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Biochemical changes in banana fruits due to postharvest fungal pathogens

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CORRESPONDENCE

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ABSTRACT

The nutritional value of fruits chiefly depends on the quality and quantity of nutritive substances. In the present investigation, four fungi were studied from banana fruits which cause considerable biochemical changes to alter the quality of banana fruit. The infected bananas showed a decrease in the quantity of total soluble sugar, protein, ash, ascorbic acid and mineral elements when compared with the control of fruit. *B.theobromae, R.oryzae, G.musarum, A.niger, A.flavus* and *F.roseum* were found to be associated with the ripening of bananas and also causes rot during storage.

Introduction

Banana is an important fruit crop in India. Completely ripened banana fruits are highly digestible. Nutritionally, banana fruit is a good source of vitamin–A and vitamin-C. During ripening, the starch contents are gradually converted to sucrose, glucose and fructose and in addition water in the pulp increases. Such ripened fruits are and vegetables are vulnerable to attack by microorganisms because of their high moisture and rich nutrients (Mehrotra, 1980). Bananas in storage and transit are subjected to various fungal rots. As a result of such infectitious rots the market and nutritive value of the fruit is lowered, either due to its ugly appearance or the changes in the stored products of the fruits.

Materials and Methods

Infected banana fruits were collected from banana market for two consecutive years and brought to the laboratory in separate clean polythene bags. As soon as the infected fruits were brought in laboratory, symptoms were critically studied. Various stages of disease development were noted. The nature of rot and extent of tissue damages in fruits were carefully estimated. Isolations were made from infected fruits on PDA medium containing trace of streptomycin to prevent bacterial growth. Small bits of infected parts of fruits were removed carefully and surface sterilized with 0.1% HgCl2 and transferred to petridishes which were then incubated for 8 days at 28ºC. Prevalence of different fungal pathogens was recorded. Fungal cultures were purified and maintained in test tube slants at 4ºC for further studies.

The vegetative and reproductive structural details were noted. Exact identification of each pathogen was made by referring to Gilman (1971); Smith (1960); Tilak (1998) and with other standard literature. The pathogenicity of various fungi isolated from infected banana fruits was carried out in laboratory by following Koch's postulates.

Healthy and uninjured ripened banana fruits of uniform size were washed with distilled water. Surface sterilized fruits were wounded 2×2×2mm. spore suspension of *Aspergillus niger, Fusarium roseum, Rhizopus stolonifer, G.musarum* were inoculated to banana fruits separately. The fruits were incubated at 28±°C for 8 days. The healthy fruits without inoculation served as control. The inoculated and healthy fruits were analyzed for nitrogen, protein, total sugar, reducing sugar, total free amino acids, ash content, non reducing sugar and total phenol content. The nitrogen content was estimated by conventional Microkjedalh's method and multiplied by factor 6.25 to determine the protein percentage. Free amino acids were estimated by the method of Jayaraman (1984). The changes in total sugar and reducing sugar were estimated by following the method of Dubols, et al. (1956) and Miller (1959) respectively. The ash content was estimated by using the method of Hart and Fisher (1971). The method for quantitative estimation of total phenol and estimation of ascorbic acid was done by following the method described by Sadasivam & Manikam (1992). Non reducing sugar content was determined by substracting the values of reducing sugar from total sugar.

Results and Discussions

The spoilage of banana fruits is caused by various fungal pathogens. But four pathogens viz; *Rhizopus stolonifer* (*Rhizopus* rot), *Fusarium roseum* (Fusarial rot), *Gleosporium musarum* (Anthracnose) and *Aspergillus niger* (*Aspergillus* rot) were more common causing considerable damage.

Biochemical changes in infected banana fruits

The nutritional content of healthy banana fruits was found to be significantly higher than the infected fruits. These differences may be due to deterioration caused by the fungi, since fungi require some essential nutrients for growth of survival (Obgonna et al.,1998; Campbell, 1985). In present investigation, there is decrease in total sugar and increase in reducing sugar was observed. Generally, it is observed that the quantity of amino acids in free as well as bound forms increased in infected fruits. Increase in free amino acids may be due to proteolysis of fruit

proteins catalyzed by the fungal enzymes (Arya, 1993). The increase in protein bound amino acids appears to be due to the association of fungal mycelium with fruit tissues. The vitamin-C of both healthy and infected fruits are stored but the decline is more pronounced in the infected fruits. Healthy fruits are very rich in mineral content, while in banana infected with *R.stolonifer;* there is increase in mineral content heavily due to the secretion of cell wall degrading enzymes and by toxin produced by pathogens. There is considerable increase in total phenols in infected banana fruits.

Table1. Biochemical changes in banana fruits infected with post- harvest fungi

Fungal Pathogens	Nitrogen (%)	Protein (%)	Total Free Amino Acids (%)	Total Sugar (%)	Reducing Sugar (%)	Vitamin-C (%)	Total Ash (%)	Total Phenol (%)
R. stolonifer	0.16	1.00	4.00	16.05	10.03	0.4	1.50	3.00
F. roseum	0.21	1.31	3.32	14.08	10.28	0.2	1.61	3.92
G. musarum	0.18	1.12	3.50	17.52	10.08	0.3	1.08	3.89
A. niger	0.17	1.06	3.54	16.08	10.00	0.5	1.69	3.10
Control	0.2	1.25	3.0	30.0	8.00	0.8	2.05	2.88

Conclusion

The nutritional value of fruits chiefly depends on the quality and quantity of nutritive substances. Various fungi causes rots in fruit of banana. Postharvest losses of fruits are very high and diverse post infectional biochemical changes reduce their food and market value considerably. Results of study showed that fungal infection brought about nutritional changes in fruits.

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