Effect of Seed Mycoflora on Nutritional Constituents of Paddy Under Conventional and Newly Devised Storage Systems

T. Prasad, R.K. Sinha & Shivendra Kumar Post Graduate Department of Botany, Bhagalpur University, Bhagalpur-812 007.

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Seed samples of paddy obtained from conventional storage, *Kothi* and Iron-bin and newly devised storage structures prescribed under "Save Grain Campaign", i.e. *Pucca kothi* and Metal-bin were analysed for fungal association and changes in nutritive content at different storage intervals. Fungal species 18 and 13 were isolated respectively, from *Kothi* and Iron-bin stored samples while from *Pucca Kothi* and Metalbin only 8 and 6 fungal species respectively, were recorded. Depletion of starch, protein, total sugar, reducing sugars and non-reducing sugars was recorded in both the conventional and newly devised structures. Depletion in nutritive constituents was less in the newly devised structures.

Key Words Deterioration Fungi Nutritive Paddy Post Harvest Storage

Paddy (Oryza sativa L.) is a staple food in India. It is stored in traditional storage structures by farmers. Post harvest losses of grains in tropical and sub-tropical countries have been reported by various workers (Christensen & Kaufmann, 1969, Schroeder, 1965.) Prasad et al 1986 have reported major changes in chemical constituents of stored grains by fungi in different traditional storage systems. Recently the Government of India introduced some new storage structures under "Save Grain Campaign" for the storage of grains. Pucca Kothi and Metal-bin are the newly devised structured in Bhagalpur and Munger districts in Bihar.

The present investigation aims in evaluating the comparative efficacies of these newly devised and traditional storages in terms of changes in nutritive constituents of seed by associated fungi.

MATERIALS & METHODS Samples of paddy were collected from 14 cultivars of this area, representing 4 each from *Kothi* and Iron-bin (traditional storage) and 3 each from *Pucca Kothi* and Metal-bin. The storage structures having storage capacity of 3-3.5 quintal each, were hired from the farmers at three blocks and kept undisturbed throughout the study. After 2,4,6 and 8 months, the samples were collected randomly to analyse fungi and changes in nutritive constituents. Moisture content of the grains was measured

by drying them in an oven

Isolation of fungal flora was done by standard blotter method and agar plate method (ISTA 1966).

Estimation of constituents, i.e. protein, total sugar, reducing sugars and starch was done by following the methods of Lowey et al., (1951), Doubois et al., (1961), Paech & Tracey (1955) and Snell et · al. (1961), respectively

RESULTS Table-1 shows the percentage incidence of fungi associated with stored paddy seeds in different storage structures. In all, 18 and 13 fungal species were isolated from Kothi and Iron-bin respectively; 5 species occurred always in Kothi, i.e. Aspergillus flavus (20%), A. niger (15%), A. candidus (10%), Fusarium semitectum (18%) and Penicillium citrinum (17%) and only 3 were predominant in Iron-bin, i.e. A. flavus (12%), F. semitectum (14%) and Penicillium citrinum (15%). Modified structures showed comparatively lesser percentage incidence and number of fungal organisms. Only 8 fungi were

isolated from *Pucca Kothi* stored seeds, out of which *A*. flavus, *A*. ochraceous, *A*. ustus and *Doratomyces purpure*ofuscus showed 4-5% incidence, Metal-bin stored seeds exhibited the presence of only 6 fungi. *Cunnighamella* clegans was a new fungus in this storage.

Table 2 reveals the periodical changes in nutritive constituents of stored paddy seeds. There was a gradual depletion of nutrients with prolonged storage period. Protein showed 24% decrease in its value in Kothi whereas in Iron-bin, *Pucca kothi* and Metal-bin, the decline was 23%, 17% and 15% respectively, within 8 months of storage. Depletion in starch was maximum in Kothi (18%) and minimum in Metal-bin (3%). Likewise total sugars, reducing sugars and non-reducing sugars declined in their value in different storage system. The general depletion of constituents in relation to storage structures was Kothi > Iron-bin > Pucca kothi > Metalbin.

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DISCUSSION Christensen & Kaufmann (1967), Mathur and Sinha 1978 reported that atmospheric conditions in the tropical and sub-tropical areas are congenial for the growth of moulds. Prasad & Kumar (Unpublished data) reported that the traditional storage structures of Bihar provide ideal conditions to microorganisms to cause deterioration of grains.

Higher percentage incidence of fungi in the samples of kothi than Pucca kothi may be attributed to structure and building materials of kothi. It is made up of husk and mud mixture, providing ample scope to fungi to enter and grow on the stored commodities. Pucca kothi on the other hand is constructed by cemented brick wall having internal coating of polythene sheet and showing better and airtight conditions disallowing the growth of microorganisms. Likewise reduced incidence of fungi in Metal-bin structure compared with Iron-bin is due to thick galvanised iron sheet having separate outlets for handling of grains. This storage structure is better than the ordinary Iron-bin having thin iron sheet and only one opening for grain handling. However, none of the storage structures is perfectly safe from fungal colonization on the stored grains.

Changes in nutritional components of paddy seeds under different storage period might be attributed to the association of seed mycoflora and their preferential utilization of ingredients. Fungi have the ability to utilize the complex substances like protein and starch with the help of specific enzymes converting them into simpler forms (Bilgrami & Verma, 1976). Bilgrami *et al.* (1979) and Prasad *et al.* (1986) reported remarkable changes in protein and starch contents of stored paddy seeds, respectively. Degradation of total sugar, reducing sugars and non-reducing sugars may also be ascribed to the fungal activities (Bilgrami *et al.*, 1976 Prasad *et al.* 1986). Acknowledgement We thank Prof. K.S. Bilgrami, Head, P.G. Department of Botany, Bhagalpur University for providing laboratory facilities and to the Indian Council of Agricultural Research for financial assistance.

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