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Survey of five clusterbean growing districts of Rajasthan to know the status of dry root rot caused by *M. phaseolina*

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Abstract
A total of 90 fields from five districts covering ten tehsils with 30 villages of Rajasthan were surveyed. The survey results revealed that the dry root rot caused by *Macrophomina phaseolina* is an important pathological problem, mainly in clusterbean growing districts and dry root rot incidence appeared in all the surveyed districts. Dry root rot infected plants appeared in patches in all the affected fields. The mean maximum dry root rot incidence was recorded in Bikaner (25.52%) followed by Churu (22.39%), Sikar (21.09%), Jaipur (18.39%) and Jhunjhunu (17.50%) district. The disease incidence appeared in patches in all the affected fields during the survey wherever clusterbean crop has been grown regularly. The results of the study also revealed that per cent dry root rot incidence varied from location to location and variety to variety. As compare to improved varieties, local varieties were found to be more susceptible to infection of *M. phaseolina*. Variation in dry root rot incidence was also observed among the soil types. Sandy soils were more conducive to the pathogen *M. phaseolina*.

Keywords: Lentil, fusarium, fungicides, evaluation, neem

Introduction
Clusterbean [*Cyamopsis tetragonoloba* (L.)], eminently known as guar, is a deep-rooted annual legume crop of family *Leguminosae* (*Fabaceae*) known for its drought and high-temperature tolerance (Kumar and Rodge, 2012) [4]. It is figured as a high-valued cash crop within the arid and semi-arid regions due to its drought robustness and multiple uses and has occupied a special place in the commercial scene due to its gum. The Indian arid zone area is deficient in moisture and nutrient content. However, it has an ample amount of sunshine and optimum agro-climatic conditions for the successful cultivation of clusterbean. Clusterbean is a source of nutrients, especially nitrogen, of poorly fertile soil through biological nitrogen fixation. Thus, it plays a vital role in sustainable agriculture. It further needs little surface water, copious sunshine, and lower relative humidity during the cropping season (Pathak and Roy, 2015) [7].

Globally, India is the preeminent clusterbean producing country and covering about 80% of production. Due to the heavy demand for guar gum in the international market, it is also being introduced under progressive growing areas like Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, and Chhattisgarh. Among all the clusterbean producing states in India, Rajasthan is the largest clusterbean producing state because it dominates the Indian production scenario by contributing 70 per cent of its total production, followed by Haryana Gujarat. The production of the clusterbean crop has been stagnant because of its cultivation under rainfed areas, marginal and sub-marginal lands, low soil fertility, and biotic stresses. Aong biotic stresses diseases, insects, nematodes, and parasitic weeds are account for significant crop losses. The significant diseases of clusterbean are *Alternaria* blight, Anthracnose, Dry Root rot, Bacterial blight, and Powdery mildew. Among these diseases, dry root rot is incited by *Macrophomina phaseolina* (Tassi) Goid has become a major biotic threat in several regions of the country and causes considerable economic yield losses. Because clusterbean is generally raised under moisture stress conditions and high temperature, which is conducive to developing dry root rot disease, this disease was not of much significance in clusterbean earlier; however, it has become a significant threat to clusterbean production nowadays due to altered weather conditions, mainly due to longer drought spells and the formidable nature of its pathogen.

M. phaseolina is a non-specialized fungus well known for its survival in seed, stubble, and soil-borne nature, attacking about 500 host species in more than 100 families of economically important crops throughout the world (Mihail *et al*., 1995, Purkayastha *et al.*, 2006). *Macrophomina* known as a polyphagous pathogen causes dry root rot or charcoal rot disease in several economically important crops such as legumes and vegetables (Kaur *et al*., 2012; Kumar *et al*., 2017) [4, 5]. It is a soil-borne fungus that survives in soil for prolonged periods (Dhingra and Sinclair, 1978). Low soil moisture is reported to increase growth and enhance the survival of *M. phaseolina* in soil (Short *et al*., 1980). The evidence suggests that it is primarily a root inhibiting fungus and produces tuber or cushion-shaped 1-8 mm diameter black sclerotia. These sclerotia serve as a primary means of survival (Mirza, 1984, Kaisar *et al*., 1988) [6, 3].

Materials and Methods

Survey and incidence of disease

Survey in major clusterbean growing districts of Rajasthan *viz*., Bikaner, Churu, Jaipur, Jhunjhunu and Sikar was undertaken during the *Kharif* season of 2019 and 2020. To assess the disease incidence, under each district, two tehsil were selected, under each tehsil three villages were selected and under each village three farmers fields were selected and, in each field, five spots of one square meter area were marked diagonally at randomly to cover entire field. While surveying, data on variety grown, type of soil prevalence in the area also observed. Diseased and healthy plants were counted in each spot and the per cent disease incidence was calculated as per formula given below.

$$\text{Per cent disease incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants observed}} \times 100$$

Also, the infected plants showing the typical symptoms of dry root rot due to infection with *M. phaseolina* were collected along with rhizosphere soil to isolate the pathogen. The other information related to soil type in which the crop is grown; irrigation situation and the variety of clusterbean cultivated were also recorded in the respective survey fields.

Results and discussion

Survey, occurrence and distribution of dry root rot of clusterbean in major crop growing areas of Rajasthan during the survey (*Kharif* 2019-2020)

A field survey was conducted during *Kharif*, 2019 and 2020 in major clusterbean growing districts of Rajasthan to assess the extent of dry root rot incidence and collect diseased samples infected by *Macrophomina phaseolina* (Tassi) Goid. A total of 90 fields from five districts covering ten tehsils with 30 villages of Rajasthan were surveyed. The survey revealed that the dry root rot caused by the *Macrophomina phaseolina* is an important pathological problem, mainly in clusterbean growing districts. Dry root rot incidence appeared in all the surveyed districts and infected plants due to dry root rot appeared in patches in all the affected fields. It is apparent from data depicted in Table 4.1 and fig 4.1a; 4,1b that average dry root rot incidence in different districts varied from 17.50 to 25.52 per cent, and the overall mean of dry root rot incidence of five surveyed districts was 20.98 per cent. It is evident from Table 1 that the mean maximum dry root rot incidence was recorded in Bikaner (25.52%) followed by Churu (22.39%), Sikar (21.09%), Jaipur (18.39%) and Jhunjhunu (17.50%) district. No single district and location was completely free from the dry root rot incidence in the surveyed districts. The survey results also indicated that the disease incidence recorded was more under rainfed (25.52) condition, while, under irrigated conditions, disease incidence (17.50%) was less than rainfed conditions. Variation in soil types was also found among the surveyed districts, and maximum disease incidence was recorded in sandy soil.

The observations of dry root rot incidence are presented in Table 2 also recorded on twelve improved and local clusterbean varieties on farmer's field during the survey. Out of twelve cultivars grown on farmer's fields, no cultivar found free from the dry root rot incidence and the maximum disease incidence was recorded in local cultivar *i.e.* 20.0 per cent, followed by RGC-986 (18.50%), HG-2-20 (14.05%), RGC-936 (13.55%), RGC-1003 (10.23%), GC-1 (7.25%), RGC-1038 (6.10%), RGC-1066 (5.15%), RGC-1002 (5.10%), RGC-1055 (3.90%) and lowest disease incidence (3.15%) was recorded in RGC-1017 cultivar.

Table 1: Status of dry root rot incidence in clusterbean growing districts of Rajasthan during the survey (*Kharif* 2019-2020)

District	Tehsil	Village	Situation	Cultivar	Soil type	Disease incidence (%)
Bikaner	Bikaner	Beechwal, Gadhwala, Napasar	Rainfed	Local, RGC-986 RGC 1033, HG 2-20	Sandy loam	23.20
	Loonkaransar	Phuldesar Sahniwala, Udana	Rainfed	Local, RGC-936 RGC 1033	Loamy sand	27.85
Mean						**25.52**
Churu	Rajgarh	Chandkothi, Janau Khari Norangpura	Rainfed	Local	Sandy loam	23.23
	Sardarsahar	Mitasar, Rajasar, Swai	Rainfed	Local	Sandy loam	21.55
Mean						**22.39**
Jaipur	Jaipur	Kalwar, Lalpura, Pachar	Rainfed	Local, RGC- 1038 RGC- 1066,	Sandy loam	19.23
	Rainwal	Basri Khurd, Pachlodiya Manda bheem singh	Rainfed	Local, RGC- 1055, RGC-1066	Clay loam	17.55
					Mean	**18.39**
Jhunjhunu	Jhunjhunu	Abusar, Khajpur Marigsar,	Sprinkler	Local, RGC-1055, RGC- 1033	Sandy loam	16.68
	Malsisar	Dhanuri Shivpura, Shobha ka Bas	Rainfed	Local, RGC-1038	Sandy loam	18.32
Mean						**17.50**
Sikar	Sikar	Khud, Lakshmangarh, Shivsingpura	Sprinkler	Local, RGC-1038, GC-1, HG-2-20	Sandy loam	19.57
	Dantaram garh	Samer, Govati, Bai	Rainfed	Local, RGC-986, RGC-1002, RGC-1002	Sandy loam	22.55
Mean						**21.09**
Over all mean						**20.98**

Table 2: Dry root rot incidence in different cultivars recorded at farmer's field during the survey (*Kharif* 2019 and 2020)

S. No	Cultivar	No. of Fields Observed	PDI% (Mean)
1	RGC-986	5.0	18.50
2	Local	18.0	20.00
3	RGC-936	3.0	13.55
4	RGC-1033	5.0	10.23
5	RGC-1055	5.0	3.90
6	RGC-1038	6.0	6.10
7	RGC-1066	4.0	5.15
8	RGC-1003	5.0	10.13
9	RGC-1017	5.0	3.15
10	RGC-1002	6.0	5.10
11.	GC-1	6.0	7.25
12.	HG-2-20	5.0	14.05

In the present study, it evident from survey data, dry root rot incidence varied from locality to locality. Soil type, varieties grown, environmental conditions and prevalence of the different pathogen isolates in their virulence could be the reason for the variation in the extent of the dry root rot incidence observed in the present study.

Several earlier workers support the present findings. Mawar and Lodha (2006) did a regular survey for standing rainfed annual crops, including clusterbean at the central research farm, Jodhpur and observed dry root rot incidence ranged from 13–46 per cent on these crops. Similarly, Vengadeshkumar (2019) [9] conducted a survey on cowpea root rot disease incidence in major cowpea growing regions in Tamil Nadu. Their survey data revealed that root rot incidence varied from locality to locality, variety to variety and rainfed to irrigated conditions and observed higher levels of disease incidence in the rainfed crop than that of the irrigated crop. Jimenes, 2011 also observed similar findings regarding the highest *M. phaseolina* root populations in black soils, followed by loamy sand and loam soil textures. On the contrary, the crop grown in sandy loam soil registered higher root rot incidence than clay soil (Rettinasababady and Ramadoss, 1999) [8]. Balabaskar *et al*. (2015) [2] and Thirunarayanan *et al*. (2017) [9] also conducted a survey to assess the root rot incidence in sesame and also found similar finding that dry conditions are more prevalent in the rainfed conditions and caused more damage because of the increased number of sclerotia under lower rainfall conditions.

Out of twelve cultivars grown on farmers' fields, no cultivar found free from dry root rot incidence and the maximum incidence was recorded in local cultivar *i.e.* 20.0 per cent, followed by RGC-986 (18.50%), HG-2-20 (14.05%), RGC-936 (13.55%), RGC-1003 (10.23%), GC-1 (7.25%), RGC-1038 (6.10%), RGC-1066 (5.15%), RGC-1002 (5.10%), RGC-1055 (3.90%) and the lowest disease incidence (3.15%) was recorded in RGC-1017 cultivar. Anonymous (2019) [1] conducted a field survey in the Bikaner district to assess the extent of dry root rot incidence in clusterbean cultivar grown on farmers field, and recorded maximum dry root rot incidence was recorded in local cultivar (18%) followed by RGC-986 (15%) and RGC-936 (10%), these results are accordance with the present findings.

References

1. Anonymous. Annual report arid legumes, ICAR-IIPR, Kanpur 2018.
2. Balabaskar P, Renganathan P, Sanjeevkumar K. Occurrence of sesame root rot disease in Cuddalore district of Tamil Nadu and analysis of the variability in cultural characteristics and pathogenicity among isolates of *Macrophomina phaseolina* (Tassi) Goid. European J. Biotechnol. Biosci 2015;3(8):55-59.
3. Kaisar SAKM, Das SN. Physical factors that influence the growth and spread of charcoal rot pathogen (*Macrophomina phaseolina*) infecting maize. J Phytopathol 1988;123:47-51.
4. Kumar D, Rodge AB. Status, scope and strategies of arid legumes research in India: A Review. J. Food Leg 2012;25:255-272.
5. Kumar P, Gaur VK, Meena AK. Screening of different *Macrophomina phaseolina* on susceptible (RMG-62) variety of mungbean. Int. J Pure Appl. Biosci 2017;5:698-702.
6. Mirza MS. Occurrence of sunflower diseases in Pakistan in 1980-83. In: Proceedings of the National sunflower workshop, PARC 1984, 31-32.
7. Pathak R, Roy MM. Climatic responses, environmental indices and inter relationships between qualitative and quantitative traits in cluster bean under arid condition. Proceedings of the National Academy of Sciences, India Section B (Biological Science) 2015;85(1):147-154.
8. Rettinasababady C, Ramadoss N. Occurrences of root rot in rice fallow blackgram (*Macrophomina phaseolina*). Legume Res 1999;22:139-140.
9. Thirunarayanan P, Gandhi SS, Kumar R. Occurrence, virulence, and cultural characteristics of *Macrophomina phaseolina* causing root rot of sesame from Cuddalore District of Tamil Nadu. Bio sci. Trends 2017;10(45):9264-9269.
10. Vengadeshkumar L, Kalaiselvi M, Sanjaygandhi S, Jaiganesh V. Survey on the incidence of cowpea root rot disease and assessing the cultural characters and virulence of *M. Phaseolina*. Plant Arch 2019;19(1):143-148.