

Research Article

Aeromycology of *Cercospora* on groundnut at Newasa (M.S.)

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ABSTRACT

Tikka disease is the major disease of groundnut in India. It occurs in every state in India and in every groundnut growing country of the world. Aerial dissemination of conidia of *Cercospora* sp., which causes Tikka disease to groundnut (*Arachis hypogea* L.) var. JL-24, was studied using Tilak volumetric air sampler in two consecutive *Kharif* seasons of 2007 and 2008. Airborne monthly conidial concentration of *Cercospora* sp. in the ambient air over groundnut field was observed higher in the month of October in both *Kharif* seasons, when the monthly mean temperature was 24.1°C and 24.3°C, monthly average percentage of relative humidity level was 61.1 per cent and 68.00 per cent, monthly mean wind velocity 2.9km/hr and 2.8 km/hr and no incidence of rainfall in first *Kharif* season but 119.3 mm rainfall was recorded in second *Kharif* season. However, influence of mechanical disturbances also temporarily increased the concentration of *Cercospora* conidial spores in air in both *Kharif* seasons during the present study.

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INTRODUCTION

Groundnut (*Arachis hypogea* L.) is widely cultivated as a staple food in tropical and sub-tropical developing countries, providing a valuable source of proteins (20-45%), fats (23.8%), energy (2800 cal) and minerals (Rakipov, 1987, Enwere, 1998). In most of the developing countries in the world, groundnut is produced and consumed. Groundnut as a leguminous crop is important both as a subsistence crop and an animal feed. It is used as an after-culture plant in crop rotation in tropical zones (Pavliukov, 1988; Mekontchou, 1990). Groundnut production in African countries, where groundnut is cultivated, is found fluctuated greatly, but it never exceeded 8 per cent of the world's output over the last decade. Yields per hectare are low, because of unreliable rains, small scale traditional farming with little mechanization, outburst of pests and diseases and use of low-yielding seed varieties. This low yield is generally due to incidence of diseases such as rust, *Cercospora* leaf spot (Ouzounov, 1988; Bosc and Bonkounou, 1990; Ambang *et al.*, 2008).

Groundnut *Cercospora* Leaf spots are caused by two species of *Cercospora* i.e. *Cercospora arachidicola* Hori, causing early leaf spot (CLS) and *Cercosporidium*

personatum (Berk. and Curt.) Deighton, which causes late leaf spot. The *Cercospora* leaf spot is also referred to the term - Tikka disease of groundnut.

Tikka disease of groundnut (*Arachis hypogea* L.) caused by *Cercospora* Fr. is very prevalent, wherever the crop is grown and losses amount up to 50 per cent (Jackson and Bell, 1969). Feakin (1973) considered this as the most important airborne fungal disease of the crop. However, work on dispersal of the pathogens involved is very limited. Sreeramulu (1970) studied aerial dispersal of conidia of *Cercospora* sp. for a single crop season, while Smith and Crosby (1973) studied *Cercospora* sp. in three rainy season crops. Mallaiah and Rao (1980) at Guntur, studied aerobiology of two species of *Cercospora* pathogenic to groundnut, using Hirst spore trap and glass rod samplers for a period of three years from 1974 to 1976, covering nine crop periods. Rajalakshmi and Shakila (2008) at Peravurani, Thanjavur district, undertook aeromycological survey over groundnut field in order to access, the disease incidence to the crop by pathogenic spore types. Ghewande *et al.* (2002) at Junagadh in Gujarat, observed on set of early and late leaf spots in groundnut which emerged when crop was of 10-28 days. In

view of the above, the aeromycological surveys were conducted in the ambient air over groundnut fields in two consecutive *Kharif* seasons and the results are presented in this paper.

MATERIALS AND METHODS

The crop was raised in two *Kharif* seasons *i.e.* 1st *Kharif* crop from 15th July to 8th November 2007 and 2nd *Kharif* crop from 10th July to 7th November 2008. Air spora was estimated by employing the volumetric Tilak air sampler (Tilak and Kulkarni, 1970) was kept at a constant height of 0.75 meter above the ground level. The process of air sampling was extended and continued 7 days more after the crop harvesting in both the *Kharif* seasons.

The meteorological data were maintained throughout the investigation period. The diseased material from the field, once in a week, was collected for assessing the disease incidence. Scanning of aerobiological slides and further calculations were done by using the method described by Tilak and Srinivasulu (1967). Identification of trapped fungal spores was done on the basis of spore morphology and authentic slides prepared from the known fungal infected material (Ellis, 1976; Tilak, 1989; Barnett and Hunter, 1998).

RESULTS AND DISCUSSION

The conidia of *Cercospora* sp. were recorded on the aerobiological slides regularly during first and second *Kharif* seasons except in the months of July in first *Kharif* 2007 and second *Kharif* 2008 (Table 1). The conidia of *Cercospora* sp. were recorded 3.03 per cent and 3.67 per cent to the total airspora during first and second *Kharif* seasons, respectively. Their total concentration 12894/m³ of air and 13706/m³ of air was recorded during first and second *Kharif* seasons, respectively. Tikka disease, in both the *Kharif* seasons 2007 and 2008, on leaflets of groundnut crop was found to be evident and severe. With the result, occurrence of conidia of *Cercospora* sp. in air and on leaflets of groundnut was also noted maximum, particularly in the months of October in both the *Kharif* seasons, when there was a record of no incidence of rainfall in the month of October in first *Kharif* season 2007,

which appeared to be an unusual record, whereas in second *Kharif* season in October 2008, there was a record of an incidence of rainfall 119.3mm, which was found to be congenial in initiating the disease development. Therefore, it pertinent to state that the incidence of rainfall might be found to be responsible not only to initiate the disease development to groundnut but also in bringing about detachment, discharge and dispersal of conidia of *Cercospora* sp. from the host plant into the air. The conidia of *Cercospora* were caught in low number (2968/m³ and 3220/m³ of air) in August in first *Kharif* 2007 and second *Kharif* 2008, when there was a record of 26.4°C and 25.9°C monthly average temperature, 80.00 per cent and 76.7 per cent monthly average relative humidity, 10.3km/hr and 9.0km/hr monthly mean wind velocity and 187.8 mm and 46.1 mm rainfall. And then on words the concentration of conidia of *Cercospora* started rising steeply reaching the peak towards the end of October (4928/m³ and 5474/m³ of air) in first *Kharif* season 2007 and second *Kharif* season 2008, respectively, eventually when there was a record of 24.1°C and 24.03°C monthly mean temperature, 61.1 per cent and 68.00 per cent monthly mean relative humidity, 2.9km/hr and 2.8km/hr monthly average wind velocity and no rainfall in first *Kharif* season and 119.3mm rainfall in second *Kharif* season 2008, respectively (Table 1 and Fig. 1A and 1B.).

Rainfall plays a key role in influencing conidial concentration of *Cercospora* in air. However, exceptionally during present study in the months of July in first and second *Kharif* seasons, no incidence of *Cercospora* conidia was recorded, when there was a record of only 19.20 mm and 33.1 mm rainfall. However, progressive increase in concentration of *Cercospora* conidia was observed from the months of August to October in both the *Kharif* seasons of 2007 and 2008, eventually when there was a record of progressive increase in rainfall and progressive decrease in wind velocity from August to November in both the *Kharif* seasons of 2007 and 2008, respectively.

Tikka leaf spots appeared on leaflets of groundnut when the crop was 30-40 days which agrees with the earlier observations of Ramakrishna and Apparao (1968), Mallaiah and Rao (1980), Ghewande *et.al.* (2002), Kadam *et.al.* (2008), Rajalakshmi and Shakila (2008). Severity and subsequent

Table 1 : Monthly concentration of airborne pathogenic *Cercospora* spores/m³ of air over the groundnut fields during 1st and 2nd *Kharif* seasons 2007-2008) with weather parameters

Spore type	Weather parameters	Months									
		July		August		September		October		November	
		2007 I	2008 II	2007 I	2008 II	2007 I	2008 II	2007 I	2008 II	2007 I	2008 II
<i>Cercospora</i> sp. / m ³	–	0	0	2968	3220	3948	4746	4928	5474	1050	266
	AVG.TEMP °C	26.8	26.8	26.4	25.9	25.8	25.3	24.1	24.3	25.9	22.5
	AVG.R.H. %	78.7	72.3	80.0	76.7	81.8	79.2	61.1	68.0	73.6	60.8
	AVG.W.V. Km/h	7	11.4	10.3	9.0	5.9	6.7	2.9	2.8	2.4	2.2
	Total R.F. mm	19.20	33.1	187.8	46.1	212.7	323.4	000.0	119.3	30.9	000.0

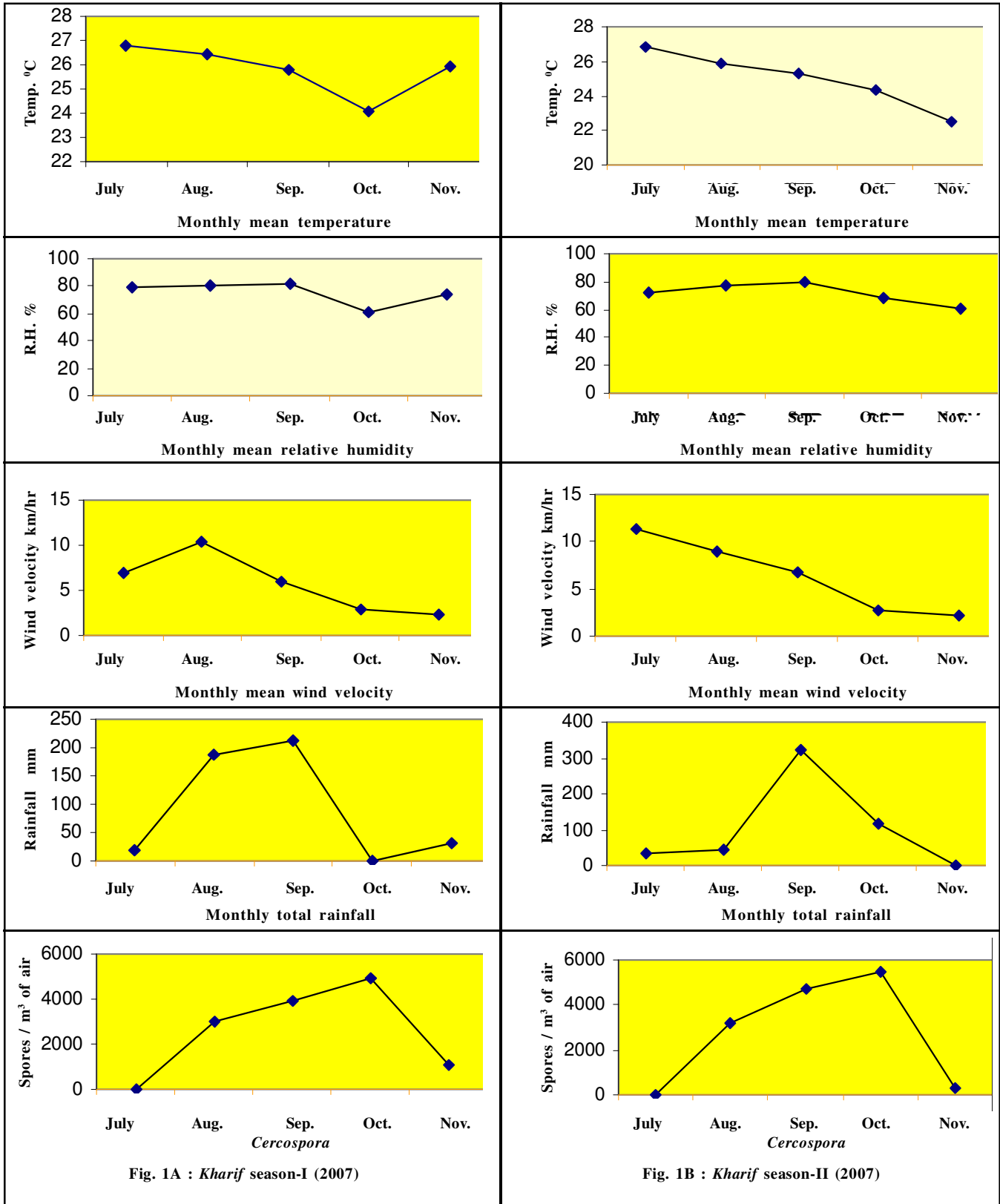


Fig. 1 : Monthly variation in concentration of *Cercospora*/m³ of air in relation to meteorological conditions

spread of Tikka disease of groundnut depends on prevalence of high humidity (74-86%) and low temperature (25-28°C). This is in agreement with the earlier observations of Tilak (1996 and 2010).

Conclusion:

The data on aeromycological investigations on the Tikka leaf spot disease of groundnut clearly brought out the close correlation between the spore load of pathogen in air, growth stages of crop, meteorological factors and disease incidence and its subsequent spread. This study provides ample scope to mycologists, plant pathologists to formulate disease forecasting system which ultimately would help groundnut cultivars to save the crop from great loss.

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