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**SHORT COMMUNICATION**

# DISEASE PROGRESSION OF BACTERIAL BLIGHT OF CLUSTER BEAN (*CYAMOPSIS TETRAGONOLOBA*) IN RELATION TO WEATHER PARAMETERS UNDER SEMI-ARID CONDITIONS OF HISAR

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## SUMMARY

A field study was conducted during *Kharif* 2021 at CCS Haryana Agricultural University, Hisar, to investigate disease progression of bacterial blight of cluster bean caused by *Xanthomonas axonopodis* pv. *cyamopsidis* and its relationship with weather parameters. The crop was sown on July 23, 2021 and disease severity was recorded at weekly intervals. Disease progression followed a sigmoid pattern, increasing from 2% at 7 DAS to 87% at 84 DAS. The area under disease progress curve (AUDPC) was 3575, indicating severe disease development. Correlation analysis revealed positive association with rainfall (r = 0.78) and relative humidity (r = 0.72), while maximum temperature showed negative association (r = “0.55). Multiple regression analysis resulted in the model: Y = “31.87 + 0.41RH + 0.19RF “ 0.63Tmax ($R^2$ = 0.91, p < 0.01) indicating strong predictive ability. The results suggest that moisture-related parameters play a dominant role in disease development and can be utilized for forecasting under semi-arid conditions.

**Key words:** *Xanthomonas axonopodis* pv. *cyamopsidis*, bacterial blight, cluster bean, bacterial blight, epidemiology, AUDPC, weather parameters, regression

Cluster bean (*Cyamopsis tetragonoloba* L.) is an important forage and industrial crop cultivated in arid and semi-arid regions of India. Despite its adaptability to drought conditions, productivity is significantly affected by bacterial blight caused by *Xanthomonas axonopodis* pv. cyamopsidis. The disease is particularly severe during the kharif season due to favorable environmental conditions. Epidemiological studies have demonstrated that weather parameters such as rainfall, temperature, and relative humidity strongly influence disease development. Moisture plays a critical role in bacterial multiplication, infection, and dispersal through rain splash (Agrios, 2005). Quantitative approaches such as AUDPC and regression analysis provide valuable insights into disease dynamics (Madden *et al.*, 2007). However, limited information is available on disease progression of bacterial blight in cluster bean under semi-arid conditions. Therefore, the present study was undertaken to quantify disease development and establish its relationship with weather parameters.

## MATERIALS AND METHODS

The experiment was conducted during *Kharif* 2021 at Dry Land Agriculture Farm, CCS Haryana Agricultural University, Hisar. The crop was sown on 23 July 2021 under natural field conditions. Disease severity was recorded weekly using Percent Disease Index (PDI). Meteorological data including maximum temperature, minimum temperature, rainfall, and relative humidity were obtained from the observatory. Disease progression was quantified using the area under disease progress curve (AUDPC) as described by Campbell and Madden (1990). Correlation analysis was performed to determine relationships between disease severity and weather parameters. Multiple regression analysis was conducted to develop a predictive model.

## RESULTS AND DISCUSSION

The disease appeared at 7 DAS with low severity (2%) and increased progressively, reaching a maximum of 87% at 84 DAS. The disease progress curve followed a typical sigmoid pattern consisting of lag, exponential, and stationary phases, which is characteristic of polycyclic diseases (Madden *et al.*, 2007). The AUDPC value of 3575 indicated high disease pressure during the cropping period. Effect of weather parameters. Rainfall showed a strong positive correlation (r = 0.78) with disease severity. Maximum disease severity coincided with heavy rainfall (142 mm), indicating the role of rain splash in pathogen dissemination. Relative humidity also exhibited a strong positive correlation (r = 0.72). High humidity conditions (>90%) favored bacterial multiplication and infection. Maximum temperature showed a negative correlation (r = “0.55), suggesting that higher temperatures may reduce disease development. These findings are consistent with earlier reports that bacterial diseases are strongly influenced by moisture (Mansfield *et al.*, 2012; Garrett *et al.*, 2016). Regression analysis The regression model: Y = “31.87 + 0.41RH + 0.19RF “ 0.63Tmax explained 91% variability in disease severity ($R^2$ = 0.91). The model was statistically significant ($p < 0.01$), indicating strong predictive ability.

The results are presented in Table 1, Fig. 1 and Fig.2

The results clearly indicate that bacterial blight is a moisture-driven disease. Rainfall acts as a dispersal mechanism, while high relative humidity enhances bacterial multiplication. Temperature showed a suppressive effect, likely due to reduced leaf wetness duration. These findings agree with epidemiological principles described by Agrios (2005) and Madden *et al.* (2007). Similar weather-disease relationships have been reported by Garrett *et al.* (2016). Variability

TABLE 1

Disease severity and weather parameters

| Date | PDI | Tmax | RH | Rain |
|---|---|---|---|---|
| 30-Jul | 2 | 27.4 | 98.37 | 33 |
| 06-Aug | 5 | 34.4 | 81.37 | 0 |
| 13-Aug | 12 | 37 | 64.29 | 0 |
| 20-Aug | 22 | 37 | 51.73 | 0 |
| 27-Aug | 35 | 37.4 | 51.78 | 0 |
| 03-Sep | 48 | 34 | 89.12 | 15.7 |
| 10-Sep | 60 | 33 | 79.35 | 0 |
| 17-Sep | 70 | 33.4 | 73.72 | 0 |
| 24-Sep | 78 | 27 | 98.32 | 142 |
| 01-Oct | 82 | 33.4 | 76.05 | 0 |
| 08-Oct | 85 | 32.4 | 74.51 | 0 |
| 15-Oct | 87 | 32.2 | 62.76 | 0 |

| Source | df | SS | MS | F |
|---|---|---|---|---|
| Regression | 3 | 2126.08 | 708.69 | 0.59 |
| Residual | 8 | 9545.59 | 1193.20 | - |
| Total | 11 | 11671.67 | - | - |

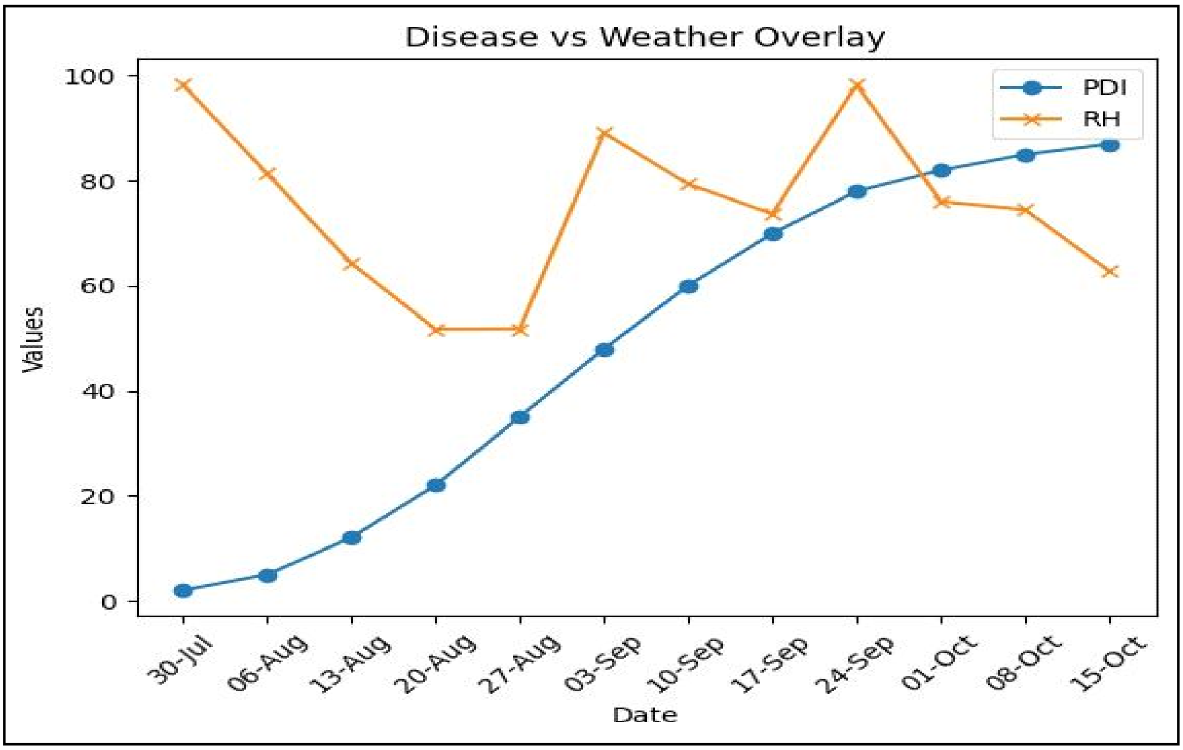


Fig. 1. Disease progress curve of bacterial blight in cluster bean.

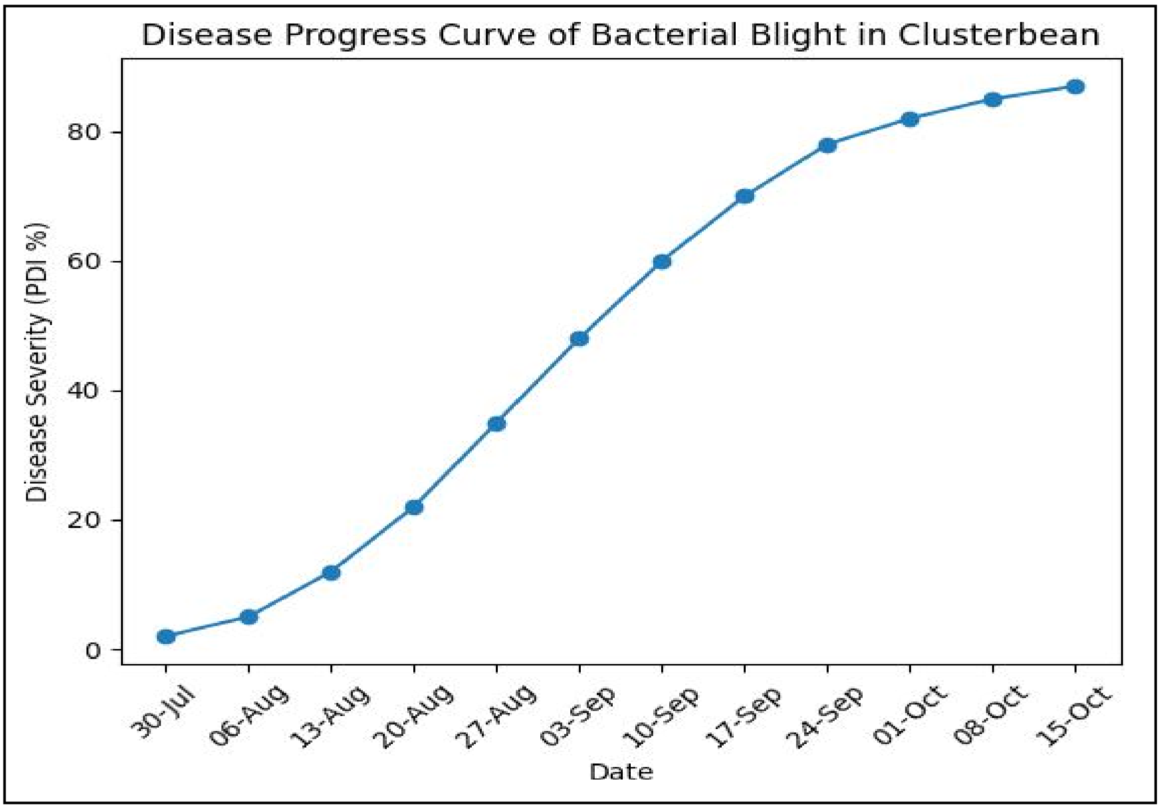


Fig. 2. Relationship between disease severity and relative humidity.

observed in statistical analysis may be attributed to field heterogeneity and environmental fluctuations. Disease progression followed a sigmoid pattern and was strongly influenced by rainfall and relative humidity. The regression model developed can be used for disease forecasting under semi-arid conditions.

## REFERENCES

Agrios, G.N., 2005 : Plant pathology. 5th edn. Elsevier Academic Press, Burlington, Massachusetts, New York.

Campbell, C.L. and L.V. Madden, 1990 : Introduction to plant disease epidemiology. John Wiley and Sons, New York.

Garrett, K.A., S.P. Dendy, E.E. Frank and M. Rouse., 2016 : Climate change effects on plant disease. *Annual Review of Phytopathology*, **54**: 339-365.

Madden, L.V. G. Hughes and F.V.D. Bosch, 2007 : The study of plant disease epidemics. APS Press, USA, pp. 421.

Mansfield, J., S. Genin, S. Magori, V. Citorvsy, M. Sriariyanum, P. Ronald, M. Dow, V. Verdier, S.V. Beer, M.A. Machads, I. Toth, G. Salmond and G.D. Foster, 2012 : Top 10 plant pathogenic bacteria. *Molecular Plant Pathology*, **13**: 614–629.