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Effect of Fungal Metabolites on Seed Germination and Seedling Growth of *Trigonella foenum graecum* L.

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Abstract: *Seed samples of fenugreek (Trigonella foenum graecum L.) were analized for the study of seed germination and seedling growth. Culture filtrates of seven seed borne fungi namely Alternaria alternata, Aspergillus niger, Aspergillus flavus, Fusarium oxysporum, F.moniliforme, F. solani, Rhizopus sp. were taken for the study. All the seven fungal metabolites affected germination percentage and seedling growth. Of all the seven fungi Aspergillus flavus* showed the highest germination percentage while it was least in Fusarium oxysporum. *Aspergillus flavus showed the highest seedling vigour, while low seedling vigour was recorded in the seeds treated with Fusarium oxysporum culture filtrates.*
Key words: *Trigonella foenum graecum,* fenugreek, seed metabolites, seed germination.

1. Introduction

Trigonella foenum-graecum L. (Fenugreek) is an important condiment legume crop that occupies prime place amongst the seed spices grown in Rajasthan, Gujarat, Uttar Pradesh and Tamil Nadu. *Trigonella foenum-graecum* (also known as fenugreek, locally as methi), is an annual plant belongs to family Papilionaceae having chromosome number 2n=16, is one of the oldest medicinal plants, most likely a native of the eastern Mediterranean and from there spread to India and China.

Fungal metabolites are those substances which are produced by fungi during their metabolic processes. The constituents of metabolites are phenols, terpenoids, amino acids and plant growth regulators (Griffin, D.H., 1981). Aspergellic acid, aflatoxin B1 and B2, cyclopiczonic acid,fusaric acid, naphthoquinones and fumonizin are some of those substances which threaten the health of plants and animals, (Singh *et al.* 1991). Seed-borne fungi are responsible for inhibiting normal growth of seedlings in various crops, (Howlett, 2006). (Kritzinger *et al.*2003) observed that the mycotoxin produced by *Fusarium proliferatum* reduces seed germination.

2. Materials and methods

Standard blotter paper and agar plate method were used to isolate seed borne mycoflora of fenugreek seeds.

2.1. Standard Blotter Paper test

For blotter paper test surface sterilized seeds with 1 % sodium hypochlorite solution were placed on three layers of moistened blotter papers in Petri plates of 9 cm size. The Petri plates were then incubated at 25±2ºC in alternating cycles of 12 hours light and 12 hours darkness for seven days. The seeds were examined under microscope for detection of associated mycoflora.

2.2. Agar plate test

In agar plate method, potato dextrose agar (PDA) was poured aseptically in the sterilized glass Petri dishes of 9.00 cm. diameter at the rate of about 15 ml per Petri plate. After solidification of the medium 10 seeds per Petri plate were plated. The seeds prior to plating on PDA were surface sterilized by emerging in mercuric chloride solution (0.1%) for 30 sec and subsequently rinsing for three times in sterilized distilled water. The Petri plates were later incubated at 25±1^{o}C for 7 days under 12 hours alternating cycle of near ultra violet (NUV) light and darkness. The seeds were then examined for the presence of fungal growth after five and eight days of incubation.

The fungi were cultured on czapeck's media for seven days at 25± 1ºC. After seven days the fungal mycelia were grown on the media, which were then aseptically transferred to liquid czapeck's media from pure culture and then cultured for 10 days at 25± 1ºC. After 10 days it was filtered with Whatman filter paper no 1. The filtrate was boiled for 2 minutes at 100ºC for the inactivation of enzymes.

The seeds then soaked in the filtrate which then underwent germination test. After 10 days germination percentage and seedling growth was measured.

3. Result and discussion

Table i. shows that a total of seven fungi were found which produced toxic metabolites in *Trigonella*. These mycotoxins affected seed germination, seedling vigour and seedling length adversly. The least reduction of root length was due to mycotoxins of *Fusarium oxysporum* (1.86cm). The maximum reduction in shoot length was also due to mycotoxins produced by *Fusarium oxysporum* (1.41cm). The maximum root length was recorded in *Aspergillus niger* (2.32cm) while in control it was 7.12cm. Shoot length was recorded maximum in the mycotoxins produced by *fusarium solani* (1.72cm) and minimum in *Fusarium oxysporum* (1.41cm). The maximum seedling vigour was recorded in *Fusarium solani* (211.18) followed by *Aspergillus flavus* (196.18) and *Rhizopus spp* (196.49) while vigour was least in case of *Fusarium oxysporum* (135.15), followed by *Aspergillus niger* and *Fusarium moniliforme* as compared to control (1536.96).

Maximum seedling length was recorded in *Rhizopus spp* (3.98cm) followed by *Fusarium solani* (3.96cm) and it was found minimum in *Fusarium oxysporum* (3.27cm) while it was found to be 16.24cm in control.

The maximum germination percentage was recorded in the case of fungal metabolites of *Aspergillus flavus* (56.00) while minimum germination was found in the culture filtrates of *Fusarium oxysporum* (41.33) while it was 16.24% as compared to control.
From the study it was found that some toxic fungal metabolites affect seed germination and vigour of fenugreek seeds adversely.

Table 1. Effect of fungal metabolites on seed germination and seedling growth

Treatment	Root length (cm)	SL (cm)	Ger%	Ab%	Dead%	SV	Seedling length (cm)
Alternaria alternata	2.11	1.58	52.66	24.00	23.33	191.70	3.69
Aspergillus niger	2.32	1.52	48.66	25.33	26.00	187.01	3.84
Aspergillus flavus	1.99	1.52	56.00	30.66	13.33	196.18	3.50
Fusarium oxysporum	1.86	1.41	41.33	30.00	28.66	135.15	3.27
Fusarium moniliforme	2.15	1.62	50.00	27.33	22.66	188.83	3.78
Fusarium solani	2.24	1.72	53.33	26.00	20.66	211.18	3.96
Rhizopus	2.29	1.69	49.33	23.33	27.33	196.49	3.98
control	7.12	7.63	94.66	9.66	14.00	1536.96	16.24

4. Acknowledgements

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5. References

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