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Traditional Grain Storage Practices in India

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Post harvest management including storage and infestation accounts for about 10 % losses of total food grains in India. Thus, efficient storage of grains immensely contributes to socio- economic developments. The main factors affecting the spoilage loss of food grains during storage are as follows(A) physical factors e.g. temperature, relative humidity, oxygen and carbon dioxide levels (B) Biological factors, e.g. microorganisms, rodents and insects (C) chemical storage e.g. pesticides and (D) engineering or mechanical factors e.g. design of storage structure, type of packaging and transportation. The modern warehouses and traditional storage structures have their own merits and demerits. It appears that the traditional storage structures are superior to modern warehouses in certain aspects including lesser storage losses, but require some technical interventions. The key parameters like temperature, relative humidity, oxygen and carbon dioxide levels should be monitored during the traditional storage of different grains. The modern warehouses should be designed to include the positive features of traditional storage. In many parts of India, sun drying is used to control the moisture content, which is less effective in the north- east region of India due to heavy rainfall. Hence, the method of withering tea leaves by hot air can be used. Similarly, the use of camphor, tulsi, onion, neem and neem berry in place of some chemical pesticides can be used to prevent grains from pest and insects. Through this informatic article of Indian traditional system an attempt shall be made to formulate technological concepts for designing a novel efficient food grain storage system based on beneficial Indian traditional knowledge so that we conserve our Indian Tradition utilised from ancient time.

Introduction

The origin of tea was China and found in 2750 BC. It is found that the tea leaves are so much medicinal properties and it is very sensitive for absorbing the moisture quickly from the atmosphere. Hence it is used in grain storage to prevent the grains from the insect, pest and rodents etc. A post-harvest management including storage and infestation account for about

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10% of total food grains losses due to unscientific storage, insects, rodents, micro-organisms etc. Approximately one-third of the food produced (about 1.3 billion ton), worth about US $1 trillion, is lost globally during postharvest operations every year (Gustavsson J., et al, 2011).In India, annual storage losses have been estimated 14 -million tonnes worth of Rs. 7,000 crore in which insects alone account for nearly Rs. 1,300 crores. The major economic loss caused by storage insect pests is not always by consumption but also by the amount of contamination. About 600 species of insects have been associated with stored grain products. Nearly 100 species of insect pests of stored products impact on economic losses. According to World Bank Report, post-harvest losses in India amount to 12 to 16 million metric tons of food grains each year, an amount that the World Bank stipulates could feed one-third of India's poor. Out of these post-harvest losses storage -insects alone account for 2.0 to 4.2 % followed by rodent's 2.50%, Birds 0.85 % and moisture 0.68 %.

Requirement of storage grains

The traditional approaches of grains storage were developed by the communities and tribes and transferred this knowledge from generation to generation (Natarajan and Santha, 2006). One fourth parts of developing countries, farmers keep their products at the village level. The traditional storage system is considered to be more effective or give satisfaction in which they continue improving so as to sustain grains from damage. The percentage of total food crop production reserved at the farm-level and the storage time is largely a function of farm size and production per acre, marketing chain, pattern of consumption, labour wage, credit availability and future crop outlooks. Grains can be stored at inside, outside and at below the ground level ranging from those of mud to modern bins. The storage structures are built from a variety of locally available materials differing in design, shape, size, and functions (Channal et al., 2004; Kanwar and Sharma, 2003).

Traditional grains storage practices and methods

Withering process impact on tea leaves moisture. It will reduce moisture content of tea leaves from about 75 % to 55 %. Withering consumes 49-61 % of total energy consumption. Currently weathering process is done manually to control the air flow upto to 40 % energy saving can be achieved with withering application. A mixture of ambient air and hot air enter to the trough to remove moisture from the grains. Wireless sensors like temperature and relative humidity sensors collects the data and send data to the main controller and controller

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sends commands to damper actuator and USD to control ambient temperature and hot airflow. The user enters the initial parameters from the controller or mobile app to start process. The user enters the initial parameters like weight, moisture content, leaf temperature and duration are controlled from controller or mobile app to start process. Wireless collects the data and seed data to main controller. Main controller sends the main commands to VSD and damper actuator. Finally, application of cloud platform can be used to monitor and analyse the data.

Fig: Data int device

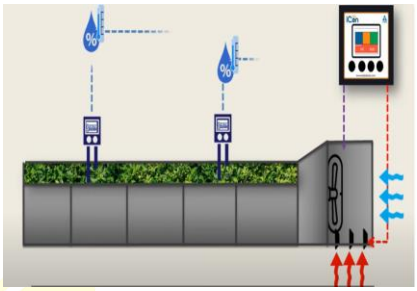

Fig: Drying of leaves by hot air

Fig: Mobile app analysis of data

Fig: drying chamber

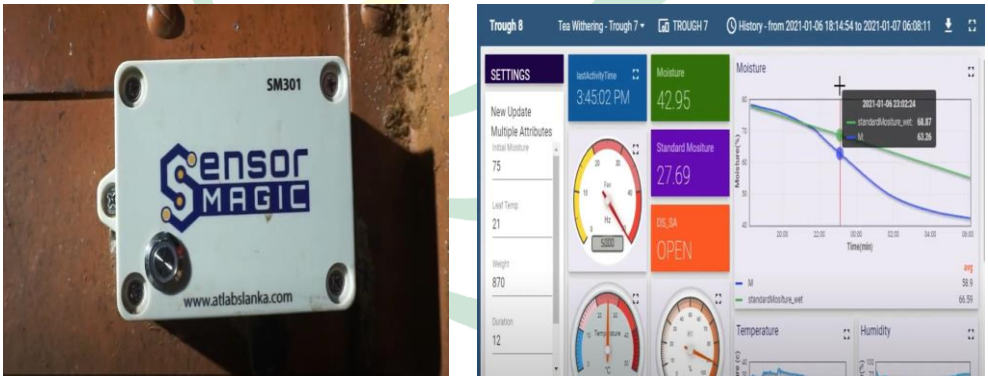

Fig 1: Tea leaves processing equipment

Traditional Storage Bin

In the West Siang region of Arunachal Pradesh, India, the resource-poor farmers employ nahu, a traditional storage structure, for storing food grains like rice, maize, millet, etc. Nahu has a storage capacity of 5.0–8.0 t, with the ability to store 0.20–0.24 t/nahu for seed

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purposes. The structure has a 20-year lifespan. In order to prevent a fire from starting, these storage buildings are erected in close proximity to the village's residential zones. Although the construction resembles a crib, it is separated vertically into three compartments: the center compartment is left vacant, the lowest compartment is used for firewood, and the topmost chamber is where the grains are kept until they have dried completely and are constructed of bamboo mats and Livistona.

Solar heating

Solar heating is the traditional methods was used in India from ancient time to till now. This method is very much beneficial for drying of grain in presence of sun light. It is old practices adopted by farmers before storing it in the storage bins in the region where temperature rises more 20 °C or higher (Chua and Chou, 2003). The solarisation time is varying from crop to crop and crops are dried upto whenever it is reached a satisfactory level. The process of drying the grain is first the grains are spreading over the surface or on the roof or on over the polyethylene sheet, bamboo mat and roadside to reduce the moisture content and killed the infective agents (Ofor, 2011)

Fig 2: Sun drying of grains

Use of camphor

Camphor is a waxy, colorless solid strucyure with strong aroma. It IUPAC name is 1,7,7- trimethylbicyclo(2.2.1) heptan-2-one. Camphor has been produced from as a forest wood.

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Camphor is used for short-term storage of grains required for next season planting. The shelled grains or paddy are stored in bags or pots after being sun-dried and camphor is placed inside the storage bags or container. The mode of action of camphor used in such grain's storage could be either fumigant, repellent or antifeedant attributed to pungent odor emanating from the camphor (Karthikeyan et al., 2009a).

Fig 3: Camphor

Neem leaves:

Neem is a bon for human being. Ayurveda recommended that used of neem in daily life save you from uses of neem in daily life save you from many bacterial and infection diseases. It purified human blood naturally. It is the ocean of many properties like anti-bacterial, anthelmintic, antiviral, anticancer and also immune booster agent. It is very useful in treat acne problem. It nourishes your skin because it is rich sources of vitamin E which help to repair damage skin cells. Neem is proved as antifungal property which helps treat fungal infection. Neem can be used for detoxification both inside and outside. Consumption of neem leaves stimulates your kidney and liver, increase the metabolism and eliminating the toxin out from the body. Externally it is used to remove germs, bacteria etc. It also increases immunity. If we burn a few leaves of neem, it prevents them from mosquitoes and it is also be used in chickenpox diseases from ancient time to till now.

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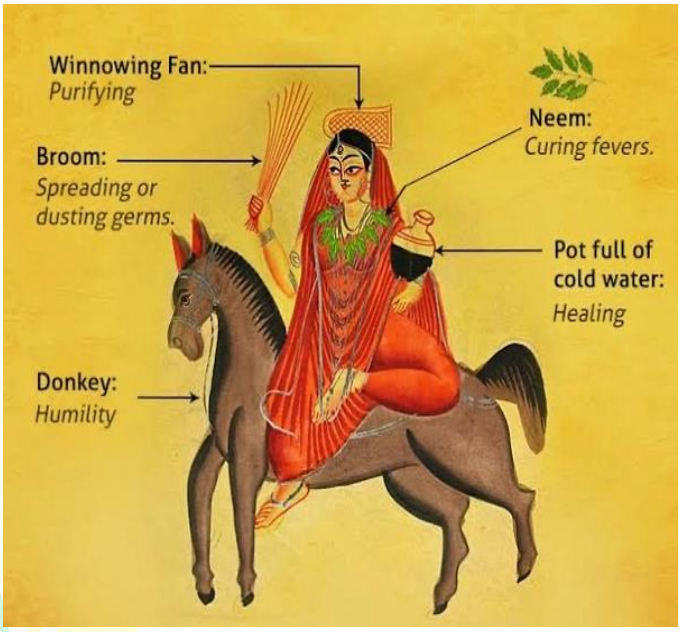
Neem trees and its leaves are very useful both for skin and storage purpose of grains. Its medicinal property kills the insect, pest and rodents present in the grain. To store the rice firstly we place a layer of neem leaves on the surface and then place a rice over it and then it again covers with the leaves of the neem. This reduces the chances of insect and pest effect the rice and if there are insects, then they will die by consuming these leaves.



Mustard oil:

Mustard oil and Til oil repel the insects. A small quantity of mustard oil or Til oil is mixed with pulse grains while storing. This guards the pulses from storage pests. This costs Rs. 20-25 per quintal pulse grain. For the storing of dal about 3 to 4 months , mustard oil should be used and applied on the dal and after that it is sun drying and then fill it in the container.

Before storing the dal for 2-3 months, mustard oil should be applied. After that, dry it in the sun and then fill it in the container. After applying mustard oil on rajma, chickpeas and drying it in the sun, and then filling it in the container also prevents insects like weevil.

Onions:

Alliums are a family of plants that also includes leeks, chives, and garlic. These vegetables have some medicinal qualities in addition to their distinctively strong flavors. Onions were regarded as one of India's most important vegetables, spices, and medicinal herbs in the sixth century (Kabrah 2010). According to the current review, the majority of Asian countries—India and Pakistan, for example—treat a variety of illnesses with onions. Overall, it is found that less developed nations were the ones that utilized A. cepa the most frequently. This may be caused by the dearth of healthcare facilities and the accessibility of conventional treatments. You can add onions to it to protect the wheat. Onions can be mixed in it to keep wheat safe. Half kg onion in a quintal wheat, by following this ratio mix onion. First put the onions in the bottom of the container and then put it the middle and then at the top. This will prevent the insects.

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Neem Berries:

In 100 kg of chickpeas add 1kg of neem berries, by following this ratio you can protect chickpeas from insects. Other than this, if you want to protect the flour and rice from pests, put dry red chilies or whole salt tied in the cotton cloth in the container.

Fig 4: Neem Beery

Tulsi

Tulsi is very common plant and it is found in every house of India. It is used as a medicinal plant because it has a numerous medicine property. It is used in various diseases like sinus, nose running, fever and cough etc. It consumption boost the immunity of human being. It is also used in grain storage treatments to protect its from insect, pest and rodents etc.

Fig 5: Tulsi

Conclusion

The conclusion of the article is to remind your traditional system of Indian culture and adopted this system in your life cycle and also adopted it in dairy life. It is naturally found in our planet and we must be well known about of the importances of the vegetable, medicinal plant in our life.

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References

Channal, G., Nagnur, S., Nanjayyanamath, C., 2004. Indigenous grain storage structures. Leisa India 6, 10.

Chua, K.J., Chou, S.K., 2003. Low-cost drying methods for developing countries. Trends Food Sci. Technol. 14, 519–528

Gustavsson J., Cederberg C., Sonesson U., van Otterdijk R., Meybeck A. *Global Food Losses and Food Waste*. Food and Agriculture Organization of the United Nations; Rome, Italy: 2011

Kabrah, A. 2010. The antibacterial activity of onion on MSSA and MRSA isolates of Staphylococcus aureus. Biomedical Sciences 1:24–64.

Kanwar, P., Sharma, N., 2003. An insight of indigenous crop storage practices for food security in Himachal Pradesh. In: Food and Nutritional Security, Agrotechnology and Socioeconomic Aspect. SAARM, India, pp. 175–179.

Karthikeyan, C., Veeraragavathatham, D., Karpagam, D., Firdouse, S.A., 2009b. Indigenous storage structures. Indian J. Tradit. Knowl. 8, 225–229.

Natarajan, Santha, G., 2006. Indigenous agricultural practices among tribal women. Indian J. Tradit. Knowl. 5, 114–117.

Ofor, M.O., 2011. Traditional methods of preservation and storage of farm produce in Africa. N. Y. Sci. J. 4, 58–62.