



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2017; 6(5): 504-506
Received: 03-07-2017
Accepted: 04-08-2017

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Efficacy of Bio-agents and Botanicals against leaf Spot (*Cercospora arachidicola* Hori) of Groundnut (*Arachis hypogaea* L.)

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Abstract

Among all oilseed crops, groundnut (*Arachis hypogaea* L.) is one of the principal oilseed crops of the world. The groundnut is affected by various diseases like early leaf spot, late leaf spot, rust, crown rot or seeding blight, stem rot and collar rot. Among these important fungal diseases, leaf spot caused by *Phaeosariopsis personata* van Arx (late leaf spot) and *Cercospora arachidicola* Hori (early leaf spot) are the most serious diseases causing premature defoliation.

Several diseases like leaf spot, tikka, rust, peanut bud necrosis, collar rot, and anthracnose are constraints to the yield. The yield losses due to leaf spot disease ranges from 10 to 50 per cent. Considering the importance of groundnut crop and losses caused by leaf spots present study was undertaken with an objective to find out the efficacy of bio-agents and botanicals against Leaf spot (*Cercospora arachidicola* Hori) disease of groundnut. A field trial was conducted in *kharif* season of 2016 to test the effect of foliar spray of bio-agents and botanicals against Leaf spot disease of groundnut. The treatments included mancozeb 75%WP 2g/lit (treated check), Garlic extract 20 %, *Trichoderma viride* 5 %, *Pseudomonas fluorescens* 5 %, Neem leaf extract 20 % and Datura leaf extract 20 %. All the treatments used as foliage application and control with water spray. Mancozeb 75% WP 2g/lit was used as treated check and found superior among all the treatments in managing the leaf spot followed by *Trichoderma viride* 5 %.

Keywords: Bio-agents, Disease, Groundnut, Leaf spot, Management, Plant extracts.

Introduction

Groundnut (*Arachis hypogaea* L.) is one of the most important oilseed crop which is known by different names in different languages in English - Groundnut, Monkeynut, Peanut, Goobernut, Bengali – Chiniya-badam, Gujarati – Mungphali, Hindi –Mungphali, Vilayatimung, Marathi – Bhuimug, Sanskrit – Bucha-naka, Tamil – Nelakadalai, Telugu – Nelasena-galu. The groundnut is believed to be native of Brazil and belongs to the family Fabaceae. It is grown widely between latitudes 40⁰ N and 40⁰ S in the semi-arid tropics and is cultivated on a variety of soils pH ranging between 6.0-6.5 are more preferable (Patra *et al.* 2011) [8]. On the world scene, groundnut is grown in several parts of India, China, Asia, Africa, Australia, America, Indonesia, Brazil, and Argentina. Groundnut is an annual oil seed crop of *Kharif* season but also grown in the *Rabi* season where winter is not severe (Hegde, 2008) [1].

India is one of the largest producers of groundnut in the world. Total world production of groundnut in 2013-14 is approximately 39.34 million tonnes. China, India, Nigeria, United States, Burma, and Indonesia are the major producers of groundnut globally. In India, groundnut production in *Kharif* (2012-13) was 26.20 lakh tonnes and 47.15 lakh tonnes in *Kharif* 2013-14 is anticipated. The major producers of groundnut are Gujarat (26.34 %), Andhra Pradesh (19.08 %), Rajasthan (17.68 %), Tamil Nadu (9.54 %), Karnataka (7.63 %), Madhya Pradesh (7.25 %) and Maharashtra (5.34). The area under groundnut in Uttar Pradesh was 0.820 lakh hectares with a production of 2.50 lakh tones and yield 1000 kg/ha in during *Kharif* (2012-13).

The groundnut is affected by various diseases like early leaf spot, late leaf spot, rust, crown rot or seeding blight, stem rot and collar rot. Among the important fungal diseases, leaf spot caused by *Phaeosariopsis personata* (Blerk. and Curt.), van Arx (late leaf spot) and *Cercospora arachidicola* Hori (early leaf spot) are the most serious diseases causing premature defoliation. 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) [9], 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) [6].

Materials and Methods

Studies on the "Efficacy of Bio-agents and Botanicals against Leaf Spot (*Cercospora arachidicola* Hori) of Groundnut (*Arachis hypogaea* L.) in Allahabad (U.P.) carried out with a view to manage the groundnut Leaf spot diseases with the help of bioagents and botanicals. The present investigation carried out during *Kharif* season 2016-17 at the field, Department of Plant Pathology, Sam Higginbottom University of Agriculture, Technology and Science, Allahabad (U.P.) India. There are six treatments including an untreated control and application of foliar sprays was given in the Randomized Block Design. Foliar spray of chemicals and botanicals were started at onset of the disease and repeated mancozeb (2/gm), Garlic extract (20%), *Trichoderma viride* (5%), *Pseudomonas fluorescens* (5%), Neem leaf extract (20%), Datura leaf extract (20%) and control were used for management of disease.

Results and Discussions

Table 1: Effect of various treatments on per cent disease intensity at 90 DAS.

Treatments	30 DAS	60 DAS	90 DAS
T ₀ Control	17.61 (24.81)	38.77 (38.51)	45.42 (42.37)
T ₁ Mancozeb	9.32 (17.78)	14.55 (22.42)	20.59 (26.99)
T ₂ Garlic extract	13.3 (21.39)	26.27 (30.83)	35.13 (36.35)
T ₃ <i>Trichoderma viride</i>	11.31 (19.65)	18.69 (25.61)	31.5 (34.14)
T ₄ <i>Pseudomonas fluorescens</i>	11.51 (19.83)	25.14 (30.09)	31.89 (34.38)
T ₅ Neem leaf extract	13.22 (21.32)	25.96 (30.63)	34.9 (36.21)
T ₆ Datura leaf extract	13.32 (21.41)	26.47 (30.96)	36.15 (36.96)
	12.8	25.12	32.23
F- test	S	S	S
S. Ed. (±)	0.478	0.877	0.896
C. D. (P = 0.05)	1.014	1.858	1.9

(Figures in parentheses are Arc sine transformed values)

Note: Values are average of three replications.

3 Effect of various treatments on per cent disease intensity at 90 DAS.

The result presented in table 1 and depicted in figure 1 revealed that all the treatments were statistically significant as compared to control. At 90 DAS, the plants treated with T₁Mancozeb @ 2 gm/lit showed minimum Per cent disease intensity (20.59%) as check control but among the bio-agents

and botanicals used the minimum Per cent disease intensity was recorded in T₃ - *Trichoderma viride* 5 % (31.5%), T₄ - *Pseudomonas fluorescens* 5 % (31.89%), T₅-Neem leaf extract 20 % (34.9%), T₂ .Garlic extract 20 % (35.13%), followed by, T₆-Datura leaf extract 20% (36.15%), Maximum Per cent disease intensity was shown in T₀ - control (45.42%). Similar results have been obtained by Kishore *et al.* (2001) [4], Ihejirika *et al.* (2010) [3] reported that botanicals (leaf extract) spray recorded lowest leaf spot disease severity while no spray (control) recorded highest.

Table 2: Effect of various treatments on yield (q/ha)

Treatments	Yield (q/ha)
T ₀ Control	4.85
T ₁ Mancozeb	8.28
T ₂ Garlic extract	6.51
T ₃ <i>Trichoderma viride</i>	7.78
T ₄ <i>Pseudomonas fluorescens</i>	7.14
T ₅ Neem leaf extract	6.80
T ₆ Datura leaf extract	5.51
Overall Mean	46.86
S. Ed. (±)	0.16
C. D. (P = 0.05)	0.35

2. Effect of various treatments on yield (q/ha)

The result presented in table 2 and depicted in figure 2 revealed that all the treatments were statistically significant and the mean of maximum yield (q/ha) as compared to control.

Plants treated with T₁Mancozeb @ 2 gm/lit showed maximum yield (8.28q/ha) as check control but among the bio-agents and botanicals used the maximum yield was recorded in T₃ - *Trichoderma viride* 5 % (7.78q/ha), T₄ -*Pseudomonas fluorescens* 5 % (7.14q/ha), T₅-Neem leaf extract 20 % (6.80q/ha), T₂ .Garlic extract 20 % (6.51q/ha), followed by, T₆-Datura leaf extract 20% (5.51q/ha), maximum per cent disease intensity was shown in T₀ - control (4.85q/ha). Similar results were found by Hossain and Hossain (2013) [2], Mane (2012) [5] and Hasan *et al.* (2014). who found the boosting effect of carbendazim 50 % WP @ 0.1% *Trichoderma viride*, *T. harzianum*, *Pseudomonas sp.*, Neem leaf (20%) and Garlic clove (20%) formulation on plant growth prove (evidenced) by the fact that the Pod yield was also found maximum by use of bio-agents and botanicals was found to be the most effective in managing late leaf spot disease.

Conclusion

In the present investigation on the "Efficacy of Bio-agents and Botanicals against Leaf Spot (*Cercospora arachidicola* Hori) of Groundnut (*Arachis hypogaea* L.)" *Trichoderma viride* was found best treatment to manage for leaf spot (*Cercospora arachidicola* Hori) 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, *Trichoderma viride* would be considered as better as it is eco-friendly also.

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