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Innovation The Research Concept

Correlation of Environmental Conditions on the Severity of Anthracnose Disease of Urdbean in Nature

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Abstract

The intensity of anthracnose disease of urdbeancaused by *Colletotrichumcapsici*was found directly proportional to rainfall, relative humidity and atmospheric temperature. Maximum disease severity was observed in first fort-night in the month of September. During this period the temperature was 27.25 – 28^{0}C and relative humidity 79.50 – 80.25%. For disease initiation and development, the cumulative rainfall throughout the rainy season played important role.

Keywords: Environmental Conditions Anthracnoseurdbean.

Introduction

The environmental conditions prevailing in both air and soil , after contact of pathogen with its host , generally affect the development of pathogenic diseases. The most serious environmental factors, which affect initiation and development of infectious plant diseases, are temperature and moisture. For a disease to occur and to develop a combination of three factors viz. susceptible plant, infective pathogen andfavourable environment must be present. However sudden variation in environmental conditions may influence disease initiation and development to considerable extent. The occurrence of anthracnose disease of urdbean incited by Colletotrichum is generally common among tropical and subtropical conditions causing heavy losses in yield. Though major fungal diseases on urdbean are well documented, yet not sufficient attention has been given on anthracnose disease of urdbean caused by *C.capsici*. The anthracnose disease was found supported and spread by hot and humid environmental conditions in many crops. Rainfall, leaf surface, wetness and light have been found important factors linked with severity of anthracnose diseases (Agarwal et al 2017).

Aim of the Study

The objective of this reserach paper is to study the Correlation of Environmental Conditions on the Severity of Anthracnose Disease of Urdbean in Nature

Material and Method

The experiment was conducted with urdbeanvariety T-9 raised in the field with row to row spacing of 60 cms and the plant to plant spacing of 30 cms in a randomized block design with three replicates. The progress of disease in terms of percent disease intensity was measured periodically on the basis of leaf area affected at 15 days interval during kharif season of consecutive two years 2009 and 2010. Ten plants were randomly tagged for recording disease development. Disease intensity was recorded on the leaves using 0-5 point scale. Percent disease index was calculated by following formula:

$$\text{Disease Index (\%)} = \frac{\text{No. of leaflet X Grade rating}}{\text{Total No of leaflet X No. of rating}} \text{ X } 100$$

Weather parameters during disease observation period were recorded and correlated with disease development.

Experimental Findings

The data given in table 1 showed that disease intensity was directly proportional to rainfall, relative humidity and atmospheric temperature and with definite age of crop plant. During crop season in the years 2009 and 2010, the average rainfall ranged 3 – 225 mm and 18.6 - 332 mm respectively. The average relative humidity was 53.70 – 86.50% in

2009 and 55.5 – 90% in 2010. Average atmospheric temperature ranged 24.5 – 30.5^{O}C in 2009 and 25.5 – 29.25^{0}C in 2010. The disease intensity varied 31.76 – 75.03% in 2009 and 32.46 – 78.9% in 2010.

The influence of rains and relative humidity (Rh) on disease development was related in combination with atmospheric temperature. In general, disease intensity was relatively higher inthe month of August and September during both the years. The maximum disease intensity (75.03%) was recorded during 2009 where mean temperature and Rh in preceding fortnight were 27.25 ^{0}C and 80.25% respectively. Similarly 78.9% disease intensity was recorded in the year 2010 where mean temperature and Rh were 28 ^{0}C and 79.5% respectively. A gradual decrease in disease intensity was recorded after September with decrease of average rains, Rh and temperature. The minimum disease intensity was recorded in the month of October during both the years where mean temperature was higher and Rh was low. The host susceptibility increased with the age of host plant hence disease severity in later part of the crop was related with increased host susceptibility and favourable weather conditions.

Table 1: Diseaseintensity undernatural conditionsat theprevailing atmospheric temperature, relative humidity and rain fall during Kharif season 2009 and 2010.

S.No.	Period ending	Average Temperature (^{0}C)		Average Relative humidity (%)		Average rain fall (mm)		Average Disease intensity (%)	
		2009	2010	2009	2010	2009	2010	2009	2010
1.	July 15	30.50	29.25	76.25	83.70	64.5	44.0	-	-
2.	July 31	29.25	27.25	81.25	86.00	225.0	332.0	-	-
3.	August 15	28.50	28.25	86.50	90.00	95.0	38.6	18.4	41.9
4.	August 31	28.75	28.75	78.75	83.50	98.0	109.6	67.56	69.9
5.	September 15	27.75	28.00	80.25	79.50	80.2	45.0	75.03	78.9
6.	September 30	27.75	27.25	81.50	73.50	3.0	39.06	64.66	61.5
7.	October 15	26.50	27.50	61.25	62.75	00.0	0.0	31.76	32.46
8.	October 31	24.50	25.50	53.70	55.50	00.0	0.0	-	-
		SEm±						2.063.02	
		CD (P=0.05)						4.326.64	

Statistical Analysis

Correlation Coefficient between environmental factors and disease intensity

Variables	Simple correlation coefficient	
	2009	2010
Disease intensity x temperature	0.42*	0.44*
Disease intensity x Relative humidity	0.56*	0.52*
Disease intensity x Rainfall	0.36	0.39

*Significant (P=0.05)

The correlation of meterological factors and disease intensity were given in Table 1. The results of simple correlation studies suggested that Rh was a key factor for development of disease. There was significant positive correlation between disease intensity and Rh (0.42 – 0.44) during both the years. Relative humidity of the environment influenced the initiation and development of disease in urdbean in many inter-related ways. The humidity existed as rain or irrigation water around the plants, as Rh in the air and as dew. Moisture was indispensable for germination of pathogen spores and penetration into urdbeanhost by germ tube. Positive but nonsignificant correlation was observed between rainfall and disease intensity which suggested that rainfall did not influence disease development much, but probably helped in germination of pathogen spores and increased atmospheric humidity. Temperature also showed positive correlation with disease intensity. As evident from data, the prevalence of both cool and warm temperature in the environment contributed in favouring incidence of anthracnose disease over urdbean crop. It may thus be concluded that relative and atmospheric temperature were mainly related with incidence and development of disease. It is inferred therefore that anthracnose disease in urdbean is widely distributed where urdbean is grown in humid areas having warm to cool temperatures.

Discussion

The conclusions drawn from the study were confirmed by correlation studies. The initiation of the disease in the presence of temperature around 28^{0}C, heavy rainfall and relative humidity more than 90% suggested that moderate temperature along with high relative humidity favoured multiplication of conidia of the pathogen in the field. These findings were in agreement with those of Cango and Bernier (2000), Sharma and Verma (2007), Om Prakash (2013), NeelamGeat (2014), Rathava (2017) and Agarwal et al (2017) working with anthracnose disease caused by *Colletotrichum sp.* Dubey and Ekka (2004), Kumar (2008) and Agarwal et al (2017) also concluded that temperature around 30 ^{0}C was condusive to anthracnoses and fruit rots of vegetable crops caused by *C.capsici*. In the present study, high or low temperature operated in urdbean plants probably by affecting the genetic machinery of the cell by favouring or inhibiting the expression of certain genes involved in disease resistance or susceptibility. In present case, the disease was also favoured by moisture of the air or dew. The observation was confirmed by the observations made by Agarios

(2005) who found the occurrence of disease in a particular area, closely correlated with amount and distribution of relative humidity resulted from rainfallin the area within a year.

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