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Effect of temperature on growth of seed borne fungi of oil seeds

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Abstract:

In crop production technology seeds are the basic unit, however seeds are attacked by various storage fungi. Seed borne fungal infection reduces germination capacity of seed and market value of seeds, such seeds act as source of mycotoxins. Recently there is increase in awareness of potentially harmful effects of world wide oil spoilage to the human beings. Temperature is the most important factor which affects the growth and development of storage fungi. Different fungal pathogen requires different temperatures for their growth and development. The present study was undertaken to ascertain the effect of temperature on growth of isolated seed mycoflora of oil seeds i.e., *Aspergillus flavus, Aspergillus* n*iger, Curvularia lunata, Rhizopus nigricans, Alternaria alternate and Fusarium oxysporum* . All these 6 fungi require optimum temperature i.e.$25^0 \pm 2^0$C for growth.

Keywords: Mycoflora, mycotoxins, oil seeds,growth, temperature, fungi, etc.

Introduction:

Seed is a basic unit in crop production technology. It has attracted the attention of agriculturists even in early days leaving out the ancient period. The relationship of seed with disease in the crop production has been reflected by the Remnant (1937).

Seed plays a vital role in associating microorganisms which prove hazardous for the seed or the new plant created from of the associated microorganisms may be pathogenic i.e. weak parasites or saprophytes. They are associated internally or externally with the seed. Seed transmitted pathogen cause disease at various stages of crop growth from germinating seed up to crop maturity and heavy losses have been observed viz. caused by seed borne pathogens in various crops. Storage fungi slowly kill the embryos of the seed they invade, seedlings raised from such seeds lack the normal vigour.

The storage fungi include mainly several species of Aspergillus and Penicillium. Of these two, Aspergilli are more prevalent because they require relative temperature at 8 to 58^0C for their growth. The species differ from one another in taxonomic character.

The present study was undertaken to ascertain the effect of temperature on growth of *Aspergillus flavus, Aspergillus niger, Curvularia lunata, Fusarium oxysporium, Rhizopus nigricans and Alternaria alternata*.

Materials and methods:

The collection of seed samples of sesame, castor, soyabean, safflower, groundnut and sunflower was carried out as per the method described by Neergard (1973). Three random samples of sesame, castor, soyabean, safflower, groundnut and sunflower seeds were colleted from local market. A

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composite sample of this was made by mixing the individual sample together and preserved in cloth bags at room temperature during the studies.

The seed mycoflora was isolated by using standard moist blotter paper method of Mira Kadan and Thind (1974) as recommended by International Seed Testing Association (ISTA, 1966). A pair of white blotter paper of 8.5 cm. diameter was jointly soaked in sterile distilled water and were placed in pre-sterilized Petri plates of 10cm. diameters.10 seeds of test samples per Petri plate were placed at equal distance on the moist blotter. About 100 seeds were tested for each treatment. The plates were incubated at room temperature for seven days.

Composition and preparation of Media of Glucose Nitrate Media

Glucose	-	10gm.
KNO_3	-	2.5gm.
KH_2PO_4.	-	1gm.
$MgSO_4$	-	0.5gm.
Distilled water	-	1000ml.

Add all the chemical components in 100 ml of distilled water. Mix it thoroughly and made the final volume up to 1000ml by adding 900ml of distilled water to it. All glass wares were washed in acid dichromate solution, rinsed with distilled water twice and dried. The glass wares were sterilized in hot oven at 160^0C for one and half hour. Medium were sterilized in autoclave at 15lbs (121^0C) for 20 minutes.

Cultures were incubated at 27^0C in the laboratory and temperature was maintained constant during the incubation during the course of study. In all experiments the culture were incubated for 7 days. Semi permanent slides of fungi were prepared with lactophenol, cotton blue of appropriate stage of growth of the fungus and measurement of hyphae, conidiophores, conidia etc. were taken. These fungi from various sources and identification were confirmed with literature, photographs and earlier fungal cultures (Wolf and Wolf, 1947).

Spore suspension from 8 days of respected fungus was prepared by adding 10ml of distilled water. Standard spore suspension from 8 days culture maintained on Martin's rose Bengal agar media was prepared by adding 2ml of sterile distilled water in the form of inoculum in flask to study effect of all different temperatures. The flasks were incubated at room temperature 27 ± 3^0C for 7 days (Lilly and Barnett, 1951). The spore suspension standardized to contain 1×10^{5} spores/ml.

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After incubation, fungal mat was observed after 7 days. The flasks were harvested i.e., filtered through Whatman filter paper No.1. The fungal initial growth was obtained and dried in oven for 24 hours at 60^0C temperature and the seeds with the dried mycelium were also weighed with filter paper. All the treatments were given in triplicate and the results have been presented in table.

Results and Discussions:

Table. 1: Dry weight (mg) of different Storage fungi at different temperatures

Seeds	*Aspergillus flavus*			*Aspergillus niger*			*Curvularia lunata*		
	10^0C	Room temp.	45^0C	10^0C	Room temp.	45^0C	10^0C	Room temp.	45^0C
Groundnut	0	0.254	0.231	0	0.279	0.262	0	0.212	0.111
Sunflower	0	0.255	0.233	0	0.283	0.261	0	0	0
Safflower	0	0.253	0.235	0	0.282	0.222	0	0	0
Soyabean	0	0.272	0.231	0	0.244	0.222	0	0.211	0.139
Sesame	0	0.253	0.232	0	0.281	0.264	0	0.213	0.112
Castor	0	0.252	0.231	0	0.282	0.263	0	0.212	0.112

Table 2 Dry weight (mg) of different Storage fungi at different temperatures

Seeds	*Rhizopus nigricans*			*Alternaria alternata*			*Fusarium oxysporum*		
	10^0C	Room temp.	45^0C	10^0C	Room temp.	45^0C	10^0C	Room temp.	45^0C
Groundnut	0	0.208	0.126	0	0.153	0.151	0	0	0
Sunflower	0	0.207	0.125	0	0.152	0.127	0	0.183	0.141
Safflower	0	0.205	0.123	0	0.154	0.132	0	0.184	0.142
Soyabean	0	0	0	0	0	0	0	0.181	0.11
Sesame	0	0.208	0.126	0	0	0	0	0.185	0.143
Castor	0	0	0	0	0.154	0.152	0	0.184	0.142

The observations of the effect of temperature on growth of seed mycoflora of oil seeds shows that *Aspergillus niger* gives the significantly highest growth yield (0.283 Mg.) in the form of dry weight viz. obtained when the flasks were incubated at room temperature i.e., 27 ± 3^0C viz., followed by the growth of *Aspergillus flavus (0.272 Mg) i.e.,* followed by *Curvularia lunata* (0.213 Mg) and *Rhizopus nigricans* (0.208 Mg). Among the temperature tested, the highest growth was observed at room temperature. However less growth was observed at 45^0C and no growth at 10^0C, it is clear from the results that temperature is one of the determining factors for the growth of storage

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fungi, similarly (Ibrahim et.al., 1977) also reported that minimum and maximum temperature were important determining factor for the infection.
In the present investigation the fungi isolated from sesame, castor, groundnut, sunflower, soyabean and safflower seeds were grown at different temperatures. The fungi grown at 10^0C no growth was observed, where as at 45^0C less growth was observed as compared with room temperature.
The fungi isolated from different seeds like Sesame, Castor, Groundnut, Sunflower, Soyabean and Safflower seeds were *Aspergillus flavus*, *Aspergillus niger*, *Alternaria alternata*, *Rhizopus nigricans and Fusarium oxysporum* showed growth at room temperature (27 ± 3^0C), hence optimum temperature for all these species was 27 ± 3^0C. It is reported that optimum temperature for *Aspergillus flavus and Aspergillus niger* was 30^0C and for *Aspergillus niger* the optimum temperature was observed at 35^0C (Omprakash and Babu Singh,1978).

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