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Occurrence of early leaf spot disease (*Cercospora arachidicola* Hori.) of groundnut (*Arachis hypogaea* L.) in Bikaner region of Rajasthan

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Abstract

Groundnut (*Arachis hypogaea* L.) is the major oil seed legume crop in the world. The production and productivity of groundnut is highly affected by collar rot, early leaf spot, Late leaf spot, rust and stem rot diseases. Among the foliar fungal diseases, early leaf spot (ELS) caused by *Cercospora arachidicola* Hori is one of the most destructive disease in Rajasthan. The early leaf spot infected leaves of groundnut was found to produce typical symptoms, such as presence of light brown to black circular to irregular lesions with chlorotic hallow on the upper surface of the leaves. A proper investigation needs a perfect scrutiny. So, the survey was carried out during *Kharif*-2019 in the three major groundnut growing *tehsils* (Nokha, Lunkaransar and Shri Dungargarh) of Bikaner district revealed that none of the locations were free from the disease. However, maximum disease intensity of early leaf spot was observed in Shri Dungargarh *tehsil* (25.87%) followed by Lunkaransar *tehsil* (19.32%) at the crop age 45-60 days after sowing.

Keywords: Occurrence, early, disease, *Cercospora arachidicola* Hori, *Arachis hypogaea* L.

Introduction

Groundnut (*Arachis hypogaea* L.) also known as peanut or earthnut which belongs to the sub family *Papilionaceae* of the family *Leguminosae*. It is an annual legume native to South America. The Portuguese apparently introduced it to West Africa and then to south western India in the 16th century from Brazil. It is now grown in most tropical, sub-tropical and warm temperate regions of the world between 40° North and 40° South latitudes. Groundnut is unique among all the leguminous crops and designated as “wonder legume” in that after flowering, fertilization and fruit set, the pegs (Gynophores) elongate and penetrate the soil (positively geotropic) where the fruit enlarge and matures (Basu and Singh, 2004) ^[1].

Globally India ranks first in groundnut acreage and second in production. The total area under groundnut cultivation in India was 39.31 lakh hectares with the total production of 68.63 lakh MT and average productivity of 1,745 kg ha⁻¹ during the year 2018-19. The major groundnut area in India comprises marginal lands where the crop is grown under rainfed conditions. Eighty per cent of the total groundnut area is confirmed to five states *viz.*, Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra. The rest of the area and production is distributed mainly in the states of Rajasthan, Uttar Pradesh, Madhya Pradesh, Punjab and Orissa. Groundnut is cultivated during *kharif* season (June-July to September- October) mostly under rainfed conditions with few protective irrigations (Anonymous, 2019) ^[2].

Groundnut cultivated area in Rajasthan was 7.34 lakh hectares, with production of 16.12 MT and productivity 1580 kg ha⁻¹ during the year 2018-19. Groundnut is mainly cultivated in Bikaner, Hanumangarh, Jodhpur, Churu, Nagaur, Sikar and Jaipur districts of Rajasthan. In Bikaner district, the area under groundnut cultivation increasing day by day due to its high selling price. Bikaner district has grown maximum area of groundnut (2.45 lakh ha), with total production 5.29 lakh tonnes and productivity 2159 kg ha⁻¹ during 2018-19 (Anonymous, 2019) ^[2].

Groundnut crop is suffered from several biotic factors *viz.*, fungal, bacterial and viral diseases that limit its production and productivity. However, only a few are economically important in India, such as fungal diseases like early leaf spot (*Cercospora arachidicola*), late leaf spot (*Cercosporidium personatum*), collar rot/crown rot (*Aspergillus niger* and *A. pulverulentus*), dry root rot/dry wilt (*Macrophomina phaseolina*) and stem rot (*Sclerotium rolfsii*).

Bacterial and viral diseases like bacterial wilt (*Pseudomonas solanacearum*), Peanut bud necrosis virus (PBNV) and groundnut mottle and clump virus (GMCV) also causes significantly yield losses.

The major constraints of groundnut production are diseases. Among the fungal diseases of groundnut, the early leaf spot caused by *Cercospora arachidicola* is the major disease at early stage of groundnut crop in Rajasthan. The yield losses due to this disease could be as high as 30-50 per cent (Subrahmanyam *et al.*, 1980, Damicone *et al.*, 1999; Mohammed, 2004) [3, 4, 5]. The disease infects crop directly as well as indirectly and results in huge losses due to leaf defoliation, disruption of photosynthesis and fewer pods that are inferior in quality (Waliyar *et al.*, 2000) [6]. Losses are even more when crop is unsprayed. Leaf spot alone reduces 43.01 per cent in pod yield, 15.95 per cent in kernel weight and 32.9 per cent in dry matter weight (Ghuge *et al.*, 1981) [7]. The disease is endemic in Rajasthan and causes heavy losses in yield of groundnut crop.

Materials and Methods

Groundnut is one of the most important legume crop of Bikaner district and it is grown in *kharif* season under protected and unprotected irrigations. The survey was conducted in three tehsil of Bikaner district *viz.*, Nokha, Lunkaransar and Shri Dungargarh during *kharif*- 2019. Three villages under each tehsil were selected. Under each village, five farmer's fields were assessed. For recording observations, 25 plants were selected at random at each location and five leaves from each plant (taken randomly) were graded in 9 grades using disease assessment key developed by Subrahmanyam *et al.* (1982) [8] as mentioned below.

Per cent leaf area infected	Grade
0	1
< 1 to 5	2
< 6 to 10	3
< 11 to 20	4
< 21 to 30	5
< 31 to 40	6
< 41 to 60	7
< 61 to 80	8
< 81 to 100	9

Per cent disease intensity of the each plant was calculated by following formula (Wheeler, 1969) [9].

$$PDI = \frac{\text{Sum of all numerical ratings}}{\text{Total number of leaves examined} \times \text{Maximum rating}} \times 100$$

Finally, over all mean intensity on 25 plants was calculated for each location.

Results and Discussion

The leaf spots appeared 40-50 days after sowing and initiated as small chlorotic spots over the leaflets. After 5 days, these yellow spots were developed into brown mature sporulating spots. The spots developed a clear yellow halo around the sub circular spots. The spots were dark brown at the upper surface

of leaf and light in colour at the lower surface. The spots were 1-10 mm in diameter (Figure-1)

Survey was conducted in three tehsil of Bikaner district *viz.*, Nokha, Lunkaransar and Shri Dungargarh during *kharif* 2019 (Figure -2). Three villages under each tehsil were included. Under each village, five farmer's fields were assessed for the disease intensity. The early leaf spot disease intensity was recorded by using modified 0-9 disease rating scale developed by Subrahmanyam *et al.* (1982) [8]. The results are presented in Table-1.

It was revealed from Table-1 that disease intensity varied from 22.72 to 28.57 per cent in Shri Dungargarh tehsil, 17.89 to 20.83 per cent in Lunkaransar tehsil and 14.52 to 17.31 per cent in Nokha tehsil at the age varied from 45 to 60 days after sowing.

The maximum disease intensity observed in Derajsar 28.57 per cent and minimum disease intensity was observed in Rasisar 14.52 per cent. The overall mean of three tehsils were 20.32 per cent.

Similarly Nath *et al.*, (2010) [10] surveyed the cercospora leaf spot disease in Mirzapur district of Uttar Pradesh and observed intensity of the disease in different areas, ranged from 13 to 22% in the month of September and 35 to 45% in October during 2009. Disease intensity ranged from 13 to 24% in September and 33 to 42% in October during 2010. Early leaf spot disease intensity varied and ranged from 9.35 to 22.48% in Pothwar region of Punjab as studied by Muhammad and Khola (2018) [11] was conforming with the findings of present survey.

Table 1: Per cent disease intensity of early leaf spot of groundnut incited by *Cercospora arachidicola* in Bikaner district during *kharif*- 2019

S. No.	Tehsil	Village	Crop stage	Disease intensity (%)
1.	Shri Dungargarh	Sudsar	50 DAS	22.72
		Seruna	45 DAS	26.31
		Derajsar	55 DAS	28.57
			Mean	
2.	Lunkaransar	Rojhan	55 DAS	20.83
		Phooldesar singas	50 DAS	19.23
		Kankarwala	45 DAS	17.89
			Mean	
3.	Nokha	Rasisar	60 DAS	14.52
		Parwa	55 DAS	15.52
		Bhamatsar	50 DAS	17.31
			Mean	
		Over all Mean		20.32

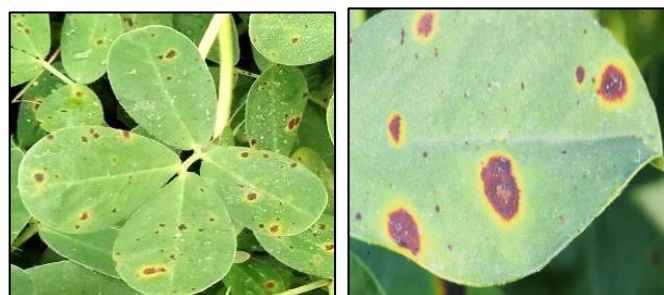


Fig 1: Symptoms of early leaf spot disease



Fig 2: Survey of groundnut in Bikaner district during *kharif*- 2019

Conclusion

A proper investigation needs a perfect scrutiny. So, the survey was carried out to monitor the disease intensity in three groundnut growing tehsils of Bikaner district namely Nokha, Lunkaransar and Shri Dungargarh during *kharif* 2019. The maximum disease intensity observed in Derajsar 28.57 per cent and minimum disease intensity was observed in Rasisar 14.52 per cent. The overall mean of three tehsils were 20.32 per cent.

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