi in Relation to Cobalt Chloride Treatment.
13. Raithak, P. V. and Gaachande, B. D. 2013 Studies on phyllosphere mycoflora of healthy and virus infected tomato plants. Asian J. Plant Sci. Res., 2013, 3(1):159-162.
14. Ren, X., et al. (2024). This field survey in Phytopathology Research provided data on common potato pathogens in China
15. Singh, A.; Singh, N. K. and Singh, U. 2014. Mycoflora of Phyllosphere of Solanum melongena L. (Eggplant): Assessment of Their Pathogenicity for Brown Leaf Spot Disease on the Host. Educational Waves Vol VI accepted for publication.