Int.J.Curr.Microbiol.App.Sci (2017) *6*(8): 2249-2251

EXCELLENT PUBLISHERS

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 8 (2017) pp. 2249-2251**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.608.264

Epidemiological Studies of Polio Disease or Sclerotinia Rot of Rapeseed-Mustard

Amlan Sushree[1*], Bhagyashree Khamari[1] and M.C. Muthu[2]

[1]Department of Plant Pathology, COA, OUAT, Bhubaneswar-751003
[2]Department of Seed Science and Technology, COA, OUAT, Bhubaneswar-751003
**Corresponding author*

Keywords

Rapeseed-mustard, *Sclerotinia sclerotiorum*, Epidemiological factors.

Article Info

Accepted:
21 June 2017
Available Online:
10 August 2017

A B S T R A C T

Sclerotinia stem rot of Indian mustard (*Brassica juncea*) caused by *Sclerotinia sclerotiorum* (Lib.) de Bary is one of the imminent diseases of Rape seed-mustard. A study was conducted to ascertain the epidemiological factors involved in disease development. As soon as the disease appeared in field, the number of infected plant was recorded. Subsequently the disease incidence was recorded fortnightly and it was correlated with atmospheric parameters. The data on the maximum and minimum temperature, relative humidity, rainfall and per cent disease incidence in each phase were recorded from the observatory of the University and correlated with the most favourable temperature, relative humidity and rain fall for the disease development. It was perceived from the observations that the disease continued to progress in field at a low temperature causing massive damage to the crop. The disease continued to progress till the temperature reached 26.9^{0}C (maximum temperature) and 14.6^{0}C (minimum temperature) in 2014-15.

Introduction

India as we know has very often been reckoned as the land of diversity. Our country is an abode of wide range of climatic realms, ranging from Himalayan alpines in the north to the tropical in the south forming a total of fourteen agroclimatic zones. These zones help to sustain an extraordinary variety of crops. Oilseeds are a principal group of commercial crops grown almost all these regions. Of which rapeseed mustard occupies only the second position after groundnut. Though India is one of the major producers of rapeseed and mustard its production is however falling short leading to importing of the crop. Diseases are one of the major constraints in rapeseed and mustard cultivation. *Sclerotinia* rot of Indian mustard (*Brassica juncea*) has recently siezed a serious portion of rapeseed and mustard production in its major growing areas in the country. The disease can take a prime toll if not checked in initial stages. In severe cases, it caused seed yield losses in Kanpur as well as in other parts of the country (Chouhan *et al.*, 1992; Shivpuri *et al.*, 2000). The climate has a notable effect on the growth of pathogen. Whenever a virulent pathogen attacks a weakened host it ushers into disease development. Therefore the study of epidemiological factors influencing disease development is of paramount importance. Considering the above facts the following studies have been conducted to ascertain the epidemiological factors involved in disease development.

Materials and Methods

The experiment was conducted at Oilseed Research Farm, Kalyanpur of the University during 2014-15. To understand the effect of different environmental factors i.e. atmospheric temperature, relative humidity and rainfall on disease development, the experiment was conducted in Oilseed Research Farm in sick plot during 2014-15. Experiment was conducted in RBD with three replications. As soon as the disease appeared in field, the number of infected plant was recorded. Subsequently the disease incidence was recorded fortnightly and it was correlated with atmospheric parameters. The data on the maximum and minimum temperature, relative humidity, rainfall and per cent disease incidence in each phase were recorded from the observatory of the University and correlated with the most favourable temperature, relative humidity and rain fall for the disease development.

Results and Discussion

The epidemiological factors such as minimum and maximum atmospheric temperature, rainfall, relative humidity, play a significant role in disease development. The present studies were laid out to understand the effect of environmental factors on disease development in natural conditions. The data on disease development and other factors are presented in table 1.

Table.1 Disease development and epidemiological factors

Standard weeks	Maximum temperature (^{0}C)	Minimum temperature (^{0}C)	Rainfall	Relative humidity I	Relative humidity II	Per cent Disease incidence
1	19.2	12.1	9.2	97	74	0
2	14	5.9	0	97	80	4.8
3	14.2	8.5	0	96	81	5.7
4	18.3	9.9	14.9	98	80	18
5	21.5	8.6	0	92	61	26.3
6	22.3	9.8	0	93	61	30
7	26.4	12.7	0	89	57	30.7
8	29.6	15.1	0	95	60	32.3
9	25.3	15.9	71.5	95	67	34
10	26.9	12.7	0	84	55	34.6
11	26.9	14.6	95	93	63	36
12	31.2	15.9	0	82	48	36

Table.2 Co-relation matrix of climatic parameters on disease incidence

	T max	T min	Rainfall	RH max	RH min	PDI
T max	1					
T min	0.872**	1				
Rainfall	0.215NS	0.459NS	1			
RH max	-0.686*	-0.436NS	0.183NS	1		
RH min	-0.902**	-0.629*	0.038NS	0.860**	1	
PDI	0.875**	0.676*	0.324NS	-0.631*	-0.830**	1

*Significant at 5%; ** Significant at 1%; Co-efficient of determination R square=0.886012; Adjusted R Square=0.791023

Prediction equation,

PDI= -8.02411+3.584402 T max-3.28285 T min+0.157171 Rainfall-0.24221 RH max+0.127608 RH min

Or

The prediction equation,

$$\mathbf{Y= -8.02411+3.584402\ X_1\ -3.28285\ X_2 + 0.157171\ X_3 - 0.24221\ X_4 + 0.127608\ X_5}$$

Where,
X_1- Maximum Temperature
X_2- Minimum Temperature
X_3- Rainfall
X_4- Maximum RH
X_5- Minimum RH

Factors	Per cent contribution to the disease incidence
T max	14.58
T min	12.23
Rainfall	0.03
RH max	0.07
RH min	0.02

It is revealed from the above table that, all the weather factors (Maximum Temperature, Minimum Temperature, Maximum RH, Minimum RH, Rainfall) contributed 79.10% towards disease development. However, the parameters like maximum temp, rainfall and minimum RH were found to be statistically significant with respect to disease development. Weather parameter, Maximum temperature contributed 14.58% to the disease incidence followed by minimum temperature (12.23%).

It can be clearly observed from the observations that the disease continued to progress in field at a low temperature causing massive damage to the crop. The disease continued to progress till the temperature reached 26.9^{0}C (maximum temperature) and 14.6^{0}C (minimum temperature) in 2014-15. After reaching this temperature the progress of the disease was not so significant.

Weather parameters such as prevalent temperature, relative humidity and rainfall influenced the stem rot incidence. The disease in the crop season 2014-15 when maximum and minimum temperature was 14^{0}C and 5.9^{0}C respectively and relative humidity 80-97 per cent, it was observed that the disease incidence increased with the decrease in maximum temperature (26.9 ^{0}C) and increase in relative humidity up to 80%. After 11th standard weeks no increase in disease was seen to occur. More or less similar observations were observed by Awabi and Grogan (1975) and Pankaj Sharma, P. D. Meena, P.R. Verma, G. S. Saharan, Naresh Mehta, Dhiraj Singh and Arvind Kumar (2015).

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How to cite this article:

Amlan Sushree, Bhagyashree Khamari and M.C. Muthu. 2017. Epidemiological Studies of Polio Disease or Sclerotinia Rot of Rapeseed-Mustard. *Int.J.Curr.Microbiol.App.Sci.* 6(8): 2249-2251.
doi: https://doi.org/10.20546/ijcmas.2017.608.264