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Short Communication

IN VITRO INHIBITORY EFFECT OF BOTANICALS ON *RHIZOCTONIA BATATICOLA* CAUSING DRY ROOT ROT IN CHICKPEA

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Abstract- Chickpea (*Cicer arietinum*) is a legume crop belonging to the family Fabaceae and subfamily Faboideae. It is the world's second most extensively grown legume after, common bean. Among the several soils borne fungal diseases of chickpea, dry root rot (DRR) caused by *Rhizoctonia bataticola* Taub (Butler) is the most severe diseases in the central and southern zone, where the crop is mostly grown under rainfed. The disease generally appears around flowering and podding stage. The indiscriminate use of most of the synthetic fungicides has created different types of environmental and toxicological problems. This work can help in exploitation of botanicals as novel chemotherapeutants in plant protection. However, garlic (Allium sativum) appeared significantly most effective and suppressed the radial mycelial growth followed by Ashwagandha (*Withania somnifera*) and Adusa (*Adhatoda vasica*) with radial growth of mycelium, recorded as 13.96mm, 44.25mm and 57.94mm respectively.

Keywords- *Cumin, Fusarium oxysporum f.sp. cumini, variability*

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Introduction

Chickpea (*Cicer arietinum*) is a legume crop belonging to the family Fabaceae and subfamily Faboideae. Chickpea, a self-pollinating plant. It has been thought to originate in south-eastern Turkey from where it has spread to other countries of the world. Chickpea (*Cicer arietinum*) is the world's second most extensively grown legume after, common bean. About 90% of the global chickpea production contributed by major chickpea producing countries includes India (67.4%), Australia (6.21%), Pakistan (5.73%), Turkey (3.86%), Myanmar (3.74%) and Iran (2.25%) [1]. Chickpea is attacked by 172 pathogens (67 fungi, 22 viruses, 3 bacteria, 80 nematodes and mycoplasma) from all over the world [3]. Chickpea cultivation is often subjected to considerable yield losses due to insects and diseases varying from 5-10% in temperate and 50-100% in tropical regions [4]. Some of the serious diseases in order of their importance are wilt *Fusarium oxysborum* f. sp. ciceri) wet root rot (*Rhizoctonia solani*), dry root rot (*Rhizoctonia, bataticola*) Ascochyta blight (Ascocthyarabiei) and collar rot (*Sclerotium rolfsii*). Among above diseases of chickpea, dry root rot is emerging as the most destructive constraint to chickpea in terms of productivity and production. *Rhizoctonia bataticola* (Taub.) Butler [Pycnidial stage: *Macrophomina phaseolina* (Tassi) Gold] is a nectrotropic fungus caused dry root rot of chickpea which is emerging as a serious threat to the chickpea production worldwide, which can infect more than 284 plant comprised of monocot and dicots [5]. Dry rot root of Chickpea can be managed by botanicals, which is biodegradable [2]. Also, to reduce dependency on synthetic pesticides, the use of plant-based antimicrobial substances as an alternative method for sustainable agriculture. Use of botanicals is still on a small scale compared to synthetic chemicals; therefore, it is timely to exploit and formulate low cost, effective, free of human hazard and eco-friendly plant based products for the management of pests and pathogens. Isolation of pathogen from diseased samples. The roots of diseased plant showing symptoms were collected from sixteen chickpea growing districts of Chhattisgarh. Samples were washed thoroughly with tap water; small pieces of infected roots were cut with the help of sterilized blade. The pieces were then transferred aseptically to Petriplates containing PDA.

Inoculated Petri plates were incubated at 25±2°C for three to five days and examined at frequent intervals to see the growth of the fungus developing from different pieces. Whenever fungal colonies appeared, they were sub cultured and purified on PDA slants.

Plant extract preparation

Antifungal activity of seventeen plant leaf extracts were studies under *in vitro* condition taking plant leaf dextrose agar medium. The following plants *viz.Tulsi Ocimum sanctum*, Lantanas (*Lantana camara*),Eucalyptu (*Eucalyptus obliqua*), Barbados nut (*Jatropha curcas*), Gokhuru (*Tribulus terrestris*),Ban tulsi (*Ocimum gratissimum*), Onion (*Allium cepa*), Ashwagandha (*Withania somnifera*), Sarpagandha (*Rauvolfia serpentine*), Moringa(*Moringa oleifera*), Marigold (*Tagetes* spp.) Neem (*Azadirachta indica*),Madar (*Calotropis gigantean*) Patharchatta, Garlic (*Allium sativum*), Adusa (*Adhatoda vasica*) were used. PDA without extract was used as control. The preparation of leaf extract medium was same as PDA medium. 20gm leaves of each plant were taken in 100ml water and boiled till it becomes softened. Softened plant leaves were cursed in pastel and mortar, and then extract was filtered. Two gm of dextrose and two gm agar- agar were mixed in filtered leaf extracts and volume was made up to 100 ml and then sterilization was done by autoclaving at 15lbs pressure for 20 minutes [6]. To avoid bacterial contamination a pinch of streptomycin sulphate was added at the time of pouring PDA. In each sterilized Petri plates 20 ml media was poured and allowed to solidify. A 5 mm disc from 4 days old culture of test fungus was placed in the centre of medium. Three replications were maintained in each treatment along with a control. The inoculated Petri plates were than incubated in the BOD incubator at 25 ± 2ºC and observation were recorded after 24 hours of incubation on mycelia growth and calculated percent growth inhibition of pathogen.

Percent inhibition of mycelial growth was calculated by the following formula,

Inhibition % = C–T/C × 100

Whereas

C = Diameter of fungus colony (mm) in control plate
T = Diameter of fungus colony (mm) in treated plates inoculated with respective test pathogen were incubated at 25 ± 2ºC and observation for colony diameter were recorded on 7th day after inoculation. Percent inhibition of growth of test fungi was calculated.

Results and Discussion

Symptomatic dry root rot infected plants were collected from seventeen chickpea growing areas of Chhattisgarh state (Ambikapur, Dhamtari, Bemetara,Bhatapara, Balod, Durg, Dhamdha, Gandai, Kanker, Kawardha, Narayanpur,Patan, Raigarh, Raipur, Rajnandgaon, Saragaon and Sitapur) for isolation and purification of the causal fungus in the laboratory. Among these locations *R.bataticola* was isolated from nine locations (Kawardha, Rajnandgaon, Kanker, Raigarh,Balod, Dhamtari, Durg, Raipur and Saragaon). Out of these isolates, Raigarh isolate was found to be most aggressive, so was further under taken for study. *In vitro* antifungal potency of seventeen plant extracts was evaluated for their fungitoxic effect on *Rhizoctonia bataticola*. The antifungal activity of plant extract was calculated by measuring the radial mycelial growth of fungi. All the treatments differed significantly with control and with each other. However, garlic (Allium sativum) appeared significantly most effective and suppressed the radial mycelial growth followed by ashwagandha (*Withania somnifera*) and adusa (*Adhatoda vasica*) with radial growth of mycelium, recorded as 13.96mm, 44.25mm and 57.94mm respectively. Maximum inhibition (83.48%) was recorded in leaf extract of garlic followed by ashwagandha (47.65%).

Table-1

SN	Common name	Botanical Name	% inhibition
1	Tulsi	*Ocimum sanctum*	17
2	Lantanas	Lantana camara	21
3	Eucalyptu	Eucalyptus obliqua	22
4	Barbados nut	*Jatropha curcas*	20
5	Gokhuru	*Tribulus terrestris*	22
6	Ban tulsi	*OcimumGratissimum*	23
7	Onion	*Allium cepa*	10
8	Ashwagandha	*Withaniasomnifera*	47
9	Sarpagandha	*Rauvolfiaserpentina*	15
10	Moringa	Moringa oleifera	23
11	Marigold	Tagetes spp.	17
12	Neem	*Azadirachta indica*	19
13	Madar	*Calotropis gigantea*	17
14	Patharchatta	*Bryophyllum pinnatum*	22
15	Garlic	*Allium sativum*	83
16	Adusa	*Adhatoda vasica*	31
17	Control		0

Conclusion

It is concluded that out of sixteen botanicals garlic (*Allium sativum*) was found best which was recorded maximum mycelium inhibition of *Rhizoctonia bataticola*.

Application of research: Management of dry root rot of chickpea through botanical extract. Exploitation of botanicals as novel chemotherapeutants in plant protection (as aeco friendly approach)

Research Category: Plant Pathology

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Study area / Sample Collection: Sixteen chickpea growing districts of Chhattisgarh

Cultivar / Variety name: *Cicer arietinum*

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.
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