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EFFECT ON SEED GERMINATION AND SEEDLING VIGOUR BY SEED BORNE FUNGI OF PEA (*PISUM SATIVUM* L.)

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ABSTRACT

The present investigation was carried out to study the effect on seed germination and seedling vigour by seed borne fungi of pea (Pisum sativum L.).During the present study different culture filtrate effects of seed borne fungi showed reduction in seed germination and seedling vigour. The percent inhibition in germination was maximum with the culture filtrate of Fusarium solani (93.46%) and the minimum percent inhibition was in case of Aspergillus and pencillum spp. The reduction in plumule length was minimum in culture filtrate of A. flavus. The decrease in plumule length (mm) was maximum in case of culture filtrate of R.solani (11.01) and F. moniliforme (10.33) as compared to control. Root growth in Pisium sativum L .was sensitive to culture filtrate of pathogenic fungi. All filtrates reduced root length with variable phytotoxic potential among them significantly. The minimum reduction in radicle length was recorded with culture filtrate of F. oxysporum (9.11mm) as compared to control (67.53mm). The seedling vigour is less affected by A. flavus and pencillum spp.

Key words: - Culture filtrate, Plumule length, Pisum sativum L, Radicle length, Seed germination.

I. INTRODUCTION

Pea (*Pisum sativum* L.) is an important legume crop widely cultivated throughout the world .It belongs to family Leguminoaceae and sub family Papilionaceae .Pea appears to have originated in western part of Asia and the Eastern Mediterranean .Being a cool season crop it is extensively grown in temperate zone but restricted to cooler altitudes in the tropics and winter season in subtropics. One of the major constraints in the pea production is the attack of various diseases at different stages of growth including seed-borne disease. Micro-organism *viz* fungi, bacteria and actinomycetes are associated with the seeds during storage affecting their germination, causing rotting of seedlings and also cause disease in standing crops. The infected seeds serve as a primary source of inoculum .Many seed-borne pathogens get established in soil, it is difficult to eradicate them. Mycoflora present internally or externally causes considerable damage to crop .There are several factors influencing the pea yield and major being pathological diseases incited by fungi , bacteria ,viruses and nematodes .Some important diseases of pea are root rot ,foot rot ,seed rot ,anthracnose. There are number of mycoflora associated with pea seeds .Among them *Aspergillus* spp, *Alternaria* spp, *Cladosporium* spp

,*Colletotrichum* spp ,*Drechslera* pp ,*Fusarium* spp ,*Macrophomina* spp ,*Penicillium* spp ,*Rhizoctonia* spp ,*Rhizopus* spp ,are responsible for reducing the yield of the crop. However, more study is needed to understand the role of seed mycoflora on crop health and their management by suitable seed.

II. MATERIAL AND METHODS

2.1:-COLLECTION AND EXTRACTION OF THE SEED SAMPLES

The method described by the Neergard (1973) has been adopted for the collection of samples.

2.1.1:-Source of the seed samples

Seed samples of pea (*Pisum sativum* L.) were collected from fields of district Pulwama of Jammu and Kashmir where pea is generally cultivated and stored. Seeds were collected during the months of May to July in two years 2016-2017 randomly. After collection sun drying pods of pea (*Pisum sativum* L.) were beaten manually to extract the seeds. The composite samples were made by mixing individual samples together. The extracted seeds were carried out in cloth bags and stored in a refrigerator at suitable temperature for further studies. A sample of 400 seeds was drawn from working sample of seed lots of pea (*Pisum sativum* L.) from each place. (Anon.1993) And the seed borne fungi were isolated by Blotter method and agar plate method .The experiment was conducted at M.V.M College Bhopal .Details of the seed samples with sample code no. is given below in table 1.

Table 1.District and location of seed sample collection.

District	Place of collection	Location code no.
Pulwama	Chewakalan	L1
	Dadoora	L2
	Frasipora	L3
	Gusoo	L4
	Looswani	L5
	Mitrigam	L6
	Murran	L7
	Rahmoo	L8
	Wahibug	L9
	Zagigam	L10
	Kachipora	L11
	Putrigam	L12

III.PATHOGENCITY

The fungi isolated were tested for their effect on seeds and seedlings.

3.1:-Preparation of fungal suspension (inoculum)

The pathogenic fungi isolated were multiplied by cultivating their culture on Potato dextrose agar (PDA) as medium in petriplates (10cm) at 25±2^{0}C for 20 days in an incubator with 12 hours of alternate light and dark arrangement. The fungus colonies were ruffled along with agar and crushed to form a paste and diluted in 250 mL of sterilized distilled water were added to make a fungal suspension for inoculation of seeds. The spores / mL were counted by haemocytometer.

3.2:-Effect and determination of pathogenic fungi on seed germination and seedling vigour

The effect of pathogenic fungi on seed germination and seedling vigour were evaluated by obtaining culture filtrates .The different fungal suspensions were filtrated through Whatman filter paper no 4 and the filtrate were heated at 100^{0}C for 2-3 minutes to inactivate the enzyme. In the culture filtrate the seeds were soaked separately for 12 hours .Ten seeds were placed in each petriplates at 25±2^{0}C.The experiment were run in four replications (set of 100 seeds as replicate) with completely randomized design arrangement. Data on seed germination, radical and plumule length were counted and were statically analyzed by ANOVA followed DMR test.

IV.RESULTS AND DISCUSSION

The different culture filtrate effects of seed borne fungi caused reduction in seed germination and seedling vigour. The percent inhibition in germination was maximum with the culture filtrate of *Fusarium solani* (93.46%) followed by *F. moniliforme* (89.60%), *F. oxysporum* (85.37%) and *R.solani* (72.38%) and the minimum percent inhibition was in case of *Aspergillus* and *pencillum* spp. Shankar *et al*,(1995) studied effect of soaking of *Vigna radiate* L. seeds for six hours in culture filtrates of *Aspergillus niger* and found that it caused reduction in seed germination.

The Culture filtrate of all the test fungi suppressed seedling vigour of *Pisium sativum* L. significantly. However, the variable phytotoxic effect of the different culture filtrate was evident. The reduction in plumule length was minimum in culture filtrate of *A. flavus.* The decrease in plumule length (mm) was maximum in case of culture filtrate of *R.solani* (10.97) and *F. moniliforme* (10.33) as compared to control. .Root growth in *Pisium sativum* L. was sensitive to culture filtrate of pathogenic fungi. All filtrates reduced root length with variable phytotoxic potential among them significantly. The minimum reduction in radicle length was recorded with culture filtrate of *F. oxysporum* (9.11mm) followed by *F. solani* (11.01mm), *R.solani* (11.01mm) as compared to control (67.53mm). The seedling vigour is less affected by *A. flavus* and *pencillum* spp.(Fig 1) The inhibition of radicle and plumule growth especially by seeds applied with high inoculum density led to lower germination percentage of up to 50 % (Linn and Ehret ,1991 ;Gilbert and Tekauz 1995 ;Menzies *et al.*

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Table 2:- Effect and determination of pathogenic fungi on seedling vigour

Fungi inoculated	Seed germination	Inhibition over control	Seedling vigour	
			Radicle length (mm)	Plumule length (mm)
Alternaria alternata	44.75c*	41.86ef	26.45i	30.23f
Aspergillus flavus	62.00c	19.46g	64.38a	54.38b
Aspergillus niger	65.25b	14.97g	34.59d	50.90c
Curvularia lunata	34.50g	55.18de	33.92de	38.35de
Aspergillus tameri	42.50f	44.79ef	30.41e	36.45e
Aspergillus terrus	51.00d	33.75fg	41.57c	39.98d
Fusarium oxysporum	11.25i	85.37abc	9.11gh	13.99h
Fusarium moniliforme	8.00j	89.60ab	12.11gh	10.33i
Fusarium roseum	25.50h	66.86cd	13.03g	17.22g
Fusarium solani	5.00k	93.46a	11.01gh	14.01h
Rhizoctonia solani	22.00l	72.38bcd	10.97 gh	11.01 i
Penicillium sp.	63.25c	17.19g	60.28b	34.38de
Macrophomina phaseolina	52.50d	31.19fg	45.15c	56.62b
Control	77.00a		67.53a	74.34a
DMR value (P=0.05)	1.85	19.34	3.84	3.01

*Mean sharing the same letter are not significant according to (DMR) Test. Data are means of four replication

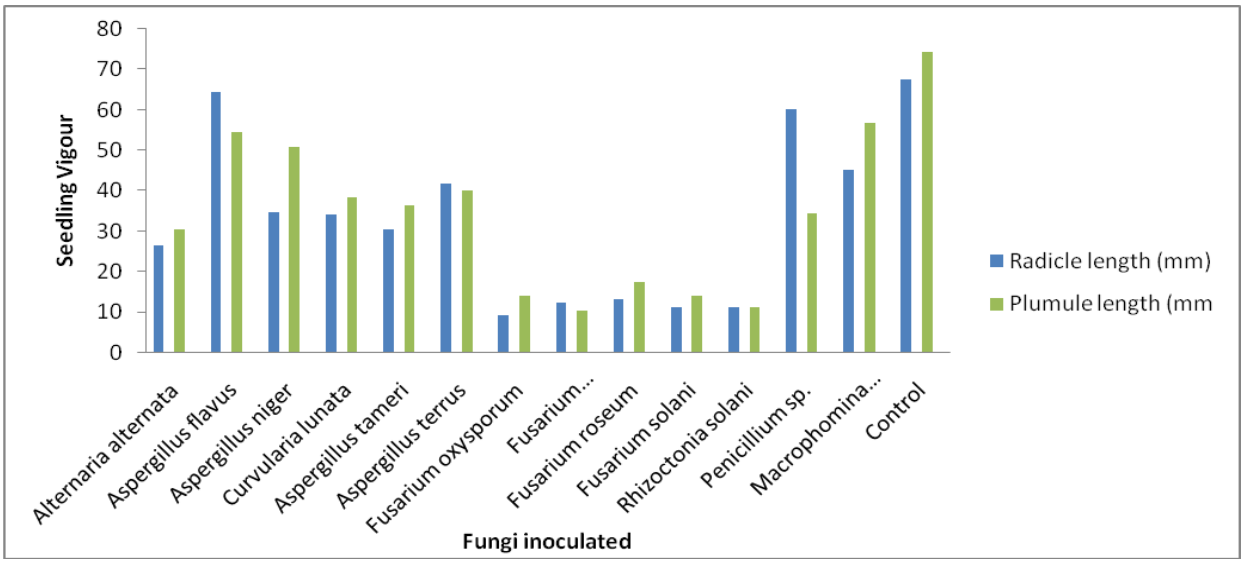

Fig 1:- Effect of inoculated pathogenic fungi on radicle and plumule length .

V.ANALYSIS OF VARIANCE FOR THE EFFECT AND DETERMINATION OF PATHOGENIC FUNGI ON SEEDLING VIGOUR

Analysis of variance for percent germination of seed

S.O.V	D.F.	S.S.	M.S	F Value
Fungi	13	32320.357	2486.181	470.699**
Error	42	71.000	1.690	
Total	55	32391.357		

Analysis of variance for percent inhibition /control

S.O.V	D.F.	S.S.	M.S	F Value
Fungi	12	37694.403	3141.200	17.172**
Error	39	7134.023	182.924	
Total	51	44828.425		

Analysis of variance for plumule length

S.O.V	D.F.	S.S.	M.S	F Value
Fungi	13	21945.977	1688.152	377.775**
Error	42	187.684	4.469	
Total	55	22133.661		

Analysis of variance for radicle length

S.O.V	D.F.	S.S.	M.S	F. Value
Fungi	13	22827.382	1755.952	241.386**
Error	42	305.527	7.274	
Total	55	23132.909		

**=Highly significant (P<0.01)

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