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Bio-efficacy of few plant extracts/botanicals against damping off of brinjal (*Pythium ultimum*)

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Abstract
Brinjal is often found affected by damping off disease in nursery stage. Sowing to the great loss the seedling an investigation was undertaken to manage the damping off disease of brinjal. The experiment was conducted under *in vitro* and pot culture conditions to observe the effects of botanicals against *Pythium ultimum*. Sevan treatments were taken up with three replications and data collected was analyzed using CRD. Minimum mycelial growth (mm) was observed in Neem leaf extract @ 10% (6.96mm) as compared to the untreated controls (29.36 mm). Followed by T_2 – Garlic clove extract (9.56 mm), T_4 – Dhatura leaf extract (10.76 mm), T_5 – Onion bulb extract @ 10% (11.21 mm), T_3- Turmeric extract (12.11 mm), T_6 – Ginger extract (12.87 mm) and T_7- Tulsi leaf extract (13.67 mm). In pot condition sevan treatments were taken up with two replications and data collected was analyzed using RBD. The treatments taken up were in Neem leaf extract, Garlic clove extract, Dhatura leaf extract, Onion bulb extract, Turmeric extract, Ginger extract and Tulsi leaf extract. Seeds were sown in pathogen inoculated soil @ 50 seeds per pot and irrigated daily. Pathogen alone inoculated pots served as control. The observation was recorded on 7th and 14th days after sowing. The results revealed that soil treatment with the botanicals against damping off (*Pythium ultimum*) as compared to check were significant. Maximum germination per cent was recorded in Neem leaf extract @ 10% (69%) as compared to the untreated controls (27%).Followed by Garlic clove extract (63%), Dhatura leaf extract (57%), Onion bulb extract (53%), Turmeric extract (50%), Ginger extract (47%) and Tulsi leaf extract (43%), Neem leaf extract was superior as compared to other treatments.

Keywords: botanicals, brinjal , *pythium ultimum*

1. Introduction
Brinjal or Egg plant or Aubergine (*Solanum melongena* L.) has been cultivated in the country for the last 4000 years. It is widely grown in the warmer regions hemispheres, although it is often as a Mediterranean or Mid-Estern vegetable. Eggplant is a versatile vegetable. Brinjal is one of the widely used vegetable crops by most of the people and is popular in many countries *viz.*, Central, South, South East Asia, some parts of Africa and Central America (Harish *et al.*, 2011). It is native of India and is grown through out the country (Pareet, 2006) [3]. In India, this crop occupies 7.22 lakh hectare area along with annual production of 1344 million tone and productivity 18.6 MT/ hectare. In Uttar Pradesh, the area under cultivation of brinjal is 2.90 ha. Producing 90.80 million tone and the productivity is 7.58 Metric/ha (Anonymous, 2013) [1]. Brinjal is known to have ayurvedic medicinal properties and good for diabetic patients. It has also been recommended as an excellent remedy for those suffering from liver complaints (Shukla and Naik, 1993) [4].

Brinjal diseases have been reported this includes fungal diseases *viz.*, damping off, Phomopsis, blight and wilt, viral diseases *viz.*, mosaic and mottled dwarf and mycoplasma of leaf. Many fungi prevalent in soils can cause damping-off. *Fursarium* spp., *Pythium* spp., and *Phytophthora* spp. are most active in cool, wet soils whereas, *Cylindrocladium* spp. and *Rhizoctonia* spp. are more common in warm, wet soils. The damping off in brinjal is caused by *Pythium* spp., including *P. aphanidermatum*, *P. irregulare* and *P. ultimum* Trow, which can cause pre -emergence damping off and results in seed rot before the plants emerge out of the soil. The post emergence damping off phase is characterized by infection of the young tissues of the collar at the ground level. The infected tissue become soft and water soaked, the collar portion rots and the seedlings ultimately collapse and die. The guaranteed supply of quality seedlings in required quantities is a major pre requisite for stabilized production of Brinjal. While raising seedlings in beds, the farmers face major problem of damping off incited by *Pythium* spp. Therefore, an integrated disease management approach that encompass the use of chemicals, biocontrol agent, and plant extract could be the most economical and effective strategy for controlling the damping off and other soil borne plant diseases. Considering economic importance of the crop and losses caused by disease damping off in Brinjal. They are eco-friendly and easy to handle, which enable to minimize input cost of management of disease.

2. Materials and Methods
In-vitro Experiment
The *in vitro* experiment was laid out in completely randomized design (CRD) with sevan treatments *viz*. Neem leaf extract @ 10%, Garlic clove extract @ 10% , Dhatura leaf extract @ 10%, Onion bulb extract @ 10%, Turmeric

extract@ 10%, Ginger extract @ 10%, Tulsi leaf extract @ 10% and three replications. The antagonistic activity of different botanicals against *pythium ultimum* was assessed by poison food technique Plant extract (10%) were poured at 10 ml and separated into 100 ml autoclaved and cooled PDA in conical flask. The plant extract amended PDA was poured (each 20ml/plate) in sterile glass Petri plates (90 mm dia.) and allowed to cool. Five mm disc of *P. ultimum* was placed on the center of the solidified PDA plate under aseptic conditions. The PDA plates without plant extract and inoculated with the test pathogen served as untreated control. These Petri plates were incubated at 26±2 0^C till the growth of the test pathogen in control plate was fully covered. The radial mycelial growth in all the plates was recorded after incubation at 24, 48, 72, 96 120, 144 and 168 hrs on room temperature and per cent inhibition of mycelial growth over control was calculated by applying the formula by (Vincent,1927) [5].

$$I = \frac{(C - T)}{C} \times 100$$

Where,
Percent reduction in growth of test pathogen
I = Percent reduction in growth of test pathogen
C = Radial growth (mm) in control
T = Radial growth (mm) in treatment

***In-situ* experiment**

In situ experiment (pot culture) was laid out in randomized block design (RBD) with sevan treatments *viz*., Neem leaf extract @ 10%, Garlic clove extract @ 10%, Dhatura leaf extract @ 10%, Onion bulb extract @ 10%, Turmeric extract@ 10%, Ginger extract @ 10%, Tulsi leaf extract @ 10% and two replications. Including inoculated check in the experimental pots of SHIATS, Allahabad in *kharif* season (2015). Each replication consisted of 14 pots. The seeds "*Local Variety* "was sown in August and inoculated with *pythium ultimum* multiplied in sorghum grains before 10 days sown.

Soil treatment of sevan antagonists *viz*. Neem leaf extract, Garlic clove extract, Dhatura leaf extract, Onion bulb extract, Turmeric extract, Ginger extract, Tulsi leaf extract. All treatment were applied at 10 %. Observations were recorded in germination per cent in the respective treatments. Germination percentage was calculated at 7 and 14 DAS, using following formula (Wheeler, 1969):

$$\% \text{ of germination} = \frac{\text{No. of germinated seeds}}{\text{Total No. of seeds}} \times 100$$

3. Results and Discussion

The result presented in table 3.1 revealed that all the treatments were statistically significant and minimum mycelia growth (mm) as compared to control. Among the botanicals minimum mycelia growth (mm) was recorded in T_1 – Neem leaf extract @ 10% (6.96 mm) as compared to the untreated controls (29.36 mm). Followed by T_2 – Garlic clove extract (9.56 mm), T_4- Dhatura leaf extract (10.76 mm), T_5 – Onion bulb extract (11.21 mm), T_3- Turmeric extract (12.11 mm), T_6 – Ginger extract (12.87 mm) and T_7- Tulsi leaf extract (13.67 mm).

All the treatments were found statistically significant over control. They reported that the inhibition mycelial growth of *Pythium ultimum by* neem leaf extract could probably be due to the botanicals inducers which have direct antimicrobial effect and inhibition of mycelial growth of *Pythium ultimum* due to neem leaf extract may have been due to secretion of extracellular cell degrading enzymes such as tannin, limonoid, triterpennoid, azadirectin, which may have helped mycoparasites in the colonization of their host.

Germination Per cent of brinjal at 7 DAS as affected by different treatments

The result presented in table 3.2 revealed that all the treatments were statistically significant and maximum germination per cent as compared to control. Among the treatments maximum per cent germination was recorded in T_1 – Neem leaf extract @ 10% (58%) as compared to the untreated controls (22%). Followed by T_2 – Garlic clove extract (52%), T_4 – Dhatura leaf extract (48%), T_5 – Onion bulb extract (46%), T_3- Turmeric extract (44%), T_6 – Ginger extract (40%) and T_7- Tulsi leaf extract (38%)

Table 1: Mycelial growth (mm) of *Pythium ultimum* as affected by different treatments

Treatments	168 hrs.	Per cent inhibition at 168 hrs
T_0 –Untreated control	29.36	0
T_1 –Neem leaf extract	6.96	75%
T_2- Garlic clove Extract	9.56	67%
T_3 –Turmeric extract	12.11	59%
T_4 – Dhatura leaf Extract	10.76	63%
T_5–Onion bulb Extract	11.21	62%
T_6 – Ginger extract	12.87	56%
T_7 – Tulsi leaf extract	13.67	54%
F-test	S	S
S. Ed. (±)	0.029	0.029
C. D. (0.05)	0.263	0.263

Germination Per cent of brinjal at 14 DAS as affected by different treatments

The result presented in table 3.2 revealed that all the treatments were statistically significant and maximum per cent germination as compared to control. Among the treatments maximum germination per cent was recorded in T_1 – Neem leaf extract @ 10% (69%) as compared to the untreated controls (27%). Followed by T_2 – Garlic clove extract @ 10% (64%), T_4 – Dhatura leaf extract @ 10% (57%), T_5 – Onion bulb extract @ 10% (53%), T_3- Turmeric extract (50%), T_6 – Ginger extract @ 10% (48%) and T_7- Tulsi leaf extract (43%).

All the treatments were found statistically significant over control. They reported that the inhibition mycelial growth of *Pythium ultimum* by neem leaf extract could probably be due to the botanicals inducers which have direct antimicrobial effect and inhibition of mycelial growth of *Pythium ultimum* due to neem leaf extract may have been due to secretion of extracellular cell degrading enzymes such as tannin, limonoid, triterpennoid, azadirectin, which may have helped mycoparasites in the colonization of their host.

Table 2: Germination per cent of brinjal at 7 and 14 DAS as affected by different treatments

Treatments	Per cent germination 7 DAS
T_0 –Untreated control	22
T_1 –neem leaf extract	58
T_2-Garlic clove Extract	52
T_3 –Turmeric extract	43
T_4 – Dhatura leaf Extract	48
T_5–Onion bulb Extract	46
T_6 – Ginger extract	40
T_7 – Tulsi leaf extract	38
F-test	S
S. Ed. (±)	13.101
C. D. (0.05)	8.561

4. Conclusion

Soil treatment with Neem leaf extract @ 10% (botanical) proved to be most effective against damping off showing minimum mycelia growth (29% mm) and maximum germination per cent (69 %). The present studies observed that treatment Neem leaf extract @ 10 % has most effective against damping off of brinjal followed by Garlic clove extract.

5. Reference

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