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Original Research Paper

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EFFECT OF SEED BORNE DEMATIACEOUS HYPHOMYCETES ON THE GROWTH OF SEEDLINGS OF WHEAT, GRAM AND MUSTARD

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ABSTRACT Studies have revealed that storage fungi inflict deterioration of seed and influence the germination of the seed, suppress the germination of crop seed. For the present work dematiaceous fungi were incorporated for their effect (a) through their metabolite and (b) by storing their spores with the noted crop seeds. Seeds of Wheat, Gram and Mustard were considered for the study. The rate of growth of seedlings was observed using the metabolite and the extract of fungus stored seeds. Metabolite of *A. alternata*and*A. tenuissima* was used to observe the effect on the rate of growth of the radicle and plumule.

Rate of growth of the radicle of the seedlings in term of the length was studies and found to be slower due to the inclusion of metabolite. The rate of growth of the radicle of wheat, gram and mustard due to the acetone extract of *A. alternata*and *A. tenuissima*stored seeds was slower than the control. But the length of the radicle due to the effect of the extract was slightly more than the effect of metabolite. Effect of *A. alternata*was observed more deleterious than *A. tenuissima*.

Rate of growth length of plumule was less than the control due to the metabolite. The length of the plumule was more adversely affected due to *A. alternata*than *A. tenussima*. Rate of elongation of the plumule due to the extract of fungus stored seed was less than the control. The effect of *A. alternata* stored seeds was observed more deleterious in expressing length. Also the rate of elongation of the plumule was slower due to metabolite than the extract of the seeds stored with these fungi.

Rate of increase in dry weight of the seedlings was observed sluggish due to the metabolite. The rate of increase in dry weight of above seedlings was slower in the metabolite of *A. alternata*. rate of increase in the dry weight of the seedling was slower due to the acetone extract of *A. alternata*and *A. tenuissima*stored seeds. The effect on the rate of increase in the dry weight of the seedlings of *A. alternata*was observed more deleterious.

KEYWORDS : Effect, Aspergillus, Wheat, Gram, Mustard, Fungi , Hyphomycetes

INTRODUCTION:

The deviation of the germination of seed due to seedborne storage fungi is the subject of the seed deterioration which has been extensively been worked out by international and national agriculture and botany scientists. Studies have revealed that storage fungi inflict deterioration of seed in various way i.e. deviation in color and texture, roughness to the surface of the seed, change in the conductivity of the seed, influence of storage fungi on the germination of the seed, suppression of the germination of crop seed. It has also been noted that many fungus invade the seed while attached in the mother plant in the field. Deterioration of the seed has been extended to the level of growth of seedlings, their physiology and biochemistry.

Growth of seedlings have been reported to be adversely affected due to the activity of storage fungi. Most of the botanists reported this effect due to *Aspergilus flavus, A. niger and Fusarium moniliforme,* the common intestent of seed with high frequency (Shanker, 1983; Prasad, 1984; Pyare, 1991; Ranjan 1999).

Harman(1972) observed slow growth of the seedlings of pea due to *Aspergillus ruber.* Shanker (1983) observed the slow growth of the seedling of finger millet AE-146 due to *Aspergillus flavus* and a few other five fungi including two fungi belonging to Dematiaceae. Prasad (1984) recorded slow rate of growth of radicle and plumule of lad bean due to *Aspergillus niger*and *A. niveus.* Some such other reports are there for mustard (Singh, 1989), radish (Sao et al,1989) and for vegetables (Ranjan, 1999). Armolik et al. (1956) in course of examining microbial deterioration of barley seed during storage have recorded involvement of toxic chemicals in the culture filtrate of *Aspergillus niger, Penicillium sp.* and *Fusarium moniliforme* in Richard solution.

The involvement of toxic principle has been reported in the deterioration of stored pea seeds by *Aspergillus ruber*by Harman (1972) and Harman and Nash (1972). Rajnish et al. (2003) observed stimulated IAA oxidase in vegetable seedlings due to *Aspergillus flavus* and other storage fungi. The activity of this oxidase was observed highly fungi augmented in short seedlings.

For the present work dematiaceous fungi were incorporated for their effect (a) through their metabolite and (b) by storing their spores with the noted crop seeds.

MATERIAL AND METHODS (Kiran R. 2009)

i. The rate of growth of seedlings was observed using the metabolite and the extract of fungus stored seeds by periodic measurement of the radicle only in nutrient medium (Harman, 1972). Length of the root and Length of shoot were measured storing the seeds with some popular seed borne dematiaceous hyphomycetes and growing them autoclaved garden soil. The seedlings were dried and dry weight was recorded.

ii. Metabolite of *A. alternata*and*A. tenuissima* was used to observe the effect on the rate of growth of the radicle and plumule . Metabolite was prepared in Richard solution.

iii. Nutrient medium for the growth of radical of the seedlings was prepared as designed by Harman (1972).Germinated seeds were set in the nutrient medium as explained by Kiran R., (2009).

iv. The growth of the radicle were recorded. Length of the radicle of 40 seedlings was pooled together and divided by 40 for mean value of one radicle.

v. For the rate of growth of the radicle under the influence of the extract of fungus stored seeds, the sterilized seed lots were infested separately with 1ml spore suspension of *A. alternata* and *A. tenuissima* .

vi. For the dry weight of the seedlings, seedlings were dried at 80°C for 48 hr in an oven and cooled over fused calcium chloride in sealed desiccators to their constant weight. The dry weight of 40 seedlings of each crop was pooled together and divided by 40 to give mean value of one seedling. The dry weight of seedling due to metabolite and due to the acetone extracts of fungus stored seed was recorded.

RESULTS AND DISCUSSION

Table :1 Rate of Growth of radicle due to metabolite

Crops	Alternaria Spp.	Length in mm of Scale			
		2nd day	4th day	6th day	8th day
Wheat	*A. alternata*	3.1	4.8	8.7	14.6
	A. tenuissima	3.5	5.7	10.6	18.3
	Control	5.6	7.8	13.1	26.2
Gram	*A. alternata*	3.8	5.3	8.6	15.1
	A. tenuissima	4.6	6.2	10.3	18.4
	Control	6.7	9.8	19.2	41.8
Mustard	*A. alternata*	2.6	4.6	7.7	11.4
	A. tenuissima	3.2	5.5	9.3	14.8
	Control	4.7	7.8	13.9	21.5

- Referring table-1 above, It seems that the rate of growth of the radicle of the seedlings in term of the length is slower due to the inclusion of metabolite. Effect of *A. alternata* was observed more than *A. tenuissima*.

Table:2 Rate of growth of the radicle due to acetone extract of fungus stored seeds

Crops	Alternaria Spp.	Length in mm of Scale			
		2nd day	4th day	6th day	8th day
Wheat	*A. alternata*	3.7	5.4	9.3	15.7
	A. tenuissima	4.4	6.3	11.7	20.2
	Control	7.8	10.8	18.4	27.3
Gram	*A. alternata*	4.2	6.3	9.5	16.6
	A. tenuissima	5.8	7.9	11.4	19.8
	Control	8.2	12.3	26.4	42.4
Mustard	*A. alternata*	3.7	5.9	9.2	13.4
	A. tenuissima	4.6	6.8	10.8	15.7
	Control	5.6	8.2	14.3	22.1

- The rate of growth of the radicle of wheat, gram and mustard due to the acetone extract of *A. alternata* and *A. tenuissima* stored seeds was slower than the control. But the length of the radicle due to the effect of the extract was slightly more than the effect of metabolite. Effect of *A. alternata* was observed more deleterious than *A. tenuissima*.

Table:3 Rate of growth of Plumule due to metabolite

Crops	Alternaria Spp.	Length in mm of Scale			
		4th day	6th day	8thday	10thday
Wheat	*A. alternata*	2.7	4.8	7.9	11.3
	A. tenuissima	3.4	6.2	9.8	13.6
	Control	4.8	11.3	17.6	28.1
Gram	*A. alternata*	2.3	3.9	6.5	9.7
	A. tenuissima	2.8	4.9	7.8	11.5
	Control	3.7	6.6	11.8	16.9
Mustard	*A. alternata*	2.1	3.2	4.8	7.2
	A. tenuissima	2.6	4.1	6.2	9.5
	Control	3.3	5.4	9.6	14.7

- As in table 3, rate of growth length of plumule was less than the control due to the metabolite. The length of the plumule was more adversely affected due to *A. alternata* than *A. tenussima*.

Table:4 Rate of growth of the plumule due to acetone extract of fungus stored seeds

Crops	Alternaria Spp.	Length in mm of Scale			
		4th day	6th day	8th day	10th day
Wheat	*A. alternata*	3.2	6.4	9.2	12.8
	A. tenuissima	4.1	6.9	10.9	14.8
	Control	5.6	12.4	19.6	30.5
Gram	*A. alternata*	2.8	4.8	7.8	11.6
	A. tenuissima	3.7	5.7	9.7	13.2
	Control	4.8	7.9	12.9	18.5
Mustard	*A. alternata*	2.7	4.5	6.1	8.8
	A. tenuissima	3.4	5.5	7.3	10.7
	Control	4.2	6.7	11.2	16.4

- As in table 4 above, it seems that the rate of elongation of the plumule due to the extract of fungus stored seed was less than the control. The effect of *A. alternata* stored seeds was observed more deleterious in expressing length. Also the rate of elongation of the plumule was slower due to metabolite than the extract of the seeds stored with these fungi. This is clear after comparing the observation as in table-3 and table-4.

Table :5 Rate of Growth in term of dry weight of the seedlings due to metabolite

Crops	Alternaria Spp.	Length in mm of Scale			
		4th day	6th day	8th day	10th day
Wheat	*A. alternata*	1.5	2.8	4.5	7.7
	A. tenuissima	1.9	3.2	5.8	8.9
	Control	2.2	4.2	7.9	11.8
Gram	*A. alternata*	1.6	2.6	4.7	7.6
	A. tenuissima	1.8	3.1	5.9	8.7
	Control	2.4	4.3	6.8	11.9
Mustard	*A. alternata*	1.1	2.0	3.6	5.4
	A. tenuissima	1.4	2.3	4.3	6.2
	Control	1.8	3.1	5.2	8.3

- Referring table 5 above, the rate of increase in dry weight of the seedlings was observed sluggish due to the metabolite. The rate of increase in dry weight of above seedlings was slower in the metabolite of *A. alternata*.

Table :6 Rate of Growth in term of dry weight of the seedlings due to the acetone extract of fungus stored seeds

Crops	Alternaria Spp.	Length in mm of Scale			
		4th day	6th day	8th day	10th day
Wheat	*A. alternata*	1.6	3.1	5.3	8.7
	A. tenuissima	2.0	3.7	6.1	9.6
	Control	2.8	4.9	8.2	14.3
Gram	*A. alternata*	1.9	3.3	5.9	8.9
	A. tenuissima	2.4	3.8	6.5	10.4
	Control	3.1	5.2	8.4	13.7
Mustard	*A. alternata*	1.2	2.1	3.7	5.8
	A. tenuissima	1.6	2.8	5.1	6.9
	Control	2.2	3.5	6.4	10.2

- Referring table 6 above, the rate of increase in the dry weight of the seedling was slower due to the acetone extract of *A. alternata* and *A. tenuissima* stored seeds. The effect on the rate of increase in the dry weight of the seedlings of *A. alternata* was observed more deleterious.
- Further referring the observation of table 5 & table 6 above, rate of increase in the dry weight of the seedlings was slower due to metabolite of the fungi noted above than the extract of the seed only.
- The rate of the growth of the seedlings of the control lot can be regarded as the normal whose magnitude is higher than the lot due to the metabolite of *A. alternata* and *A. tenuissima* and the acetone extract of the seeds stored in the noted fungi. This indicates that the effect of the metabolite of fungi and extract of the fungus stored seeds is distinctly deleterious suppressing the growth of the radicle and plumule of the seedlings of wheat, gram and mustard.
- It seems some such principles are found in the metabolite and extract that are expected to suppress the growth of the two parts of the seedlings. These are known as toxic principles which have been held responsible in suppressing the normal growth of the radicle and plumule.
- When the effects of metabolite of the two noted seed borne dematiaceous hyphomycetes in Richard solution and the acetone extract of the fungus stored seeds are compared, the metabolite produces more clear picture of toxicity than the extract. Therefore for practical purpose, if the toxicity of a fungus is proposed to be observed, the effect of metabolite can be observed for sharp magnification of the

result. Thus this investigation provides tool of seed deterioration.

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