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Comparative effect of *Pseudomonas sp*., Neem leaf extract and fungicides against leaf blight *Alternaria alternata* disease of chickpea

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Abstract
An experiment was conducted to evaluate the effect of four chemicals, one bio agents and one plant extract in field condition against *Alternaria alternata* causing leaf blight of chickpea. Under field conditions during *rabi* 2016-2017. Among all the treatments, propiconazole @ 0.1% was found effective in the disease reduction (26.50%), followed by hexaconazole @ 0.1% (27.55%), mancozeb@ 0.2% (28.79%), carbendazim @ 0.1% (28.99%). Among the bioagent and plant extract, *Pseudomonas fluorescens* @ 2.0% was found effective in disease reduction (30.99%) followed by neem leaf extracts @ 20% with (34.64%) and least effective in disease reduction was seen in control. Plant height and yield was also shown highest in propiconazole @ 0.1%, followed by hexaconazole @ 0.1%, mancozeb@ 0.2%, carbendazim @ 0.1%.

Keywords: *Alternaria alternata***,** chickpea, bioagent, fungicides**,** plant extract.

Introduction
Chickpea (*Cicer arietinum* L), also knows as Gram or Bengal gram, is the third most important pulses crop after bean (*Phaseolus vulgaris* L) and pea (*Pisum sativum* L) on world basis, it is of prime importance in the Mediterranean basin and South Asia. Chickpea belongs to the family Fabaceae and subfamily Faboideae. In India chickpea is grown on an area of 8.75 m. ha with a production 8.80 m. tonnes and productivity of 1010kg/ha and yield potential of present-day chickpea varieties exceeds 4.00 ton/ha however, actual average yield is less than 0.80 t/ha. (Anonymous. 2015).
The crop is vulnerable to a number of air-borne and soil-borne diseases, some of which may be devastating. Chickpea suffer from about 172 pathogens consisting of fungi, bacteria, viruses and nematodes. Out of 172 pathogens 38 belong to19 genera of soil- borne fungi. *Rhizoctonia solani, Sclerotium rolfsii, Fusarium oxysporum* f. sp. *ciceri* are the most serious and they are responsible for root rot, collar rot and wilt respectively. Together they may cause losses as high as 60-70 percent when conditions favour the disease development. The foliar disease, which may severely damage the chickpea under favourable condition, are blight caused by *Alternria alternata*, grey mould caused by *Botrytis cinera* and rust caused by *Uromyces ciceri-arietini*. Fusarium wilt (*Fusarium oxysporum* f.sp. *ciceri*) and alternaria blight (*Alternaria alternata)* are the two most important chickpea diseases distributed worldwide. Alternaria blight of chickpea was first noticed 1970-72 from Uttar Pradesh by Vishwakarma and Basuchaudhary (1984) [4].

Materials and method
The present investigation was carried out at the Field Experiment Centre, Department of Plant Pathology, SHUATS, Allahabad (U.P) during *rabi* (2016-2017). The experiment was conducted in Randomized Block Design with 7 treatments. The treatments were replicated three time. Treatments were randomly arranged in each replication divided into 21 plots. The cash plot size was 2*2m. Foliar spray of botanical, bioagent and fungicides were started at onset of the disease and repeated two sprays. The seven treatments were taken as: - Propiconazole (0.1%), Hexaconazole (0.1%), Mancozeb (0.2%), Carbendazim (0.1%), Neem leaf extract (20%), *Pseudomonas fluorescens* (2.0%) and control were used for management of disease. Yield data was recorded and PDI was calculated after each spray by using 0-9 disease rating scale on the basis of percentage area of foliage infected by the pathogen.

Isolation of the pathogen
The pathogen was isolated from the disease infected plants and it was identified as the

Alternaria alternata. Leaf *blight* of chickpea infected leaves was collected. The infected leaves were cut into small pieces (0.5cm^2) surface sterilized with mercuric chloride (0.1%) for 15-30 seconds, rinsed with three changes of sterile distilled water to remove the disinfectant and blotted dry. The sterilized pieces were plated (4 pieces/dish) on potato dextrose agar (PDA) medium in petri dishes under aseptic conditions and incubated at 25 ^{0}C for 2 weeks. For obtaining sufficient quantity of inoculums, pure cultures were obtained by sub culturing. For this purpose, small bits of the fungus will be taken at the tip of a sterilized needle and transferred aseptically to the centre of fresh PDA medium in Petri dishes. The dishes were incubated for 2 weeks at 25 ^{0}C in the dark.

Preparation of plant extract

The fresh leaves were ground in a pestle and mortar by using sterile distilled water. The extract was filtered through double layered muslin cloth and made to the required concentration by adding distilled water.

Table 1: Disease severity scale

Grade	leaf area covered	Reaction
0	No symptoms of on leaves.	Immune
1	Small spots covering 1% or less leaf area.	Highly resistant
3	Spots small (up to 5 mm in size) covering 1-10% of leaf area.	Resistant
5	Spots enlarging covering 11-25% of leaf area.	Moderately resistant
7	Spots coalesce to form big patches covering 26-50% of leaf area. Lesions also produced on stem.	Moderately susceptible
9	Big spots covering 51% or more of leaf area. Lesions also produced on stem and head.	Highly susceptible

Percent Disease Index (PDI) was calculated by using formula given by Wheeler (1969) [5].

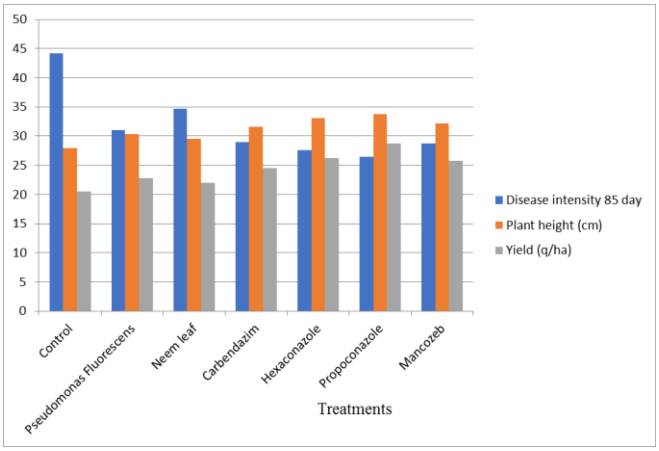
$$PDI = \frac{\text{Sum of numerical disease ratings}}{\text{No. of plants observed}} X \frac{100}{\text{Maximum disease rating}}$$

Results and discussion

The experiment result of the present investigation recorded minimum per cent disease intensity in foliar sprays of propiconazole (0.1%) (26.50%) and yield of 28.75q/ha followed by hexaconazole (0.1%) (27.55%) and yield 26.25q/ha, mancozeb (0.2%) (28.79%) and yield of 25.75q/ha, carbendazim (0.1%) (28.99%) with yield of 24.50q/ha, *Pseudomonas fluorescens* (0.2%) (30.99%) and yield 22.75q/ha, neem leaf extract (20%) (34.64%) with yield 22.00q/ha, where as depicted by control (44.23%) and yield 20.50q/ha, the result of present study are in accordance to the finding of Mesta *et al.* (2009) [2]. All the treatments combination was showed significant different to over control. Plant height (cm) reveals that the maximum Plant height was observed in propiconazole (33.76cm) followed by hexaconazole (33.08cm), mancozeb (32.20cm), carbendazim (31.62cm), *pseudomonas fluorescens* (30.39cm), neem leaf extract (29.59cm), where the all treatments combinations was showed significantly different to over control (27.97cm). Mesta *et al*. (2009) [2] reported yield of sunflower.

Table 2: Treatments Disease intensity Plant height (cm) Yield (q/ha) (85 days)

S. No.	Treatments	Disease intensity(85 days)	Plant height(cm)	Yield(q/ha)
T_0	Control	44.23	27.97	20.50
T_1	*Pseudomonas fluorescens*	30.99	30.39	22.75
T_2	Neem leaf extract	34.64	29.59	22.00
T_3	Carbendazim	28.99	31.63	24.50
T_4	Hexaconazole	27.55	33.08	26.25
T_5	Propiconazole	26.50	33.76	28.75
T_6	Mancozeb	28.79	32.20	25.75
	C.D. (P= 0.05)	1.79	0.68	0.09
	S. Ed. (+-)	0.82	0.31	0.04



Conclusion

The result allows to conclude that the improvement of local knowledge about the use of bio-agent, can permit propose new alternative of pathogen fungi management. Propiconazole (0.1%) was found best and in case of other treatments hexaconazole (0.1%) and mancozeb (0.2%) concentration was found as best treatment to manage for *Alternaria* blight disease of Chickpea. From cost benefit ratio treatment propiconozole followed by hexaconazole treatment were found as most economic method over control as chemical treatment. Yield obtained from propiconozole treated plot as well as hexaconazole treated plot were best comparable to that of control. Since chemicals have better and quick managing efficiency when compared to botanicals. They would be considered as better and can also be recommended to the farmers for the efficient management of *alternaria* blight disease of chickpea.

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