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Efficiency of selected botanicals against *Alternaria* leaf spot (*Alternaria* sp.) on cluster bean (*Cyamopsis tetragonoloba* L.)

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Abstract

The study was conducted during the *Zaid* season 2023 at the Central Research Field, Department of Plant Pathology, SHUATS, Prayagraj, U.P. Leaf spot of cluster bean is caused by *Alternaria* sp. It is one of the major constraints in the production and most trouble some foliar disease affecting all aerial portions of plants. Seven different botanicals treatments are applied as foliar spray viz, Onion bulb extract @ 20%, giant milk weed extract @ 20%, famine milk weed extract @ 20%, *Lantana camara* extract @ 20%, *Eucalyptus globules* extract @ 20%, mancozeb @ 0.2% and along with untreated check were evaluated against the leaf spot. All the treatments were found to significantly reduce the severity of the disease and increase yield. Among all the treatments onion bulb extract @ 20% were significantly superior over the other treatments in reducing *Alternaria* leaf spot intensity and also increasing in growth, yield and cost benefit ratio, as compared to treated check mancozeb @ 0.2% and untreated check.

Keywords: Cost benefit ratio, *Alternaria* sp., foliar spray, cluster bean, onion bulb extract

Introduction

Cluster bean is being grown in India since ancient time. Although believed to be of African origin. It was domesticated centuries ago in the north-western region of the Indo Pakistan sub-continent. Tender green guar pods are important source of nutrition to human being and animals. Cluster bean (*Cyamopsis tetragonoloba*) belongs to the family Fabaceae. It is an important dry land, drought hardy, annual Kharif crop grow widely under rainfed condition for grain, green fodder, vegetable, green manuring and for seed purposes

India accounts for more than three-fourth (about 80 per cents) of the global production of cluster bean. The area under the crop is reported about 5345.9 Hectares with production is about 3286 tones and productivity are 615 (kg/Hectares) during the year 2014-15. Rajasthan is the largest cluster bean producing state in India followed by Haryana, Gujarat, UP, MP and Punjab. Rajasthan has an area of 46.30 lakh hectare, production of 27.47 M tonnes with a productivity of 593 kg/ha during the agricultural year 2014-15. The state contributes about 85 percent of the total area under crop in the country. The district of Bikaner, Jaisalmer, Barmer, Churu and Hunumangarh contributes to higher average about 29.1%, 13.9%, 13.8%, 10.6% and 9.6% respectively (Bhupender and Kumar, 2020) [3].

The production of cluster bean in terms of grain and fodder is limited mostly due to the *Alternaria* blight disease of cluster bean in Northern India and Rajasthan. *Alternaria* blight of cluster bean is also severe which was reported from Pusa (Bihar) and Madras. It suffers from several diseases that cause quantitative and qualitative losses, among them *Alternaria spp.* is an economically important pathogen widely distributed throughout the world and cause devastating disease on field crops (Ambesh *et al.*, 2014) [1].

Alternaria in early stages of infection, the water-soaked spots appear on leaf blade which later turn greyish to dark brown with concentric zonation, demarcated with light brown lines inside the spot on the under surface. The lesions are light to grayish brown. Higher yield losses (43-78%) were recorded when leaves were infected at seedling stage than at old stage. For the assessment of nature of damage, caused by the pathogen, survey is essential.

It also helps in identification of the specific pathogen species and its aggressiveness prevailing in a particular area. During favourable weather conditions for disease development very meager work has been carried out on weather parameters, which are responsible for disease development. There is a positive correlation between weather parameters favourable for progressive development of disease in the crop (Sharma *et al.*, 2020)^[12].

Onion bulb extract is used as to prevent the germination of fungal spores. It consists of chemical compound Quercetin, quercetin 3-glucoside, isorhamnetin - 4 - glucoside present in onion which has antifungal properties and may have inhibited growth of fungi which in turn lead to healthy growth of the plant hence yield also increases, similar findings was reported by Yedida *et al.* (2018)^[19]

Materials and Methods

The present study was conducted at the experimental field of Department of Plant Pathology in Central Research Field, Sam Higginbottom University of Agriculture, Technology and Sciences, during the *Zaid* season of 2023. Field experiment was laid-out in Randomized block design with three replications. Clusterbean crop variety Pusa navbahar was sown in second week of April with spacing of 45 cm and 15 cm between rows and plants, adopted in plot in plot size of 2x1m², respectively. Generally, alternaria leaf spot disease appeared at 35- 40 days after sowing. Observations on alternaria leaf spot disease intensity were recorded on randomly selected five plants of upper, middle and lower leaves from per plot. The alternaria leaf spot was graded on the basis of disease intensity observed on the leaves by applying 0- 6 disease rating scale developed by (Barnet and Hunter, 1998)^[4] as described below.

The disease severity of alternaria leaf spot was recorded before spray, seven days after first spray and seven days after second spray using 0- 6 rating scale and percent disease index (PDI) was calculated using the formula given by Wheeler (1969)^[18].

Application of phyto-extract solution

The fresh leaves and bulb of selected treatments were grinder by pouring some distilled water with the help of mortar and pestle. The extract was filtered through double layered muslin cloth and made into the required concentration by adding distilled water. This formed the standard solution (100%). The phyto-extracts

will be sprayed at the rate of 20% prepared from standard solution.

Statistical analysis

The data obtained from the field experiment were statistically analysed by following the standard procedures (Fisher and Yates, 1989)^[5]. In the experiment Randomized Block Design (RBD) was adopted. The analysis of variance (ANOVA) technique was applied for drawing conclusion from data. The calculated values were compared the tabulated values at 5% level of probability for the appropriate degree of freedom.

Results and Discussion

A field study was carried out to assess on various aspects of Alternaria leaf spot of clusterbean caused by *Alternaria* sp. with reference to evaluation of disease intensity (%), pods yield (q/ha) and cost benefit ratio among the treatments.

The results of the field experiment presented in table no.1 two clearly indicate that the disease intensity was significantly low in all the treated plots compared to the unsprayed control plot after two sprays. Disease intensity was recorded three times before spray, seven days after first spray and seven days after second spray of botanical extracts, respectively. The first spray botanical extract treatment was applied at 40 days after sowing and the second was given at 47 days after sowing an interval of 7 days. Among the treatments the significant reduction in the disease intensity (%) at 45, 60, 75 DAS was recorded in the treatments. The minimum disease intensity (%) of clusterbean was recorded in T₁- onion bulb extract @ 20% (8.46, 12.55, 16.74) followed by T₂- Neem extract @ 20% (15.43, 21.40, 24.35) as compared to other treatments including T₀- untreated control. The maximum number of pods was observed in T₁- Onion bulb extract @ 20% (12.40) followed by T₂- Neem extract @ 1.0% (11.80), as compared to other treatments including T₀- untreated control. The significant increase in yield was obtained in the treatments, T₁- onion bulb extract @ 20% (3.29 q/ha) followed by T₂- Neem extract @ 20% (2.16 q/ha) as compared to other treatments including T₀- untreated control. From cost benefit ratio onion bulb extract @ 20% was statistically found as most economic method over control. While treated check also showed significantly effective for the checking of Plant disease intensity (PDI) and other parameters over control in the field.

Table 1: Effect of treatments on percent disease intensity of Alternaria leaf spot on clusterbean at different time intervals

Treatment no	Treatment names	45 DAS (Before spray)	60 DAS (After 1st spray)	75 DAS (After 2nd spray)	Yield (q/ha)	B:C ratio
T ₀	Control	33.05	41.44	48	1.38	1:1.20
T ₁	Onion bulb @20%	8.46	12.55	16.74	3.29	1:3.62
T ₂	Neem leaf @20%	15.43	21.40	24.35	2.16	1:2.05
T ₃	Giant milk weed @20%	18.86	24.82	29.90	1.93	1:1.73
T ₄	Famine weed @20%	19.12	25.24	30.10	1.79	1:1.53
T ₅	<i>Lantana camara</i> @20%	22.13	28.81	31.38	1.77	1:1.50
T ₆	<i>Eucalyptus globules</i> @20%	22.15	29.23	31.72	1.89	1:1.67
T ₇	Mancozeb	7.30	11.60	15.33	3.41	1:3.56
SEd(+/-)		0.85	3.42	1.83	-	
C.D (5%)		0.47	0.48	0.53	-	

In present study, all treatments showed that they were significantly superior over control. Minimum disease intensity (16.74%) was recorded in T₁- onion bulb extract (20%). The probable reason for such finding might be that the active ingredient Quercetin, quercetin 3- glucoside, isorhamnetin - 4 - glucoside present in onion have antifungal properties and may

have inhibited growth of fungi which in turn lead to healthy growth of the plant and may have increased the yield, Similar findings have reported by Yedida *et al.* (2018)^[19], Sharma *et al.* (2019)^[15] Sharma *et al.* (2020) and Anupriya *et al.* (2021)^[2] So, considering the ecosystem the plant extracts may have inhibited the pathogen, and may have contributed to holistic well being of

plants, consequently resulting in minimum disease intensity(%) of *Alternaria* leaf spot (*Alternaria* sp.) in Cluster bean (*Cyamopsis tetragonoloba* L.)

Conclusions

From the above experimental findings, it can be concluded that the treatment onion bulb extract @ 20% as foliar spray recorded minimum disease intensity (%) of *Alternaria* leafspot (*Alternaria* sp.) of clusterbean (*Cyamopsis tetragonoloba* L.) and maximum number of pods, yield (q/ha) and cost benefit ratio. The present investigation is limited to one crop season (April, 2023 – July, 2023) under Prayagraj agro-climatic conditions, therefore to substantiate the present results more such trials are required in future to validate the findings.

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