

IMPACT OF *ASPERGILLUS* ON METABOLIC STATUS OF GROUND NUT (*ARACHIS HYPOGAEA*) SEED

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A Phytopathological investigation of the infested seeds of groundnut (*Arachis hypogaea*) revealed that the seeds of groundnut were infected by different species of *Aspergillus*... viz. *A. fumigatus*, *A. flavus* and *A. terreus*. Total protein and starch level in the above infected seeds showed a decline. While on the other hand there is marked increase in amino acid and reducing sugars.

Keywords : Amino acid, *Arachis hypogaea*; *Aspergillus*; Starch; Sugars; Total protein.

Introduction

Seed has been recognised as one of the vital input in modern agricultural production. The science of seed technology adds in the evolution of its genetics, nutritional value, high yield of quality product and good health. Production of quality seeds to be utilised in agriculture, horticulture and floriculture has now a days gained a considerable scientific attention in most of the advanced countries. Increasing crop productivity through the use of high yielding cultivars and avoiding crop failures are the two ways of boosting food production. Benefits of using high yielding cultivars, however, may get nullified by dangerous seed borne diseases as seed is just not a germplasm but a microhabitat as well. The pathogenic organisms can utilise and exploit nutrients according to their utilisation efficiencies, there by, lowering germ inability and nutritional values of the seeds. Observations have been recorded for the presence of mycoflora on seed surfaces with qualitative and quantitative incidence. The objective of this study was to determine the presence of mycoflora on seed surfaces and its impact on the nutritional status of seeds of groundnut in stored condition.

Material and Methods

Groundnut seeds were collected from different distantly located fields and stored lots from farmers. The seed lots right from its harvest were stored in different types of containers as earthen pots, polythene bags, GI sheets containers etc. for 12 months. Monthly isolation of mycoflora was done for

12 months. Quantitative variation in mycoflora was observed in relation to the moisture contents of seeds, humidity and temperature of the atmosphere.

For the biochemical estimation, the surface sterilised seeds were inoculated with respective test organisms and incubated for seven days. The metabolites such as total protein, free amino acids, starch and reducing sugars were analysed by using standard methods.

Results and Discussion

The results revealed that infection by *Aspergillus terreus*, *A. flavus* and *A. fumigatus* resulted in maximum loss of protein content of ground nut 93.5%, 86.6% and 86.00% respectively (Fig. 1). Decrease in amount of protein content is apparently due to the hydrolysis of seed protein, into its simpler form by activity of the hydrolytic enzymes produced by fungus¹. According to Bilgrami *et al.*², decrease in protein contents during early phase of incubation can be attributed to its hydrolysis to simpler components which ultimately results in an increase in the soluble nitrogen³. Cherry *et al.*⁴, have also made similar observation in *Arachis hypogaea* seeds infested with *Aspergillus parasiticus* and assigned it to sequence of events where by proteins were hydrolysed first to small polypeptides and finally to simple free amino acids.

Quantitative estimation of total starch content in the healthy and infested seeds were carried out to determine the starch digestion and utilisation ability of test

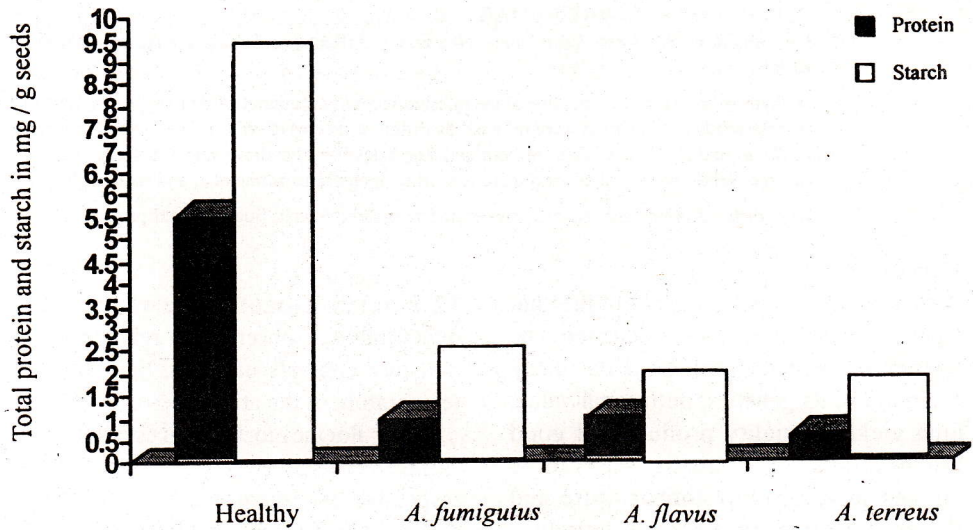


Fig.1. Total protein and starch in healthy and infested seeds of Ground nut.

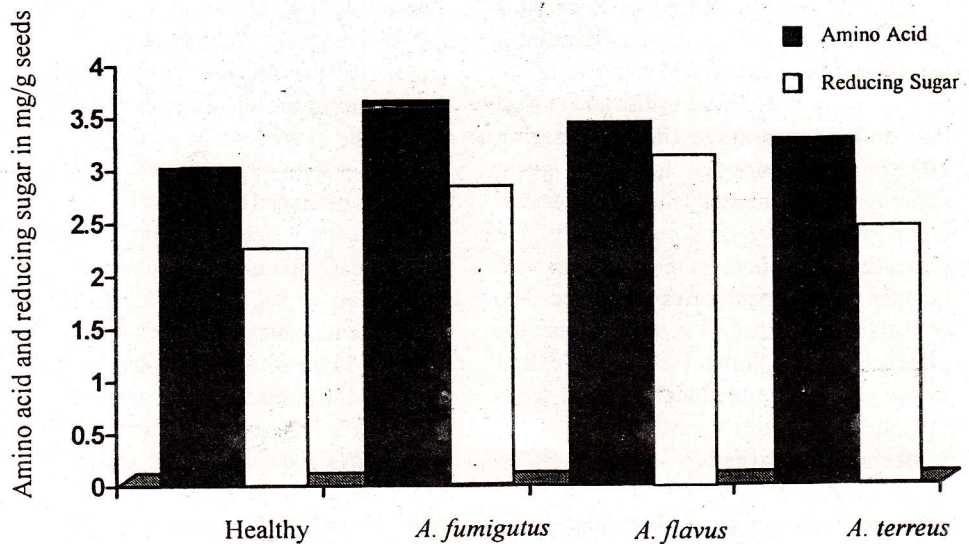


Fig.2. Amino Acid and reducing sugar in healthy and infested seeds of Ground nut.

organism. There was a marked decrease in starch content in all infested seeds. The decrease was by 77%, 86% and 89% in infected with *A. fumigatus*, *A. flavus* and *A. terreus* respectively. All the test organism were found to have ability to degrade and utilises starch quite efficiently. These pathogens were found to utilise as much as 90% to 95% of starch during 7 days of incubation. So these pathogens were more harmful for starch seeds if the seeds get infestation during stored condition (Fig. 1). Reduction in the starch content of infested seeds is quite common and has been attributed to starch hydrolysing enzymes β -amylase or α -amylase which convert starch into simpler sugars⁵. Bilgrami *et al.*⁶ studied the effects of fungal flora on the seed contents of moong and observed that the hydrolysis of starch into sugars appears to be the reason for higher level of hexose sugars in infested seeds.

The present study also revealed that the proteolytic enzyme secretion ability of *A. fumigatus*; (29.39%) *A. flavus*; (27.84%) is quite high as compared to *A. terreus*; (27.35). *A. terreus* shows a tendency to store less amount of amino acid in its mycelia as compared to rest of the species of *Aspergillus*, studied. This may be correlated with the lower proteolytic enzyme production ability of *A. terreus* (Fig. 2). Sinha and Prasad⁷ observed that the total absence or reduction in the contents of amino acids in the diseased seeds may be attributed

to their utilisation by the fungus or their degradation by enzymes, while the increase in the amino acids may be due to the decomposition of host protein caused by proteolytic enzyme of the pathogen. There was a marked increase in reducing sugar content in all infested seeds. The increase was by 20%, 50% and 10% in infected with *A. fumigatus*; *A. flavus*; *A. terreus* respectively (Fig. 2).

Sinha and Prasad⁷ observed that the increase in the concentration of reducing sugars in the infested seeds may be assigned to the activity of the fungus in bringing about the conversion of sucrose into its various components (glucose and fructose). However, this observation is contrary to the observations of Bilgrami *et al.*⁶ who observed marked decline in the sugar concentration in diseased moong and urad seeds.

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