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Incidence and Progression of Collar Rot Disease in Groundnut (*Arachis hypogaea* L.)

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ABSTRACT

Groundnut is an important oilseed crop, and its productivity is often constrained by soil-borne diseases, among which collar rot is a major threat, particularly during the early crop growth stages. Limited information on the seasonal prevalence of collar rot and its relationship with prevailing weather parameters hampers timely disease management under field conditions. Therefore, a field survey was undertaken at different locations during *Kharif* 2023 to assess the incidence and temporal dynamics of collar rot disease in groundnut. The results revealed that collar rot disease initiated 20–25 d after sowing during the 25th Standard Meteorological Week (SMW) with a minimum disease incidence of 0.33 per cent. Disease intensity increased progressively and reached its peak (18.66 %) during the last week of July, after which a gradual decline was observed, reaching 0.33 per cent by the 37th SMW. Correlation analysis indicated a negative but non-significant association between disease intensity and temperature, whereas a positive and significant correlation was observed with relative humidity. The study concluded that collar rot incidence in groundnut is strongly influenced by seasonal weather conditions, particularly humidity, and is most severe during the early growth stages of the crop. Understanding the disease onset and peak period will aid in timely implementation of preventive and management strategies, thereby minimizing yield losses in groundnut-growing areas.

Keywords: Collar rot, Disease intensity, Groundnut, Temperature, Survey.

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is one of the most important oilseed crops cultivated across tropical and subtropical regions of the world (Murugan and Nisha, 2016; Mallikarjuna *et al,* 2023. It belongs to the family Fabaceae and plays a vital role in ensuring edible oil availability, nutritional security, and farm income, particularly in developing countries. In India, groundnut is grown under diverse agro-climatic conditions during *Kharif*, *Rabi*, and summer seasons, occupying a substantial share of the oilseed acreage (Anuratha *et al,* 2021). Globally, groundnut cultivation is predominantly concentrated in Asia and Africa, which together account for a major share of the total cultivated area and production (Sreenivasulu *et al,* 2021). India ranks among the leading groundnut-producing countries, contributing significantly to global output. During 2021–22, the crop was cultivated over 5420 thousand hectares in India, with a production of 10.16 million tonnes and an average productivity of 1863 kg/ha. Groundnut seeds are valued for their high oil content and protein, making them an important component of human diets (Manan and Sharma, 2018). In addition to edible uses, the crop provides by-products such as shells and haulms, which are utilized for fuel, fodder, and organic amendments. The crop also improves soil fertility through biological nitrogen fixation, thereby contributing to sustainable cropping systems (Dhanushkodi and Balamurugan, 2024).

Despite its importance, groundnut productivity is often constrained by several biotic and abiotic stresses. Among biotic factors, diseases caused by fungi, bacteria, and viruses pose serious challenges to crop establishment and yield stability. Among the diseases affecting groundnut, collar rot caused by *Aspergillus niger* is considered one of the most destructive seed- and soil-borne diseases, particularly during the early growth stages. The disease may occur both before seedling emergence and after emergence, leading to poor plant stand and seedling mortality. Infected plants typically show rotting of tissues at the collar region, followed by wilting and eventual death (Pande and Rao, 2000).

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The occurrence of collar rot in groundnut was first documented in the early twentieth century, and later reports confirmed its widespread distribution in India (Jochem, 1926; Jain and Nema, 1952). Under favourable environmental conditions, the disease can cause severe losses due to high plant mortality, with reported yield reductions reaching up to 40 per cent in affected fields (Ghewande *et al*, 2002; Gajera *et al*, 2011). Severe infections may persist up to crop maturity, adversely affecting pod development and seed quality. Because of its damaging nature, collar rot remains a key factor responsible for reduced groundnut yields in many production regions. The absence of comprehensive information on the seasonal prevalence of collar rot and its relationship with weather conditions often delays the adoption of timely management practices. In view of this, a field survey was undertaken during *Kharif* 2023 at multiple locations under the jurisdiction of Krishi Vigyan Kendra to assess the incidence and seasonal behavior of collar rot disease in groundnut.

MATERIALS AND METHODS

A field survey was conducted during the *Kharif* season of 2023 to assess the prevalence of collar rot disease in groundnut across selected locations of the Raniwara block under the jurisdiction of KVK Jalore-II. The crop was maintained without the application of pesticides throughout the growing period to allow natural disease development. At each location, observations were recorded from plots measuring 10 m² (5 m × 5 m), replicated three times. Disease incidence was assessed at weekly intervals following standard meteorological weeks (SMW) up to 60 d after sowing. The percentage of disease incidence was calculated using the formula:

$$\% \text{ Disease Incidence} = \frac{\text{No. of infested plants}}{\text{Total no. of Plants}} \times 100$$

A simple correlation between disease incidence and weather parameters was worked out to study the impact of different weather parameters on disease incidence.

$$r_{xy} = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\left[\sum (x)^2 - \frac{(\sum x)^2}{n}\right]\left[\sum (y)^2 - \frac{(\sum y)^2}{n}\right]}}$$

where,

r_{xy} = Simple correlation coefficient

x = variable i.e. abiotic component

y = variable i.e. Mean disease infestation

n = Number of observations

$$t = \frac{r}{\sqrt{1-r^2}} \times \sqrt{n-2}$$

RESULTS AND DISCUSSION

The data (Table 1) indicated that the collar rot disease first appeared during the 25th standard meteorological week (SMW) *i.e.,* 18th June-24 June (3rd week) with a mean population of 0.33 % disease intensity. The disease increased gradually and attained the peak in the third week of September (30th SMW) with a mean per cent disease infestation of 18.66. Later on, the disease intensity declined and reached a minimum level of 0.33 per cent during the 37th SMW i.e 10 Sep – 16 Sep. The disease exhibited a non-significant and negative correlation (r1 = -0.4614) with average temperature and a significant positive correlation with relative humidity (r2 = 0.7844). The seasonal pattern of collar rot incidence revealed higher disease intensity during periods of elevated relative humidity, confirming the role of moist conditions in disease development. The non-significant negative association with temperature suggests that humidity plays a more decisive role, corroborating earlier findings of Venkata Ramesh (2014) and Bajaya *et al.* (2022).

CONCLUSION

The present investigation clearly demonstrated that collar rot disease in groundnut exhibits a distinct seasonal pattern, with initiation occurring during the early growth stages of the crop and reaching peak intensity during periods of high relative humidity. The disease onset was observed 20–25 days after sowing, emphasizing the vulnerability of young plants to soil-borne pathogens. Correlation analysis indicated that relative humidity significantly influenced disease development, whereas temperature showed a non-significant negative association. These findings highlight the critical role of weather parameters, particularly humidity, in governing the temporal dynamics of collar rot disease under field conditions. The identification of the disease onset and peak period provides valuable insight for scheduling timely preventive and control measures, such as seed treatment, soil management, and need-based fungicidal application. Overall, the study underscores the importance of weather-based disease surveillance as an effective tool for minimizing yield losses and improving sustainable groundnut production in collar rot–prone areas.

Table 1: Collar rot disease incidence in groundnut.

SMW	Date	Disease incidence/10 Plant 2023 (%)	Mean Temperature (°C)	Mean Humidity (%)
22	28 May - 03 Jun	0.00	31.0	60.6
23	04 Jun - 10 Jun	0.00	32.1	57.6
24	11 Jun - 17 Jun	0.00	33.0	56.6
25	18 Jun - 24 Jun	0.33	30.7	74.9
26	25 Jun - 01 Jul	2.66	32.0	73.4
27	02 Jul - 08 Jul	6.33	32.1	72.6
28	09 Jul - 15 Jul	8.33	30.9	78.5
29	16 Jul - 22 Jul	15.99	31.9	75.6
30	23 Jul - 29 Jul	18.66	29.9	84.1
31	30 Jul - 05 Aug	13.33	29.1	84.1
32	06 Aug - 12 Aug	10.66	29.2	77.6
33	13 Aug - 19 Aug	6.99	29.6	73.7
34	20 Aug - 26 Aug	3.66	29.9	72.8
35	27 Aug - 02 Sep	2.99	29.9	66.9
36	03 Sep – 09 Sep	1.99	31.8	59.4
37	10 Sep – 16 Sep	00.33	30.7	70.9
Correlation coefficient between disease incidence and abiotic factors				
Mean Temperature (°C)				-0.4614
Mean relative humidity (%)				0.7844

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