Grain storage: methods and measurements

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Reducing post-harvest losses is considered as a major step towards food security. However, losses vary significantly by climatic region, country, crop and of course the infrastructure and methods of storage followed. In India, the post-harvest losses of food grains amount to more than 20 million tons per year, which is approximately 10% of the total food grains produced. This can be attributed to the poor infrastructural facility and unscientific methodologies followed for food grain storage in the country. In a country where about 20% of the population is undernourished, post-harvest losses of 20 million tons annually is a substantial avoidable waste. Safe grain storage methods play a crucial role in preventing losses caused mainly by weevils, beetles, moths and rodents. It is estimated that 60–70% of food grain produced in the country is stored at domestic level. To ensure safe and scientific storage, careful selection of storage site, storage structure and proper aeration of grains, regular inspection of grain stock, cleaning and fumigation needs to be performed when required. Traditionally two approaches are employed for grain storage in India: temporary and long-term storage methods. Under temporary storage, aerial storage, storage on the ground or on drying floors and open timber platforms which is normally done at farm level are followed, whereas under long term storage, methods storage baskets (cribs) made exclusively of plant materials, calabashes, gourds, earthenware pots, jars, solid wall bins and underground storage can be employed. Bulk storage of produce is done in warehouses owned by the Food Corporation of India (FCI) and the Central and State Warehousing Corporation (CWC/SWC). Warehouses are scientific storage structures especially constructed for the protection of the quantity and quality of stored products. Under bulk storage, sealing and aeration play an important role. Aeration may be ambient or refrigerated based on the requirement. Over 420 standard test methods including more than 75 internationally accepted methods are available to test the quality of stored grains. Of the wide range of properties used for testing, the bulk density and the foreign matter are commonly assessed for most grain types. For foreign matter content analysis, the screens of sieves used for the assessment should consist of perforated metal plate conforming to specifications laid down by national or international standards organizations. Moisture content is another important parameter which should be considered during grain quality analysis. The indigenous storage structures are not suitable for storing grains for very long periods. Thus, improved storage structures and scientific storage of grains in form of warehouses is the need of the hour to strengthen traditional means of storage with modern inputs and to provide cheaper storage facility to farmers as well as to prevent enormous storage losses.

Keywords
grain storage methods; storage structures; warehouses; bulk storage; quality measurement methods.

FOOD SAFETY

Towards the world-wide harmonisation of analytical methods for monitoring quality and safety in the food chain

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With the demand for good and healthy food, its availability in sufficient quantities and year round, conveniently packaged and sold in supermarkets, with an acceptably long shelf-life, and appealing taste and appearance, more and more foods and food products are being traded around the world. Globalisation and consumer demands require new processing and distribution strategies, which bear new risks and challenges for the safety of foods and feeds. Climate change and natural disasters add to the challenges to provide safe and sufficient foods.

Ensuring that these foods are of high quality and safe to eat when they reach the consumer requires reliable food analysis techniques. Recent food scares such as BSE, Salmonella and E. Coli outbreaks, Listeria monocytogenes, Acrylamide, Avian influenza, Sudan red, melamine, Ochratoxin, and others have emphasized the importance of protective legislation and powerful analytical test systems to ensure safety of foods.

There is always, however, the required aspect of proving that the method works where it is applied, that it is fit for purpose, gives indeed equivalent results to a reference point and can be used with confidence in the user's laboratory. Standardized methods of analysis are highly valued by all stakeholders involved in food safety and quality, trade and retail. National legislation as well as international agreements refer to documentary standards (product as well as procedural standards) to enable international trade as well as to support the well being of consumers. Many of the standardized methods available nowadays have been validated by a collaborative study organized and evaluated according to internationally agreed protocols. Although a collaboratively validated method is considered as having an impeccable pedigree with regard to transferability among laboratories, a laboratory still needs to demonstrate that it is able to competently apply it.

In collaboration with ISO and CEN and other national and international organisations, ICC has initiated various projects to improve methods of analysis for food safety (beyond cereals and cereal products to apply horizontally across all foods), validate methods and harmonise method requirements and validation protocols on a global basis. One example is the MoniQA Network of Excellence (Monitoring and Quality Assurance in the total food supply chain, www.moniqa.org), which is funded by the European Commission under contract no. FOOD-CT-2006-36337, and which has recently been established as an international association aiming at making the food chain safer by contributing to the development and validation of reliable test methods and by harmonising safety and quality testing schemes on a global basis. MoniQA involves partners and associates from all continents and integrates the needs of all stakeholders from policy makers and standardisation bodies, consumer organisations, science and research institutions, and companies, including food manufacturers, method providers, control laboratories, retailers, etc. The initial network of over 155 scientists from 20 countries has grown to over 500 experts from some 45 countries from 5 continents.

To overcome the different challenges in assuring the reliability and comparability of analytical results, international harmonisation efforts have worked on providing guidelines and standards, and other tools available to governments, food businesses, research institutions and control laboratories to assure a safe food supply chain.