

Original Research Article

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Efficacy of Bio-agents and Botanical Extracts against Tikka Leaf Spot of Groundnut (*Arachis hypogaea* L) Waldron and J Kohler

Jalde Ravi Kumar* and Sunil Zacharia

Department of Plant Pathology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.), India

*Corresponding author

ABSTRACT

Keywords

Bio-agent,
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The experiment was conducted at the research plot of the Department of Plant Pathology, SHUATS, Prayagraj, U.P. during the *kharif* season of 2019-2020 with RBD having nine treatments replicated thrice to evaluate the efficacy of some botanical extract and bio agents for the management of groundnut tikka leaf spot disease. Fungicides and bio agent used for seed treatment were *Trichoderma viride*@5% and mancozeb (check)@4g/kg, as foliar spray were Neem leaf extract @ 20% Datura leaf extract @ 20% Tulasi leaf extract @ 20% Onion bulb @ 20% Debdaru leaf extract @ 20% Garlic clove @ 20% and Moncozeb @ 2g/lit. The treatments were applied thrice as spray at 30, 45 and 60 DAS. *Trichoderma viride* (S.T.) and Neem leaf extract (F.S.) were the most effective treatment to manage the tikka leaf spot disease, germination percentage, plant height, no. of leaves, and yield of groundnut (t/ha).

Introduction

Groundnut (*Arachis hypogaea* L.) is one of the world's most important oilseed crops (Dwivedi *et al.*, 2003), ranking the 13th most important food crop and 4th most important oilseed crop of the world (Surendranatha *et al.*, 2011), being cultivated in more than 100 countries in six continents (Sharma and Mathur, 2006). India is one of the largest producers of oilseeds in the world and occupies an important position in the Indian agricultural economy. Groundnut is called as the 'King' of oilseeds. It is one of the most important food and cash crops of our country.

Groundnut is also called as wonder nut and poor men's cashew nut. It contains 48-50% of oil and 26-28% of protein, and is a rich source of dietary fiber, minerals, and vitamins.

In India, groundnut production in *Kharif* (2019-20) was 63.11 lakh tonnes (Agricultural Market Intelligence Centre, PJTSAU 2020). National Agricultural Cooperative Marketing Federation of India (NAFED) is holding a 2018 crop peanut stock of around 0.26 million tonnes as on 22nd 2019. NAFED bought 0.71 million tonnes of peanut during 2018-19 from farmers at government fixed MSP of Rs. 4890 per

quintal (NAFED 2019-2020).

Groundnut leaf spot is most common in which early leaf-spots (ELS) *Cercospora arachidicola* and late leaf-spot (LLS) *Cercospora personatum* is mainly prevalent during the *kharif* than the *rabi* season. The spots begin to appear on one to two months old plants. ELS are sub-circular to irregular, 1 to 10 mm in diameter. Lesions are commonly dark (reddish) brown to black on the upper surface and light brown on the lower leaf surface. Leaf spot on upper surface is commonly surrounded by a yellow chlorotic halo. LLS are usually smaller and more nearly circular than early leaf spot lesions, 1 to 6 mm in diameter and are commonly dark gray or black on the lower leaf surface. There is no yellow halo around them. The LLS is usually more severe than ELS (Sharma, 2006) late leaf spot caused by *Cercosporidium personatum* is the destructive foliar disease in groundnut. The most obvious effect of this disease is the loss of photosynthetic tissue, which leads to premature defoliation. Late leaf spot is almost co-existent with the crop and contributes to significant loss in yield throughout the world (Meena, 2010).

Materials and Methods

In vitro experiment

Different media employed for growth of *Cercospora arachidicola* Potato dextrose agar, Potato sucrose agar, Richards synthetic agar, Czapek dox agar, Carrot dextrose agar, Sabouraud's agar and Oat meal agar.

Field experiment

Study on the "Efficacy of bio-agents and botanical extracts against Tikka leaf spot of groundnut (*Arachis hypogaea* L)" was conducted during *kharif* 2019, at central research farm, Sam Higginbottom University

of Agriculture, Technology and Sciences Prayagraj. There are six treatments including an untreated control and application of foliar sprays was given in the Randomized Block Design. Neem leaf extract (*Azadirachta indica*) @ 20% Foliar spray, Datura leaf extract (*Datura metel*) @ 20% Foliar spray, Tulasi leaf extract (*Ocimum sanctum*) @ 20% Foliar spray, Onion bulb (*Allium cepa*) @ 20% Foliar spray, Debdaru leaf extract (*Polyalthia longifolia*) @ 20% Foliar spray, Garlic clove (*Allium sativum*) @ 20% Foliar spray, Mancozeb @ 75% WP 2g/lit foliar spray and Seed treatment (treated check) and *Trichoderma viride* @ 5% (S.T).

The selected fresh leaves of healthy plants were collected and washed thoroughly with clean water and dried to drain the water. About 10 g of plant leaves were grounded using pestle and mortar by adding same proportion (10 ml) of sterilised distilled water in weight by volume method. The botanical extract thus obtained by grounding was filtered through muslin cloth and the extract was diluted by adding sterilised distilled water to get required concentration. The mancozeb was weighed 2 gm with the help of weighing machine and mixed thoroughly with 1 lit. Control was maintained without any treatment.

Results and Discussion

Radial Growth of *Cercospora arachidicola* on different media

In the present study table 1 and plate 1 shows that growth of has recorded. The maximum radial growth of *Cercospora arachidicola* was observed on Potato sucrose agar (85mm), Richards agar (83mm), Czapeks dox agar (79mm), Oatmeal agar (77mm), Carrot dextrose agar (65mm), Potato dextrose agar (45mm) followed by, Sabouraud's agar (39mm). Similar finding have been

reported by Surendra *et al.*, (2015); Poornima and Yashoda (2014) and Swamy (2012).

Effect of bio-agents and botanical extracts on seed germination of Groundnut at 15DAS

The result presented in table 2 and depicted in figure 1 revealed that all the treatments were statistically significant as compared to control. At 60 DAS, among the bio-agents and botanicals used the Maximum Per cent seed germination was recorded in T₈ - *Trichoderma viride* 5 % (94.287%), T₁ - Neem

leaf extract @ 20% (93.253%), T₃ - Tulasi leaf extract @ 20% (85.273%), T₆ - Garlic leaf extract @ 20% (91%), T₄ - Onion bulb @ 20% (88.853%), T₂ - Datura leaf extract @ 20% (86.753%) followed by, T₅ - dabdaru leaf extract @ 20% (90.447%), minimum Per cent disease intensity was shown in T₀ - control (83.433%) and the plants treated with T₇ Mancozeb @ 2 gm/lit showed Maximum Per cent seed germination (95.287%) as check control. Similar finding have been reported by Hasan *et al.*, (2016) and Mushrif *et al.*, (2017).

Table.1 Radial Growth of *Cercospora arachidicola* on different media

Media	Radial growth of <i>Cercospora arachidicola</i> (mm)
Potato sucrose agar	85.000
Richards agar	83.000
Czapeks dox agar	79.000
Oatmeal agar	77.000
Carrot dextrose agar	65.000
Potato dextrose agar	45.000
Sabourauds` s agar	39.000
SE(d)	0.816
C.D.(0.05)	1.768

Table.2 Effect of bio-agents and botanical extracts on seed germination (%) of groundnut at 15 DAS

Symbols	Treatment	Germination %
		15 DAS
T ₁	Neem leaf extract @ 20% (F.S.)	93.253
T ₂	Datura leaf extract @ 20%(F.S.)	86.753
T ₃	Tulasi leaf extract @ 20% (F.S.)	85.273
T ₄	Onion bulb@ 20% (F.S.)	88.853
T ₅	Debdaru leaf extract @ 20% (F.S.)	90.447
T ₆	Garlic clove @ 20% (F.S.)	91.000
T ₇	Mancozeb @75% WP 2g/lit(F.S.) and (S.T.) (check)	95.287
T ₈	<i>Trichoderma viride</i> @5% Seed treatment	94.287
T ₀	Control	83.433
	S.Ed(±)	1.408
	C.D. (0.05)	2.991

Table.3 Effect of bio-agents and botanical extracts on plant disease intensity of tikka leaf spot of groundnut at 60 DAS

Symbols	Treatment	PDI		
		30DAS	45DAS	60 DAS
T ₁	Neem leaf extract @ 20% (F.S.)	2.718	7.161	13.621
T ₂	Datura leaf extract @ 20%(F.S.)	3.932	11.571	18.459
T ₃	Tulasi leaf extract @ 20% (F.S.)	3.561	8.369	14.521
T ₄	Onion bulb@ 20% (F.S.)	3.687	10.726	16.390
T ₅	Debdaru leaf extract @ 20% (F.S.)	4.069	12.635	20.553
T ₆	Garlic clove @ 20% (F.S.)	3.566	9.469	15.402
T ₇	Mancozeb @75% WP 2g/lit(F.S.) and (S.T.) (check)	2.615	5.369	9.707
T ₈	<i>Trichoderma viride</i> @5% Seedtreatment	2.701	6.671	10.479
T ₀	Control	5.997	15.579	27.287
	S.Ed(±)	0.371	0.256	0.176
	C.D.(0.05)	0.786	0.542	0.373

Table.4 Effect of bio-agents and botanical extracts on plant height (cm) of groundnut at 60 DAS

Symbols	Treatments	Plant height (cm)		
		30 DAS	45 DAS	60 DAS
T ₁	Neem leaf extract @ 20% (F.S.)	20.007	36.047	48.040
T ₂	Datura leaf extract @ 20%(F.S.)	16.047	31.127	42.060
T ₃	Tulasi leaf extract @ 20% (F.S.)	18.560	34.447	47.227
T ₄	Onion bulb@ 20% (F.S.)	17.337	33.060	46.660
T ₅	Debdaru leaf extract @ 20% (F.S.)	16.613	31.440	43.293
T ₆	Garlic clove @ 20% (F.S.)	18.180	33.713	46.980
T ₇	Mancozeb @75% WP 2g/lit(F.S.) and (S.T.) (check)	22.060	39.020	52.847
T ₈	<i>Trichoderma viride</i> @5% Seed treatment	20.173	36.120	48.820
T ₀	Control	15.680	28.533	38.047
	S.Ed(±)	1.344	0.975	1.659
	C.D.(0.05)	2.849	2.087	3.517

Table.5 Effect of bio-agents and botanical extracts on number of leaves of groundnut at 60 DAS

Symbols	Treatment	No.ofLeaves		
		30 DAS	45 DAS	60 DAS
T ₁	Neem leaf extract @ 20% (F.S.)	46.000	99.333	176.400
T ₂	Datura leaf extract @ 20%(F.S.)	36.067	84.200	166.600
T ₃	Tulasi leaf extract @ 20% (F.S.)	42.467	97.267	175.333
T ₄	Onion bulb@ 20% (F.S.)	40.000	88.133	170.600
T ₅	Debdaru leaf extract @ 20% (F.S.)	44.200	97.867	176.000
T ₆	Garlic clove @ 20% (F.S.)	38.267	86.200	168.600
T ₇	Mancozeb @75% WP 2g/lit(F.S.) and (S.T.) (check)	52.067	113.400	183.533
T ₈	<i>Trichoderma viride</i> @5% Seed treatment	49.400	100.267	179.733
T ₀	Control	31.000	81.800	160.867
	S.Ed(±)	1.828	2.465	2.067
	C.D.(0.05)	3.876	5.177	4.383

Table.6 Effect of bio-agents and botanical extracts on yield of groundnut at 120 DAS

Symbols	Treatment	Yield (t/ha)
		120 DAS
T ₁	Neem leaf extract @ 20% (F.S.)	1.660
T ₂	Datura leaf extract @ 20%(F.S.)	1.278
T ₃	Tulasi leaf extract @ 20% (F.S.)	1.539
T ₄	Onion bulb@ 20% (F.S.)	1.412
T ₅	Debdaru leaf extract @ 20% (F.S.)	1.388
T ₆	Garlic clove @ 20% (F.S.)	1.497
T ₇	Mancozeb @75%WP 2g/lit(F.S.) and (S.T.) (check)	1.775
T ₈	<i>Trichoderma viride</i> @5% Seed treatment	1.673
T ₀	Control	0.833
	S.Ed(±)	0.139
	C.D. (0.05)	0.296

Fig.1 Effect of bio-agents and botanical extracts on seed germination of groundnut at 15 DAS

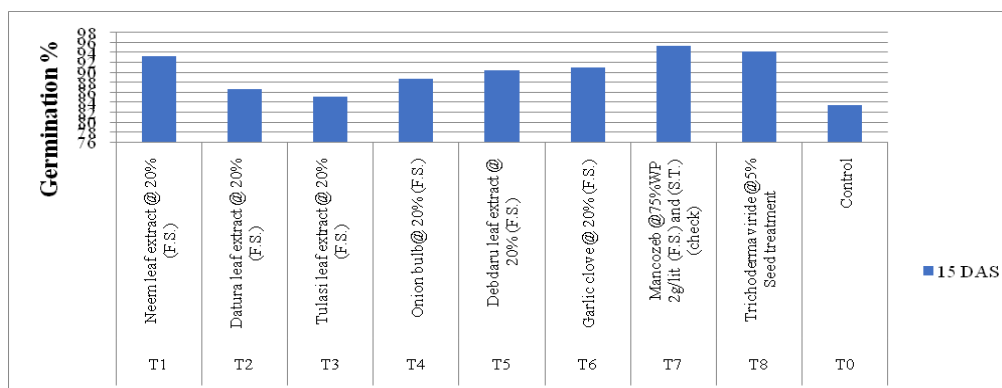


Fig.2 Effect of bio-agents and botanical extracts on plant disease intensity of tikka leaf spot of groundnut at 60 DAS

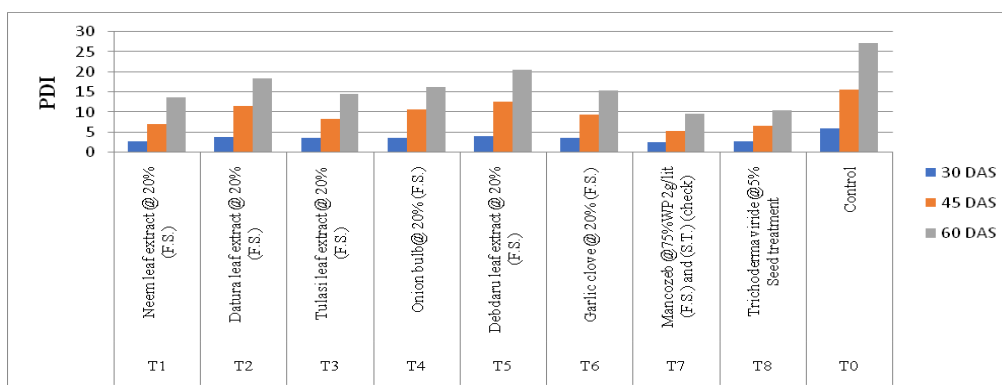


Fig.3 Effect of bio-agents and botanical extracts on plant height (cm) of groundnut at 60 DAS

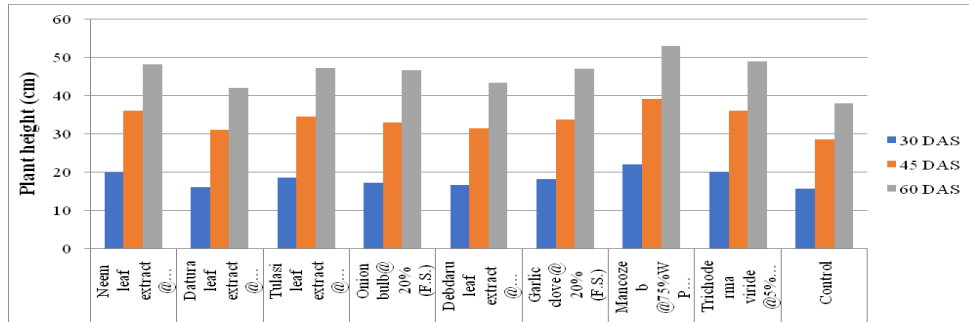


Fig.4 Effect of bio-agents and botanical extracts on Number of leaves of groundnut at 60 DAS

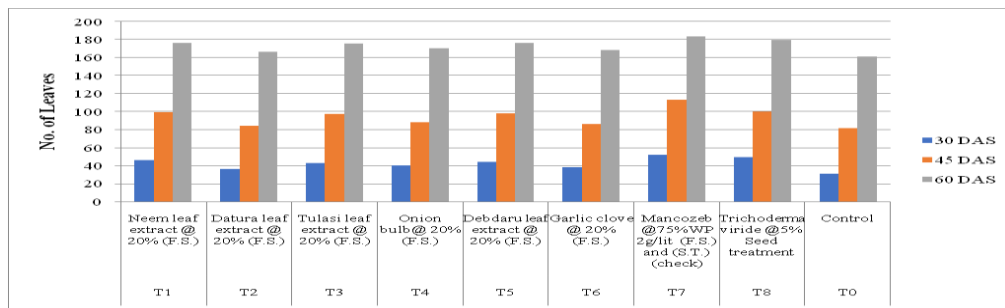


Fig.5 Effect of bio-agents and botanical extracts on yield of groundnut at 120 DAS

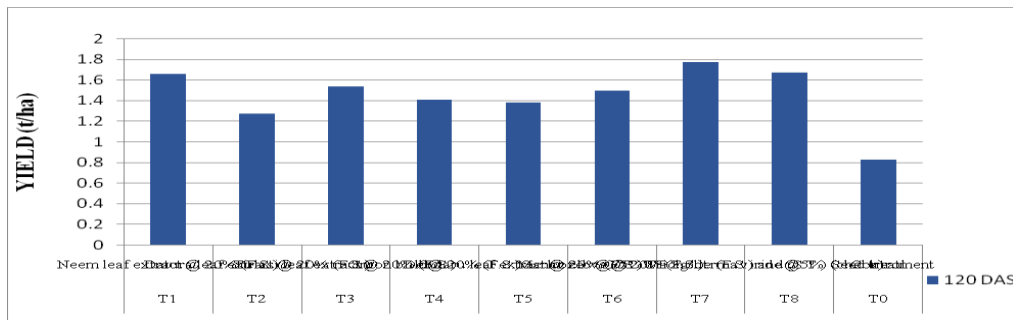
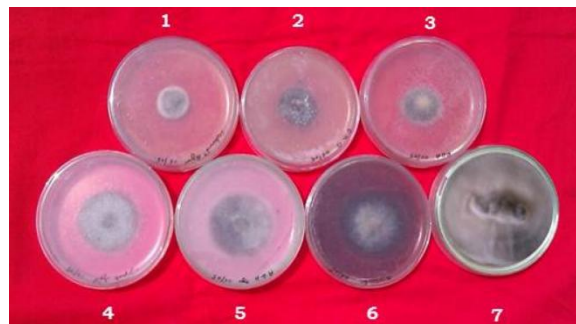


Plate.1 Growth of *Cercospora arachidicola* on different solid media



1. Sabouraud's agar
2. Oat meal agar
3. Potato dextrose agar
4. Czapek's agar
5. Carrot dextrose agar

Effect of bio-agents and botanical extracts on plant disease intensity of tikka leaf spot of groundnut at 60 DAS

The result presented in table 3 and depicted in figure 2 revealed that all the treatments were statistically significant as compared to control. At 60 DAS, among the bio-agents and botanicals used the minimum Per cent disease intensity was recorded in T₈ - *Trichoderma viride* 5 % (10.479%), T₁-Neem leaf extract @ 20% (13.621%), T₃ - Tulasi leaf extract @ 20% (14.521%), T₆ - Garlic leaf extract @ 20% (15.402%), T₄ - Onion bulb @ 20% (16.390%), T₂ - Datura leaf extract @ 20% (18.459%) followed by, T₅ - dabdaru leaf extract @ 20% (20.553%), Maximum Per cent disease intensity was shown in T₀ - control (27.287%) and the plants treated with T₇ Mancozeb @ 2 gm/lit showed minimum Per cent disease intensity (9.707.%) as check control. Similar results have been obtained by Kishore *et al.*, (2001), Ihejirika *et al.*, (2010).

Effect of bio-agents and botanical extracts on plant height (cm) of groundnut at 60 DAS

The result presented in table 4 and depicted in figure 3 revealed that all the treatments were statistically significant as compared to control. At 60 DAS, among the bio-agents and botanicals used the maximum plant height was recorded in T₈-*Trichoderma viride* 5 % (48.820cm), T₁-Neem leaf extract @ 20% (48.040cm), T₃-Tulasi leaf extract @ 20% (47.227cm), T₆-Garlic leaf extract @ 20% (46.980cm), T₄-Onion bulb @ 20% (46.660cm), T₂-Datura leaf extract @ 20% (42.060cm) followed by, T₅-dabdaru leaf extract @ 20% (43.293cm), minimum plant height was shown in T₀ - control (38.047cm) and the plants treated with T₇ Mancozeb @ 2 gm/lit showed maximum plant height (52.847cm) as check control. Similar finding have been reported by Hossain and Hossain

(2013), Uddin *et al.*, (2013) and Ramesh and Zacharia (2017).

Effect of bio-agents and botanical extracts on Number of leaves of Groundnut at 60 DAS

The result presented in table 5 and depicted in figure 4 revealed that all the treatments were statistically significant as compared to control. At 60 DAS, among the bio-agents and botanicals used the maximum no. of leaves was recorded in T₈ - *Trichoderma viride* 5 % (179.733), T₁- Neem leaf extract @ 20% (176.400), T₃ - Tulasi leaf extract @ 20% (175.533), T₆ - Garlic leaf extract @ 20% (168.600), T₄ - Onion bulb @ 20% (170.600), T₂ - Datura leaf extract @ 20% (166.600) followed by, T₅ - dabdaru leaf extract @ 20% (176.000), minimum no. of leaves was shown in T₀ - control (160.867) and the plants treated with T₇ Mancozeb @ 2 gm/lit showed maximum no.of leaves (183.533) as check control. Similar finding have been reported by Tiwari *et al.*, (2004) and Hossain and Hossain (2013) to best control of tikka diseases and increased the no. of leaves.

Effect of bio-agents and botanical extracts on yield of Groundnut at 120DAS

The result presented in table 6 and figure 5 revealed that all the treatments were statistically significant as compared to control. At 120 DAS, among the bio-agents and botanicals used the maximum yield was recorded in T₈-*Trichoderma viride* 5 % (1.673t/ha), T₁-Neem leaf extract @ 20% (1.660t/ha), T₃-Tulasi leaf extract @ 20% (1.539t/ha), T₆-Garlic leaf extract @ 20% (1.497t/ha), T₄-Onion bulb @ 20% (1.412t/ha), T₂-Datura leaf extract @ 20% (1.278t/ha) followed by, T₅-dabdaru leaf extract @ 20% (1.388t/ha), minimum yield was shown in T₀ - control (0.833%) and the plants treated with T₇ Mancozeb @ 2 gm/lit

showed maximum yield (1.775t/ha) as check control. Similar results were found by Hossain and Hossain (2013) and Mane (2012).

In the present investigation on the “Efficacy of bio-agents and botanical extracts against Tikka leaf spot of groundnut (*Arachis hypogaea* L)” *Trichoderma viride* was found best treatment to manage for leaf spot (*Cercospora arachidicola*) of Groundnut. From cost benefit ratio *Trichoderma viride* treatment were statistically found as most economic method over control after chemical treatment. Yield obtained from plot as well as *Trichoderma viride* treated plot were comparable to that of chemical treated one. Since chemicals have many harmful effects on the environment as well as the human health, botanicals and bio-agents would be considered as better as it is eco-friendly also.

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