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Short Comminucation

Influence of weather factors on incidence of *Alternaria* blight of rapeseed under the agro-climate of upper Brahmaputra valley of Assam

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In India, rapeseed & mustard is the second largest indigenous oilseed crop next to groundnut. Three ecotypes of *Brassica campestris* sub sp. *oleifera* namely yellow sarson, brown sarson and toria as well as *Brassica juncea* are grown in an area of 280 thousand hectares with a productivity of 667 kg per ha in Assam. Despite considerable increase in the productivity and production of oilseed, a wide gap is found to exist between the potential yield and the yield realized at the farmer's field, which is largely because of a number of biotic and abiotic stresses. Erratic and scanty rainfall leading to low soil moisture during crop growth period and infestation of the crop with insect-pests and diseases are major factors causing low productivity of the crop in the state (Neog *et al.*, 2015). Among the major diseases (*Alternaria* blight, downy mildew, powdery mildew and white rust), *Alternaria* blight is the most important disease which causes serious yield and quality losses (Sharma and Pandey, 2013). *Alternaria* blight severity on rapeseed & mustard differs among seasons and regions and also between individual crops within a region in India (Kumar *et al.* 2010*)*.Since weather has overriding influence on disease development therefore, monitoring the weather conditions under different dates of sowing is an important consideration in disease forecasting models. Which may enable prediction of its occurrence so as to allow growers to take timely fungicidal sprays for an efficient crop management (Chattopadhyay *et al.*, 2005). The present investigation is planned with the aim of finding the correlation between *Alternaria* blight disease and weather factors and to develop a disease forewarning model.

Field experiments were conducted during the *rabi* seasons of 2012-13 and 2013-14 at the Instructional-cum-Research (ICR) farm of Assam Agricultural University, Jorhat, Assam.TS-38, an *Alternaria* blight susceptible rapeseed variety was sown during five different dates at 7 days interval viz., 7th November, 14thNovember, 21stNovember, 28th November and 5th December during both the years. The data for disease index was recorded at 30, 45, 60, 75 and 90 days after sowing (DAS) for each sowing date. Prior to sowing, the seeds were treated by blotter method (Limonard, 1966) and found free from infection of *Alternaria* spp. and had 100 per cent germination. The experiment was carried out in randomized block design (RBD) with five replications. Altogether there were 25 plots having 2 m x 2 m area. The seed rate used was 5.0 $kgha^{-1}$. A line spacing of 15 cm was maintained. Thinning was done at 15 DAS to get optimum plant population. Weeding, irrigation, pest control and other cultural practices were done as per normal package of practices during the cropping period.

Five plants were selected randomly in each plot and tagged and observations on incidence of disease on the foliage were recorded at 7 days interval starting from 30 DAS using 0-5 scale (Sangeeta and Siddaramaiah, 2007) as shown in Table 1. The per cent disease index (PDI) was worked out following formula given by Wheeler (1969).

$$PDI = \frac{\text{Sum of individual rating}}{\text{Number of leaves examined} \times \text{Maximum disease grade}} \times 100$$

To assess the effect of meteorological parameters on development of the disease, daily maximum temperature (Tmax), minimum temperature (Tmin), rainfall and relative humidity during morning (RH-I) and evening(RH-II) and bright sunshine hours (BSS) data were collected from the Department of Agro-meteorology, Assam Agricultural University, Jorhat for both the years. The Agro-meteorological observatory is located within a radius of 100 m from the experimental site. Weather parameters in preceding seven days of date of record of the disease were considered in statistical analysis. PDI data on all the dates of observations (DAS) was averaged over the two seasons. Correlation studies between PDI and weather parameters were made with data pooled over dates of sowing and years. Finally multiple regression equationwas developed.

Table1: Modified 0-5 scale disease severity of *Alternaria* blight in rapeseed and mustard

Grade/ Rating scale	Description on disease severity
0	No symptoms on the leaf
1	Small circular, scattered, brown spots covering 1 to 10 percent of leaf area and infection on lower most leaves of the plant.
2	Spots enlarging, dark brown in color covering 11 to 25per cent of leaf area
3	Spots enlarging, dark brown in color covering 26 to 50 per cent of leaf area
4	Spots dark brown, coalescing, covering 51 to 75 per cent of the leaf area.
5	Spots uniformly dark brown, coalescing. Severe infection on all leaves infested to a greater degree covering 76 to 100 per cent.

Table 2: Effect of date of sowing on per cent disease index (PDI) of *Alternaria* blight under field conditions (pooled for 2012-13 and 2013-14)

Date of sowing	30 DAS	45 DAS	60 DAS	75 DAS	90 DAS
7th Nov	0.0	6.6	15.7	27.4	40.2
14th Nov	0.0	10.8	18.6	29.1	45.3
21st Nov	0.0	12.9	17.9	32.3	49.3
28th Nov	0.0	15.3	18.3	34.9	53.6
5th Dec	7.4	17.1	24.9	43.4	61.2

Table 3: Correlation coefficients between PDI of *Alternaria* blight and weather parameters in rapeseed (pooled over dates of sowing and years)

Weather Parameter	Correlation coefficient
Max temperatures	-0.252*
Min temperatures	-0.544*
Morning RH	-0.161
Afternoon RH	-0.625*
Rainfall	-0.047
BSS	-0.239*

* Significance level alpha = 0.05

The disease severity of Alternaria blight was significantly influenced by dates of sowing (Table 2). The PDI was found to be lowest in the early sown crop (7th Nov.) and gradually increased with successive delay in sowing time i.e., from 14th November to 5th December over all the dates of observations. The lowest PDI was observed on 5th December sown crop at 30 DAS while the highest PDI was observed at 90 DAS on the same date of sowing. No disease developed at the early stages of crop growth (30 DAS) from 7th Nov. to28th Nov. sowing dates (Gupta *et al*. 2003). They observed that the crop sown on 21st October recorded significantly less disease severity then the subsequent delay in sowing. They also noticed that disease severity increased with age of plant.

It is observed that PDI was significantly and negatively correlated with maximum temperature, minimum temperature, afternoon RH and bright sunshine hours (Table 3). These findings are in accordance with Neog *et al*. (2015) who reported significant negative correlation of *Alternaria* blight with maximum and minimum temperature in the north bank plains zone of Assam. Saharan and Saharan (2001) also reported that *Alternaria* blight of cluster bean is correlated significantly and negatively with minimum temperature.

Regression analysis was carried out between PDI of *Alternaria* blight and weather parameters pooled over dates of sowing and years. It is observed that afternoon RH and BSSH could explain about 86.1 per cent of PDI. It may be concluded that decrease of afternoon RH and BSS during the growing period aggravated the disease in late sown crops.

$PDI = 293.5 - 3.596 * RH II - 8.736 * BSS$

$(R^2 = 0.861^*)$

CONCLUSIONS

Early sowing of rapeseed can effectively help in reducing the severity of *Alternaria* blight under Jorhat condition. Regular monitoring of afternoon humidity and BSSH during the crop season will help in predicting the disease severity in rapeseed crop. The disease forewarning

models developed over pooled dates of sowing and years need to be tested at different agro-climatic zones of Assam.

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