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RESEARCH ARTICLE

EPIDEMIOLOGICAL STUDIES OF PHYTHOPTHORA STEM BLIGHT ON PIGEONPEA (*Cajanus cajan*) IN MEDZIPHEMA

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ABSTRACT

A Field experiment was conducted for the year 2023-2024 from August to November at AICRP research farm, School of agricultural sciences, Nagaland University, Medziphema campus to assess the epidemiology of Phythopthora stem blight in pigeonpea. Corelation studies between different weather parameters and Phythopthora disease was carried out and the data are summarized. It revealed that rainfall and rainy days showed a significant positive correlation with disease intensity i.e, disease increased with increase in rainfall and no of rainy days. On the other hand,Maximum and minimum temperature, maximum and minimum relative humidity showed.no significant correlation with the disease intensity.

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INTRODUCTION

Pigeonpea (*Cajanus cajan* (L.) Millsp.) (family – Fabaceae) is a legume crop of high importance, tremendously nutritious grain legume crop of semi-arid tropics in the Indian subcontinent. It is the second most important pulse crop after chickpea in India. In India, it was first reported on pigeonpea in 1966 by Williams *et al.* 1968. Pigeonpea is prone to many diseases and pests.More than 50 diseases caused by fungi, bacteria, viruses, nematodes, etc have been reported to affect the pigeon pea crop.Phytophthora stem blight (PB), is considered the third potentially major disease of pigeon pea after Fusarium wilt and SMD (Sterility mosaic) which is incited by the fungus *Phytophthoradrechsleri* Tucker f. sp. *cajani*. (Kannaiyan, 1984).

MATERIALS AND METHODS

The experiment was conducted during the Kharif season 2023 at AICRP research farm located at School of Agricultural Sciences, Nagaland University, Medziphema campus.Three replications were maintained where each plot consists of 10 m long and 5 m in breadth. The plant-to-plant distance was maintained at 20 cm and row to row was at 50 cm. Susceptible variety of pigeonpea i.e., ICP7119 was sown on the last week of July with recommended agronomic practices.Disease progress was recorded at fortnightly intervals in randomly selected 100 plants per plot. The weather data (maximum and minimum temperature, relative humidity, rainfall) was recorded and statistically analyzed for calculating the correlation between incidence between disease and weather parameters, To determine the status of incidence of Phytophthora blight of pigeonpea, observations were drawn for the disease incidence. Percentage PB incidence was calculated as (Sharma *et al*., 2006)

PB incidence (%)=Number of PB infected plants/total number of plants x 100

EPIDEMIOLOGY

The weekly weather data from the period of observation from August to November2022, i.e., Temperature Maximum, temperature minimum, Relative humidity max, relative humidity minimum, Rainfall, no of rainy days were recorded and collected from meterological observation of ICAR for NEH region, Jharnapani (Table-1).The linear relationship of disease development with environmental factors was calculated by Karl Pearson linear correlation coefficient. The quantity r, called the linear correlation coefficient, measures the strength and the direction of a linear relationship between two variables. The linear correlation coefficient is sometimes referred to as the Pearson product moment correlation coefficient in honor of its developer Karl Pearson. The mathematical formula for

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computing r is:

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[\, n\Sigma x^2 - (\Sigma x)^2 \,][\, n\Sigma y^2 - (\Sigma y)^2 \,]}}$$

Where, n is the number of pairs of data.

Based on disease incidence the lines were categorized as per the scale described by Reddy and Jain (1989)

RESULTS AND DISCUSSION

The sowing of the crop was done on 25th July,2023. The weather parameters were recorded during the experiment. The disease initiated four days after crop emergence i.e. on 4th August, 2023 with the onset of heavy rainfall. Initial symptoms of the disease infection was noticed on stem and collar region of the stem which led to wilting of the plant and death of the infected plants. Water soaked lesions were visible on the foliage. With the variations in weather parameters, the disease progression was observed to be low from 33rd to 44th week of the crop stage. However, the infected crop showed symptoms of stem blight with girdling and cankers during the 45th week. The infected stem got detached or break easily at lesion site from the crop. The stem swollen at base turns into a cankerous structures.

The correlation studies between individual parameters and Phytophthora disease incidence was carried out and the data are summarized in (Table-1) which reveals that maximum temperature (0.119), minimum temperature (0.16) and minimum relative humidity (0.278) showed positive correlation coefficient with the disease intensity but it was not significant. On the other hand, total rainfall (0.412*) and number of total rainy days (0.427*) indicatedsignificant association with the disease intensity, with positive correlation coefficientwhich clearly indicates that the phytophthora blight disease increased with the increase in total rainfall and total rainy days. (Table-2). Pande *et al*.2011 reported that climate variability resulting in more frequent flooding owing to continuous and erratic rainfall within a short span of time along with warm temperature is responsible for the emergence of PB irrespective of cropping system, soil types, and cultivar grown. Bisht, 1985 reported that short showers of heavy rains and the prevalence of hot weather (up to 30°C) during July - September causing leaf wetness for almost 7-8 hours favors the rapid and intense progress and spread of the disease. The zoospore of the fungus is considered the primary source of inoculum and wind disseminates inoculum over a short distance during the rain. It can be concluded that further research is required to

Table 1 Weather parameters and disease progress during the year 2023-2024.

SMW	Dates	PB **Incidence (%)**	**Temp**		RH %		Rainfall	**Rainy days**
			Max	Min	Max	Min	mm	Nos
28.	09 July-15 July	0	33	25.1	92	73	4.4	1
29.	16 July-22 July	0	33.4	25.1	94	72	41.5	3
30.	23 July- 29 July	0	34	25	93	70	123.6	3
31.	30 July-05 Aug	15.4	34.2	25.1	92	74	112.3	4
32.	06 Aug-12 Aug	11.3	32.3	25.1	91	76	73.2	4
33.	13 Aug-19 Aug	8.9	33	25.3	92	74	41.9	3
34.	20 Aug-26 Aug	6.2	31.5	24.6	93	81	70.6	3
35.	27 Aug-02 Sep	5.1	32.6	24.5	93	67	16.2	1
36.	03 Sep-09 Sep	4.8	35.3	25.1	92	68	21.3	2
37.	10 Sep-16 Sep	2.6	33.4	24.9	93	70	18.2	2
38.	17 Sep-23 Sep	4.5	32.3	24.3	94	75	48.4	3
39.	24 Sep-30 Sep	5.2	33.5	24.1	92	70	70.9	3
40.	01 Oct-07 Oct	0.8	31.5	24.1	93	76	23.8	3
41.	08 Oct- 14 Oct	1.7	31	22.7	92	67	1.2	0
42.	15 Oct-21 Oct	2	30.8	20.3	94	62	0	0
43.	22 Oct-28 Oct	2.6	29.2	21	94	70	1.4	0
44.	29 Oct-04 Nov	3.3	30.5	18	93	59	0	0
45.	05 Nov-11 Nov	4.1	28.7	16.6	95	62	0	0
46.	12 Nov-18 Nov	13.7	27.7	17.7	95	67	29.1	2
47.	19 Nov- 25 Nov	6.9	27	15.5	95	60	0.1	0
48.	26 Nov- 02Dec	5.1	27.1	12.9	95	55	0	0
49.	03 Dec-09 Dec	5.8	24.7	15.6	96	74	35.2	2
50.	10 Dec-16 Dec	2.8	23.6	13	95	66	0	0
51.	17 Dec-23 Dec	0	24.4	9.4	96	52	0	**0**

Fig. A wilting of seedling

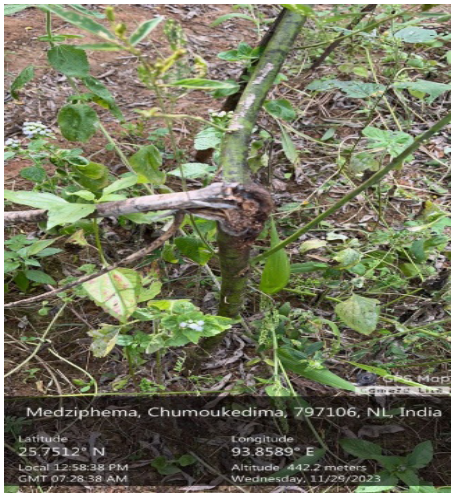

Fig B. Girdling of infected stem

Fig C.Stem swollen at base

understand the effects of the changing climatic conditions on the progression of diseases.

Table 2 Pearson's Correlation coefficient (r) of disease incidence with individual weather parameters with development of PSB in pigeon pea.

Sl.no	Weather parameters	Correlation coefficient
1.	Maximum temperature	0.119
2.	Minimum temperature	0.16
3.	Relative humidity max	-0.251
4.	Relative humidity min	0.278
4.	Rainfall (mm)	0.412*
5.	No of rainy days	0.427*

*Co relation is significant at 0.05% level

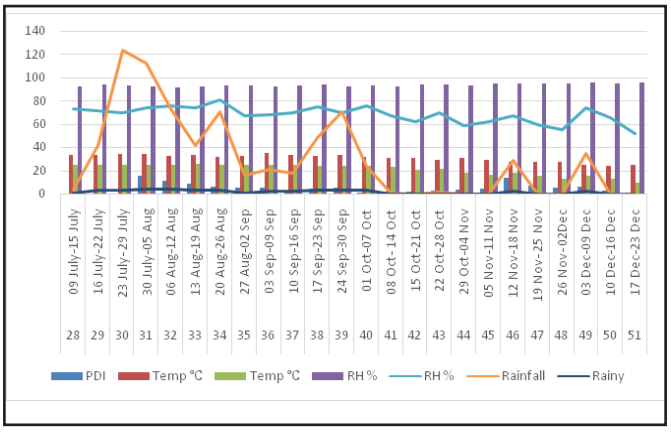

Fig 1 Weather and disease progress during the year 2023-20224 at Medziphema.

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