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Aeromycological approach of some fungal diseases on Tomato Crop (*Lycopersicon esculentum* Mill.) at Nashik, India 422007

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ABSTRACT

Tomato (*Lycopersicon esculentum* Mill.*)* family Solanaceae is the most popular and widely grown vegetable crop in India and throughout the world and having highly nutritious and medicinal value. Tomato crop and yield suffers from number of fungal diseases and shows correlation ship with airborne fungal spores and meteorological parameters; like mean temperature, relative humidity and average rainfall. The present investigation is done over Tomato field by using Rotorod air sampler (Tilak 1987) during Kharif season in Nashik, India. Weather conditions play an important role in seasonal development of many plant diseases. The present studies reveals the high concentration of air born pathogenic fungal spores were responsible in diseases incidence in Tomato crop. Some of them are Early blight (*Alternaria solani*), Late blight (*Phytophthora species*), *Fusarium* stem rot (*Fusarium species)* and showed more or less severity during the entire period of investigations.

Keywords: Tomato, Rotorod sampler, Kharif season, Nashik.

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INTRODUCTION

Aerobiology is the study of dispersion of airborne microorganisms, pollen grains, especially fungal spores which can create infections in plants and human beings. Fred. C. Meier (1930) explained 'Aerobiology' its scientific nature, transportation of airborne diseases by microorganism[1]. The first work in the field of aerobiology in India was carried out by Prof. Sreeramulu[2] at Visakhapatnam in 1958. In Maharashtra this study was put forward by Tilak and Jogdand (1989) and thus also succeeded in developing several branches of aerobiology like Aerophycology, Aerobacteriology, and Aerovirology[3].

The scope of Aerobiology has been widened to incorporate different kinds of biological particles (Airspora) for example, fungi and fungal spores, algal filaments, hyphal fragments, minute pollens, protozoan cysts, bacteria, insects and insect parts. Abiotic factors involve major five steps: source, liberation, passive transport, deposition and impact on vegetation, water bodies and various substrates.

The Aeromycological studies was done by trapping, scanning and identification of airborne fungal spores, and this data is used to predict probable fungal diseases which can be used to determine the dissemination and deposition of phytopathogenic spores within crops, and to predict their transport from one crop to another (Frenguelli G; 1998). Shivpuri *et al*., 1960; initiated a new kind of study and gave emphasis on pollen allergies found in the different part of Delhi[4]. Agarwal and Gupta (1966) worked on seasonal census of the spores of *Alternaria solani* caught from the atmosphere over chilli field[5]. Fuchs *et al.,* (1970) worked on the activity of *Fusarium* wilt of guava and tomato plants. Some researchers who have worked on airspora in Tomato are Singh N.I. and Devi S.P. (1989). Patel, S.I. (2008) worked on effect of rainfall on dissemination of airborne fungal spores over Tomato fields at Nashik[6, 7]. Neeraj and Shilpi Verma (2010): Studies on Alternaria diseases of vegetable crop and new approaches for its control[8]. A. H. Wani (2011) worked on an overview of the fungal rot of tomato[9]. Aher, S. K., Dhawale V. P. and Baviskar P. S. (2015) worked on Qualitative assessment of airborne Deuterospores over Pomegranate field at Parner, Ahmednagar district, Maharashtra[10].

MATERIAL METHOD

The present aeromycological investigation was conducted during the year 2016 in Kharif season over Tomato (*Lycopersicon esculentum* Mill). In the present investigation,

the airborne fungal spore trapping was done by using Rotorod Air Sampler (Perkins 1957 modified by Harrington 1959). The sampler was operated in morning and evening, for 10 minutes twice in a day in Tomato field at Nashik (Maharashtra).

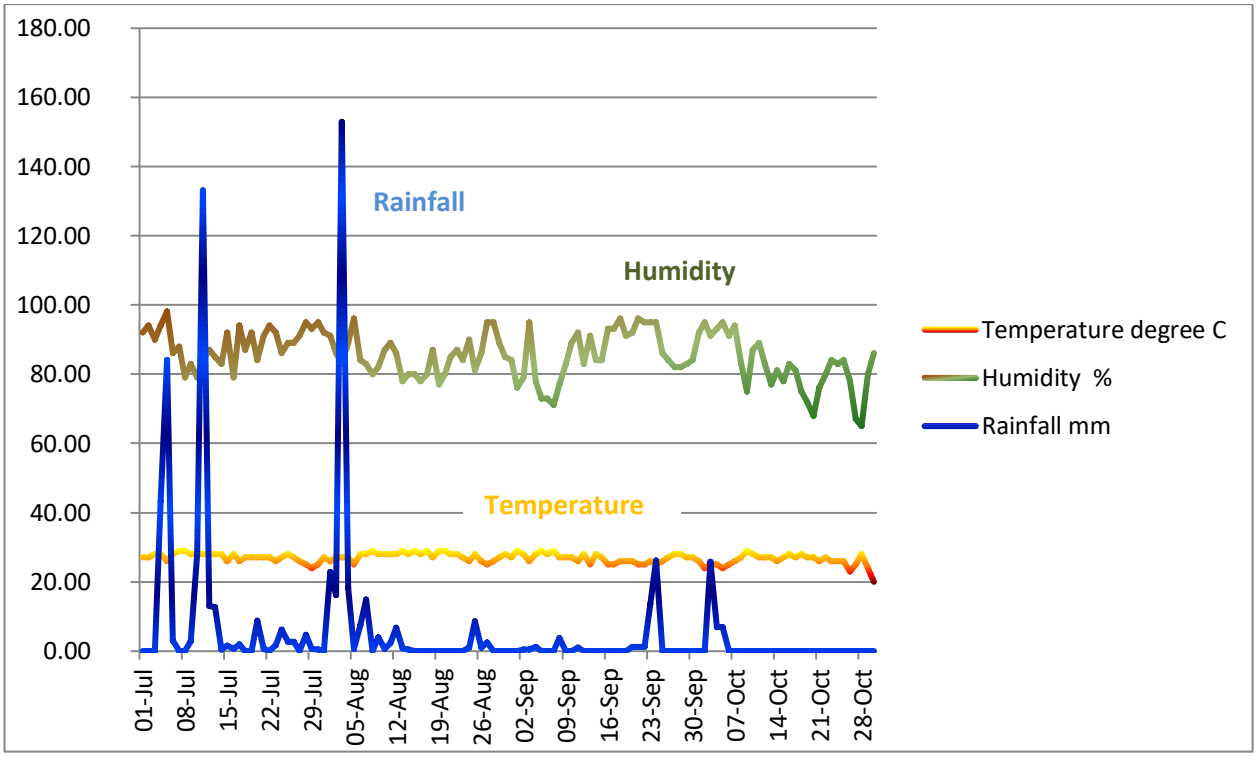
The principle of Rotorod air sampler is based on, increasing the speed of air flow towards the trapping surface to impact particles. The sampler is operated by using dry battery of 1.5 volts which runs motor and whirl thin brass rods coated with sticky cellophane smeared with petroleum jelly about its axis at a constant high speed. It is battery operated and well fitted to use in the field and relatively independent of external wind speed. The efficiency of Rotorod sampler was between 80 to 100% for trapping of particles larger than 20µ diameter. The scanning was done regularly throughout the period of investigation. The prepared slides were scanned under stereoscopic research microscope with computerized eyepiece camera attachment. Identification of fungal spores and fungal colonies on culture plate was done on the basis of literature of Barnett and Hunter (1972) and Tilak (1989)[11].

RESULT AND DISCUSSION

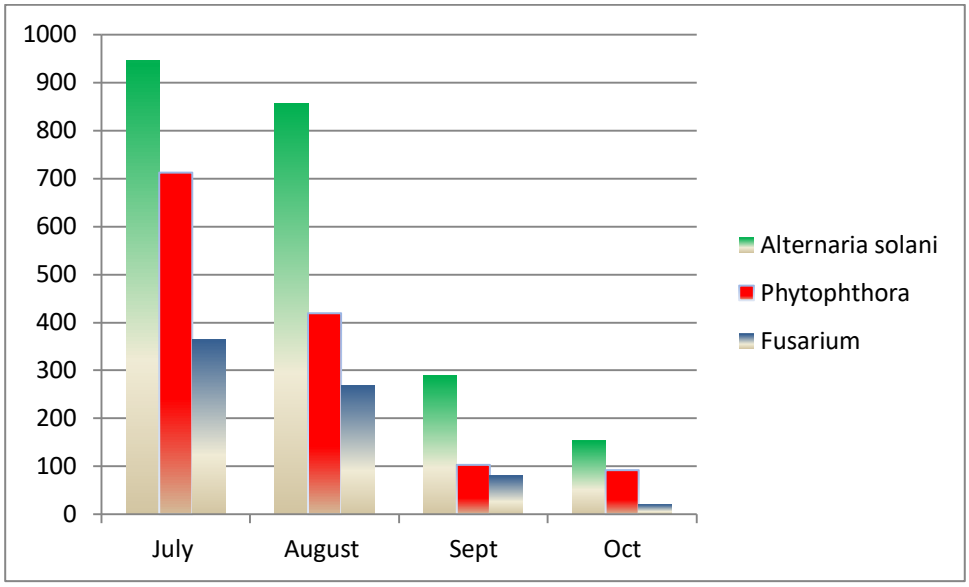
During the period of investigation, the total concentration of 20,005 spores/m^3 was recorded from 1st July 2016 to 31st October 2016 in Tomato field. In the present aerobiological investigation, 39 aerobiological components were trapped and recorded; these include 33 fungal spore types, and 6 belong to other bioparticles category; which consists hyphal fragments, pollen grains, algal filaments, epidermal hairs, insect parts, and unidentified bioparticles. Out of 33 fungal spore types; Duteromycetes contributed maximum as 20 fungal spores, 5 spore types were of Ascomycetes, 4 from Phycomycetes and 4 were from Basidiomycetes.

The early blight is one of the common diseases found on Tomato fields. The causal organism of early blight is the *Alternaria solani*. This disease appears early in season so it is known as early blight, in contrast to *Phytophthora* which appears late in season, to cause blighting of the foliage, it is known as late blight. The fungus attacks the foliage causing characteristic leaf spots and blight. This disease seen generally in humid climatic condition with cool nights temperature about 10-15°C and warm days temperature is about 21-29°C. In the month of July and October 2016, the maximum disease intensity was noticed where average relative humidity was more than 85% and alternate spell of rain responsible for the severity of infection and disease development. *Fusarium* stem rot disease occurs in the field caused by *Fusarium species.* Dark-brown, sometimes sunken lesions occur on the stem near soil level. When young seedlings are affected, it is smaller than healthy ones and fails to survive long enough to mature the upper hands of fruit. Stem infection requires damp soil, warm and wet weather favours fruit infection and disease development. Late blight disease occurs as water-soaked, light brown lesions on the leaf blade of Tomato and the casual organism is *Phytophthora infestans.* Humid and cloudy weather are the favorable climatic condition to spread fast over the entire leaflet and petiole. The lesions which are dark brown in the beginning soon turn black. The fungus infects the tuber formed in the soil, causing dry discoloration of tissues. The severely diseased plants wilt within a few days after the first symptoms are seen on the leaves and in the field the disease spreads like wild-fire, causing severe damage to the crop yield. In the month of July to October, 2016, maximum disease intensity was noticed in Tomato and average relative humidity was more than 85%.

The temperature and high humidity had profound effect on growth and development of spores. The weather parameters like monthly mean temperature 25°*C*, monthly mean relative humidity 87.42% and 86 mm mean rainfall were recorded. It was observed that, fungal spore occurrence was in correlation with the weather changes, field operation, plant growth and disease incidence on the crop. The results obtained and the conclusion drawn; would help further as the basis of devising the disease forecasting system, for the efficient control of disease of Tomato or horticultural practice.



Graph showing correlation between meteorological parameters



Graph showing monthly concentration of spores

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