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EVALUATION OF DIFFERENT BOTANICALS (LEAF EXTRACT) MANAGEMENT OF FUSARIUM WILT OF VEGETABLE PEA

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Abstract: *Pulses have a special role in meeting the protein requirement of predominantly vegetarian in India. It is used as vegetable, pulse and processed pickle, canning, frozen or dehydrated to increase the availability during off season. Use of fungicides is one of the major components in the disease management but regular use of fungicides adverse effect on environmental. The radial growth of the fungus in various treatments was measured and the average diameter of the colony. The 13 leaf extract, only five leaf extract viz., Neem (48.00%), Dhtura (38.00%), Ginger (38.00%), Mustrad (36.00%) and Porthenium (36.00%) proved to be the most effective as they have inhibited the fungus growth. The efficacy various of seed treatment with leaf extract under glass house conditions. The mean of analysis of two years' data revealed that the maximum seed germination (93.33 and 85.53%), minimum wilt incidence (14.25 and 19.95%), maximum disease control (81.59 and 74.16%) and maximum green pods yield (438.33 and 420.83 g/pot) wilt of vegetable pea was recorded in the treatment where seed treatment of Garlic (10%) and Neem (10%).*

Keywords: *Neem, Dhatura, Ginger, colony growth and Fusarium wilt of pea.*

Introduction: Pulse crops play an important role in Indian agriculture. Pulses have a special role in meeting the protein requirement of predominantly vegetarian in India. They form an integral part of diet as source of protein. It is used as vegetable, pulse and processed pickle, canning, frozen or dehydrated to increase the availability during off season. Pea belongs to the family "Leguminosae", sub family "Papilionaceae" and genus *Pisum.* The chromosome numbers are *2n= 14. Pisum sativum* sp. *hortense* L. popularly known as garden pea with local name as "Matar" is one of the most important pulses used as vegetable and canning purpose [1]. Pea is grown mainly as a *Rabi* crop, sown in October and November and harvested in February and March. The major pea growing states in India are Uttar Pradesh and Jharkhand which together share as much as 53% of the total area. Uttar Pradesh ranks first, with 46.9% and Jharkhand 8.9% share in the production of the country [2]. In India, total area under pea cultivation is about 420.9 thousand ha with the production of 4006.2 thousand mt and productivity 9.5 mt ha^{-1}. In Uttar Pradesh, total area under pea crops is about 175.01 thousand ha with production 1877.93 thousand mt. and productivity 10.7 mt ha^{-1} [2].

Pulses are the unique crops for three reasons *i.e.* they have capability to fix atmospheric nitrogen in symbiotic association with root nodule bacterium (*Rhizobium*), pulses are versatile crops to fit in diverse cropping systems and grown during *Rabi* season. To this effect selection of resistant verities against devastating diseases such pea root rot caused by *Aphanomyces euteches*, Fusarum wilt, Downy and Powdery mildews virus and insects [3]. Among the fungal diseases wilt (*Fusarium oxysporum* f. sp. *pisi)*, downy mildew (*Peronospora pisi*), powdery mildew (*Erysiphe polygoni*) and rust (*Uromyces fabae*) are important.

Materials and Methods

Present investigation was carried put during 2009-10. Laboratory experiment was carried out at the Department of Plant pathology, C.S.A University of Agriculture and Technology Kanpur. The efficacy of different leaf extract was tested against *F.o.* f.sp. *pisi* for radial growth and

inhibition on the Potato dextrose agar medium using *in vitro* condition.

Effect of Different Botanicals (Leaf Extract) on Growth and Sporulation of the Pathogen: Hundred gram of fresh leaf material from Neem *(Azadirachta indica),* Datura (*Datura stramonium),* Ginger (*Zingiber officinale*), Mustard (*Brassica nigra*), Parthenium (*Parthenium hysterophorus),* Garlic (*Allium sativum*), Pudina *(Mentha spicata),* Lantana (*Lantana camara*), Arandi *(Ricinus communis),* Tulsi *(Ocimum tenuiflorum*), Onion *(Allium cepa*), Eucalyptus *(Eucalyptus obliqua)* and Madar *(Calotropis gigantea)* were taken and washed thoroughly with running tap water, rinsed with distilled water, air dried and macerated separately with 100 ml of distilled water in a warring blender. The leaf extract was filtered through double- layered muslin cloth and centrifuged at 5000 rpm for 5 minutes. The supernatant was collected and filtered through whatman No. 1 filter paper. Each filtrate was further sterilized and preserved as stock (100%) solution aseptically in number bottles at 5^0C for further use. 2 ml of stock solution of extract was incorporated in 100 ml medium to make 10% concentration of the extract. 150 ml milted PDA was poured in sterilized petri-plates. After solidification, all the plates were inoculated individually with a 5 mm diameter culture disc of *F.o.* f.sp. *pisi.* PDA plates without leaf extracts but inoculated with *F.o.* f.sp. *pisi* served as control. Four times were maintained for all the treatments and plates were incubated at 25±1^{o}C. The colony diameter of the fungus was measured and expresses as per cent inhibition by following formula.

$$\text{Per cent inhibition} = \frac{\text{Colony diameter (mm) in check} - \text{Colony Diameter (mm) in treatment}}{\text{Colony diameter (mm) in check}} \times 100$$

For testing the effect of plant leaves extract on sporulation, *Fusarium oxysporum* f.sp. *pisi* was grown on PDA for 48 hr. at 20^0C and 1.0 cm diameter discs of mycelium were cut and placed in Petri-plates. Aqueous plant leaves extract were placed on these discs and incubated under light for 24 hr. In controls the discs were covered with distilled water. Number of conidia produced per microscopic field was counted. The average for 6 microscopic fields for each replication was counted and compared with that of control.

Seed Treatment with Botanicals (Leaf Extract) Sown in Pot under Glass House Condition: The seeds of variety *"Azad P-3"* were treated with botanicals viz., Neem, Datura, Ginger, Mustard and Parthenium (10% per kg seed). The treated 15 seeds were sown in pots filled with (*Fusarium oxysporum* f.sp. *pisi)* 2% by weight per pot. The experiment was conducted on Completely Randomized Design with four replication under glass house conditions. The observation on seed germination, seedling emergence, wilt incidence and green pods yield (kg/pot) was recorded. The experiment was carried out for two consecutive years 2009-10 and 2010-11. Wilt incidence was calculated using following formula.

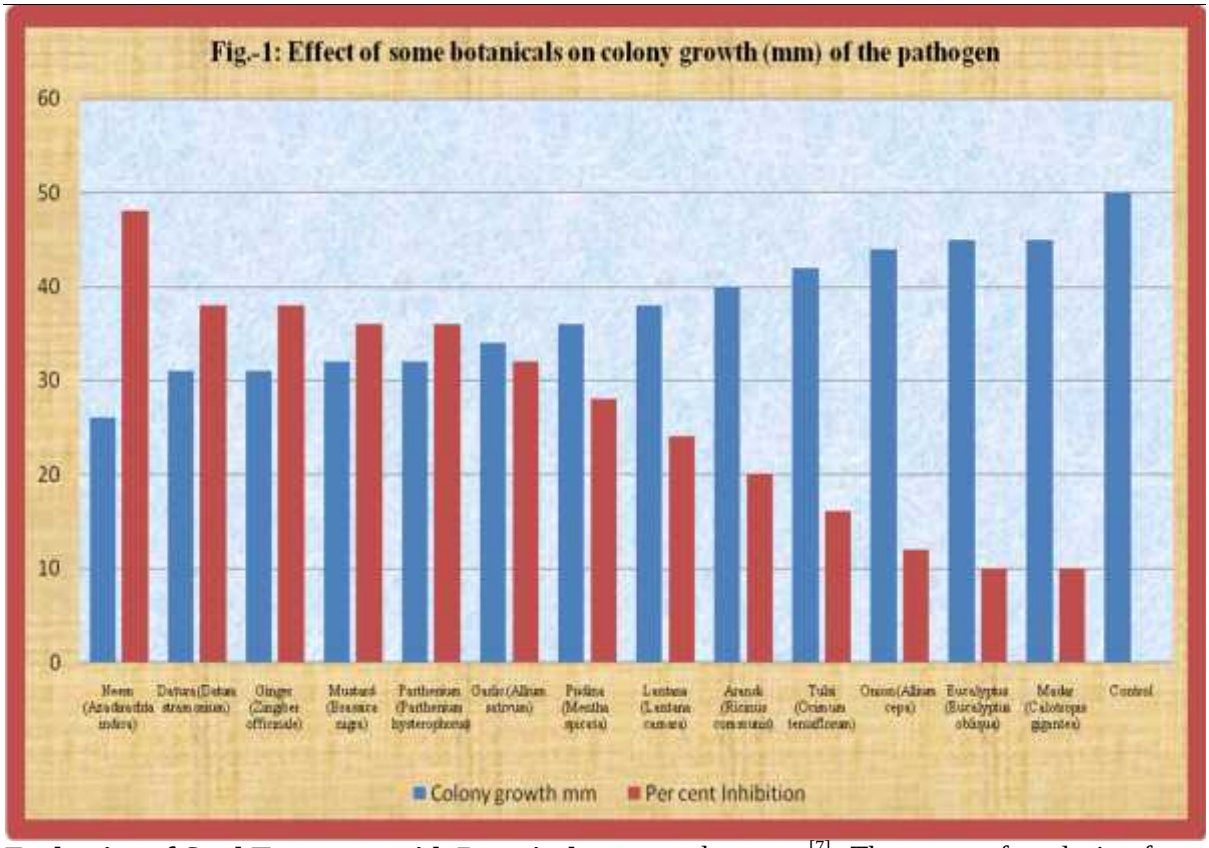
$$\text{Disease incidence \%} = \frac{\text{Total number of wilted plant/pot}}{\text{Total plant population/pot}} \times 100$$

Results and Discussion

Efficacy of Various Botanicals (Leaf Extract) on Growth and Sporulation of the Pathogen: Use of fungicides is one of the major components in the disease management but regular use of fungicides adverse effect on environmental. It also encourages development of resistance among pathogen. Reported that bio-organics and plant extracts against *Colletotrichum gloeosporioides* and *Fusarium oxysporum* [4]. The radial growth of the fungus in various treatments was measured and the average diameter of the colony in each petri-plate was calculated for each treatment and results are presented in Table-1 & Fig.-1 and found significantly superior over control. However, among the 13 leaf extract, only five leaf extract *viz.*, Neem (48.00%), Dhtura (38.00%), Ginger (38.00%), Mustrad (36.00%) and Porthenium (36.00%) proved to be the most effective as they have inhibited the fungus growth completely, whereas Garlic (32.00%), Pudina (28.00%), Lantana (24.00%), Arand (20.00%) and Tulsi (16.00%) were found the next best in inhibiting the growth of the pathogen. Many researchers have reported fungal inhibitory property of *Datura stramonium* and *Azadirachta indica* [5,6]**.**

Table-1. Effect of different botanicals (Leaf extract) on colony growth (mm) and percent inhibition of the pathogen.

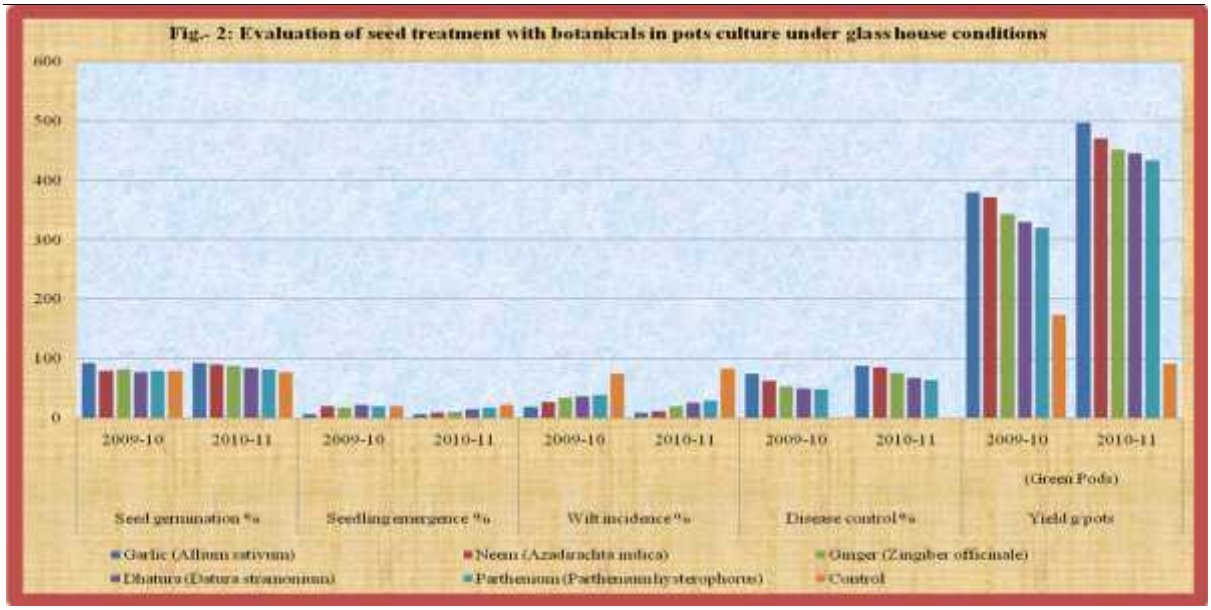
S.N.	Botanicals (Leaf extract)	Colony growth mm	Per cent Inhibition	Sporulation
1.	Neem *(Azadirachta indica)*	26.00	48.00	-
2.	Datura *(Datura stramonium)*	31.00	38.00	-
3.	Ginger (*Zingiber officinale*)	31.00	38.00	-
4.	Mustard (*Brassica nigra*)	32.00	36.00	-
5.	Parthenium (*Parthenium hysterophorus)*	32.00	36.00	-
6.	Garlic (*Allium sativum*)	34.00	32.00	-
7.	Pudina *(Mentha spicata)*	36.00	28.00	1
8.	Lantana (*Lantana camara*)	38.00	24.00	2
9.	Arandi *(Ricinus communis)*	40.00	20.00	2
10.	Tulsi *(Ocimum tenuiflorum)*	42.00	16.00	2
11.	Onion *(Allium cepa)*	44.00	12.00	3
12.	Eucalyptus *(Eucalyptus obliqua)*	45.00	10.00	3
13.	Madar *(Calotropis gigantea)*	45.00	10.00	5
14.	Control	50.00	--	5
	CD at 5%	**2.420**		
	SEm ±	**0.831**		



Evaluation of Seed Treatment with Botanicals (Leaf Extract) under Glass House Conditions: The experiment on disease management of vegetable pea fusarium wilt disease pot culture under green house conditions revealed that treatments using botanicals (leaf extract) was conducted during 2009-10 and 2010-11. The botanical (leaf extract) which formed most effective in *in-vitro* were further tested as seed dresser by their efficacy in pot experiment. The results revealed that, all the treatments were significantly superior over untreated control. The integrated disease management of pea wilt/ root rot complex by integrating plant extracts and bio-control agents [7]. The mean of analysis of two years' data revealed (Table-2 & Fig.-2) that the maximum seed germination (93.33 and 85.53%), minimum wilt incidence (14.25 and 19.95%), maximum disease control (81.59 and 74.16%) and maximum green pods yield (438.33 and 420.83 g/pot) wilt of vegetable pea was recorded in the treatment where seed treatment of Garlic (10%) and Neem (10%). This was followed by seed treatment of Ginger (27.53%), Dhtura (31.72%) and Porthenium (34.25%) wilt incidence, respectively. The statistically at par in case of green pod yield. Similar results have also been reported by [5, 8, 9 & 6].

Table-2. Evaluation of seed treatment with botanicals in pots culture under glass house conditions

S. N	Botanicals (Leaf extract)	Doses ml/kg seed	Seed germination %			Wilt incidence %			Disease control %			Yield g/pots (Green Pods)		
			2009-10	2010-11	Mean	2009-10	2010-11	Mean	2009-10	2010-11	Mean	2009-10	2010-11	Mean
1.	Garlic *(Allium sativum)*	10	93.33 (75.10)	93.33 (75.10)	93.33	19.00 (25.81)	9.50 (17.88)	14.25	74.66	88.53	81.59	380.00	496.66	438.33
2.	Neem *(Azadirachta indica)*	10	80.00 (63.42)	91.06 (72.63)	85.53	27.75 (31.76)	12.15 (20.35)	19.95	63.00	85.33	74.16	371.66	470.00	420.83
3.	Ginger *(Zingiber officinale)*	10	82.20 (65.04)	88.36 (70.09)	85.28	35.11 (36.31)	19.95 (26.50)	27.53	53.18	75.91	64.54	343.33	451.66	397.49
4.	Dhatura *(Datura stramonium)*	10	77.73 (61.83)	84.40 (66.73)	81.07	37.13 (37.52)	26.30 (30.83)	31.72	50.49	68.25	59.37	330.00	445.00	387.50
5.	Parthenium *(Parthenium hysterophorus)*	10	80.00 (63.42)	82.20 (65.04)	81.10	38.83 (38.52)	29.68 (32.99)	34.25	48.22	64.17	56.19	320.00	433.33	376.66
6.	Control	10	80.00 (63.42)	77.73 (61.83)	78.86	75.00 (59.98)	82.84 (65.52)	78.92	--	--		173.33	91.66	132.49
CD (0.05%)			**2.210**	**2.591**		**1.742**	**2.131**					**5.467**	**6.833**	
SEm ±			**0.738**	**0.865**		**0.582**	**0.712**					**1.826**	**2.282**	



Conclusion: Plant extracts are being used to manufacture natural or bio fungicide, which are environmental friendly and do not have any toxic effects on plants and soil. More ever they possess fungicidal and insecticidal properties. So these can be used as compare to synthetic/ chemical products. Various leaf extracts such as Garlic, Neem, Ginger, Dhatura and Parthenium reported that, among these extracts garlic and neem was best in retaining most of biochemical characteristics such as TSS, acidity, pectin and ascorbic acid content.

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