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Received for publication July 17, 1982.

Mycoflora associated with the processed cocoa beans

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Cocoa storage in tropics needs considerable care to prevent the deterioration arising from fungal (mould) and insect attack. Cocoa is graded on the basis of limits to its contents of defects viz., mouldy beans, slaty beans, insect damaged beans, germinated beans, broken beans and flat beans. The beans inside healthy pods are free of microorganisms. As soon as the beans are taken out from the pods they are fermented for six days and dried. The microorganisms develop on these beans at the time of processing i. e., fermentation and drying. Mouldy beans are considered as worst defect of cocoa beans, as it affects the flavour of the finished cocoa products. It is possible to detect the mould off-flavour with samples as little as 4 per cent. Several types of moulds are reported in the processed cocoa beans from other countries[1–3]. The present studies were carried out to find out the fungi, occurring in the processed cocoa beans in India.

The processed cocoa beans collected from Central Plantation Crops Research Institute, Regional Station, Vittal; CAMPCO (Central Arecanut Marketing and Processing Co-operative Ltd.,) Cocoa Processing Unit, Puttur (Karnataka State) and C. P. C. R. I., Research Centre, Kannara, Trichur (Kerala State) were used for the present studies.

The ectophytic fungi were isolated by standard blotter technique. The endophytic mycoflora were isolated from the beans after removing the shell, the surface sterilized cotyledons were cut into three pieces and placed aseptically on potato dextrose agar (PDA) plates. The bean maceration and dilution plating method was also followed to isolate the internal mould. The plates were incubated for 5 days at room temperature (30 $\pm$ 2°C) and the fungi were isolated, purified and maintained on PDA slants.

The fungi isolated from the surface of the beans according to the frequency of occurrence were *Aspergillus fumigatus*, *A. tamarii Kita*, *A. niger* Van Tieghem, *A. flavus*, *Mucor pusillus* and *M. hiemalis* Wehmer. Among fungi observed inside (endophytic) the beans were *Aspergillus niger* Van Tieghem, *A. tamarii Kita*, *A. fumigatus*, *Mucor hiemalis* Wehmer, *M. pusillus* and *Fusarium semitectum*. The ectophytically and endophytically occurring fungi were *Aspergillus fumigatus*, *A. tamarii*, *Mucor pusillus* and *M. hiemalis*. This is the first report on the occurrence of the above fungi on processed cocoa beans from India.

Review of pertinent literature reveals that *Mucor hiemalis* and *Fusarium semitectum* have not yet been reported on processed cocoa beans either from India or

abroad. These fungi are non-pathogenic but however their occurrence may lead to mouldiness affecting the flavour.

The fungi inside the beans not only affect the flavour but also increase the free fatty acid contents of the cocoa butter[4,5] and the growth of *Aspergillus flavus* and *A. fumigatus* known to produce mycotoxins[6].

Damage to testa (shell), moisture content of the beans (above 8 per cent) and atmospheric humidity (above 82 per cent) favours the mould development. *Aspergillus fumigatus* is a thermoresistant fungi which can penetrate the micropyler end of the beans[7]. With the expansion of cocoa cultivation in the high rainfall areas of Kerala, Karnataka and Tamil Nadu States, the prevention of mould growth is important to maintain the quality of the processed cocoa beans during the storage.

The authors are grateful to the Director, C. M. I., Kew, England for the identification of the fungi.

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Received for publication August 25, 1982.

Biochemical changes in tomato fruit under pathogenesis of three fruit-rot fungi

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Fungal infection of fruits besides giving an ugly appearance which results in decreased market value also affects the nutritive value due to the changes in stored products of the host. Biochemical changes under pathogenesis in tomato have been studied in few cases only[3–8]. In the present investigations changes in sugars and amino acids under pathogenesis of three fungi commonly occurring in this region were studied.

Healthy and semi-ripe fruits of tomato (*Lycopersicon esculentus* Millsp.) variety Pusa ruby were surface sterilized with 0.1 per cent mercuric chloride washed subsequently with sterile water. The fruits were dried and inoculated with different fungi *Nigrospora oryzae* (Berk. et Br.) Petch, *Phoma exigua* Desm. and *Rhizoctonia solani* Kuhn.] after inflicting a scalpel injury. The high RH was maintained by placing a moist cotton pad on the inoculated region. Every alternate day a set of fruits was taken out and analysed for sugars and amino acids. Two g of fruit tissue from infected