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Research Article

STATUS OF COLLAR ROT IN GROUNDNUT AND IMPACT OF DEMONSTRATIONS ON ITS MANAGEMENT IN DAUSA DISTRICT OF RAJASTHAN

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Abstract: Groundnut (*Arachis hypogaea* L.) is an important oilseed crop in tropical and sub tropical areas of the world. It is mainly grown as oil seed crop in India occupies 35 percent of the total cropped area and 40 percent of total production. Collar rot is caused by *Aspergillus niger* Van Tiegham is an important disease of groundnut and widely distributed in most of the groundnut growing areas, causes annual world yield losses is more than 10 percent and up to 85 percent crop losses as recorded in India. Locally the collar rot of groundnut is also known as "Kalya" in Dausa is seed and soil borne disease. Field surveys were made on the status of collar rot in the major groundnut growing areas of Dausa district of Rajasthan undertaken during 2013 to 2017. The average collar rot incidence in different blocks of district varied from 7.08 to 11.92 percent. The maximum collar rot incidence (11.92%) was observed in Lalsot block and minimum incidence (7.08%) in Sikrai block where is groundnut is shown as rainfed crop. During five years survey maximum collar rot was in 2015 (11.7%) and minimum (7.1%) was observed in 2017. Front line demonstration (FLDs) play a vital role in boosting up the yield of crop production at farmers field, under the close supervision of KVK`s scientists. Thus, Krishi Vigyan Kendra, Dausa conducted FLDs on management of collar rot with *Trichoderma viride* used as seed dresser @ 10 g/kg kernel during 2009 and 2013 at farmers' fields in three sample villages (Khatwa, Ramjipura and Didwana). The average yield in demonstration (14.47 q/ha), while on farmers` practice field it was (13.23 q/ha) and percent increase in yield was 9.37. Therefore, the use of *Trichoderma* as seed treatment is found effective for collar rot management in groundnut.

Keywords: *Groundnut, Front Line Demonstration, Collar rot, Seed treatment, Trichoderma viride*

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Introduction

Groundnut (*Arachis hypogaea* L.) is an important oilseed crop of tropical and sub-tropical areas of the world. It is mainly grown as oil seed *kharif* crop in India. The Major groundnut growing states of India are Gujarat, Andhra Pradesh, Rajasthan, Tamil Nadu and Punjab. The groundnut was cultivated in 4.59 m ha area with 6.73 mt production having 1465 kg/ha productivity. In Rajasthan the area, production and productivity of groundnut was 0.47 m ha, 0.91 mt and 1943 kg/ha, respectively [1]. The major groundnut growing districts in Rajasthan are Bikaner, Jaipur, Sikar, Churu, Dausa, Udaipur and Nagaur. Groundnut is rich in nutrient source in energy 567 calories per 100 gram and contains health benefiting nutrients, minerals, antioxidants that are essential for optimum health. They compose sufficient levels of monounsaturated fatty acids, especially aleic acid. Peanuts are technically not nutting; naturally peanuts taste good, they are also rich in protein, fat and various healthy nutrients. Many studies show that peanuts may be useful for weight loss and are linked to reduced risk of cardiovascular disease [2]. A groundnut kernel contains 45 percent oil and 26 percent protein. Groundnut kernels are relished either as snack, roasted or salted or raw form or also in the form of peanut butter [3]. The crop is principally cultivated as an oilseed but considerable quantities are used directly for human consumption like other pulses. However, the yield of groundnut is reducing day by day because of various biotic and abiotic factors *i.e*. poor soil fertility, abiotic and biotic stress factors. Goundnut is attacked by many fungal, bacterial and viral diseases, among them collar rot (*Aspergillus niger* Van Tiegham) is one of the most important disease causes annual world yield losses is more than 10 percent [4]. Collar rot is more prevalent in sandy loam soils with low moisture and high temperature [5]. Locally the collar rot of groundnut is also known as "Kalya" in Dausa which is a seed and soil borne disease. This disease was first reported by Jochem [6]. However, Jain and Nema [7] first reported the Aspergillus blight of groundnut caused by Aspergillus niger in India. It is an important disease in the groundnut growing areas of the country. The maximum disease incidence (28-50%) was recorded in Rajasthan [8] and around (55-85%) crop loss is recorded in India [9]. Nowadays disease management is mostly towards biological control. In the past, a lot of work has been carried out on the antagonistic nature of *Trichoderma* sp. [10-12]. Blakeman and Fokkema [13] reported that Trichoderma species are the well-known antagonists, particularly against soil borne pathogens. Hence the present investigation was undertaken using Trichoderma biocontrol agent as seed treatment against collar rot disease of groundnut.

Materials and Methods

During the month of July-August in *Kharif* 2013 to 2017, a preliminary survey was conducted in nearby area fields *i.e*., Dausa, Lalsot, Lawan and Sikrai blocks of Dausa district. In each block a zigzag survey was conducted in groundnut growing areas of different directions and four to six fields per village were selected. Each village/field selected for disease incidence, an area of $1m^2 \times 1m^2$ was marked diagonally across the field at five spots on each farmer's field and percent disease incidence (PDI) was calculated by [(number of diseased plants/total number of plants) x 100] counting the diseased to the total number plants per spot. The plant showing collar rot symptoms was considered as a diseased plant. During the survey, personal discussions were also held with the farmers regarding occurrence and severity of the disease, agronomic practices and field history.

Seed treatment by *Trichoderma* biocontrol agent:

Table-1 *Differences between FLDs and farmers` practices on groundnut*.

Products	Technological intervention	Farmers` practices	Gap (%)
Variety	RG 382, HNG 69, M-13	Unidentified variety (Rasdar from Gujarat)	About 80% more than recommended
Seed treatment	Vitavax power, *Trichoderma viride*	Not in practiced	Full gap (88%)
Method of sowing	Line sowing	Line sowing	No gap
Fertilizer dose	15:60:30 kg NPK/ha	25:70:0 kg NPK/ha	Not as per recommendation
Weed management	Manual weeding	Manual weeding	No gap
Irrigation	Irrigated & Rainfed	Irrigated & Rainfed	No gap
Plant protection measures	Use of clothianidin 50 WDG @ 2.0 g/kg seed as ST for management of White grub	Farmers use Fipronil, Imidacloprid and other insecticides	About 37% gap of white grub management technology

The bio-formulation of *Trichoderma viride* was used as inoculants in seed treatment in powdered form (1.0x107 cfu/g). Seeds were treated with *Trichoderma viride* @ 10 g/kg kernel and used for sowing as per package of practices of agro-climatic zone IIIa of Rajasthan. Each demo was conducted in 0.4 ha and thus, 25 demonstrations were conducted in two years. For the selection of village PRA techniques and for the selection of farmers, purposive sampling from frequently organized group meetings was exercised in each village. Before conducting FLDs, a list of sample farmers was prepared.

During meeting, respective and innovative farmers were selected for technological intervention. Improved technology released from SKNAU, Jobner was adopted, (15:60:30 NPK & 250 kg Gypsum/ha. Seed treatment with *Trichoderma* 10g/kg seed was applied and sowing was done after first shower of rain in the last week of June to first week of July, in the sandy loam soils of Dausa district. Sowing was done at 30 cm row to row and 10 cm plant to plant distance. Observations of disease incidence were recorded 40 days after sowing and yield at harvest in September to first week of October.

The performance of demonstrated technology was compared with farmers` fields practice in the same place. To study the disease incidence 100 plants were selected by randomly placing of quadrate at five places in FLDs plots as well as in farmers` practices plots and 20 plants selected from each quadrate. Yield data from FLDs and farmers` practices were collected after harvesting the crop. After threshing yield was recorded and then converted in to q/ha for further statistical analysis.

Results and Discussion

Gaps between the farmers` practices and recommended technologies of groundnut in district Dausa (Rajasthan) is presented in [Table-1]. Technology gap was observed in case of variety that high yielding varieties available but about 80 percent gap observed in case of varietal adoption. Seed treatment, plant protection measures, seed rate and fertilizer doses *i.e.* not as per recommendations. These gaps reduced productivity of groundnut in the district. Pathak [14] also observed in Black gram that farmers were not aware about recommended varieties instead of high yielding varieties because of unavailability of improved varieties seeds. Due to lack of knowledge about the importance of seed treatment and plant protection measures, farmers` were not adopting these technologies. Consequently, negative effect on yield of crops was observed under farmers` practices. About the study of seed treatment in groundnut for many insect diseases

Survey

Survey for the occurrence of collar rot of groundnut was undertaken during *Kharif* 2013-2017 in Dausa, Lalsot, Lawan and Sikrai blocks of Dausa district. During the survey, discussions were held with the farmers concerned, regarding occurrence and severity of the disease. As a result of this discussion, it was revealed that disease appeared in most of the fields. Wherever, groundnut crop was grown continuously for the last 5-6 years. Extensive survey revealed that the disease was prevalent in varying incidence in all the blocks. In earlier studies Mishra and Ghewande [15] were observed that the collar rot disease was serious problem in sandy loam and medium black soils of Punjab, Andhra Pradesh, Tamil Nadu, Uttar Pradesh, Rajasthan, Orissa, Madhya Pradesh, Karnataka, Maharashtra, Gujarat and Haryana. It was also observed that collar rot disease was more prevalent during rainy season than in post-rainy season [4].

Distribution and incidence of the disease

It is apparent from the data depicted in [Table-2] showed that collar rot incidence was different blocks of district varied from (7.08 to 11.92%). In Lalsot, disease incidence was maximum (11.92%) followed by Lawan Tahsil (9.84%), Dausa Tahsil (9.52%) and least collar rot incidence was observed (7.08%) in Sikrai Tahsil of Dausa district of Rajasthan. The disease was appeared by pre emergence mortality and post emerging mortality (7-45 days old crop). The typical symptoms noticed were rotting of collar region with black mycelial growth and drooping of young seedling and drying of the plants completely. *Trichoderma viride* use as seed treatment, the collar rot incidence was observed 3.64 and 2.3 percent and in untreated check the disease incidence was 13.01 and 11.79 percent in the 2013 and 2014 respectively. The disease reduction percentage was 72.02 and 80.49 percent in *Trichoderma* treated fields in the respective years.

Table-2 *Collar rot disease incidence in major groundnut growing areas of Dausa district of Rajasthan*

Block	Per cent disease incidence					
	2013	2014	2015	2016	2017	Average
Dausa	11.8	8.4	12.4	8.2	6.8	9.52
Lalsot	16	15.6	12.2	7.6	8.2	11.92
Lawan	11	9.6	12.8	8	7.8	9.84
Sikrai	7	8.2	9.4	5.2	5.6	7.08
Average	11.45	8.36	9.36	7.25	7.1	8.7

Table-3 *Gap in grain yield and economics of groundnut seed treatment with Trichoderma viride*

Year	Average yield (q/ha)		Percent increase	Yield gap (q/ha)	Yield Index (%)	Net Return		B:C ratio	
	FLDs	FP				FLDs	FP	FLDs	FP
2009	16.24	15.07	11.89	1.79	17.9	32800	29500	2.64	2.48
2013	12.6	11.4	10.5	1.3	13	61055	40905	4.83	3.71

Table-4 *Effect of Trichoderma use as seed treatment on pod yield of groundnut*

	2013		2014	
	FLD	Check	FLD	Check
Pod yield q/ha	12.7	11.4	16.24	15.07
Collar Rot Incidence	3.64	13.01	2.3	11.79

Conclusion

Field surveys were made on the status of collar rot in the major groundnut growing areas of Dausa district of Rajasthan the average collar rot incidence in different blocks of district varied from 7.08 to 11.92 percent. FLDs on management of collar rot with *Trichoderma viride* used as seed dresser @ 10 g/kg kernel and the average yield in demonstration was recorded 14.47 q/ha, while on farmers` practice field it was 13.23 q/ha and percent increase in yield was 9.37. Therefore, the use of *Trichoderma* as seed treatment is found effective for collar rot management in groundnut. It should be popularized among groundnut growers so that they can be benefited.

Application of research: Study of management of collar rot to increasing productivity and production of groundnut in Dausa district of Rajasthan.

Research Category: Agriculture extension

Abbreviations: FLD; Front Line Demonstration, mt; million ton, m ha; million hectare, cfu; colony forming unit.

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Study area / Sample Collection: Dausa, 303 303

Cultivar / Variety / Breed name: Groundnut (*Arachis hypogaea* L.)

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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