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SURVEY FOR THE DISEASE STATUS INTENSITY OF *ALTERNARIA* BLIGHT OF PIGEONPEA IN EASTERN PART OF UTTAR PRADESH AND ADJOINING DISTRICTS OF WESTERN BIHAR

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ABSTRACT
A roving survey of pigeonpea crop was carried out to assess the disease intensity of alternaria blight during *rabi* seasons 2009-10 and 2010-11 in Azamgarh, Ballia, Bhadohi, Chandauli, Ghazipur, Jaunpur, Mau, Mirzapur, Sohanbhdra and Varanasi of Eastern Uttar Pradesh and five neighboring districts of Bihar, *viz*. Sivan, Buxar, Arah, Bhabhua and Aurangabad. The disease intensity in different areas varied from 16.93 to 38.59 percent and 15.12 to 38.86 percent in the aforesaid two years. The disease intensity during 2009-10 was highest at Aurangabad district (32.97-38.59%) and in the year 2010-11, maximum disease intensity was recorded at Sivan district (25.22-38.86%). The congenial weather conditions like heavy rainfall, higher relative humidity and moderate temperature might have helped in building up of high disease pressure in Aurangabad and Sivan districts.

INTRODUCTION

Pigeonpea [*Cajanus cajan* (L.) Millspaugh] is one of the major food legume crops of the tropics and sub-tropics. In India, after chickpea, pigeonpea is the second most important pulse crop. India has largest acreage under pigeonpea 3.90mha with a total production and productivity of 2.89mt and 741kg/ha, respectively (DAC, 2011). It is mainly consumed as split pulse as 'dal' or fresh vegetable (de-hulled split peas) in some parts of India such as Gujarat, Maharashtra and Karnataka or as green vegetable in some tribal areas of various states (Saxena *et al*., 2010). It suffers greatly from alternaria blight may cause 40-50 percent reduction in yield, in most pigeonpea growing states of India (Kushwaha *et al*., 2010). The pathogen belong to the genus Alternaria has been recorded in many countries of the world (Rotem, 1994). The presences and absences of any individual Alternaria species could be due to a number of factors such as availability of host crops, optimal climatic conditions and management practices. Alternaria species occur either as saprophytes on various agricultural crops. Alternaria blight (*Alternaria tenuissima* (Kunze ex pers.) Wiltshire) was reported first time from Varanasi, India by Pavgi and Singh (1971). Later, Kannaiyan and Nene (1977) reported its occurrences from Hyderabad as a disease of minor importance but recently alternaria blight has become one of the serious fungal diseases of pigeonpea, especially in September sown crop. It is traditionally grown as rainy season crop. Reports on pigeonpea as post – rain season crop appeared in the literature as early as 1980. In recent years, it has again been demonstrated that pigeonpea can be grown as a successful post – rain season crop in areas where winter temperature is relatively mild. This has opened a new dimension in the pulse production. The yield is much higher as compared to normal sown crop. Very little work has been done on systematic survey of this disease in Eastern Uttar Pradesh and Bihar. In view of the above facts, a survey for alternaria blight in *rabi* season pigeonpea growing districts Eastern Uttar Pradesh and Bihar, to recognize the disease intensity of the disease over time and geographical location.

MATERIALS AND METHODS

Roving method of survey was followed to assess the disease intensity of alternaria blight. To find out the prevalence and disease intensity of alternaria blight of pigeonpea, an extensive roving survey was conducted during the crop season December-March 2009-10 and 2010-11. A roving survey of pigeonpea was conducted in ten districts *viz*., Azamgarh, Ballia, Bhadohi, Chandauli, Ghazipur, Jaunpur, Mau, Mirzapur, Sohanbhdra and Varanasi of Eastern Uttar Pradesh and adjoining five districts of Western Bihar *viz*., Sivan, Buxar, Arah, Bhabhua and Aurangabad. Naturally infected leaves of pigeonpea showing the characterized by the appearance of circular, chlorotic, dark brown minute spots with yellow halo on the upper surface of leaf lets, followed by the development of black spots which increase in size showing purple margin

around the black necrotic spots. The spots enlarge and coalesce with each other forming big lesions. On the surface of necrotic spots the spores are formed. Under severe infection, the infect leaves are defoliated. The whole upper portion of the plants bearing flower buds loses their luster showing withering and sickly stand of the crop infected with of alternaria blight. Ten major pigeonpea growing villages were spotted at the distance of 10-15km in each district. The diseased and healthy plant count was made from 3.0 X 3.0m area of five random places in each of five fields selected in every village. During the roving survey, the presences or absences of alternaria blight symptoms on pigeonpea plant was recorded. Observation on disease intensity was recorded in a crop season on the basis of leaf area affected assessed by using a visual 0-5 scale (Mayee and Datar, 1986) following scale (Table 1) adopted for diagnosing disease.

Disease intensity will be calculated as follow:

$$\text{Per cent disease intensity} = \frac{\text{Sum of individual rating scale}}{\text{No. of disease plant observation X max. dis. rating}} \times 100$$

Percent disease intensity (PDI) of five fields in each village was used for calculating the average intensity of the disease in that village. Percent disease intensity of 10 villages was used for calculating the average intensity of alternaria blight in each district.

Laboratory studies and characterization of alternaria blight isolated from pigeonpea

Leaf showing characteristic symptoms of alternaria blight disease was collected. All the specimens collected were critically examined in laboratory for the presence of the causal organism and some of it were properly preserved, labeled and kept in dry and wet form for further studies. Meteorological data for the year 2009-10 and 2010-11 were obtained from the Department of Agronomy, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi. Thus, the data on the maximum and minimum temperatures, relative humidity and rainfall and disease intensity were recorded and critically analyzed to ascertain the most conductive climatic conditions for disease development.

Table 1: Scale adopted for diagnosing different degree of resistances in genotypes/cultivars of pigeonpea for alternaria blight (*Alternaria tenuissima*)

Scale	Description	Degree of Resistance
0	No Disease	High resistance
1	0.1-5.0%	Resistance
2	5.1-10%	Moderent resistance
3	10.1-25.0%	Moderent susceptible
4	25.1-50.0%	Susceptible
5	50.1 % and above	High susceptible

RESULTS AND DISCUSSION

With a view to assess the prevalence, disease intensity and distribution of disease, fifteen districts (ten districts of Eastern part of Uttar Pradesh and adjoining five districts of western Bihar, respectively) were surveyed during crop seasons. The observations with respect to the disease intensity in different locations are summarized in Table 2.

The district wise observations in the Table 2 clearly indicate that the alternaria blight of pigeonpea was prevalent in all the areas surveyed showing its widespread occurrence. The disease intensity in different areas varied from 16.93 to 38.59 percent and 15.12 to 38.86 percent in the aforesaid two years. The disease intensity during 2009-10 was highest at Aurangabad (32.97-38.59%) followed by Ballia (31.06-38.40%), Mau (26.45-29.9%), Bhabhuaa (25.57-37.24%), Mirzapur (25.57-34.08%), Arah (25.51-34.36%) and Chandauli (24.91-36.84%) districts respectively were recorded. While at rest of the districts minimum disease intensity were recorded ranged from Jaunpur (16.03-28.71%) followed by Azamgarh (16.93-37.37%), Ghazipur (17.26-26.57%) and Sohanbhdra (18.90-33.75%), respectively.

In the year 2010-11, maximum disease intensity was recorded at Sivan (25.22-38.86%) followed by Ballia (29.95-35.70%), Aurangabad (29.82-37.23%) and Chandauli (21.14-36.16%) districts, respectively. While its rest of all the districts minimum disease were recorded in Jaunpur (15.12-27.82%) followed by Ghazipur (15.94-25.58%) Azamgarh (17.97-31.92%) and Sohanbhdra (18.1-32.73%) districts, respectively. Whereas, both the years mean maximum disease intensity was recorded at Aurangabad (34.28%) followed by Ballia (33.26%), Arah (31.71%), Sivan (29.35%) whereas, the lowest disease intensity was recorded Ghazipur (20.97%) followed by Jaunpur (21.81%) and Varanasi (24.05%) districts. The data on survey revealed that the alternaria blight of disease intensity varied from locality to locality, because of varied agro-climatological situations, cropping pattern, varieties grown and cultural practices. Even it could also be attributed to existence of variability or pathogenic diversity present in the fungus (Prasad, 2002). Hiremath *et al.* (1990) reported that, higher rainfall had positive influence on alternaria blight of sunflower.

The farmers in the said areas normally do not practice fungicidal spray against alternaria blight. Also the rainfall was continuous throughout the season and it did not allow for the fungicidal spray at least to those farmers who normally practice it. The maximum disease intensity was observed in the

Table 2: Disease intensity of pigeonpea alternaria blight in different districts of eastern Uttar Pradesh and adjoining of Western part of Bihar

S. No	Districts	Disease intensity range+(%) 2009-10	2010-11	Mean disease intensity+(%)+
1	Azamgarh	16.93-37.37	17.97-31.92	26.84
2	Ballia	31.06-38.40	29.95-35.70	33.26
3	Bhadohi	18.63-36.19	18.14-34.86	25.03
4	Chandauli	24.91-36.84	21.14-36.16	28.92
5	Ghazipur	17.26-26.57	15.94-25.58	20.97
6	Jaunpur	16.03-28.71	15.12-27.82	21.81
7	Mau	26.45-29.9	22.64-28.52	24.47
8	Mirzapur	25.57-34.08	24.74-32.73	28.83
9	Sohanbhdra	18.90-33.75	18.1-32.73	26.15
10	Varanasi	20.50-28.10	18.14-28.82	24.05
11	Sivan	22.98-33.61	25.22-38.86	29.35
12	Buxar	22.14-31.98	19.06-29.98	29.12
13	Arah	25.51.34.36	26.13-35.68	31.71
14	Bhabhuaa	25.57-37.24	18.84-35.79	24.86
15	Aurangabad	32.97-38.59	29.82-37.23	34.28
	Average 27.31			

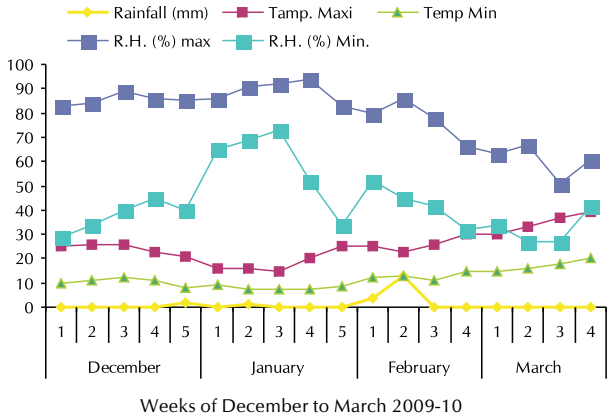

Figure 1: Weather parameters during December to March in 2009-10 survey of disease intensity of alternaria blight

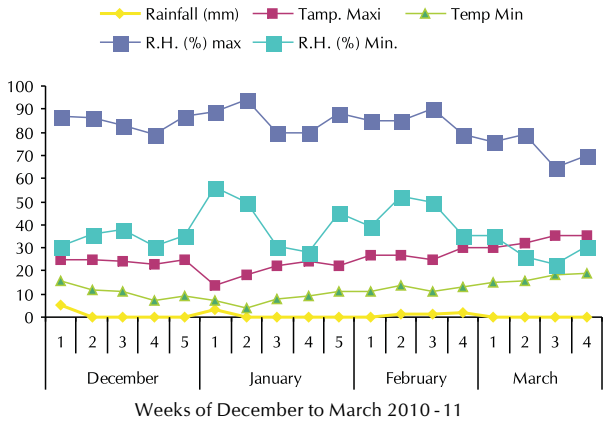

Figure 2: Weather parameters during December to March in 2010-11survey of disease intensity of alternaria blight

February month of both aforesaid years and all the weather parameters were favorable for alternaria blight. The maximum and minimum temperature recorded during 2009-10 was 36.7ºC March month and 7.1ºC January month, respectively; while in 2010-11 it was 34.7ºC and 4.1ºC. The mean temperature during the months of December to March varied from 28.54ºC -19.55ºC and 14.2ºC – 34.7ºC and the rainfall recorded during December to March in 2009-10 and 2010-11 was 0.0 to 12.3 and 0.0 to 5.6mm, respectively (Figs. 1 and 2). In 2009-10 crop seasons, the weather conditions were more conducive for disease development as compared next season. The average maximum and minimum temperature during the crop maturity was higher in 2009-10. The abnormal rainfall received during 2010-11 coupled with high relative humidity has helped built up inoculum level of the fungus. Alternaria is a saprophytic genus with an optimal development shown to occur in the temperature ranges of 22–28ºC (Hjelmroos, 1993). Kushwaha *et al.* (2010) similar findings reported that alternaria blight appeared in the third week of November 1999. The disease progress was slow in the month of December 1999 but became rapid in January 2000 and reached upto 39 percent in the last week of March 2000. Critical observation on disease development in relation to weather parameter indicated that in 2000 the most favorable temperature (max-23.9ºC and min 7.5ºC) during 22 January to 28 January 2000, as the rapid development was observed during this period. Rainfall had no positive correlation with disease development. Stennett and Beggs (2004) have suggested that temperature and relative humidity play a major role in the dispersion of *Alternaria*. Whereas, higher rainfall and relative humidity were reported to cause severe epidemics of alternaria blight of sunflower (Kolte, 1984). There is no definite sowing date for pigeonpea. This not only exhausts the nutrients from the soil but paves the way for continuous survivability of the pathogen. The infected debris left in the field serve as major source of infection, thus causing epidemic throughout the season. In this areas majority of farmers take only one crop of pigeonpea in *kharif*/*rabi* and because of lack of irrigation facilities and second crop is not possible. It is aspersed continuous cultivation of any crop over the seasons and years build up inoculum level to such an extent that the alternaria blight epidemic will become a common phenomenon (Chaube and Singh, 2001) in future.

Alka and Singh (2004) found pigeonpea to suffer from leaf blight caused by *Alternaria tenuissima* and the severity of disease varied from 13.7 to 38.5 percent areas of Utter Pradesh and cause severe losses around Kanpur and adjoins areas. Similar result (Kushwaha *et al.*, 2010) studies were carried out on the prevalence and intensity of *A. tenuissima* in pigeonpea disease varied from 18.0% to 37.5% at different location. Sharma *et al.* (2012) reported that in pigeonpea in caused by *A. tenuissima* disease intensity ranged between 20-80% irrespective of cultivars sown.

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