Research Notes

New and Old Rice

By

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Rice forms the staple food of more than half the population of the world and presents problems that are peculiar to its use in the East only. Their solution is, therefore, of importanee from considerations of public health affecting as it does the food of over 90 millions of human beings.

It is well known that rice immediately after harvest does not mill and cook well. It is therefore generally stored for sometime before it is cooked and consumed. The ill effects of a diet of new rice is a common experience, the symptoms resembling essentially of poor digestion. New rice imbibes very little water and cooks to a lumpy and shapeless mass or to a paste, yielding a thick viscous gruel. When, however, such a rice is stored for some months, it gains all round improvement in quality. It cooks to a good fluffy consistency, is more palatable and is easily digested. Its milling quality also is improved.

To effect this improvement in quality, rice is stored in many ways. In Madras State rice is stored as paddy in receptables made of plaited straw: e. g. *pattarai*, *moodas*, split bamboo: e. g. *kalanjiam*, *gadi* or cotton stalks: e. g. *kagni* or *gummi*; containers made of mud and brick: e. g. *panat*, *kanjaras;* wooden receptacles e. g. *arah* or *pathazam;* and in underground pits, earthenware pots, gunny bags etc.

The changes that take place on storage of rice in these receptacles are not clearly understood. In fact no detailed investigations on quality changes on storage of rice have so far been undertaken. The chemical and physical causes underlying the improvement in quality are in most cases merely surmised or at best indicated on evidence. Earlier workers on this problem have obtained evidence centering round one or the other of the following types of changes:

i. Starch constitutes about 65% of the rice grain. The minute particles of starch uadergo certain physical alterations, consequent on the loss of moisture and drying that obtain during storage. Due to these changes usually known as changes in the colloidal system of starch, the stored grain is able to absorb more water and expand more on cooking.

ii. The rice grain contains certain sub-microscopic biochemical substances, known as enzymes, which have the power to convert starch to a liquid condition. It is claimed that freshly harvested rice cooks to a pasty mass because of these starch liquefying enzymes, which are then at their maximum activity. These are inactivated by storage so that the stored rice is able to cook without loss of form or shape. The rice grain also contains certain other enzymes capable of breaking down starch into less

complex compounds like dextrines and sugars. It is also reported that these enzymes continue to act on the raw starch of the grain during storage and effect a slow breakdown and this brings about improvement in quality.

Recent experiments conducted by the author at the laboratories of the Government Agricultural Chemist, Coimbatore, have thrown further light on this problem. The main findings from these experiments are summarised below :

(1) On storage, rice acquires a greater capacity for swelling and expanding when boiled with water and cooked for food, to the extent of 12·45% of its original swelling capacity. The rate of cooking and the extent of expansion on cooking are different for different rices, some rice varieties howing an initial expansibility which is even greater than that obtained on storage of others. This difference is independent of the duration of the crop. It was also found that rices which show greater capacity to swell generally sell at higher prices.

(2) Old rice yields on cooking a less viscid *kanjee* (rice water). This is also true of the chemical substance starch extracted from the whole rice with cold or boiling water. These changes have been traced to alterations in the chemical make up of the starch particle.

(3) Starch is made up chemically by the combination of varying units of a simple sugar known as glucose, As new rice becomes aged, the number of the constituent glucose units become greater, thereby making the starch chemically more complex so that increasing amounts of the starch are retained in the grain and only smaller amounts pass into the kanjee while cooking.

(4) Raw and hand pounded rice contains 0·3 — 0·4 percent of phosphorus which is lost to the extent of 11·0 — 49% on washing and cooking, the loss being less in the case of the stored grain. Cooked rice is therefore poor in phosphorus and considerable proportions of it are left behind in the kanjee. Further, during storage the phosphorus contained in the exterior of the grain diffuses to the interior layers and more of it is fixed on to the starch.

(5) The starch particles of rice vary in size from two to ten thousandth of a millimeter. These are also aggregated into bigger units. The big and small granules are arranged compactly into the rice kernel. During storage the starch particles become appreciably reduced in size and altered in shape. Further there are re-arrangements of the particles themselves so that the pattern in the old rice is substantially different from that existing in the new rice.

(6) In between the particles of starch as existing in the rice there exists minute cavities or intergranular capillaries. These become wider