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A CASE STUDY

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Documentation of traditional and indigenous seed and food grain storage practices of Bidar district

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SUMMARY :

Indigenous knowledge is the accumulated knowledge, skill and technology of the local people. It is readily available at no cost and has many advantages over scientific knowledge. The study was conducted at remote villages of Bidar district to document the indigenous storage techniques adopted by the farmers. The documentation was done by direct interview and group discussion methods. Key informants including progressive farmers belonging to small, marginal and big farmer categories, aged farmers, farmwomen and farm labourers were involved during the process of data collection. The results indicate that among the different management practices followed of the control of stored grain pest, sun drying an age old practice has been observed effective and was adopted by more than 80 per cent farmers in the district. The reduced moisture content inhibited the multiplication of stored pests has been well established long back.

KEY WORDS : Indigenous, Documentation, Storage, Pests, Management practices

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The grains for food and seed purpose occupy an important position in the ever growing needs of mankind. Farmers and traditional grains processors have been evolving number of traditional practices through trial and error method, to avoid huge loss that are occurring in stored pulse grains due to insect and pest infestation (Dhaliwal and Singh, 2010). Women folk have accumulated knowledge of household practices over generations by observation, experimentation and by handling age old people's experience and wisdom. Certain practices are unique to a given culture of a society and vary between countries, regions, villages and even communities. Indigenous practices emanate from the cultural contact with specific environmental conditions and are based on traditional society's intimate knowledge of their environment. These reasons imply that indigenous knowledge is eco friendly and safe both to man and his environment (Kartikeyan *et al*., 2009). It is estimated that 60-70 per cent of food grains produced in the country is stored at home level in indigenous structures ranging from bamboo baskets to mud structures, gunny bags and modern bins (Channal *et al.*, 2004).

Indigenous knowledge is a type of knowledge, which has evolved within the community and has been passed

on from one generation to another. Proper storage of food grains is necessary to prevent spoilage of food grains, increase keeping quality and for monetary reasons (Kanwar and Sharma, 2003). The practice of using natural sources for storage of various household items dates back to the very earliest period of known history. There is evidence of ash, sand and herbs used in ancient civilization, which have been credited with mystical power for increasing storage life many of these practices, find their credibility even in the modern era (Natarajan and Govind, 2006). The logic behind the use of this material is that they are user friendly and are also associated with scientific reasoning. Hence, the study was carried out with an objective to document the traditional storage practices adopted by the farmers of Bidar district.

EXPERIMENTAL METHODS

A survey was conducted in the indigenous technologies for storage practices and structures/ containers used in rural areas of Bidar district of northern Karnataka. In each taluk of the district, ten villages were interviewed on how the food grains are stored in their own way in rural area using a standardized proforma. During this process the storage structures used were documented, photographed, and analyzed on cereals and pulses. The data pertains to a mean of 10 households (farmers) from each village covering ten villages in each are tabulated and presented.

Key informants including progressive farmers belonging to small, marginal and big farmer categories, aged farmers, farmwomen and farm labourers were involved during the process of data collection. By contacting the respondents through one to one interaction and group discussion methods, the indigenous technologies used by dry land farmers for storage of grains and seeds were documented.

EXPERIMENTAL FINDINGS AND ANALYSIS

The results from the Table 1 indicate that among various pest management practices followed for preventing stored pests in cereals, sun drying after storage (once or twice) was the most common method with a mean of 86.50 per cent in Bidar district. It was supported by Sivasrinivasu (2001) who reported practices of sun drying to the tune of 93.00 per cent in Dharwad taluk of Karnataka indicating wide adoptability of the practice which reduce moisture content in grains and become inhibitory/detrimental for the multiplication of insects during storage. This practice was followed by mixing neem leaves 18.20 per cent and wood ash 13.80 per cent. The storage structures noticed during survey was predominated by storing in gunny bags 62.40 per cent in bidar district which was followed by hagevu (an underground structure) to the extent mean of 25.25 per cent. The other storage structures noticed during survey were bamboo structure (gummi), earthen pot and metal bin. These practices were dependent on the availability of raw materials and cost effectiveness.

The results from Table 2 indicate that, for storage of pulses sun drying was most common practice followed after storage in the region with a mean adoption of 82.35 per cent in Bidar district. These results are in agreement with the findings of Pushpa and Naik (2000) who reported that all the farmers followed practice of sun drying green gram before storage, while majority of the farmers mixed the grains with ash and neem leaves during storage against insect pest. The other methods followed like training the

Table 1 : Present status of indigenous technologies followed to prevent stored pests of cereals in Bidar district

Extent of practices (%)								
Storage practices				Storage structures				
Sun drying	Neem leaves	Wood ash	Others#	Gunny bag	Hagevu	Gummi	Earthen pot	Metal bin
86.50	18.20	13.80	5.80	62.40	25.25	7.80	1.60	2.95

#others include mixing of eucalyptus leaves, custard apple leaves, cow urine and boric powder as grain protectant

Table 2 : Present status of indigenous technologies followed to prevent stored pests of pulses in Bidar district

Extent of practices (%)								
Storage practices					Storage structures			
Sun drying	Neem leaves	Wood ash	Zandu tablets	Sweet oil	Gunny bag	Gunny bag lined with polythene sheet	Earthen pot	Metal bin
82.35	16.50	17.10	9.60	5.00	94.40	3.10	1.0	1.50

grains with wood ash varied with a mean of17.10 per cent. This practice was followed by mixing neem leaves by 16.50 per cent of the respondents. The major storage practices followed for storing pulses being gunny bags with a mean of 94.40 per cent. The other minor methods of storing pulses included gunny bags lined polythene sheet and metal bins. The results are in agreement with Shashikala *et al.* (1996) who reported storing in gunny bags in cereals and pulses was a pre dominant practice followed in Dharwad district of Karnataka. The pulse beetle was the predominant grain store grain pest noticed in the survey. It is revealed from results that among the different management practices followed of the control of stored grain pest sun drying is an age old practice has been observed effective and was adopted more than 80 per cent in the district. The reduced moisture content inhibited the multiplication of stored pests has been well established long back.

Traditional storage practices documented :

A detailed description of the indigenous technologies being followed by farmers in Bidar district for storing grains and pulses are collected and presented below :

Red gram storage with common salt :

Farmers with their indigenous knowledge used common salt in red gram (*Cajanus cajan*) grains storage (Nagnur *et al.,* 2006). They had utilized a common available ingredient table salt in their house for storage purpose. In this practice, about 200 g of salt was mixed for a kg of red gram grains manually. These treated grains were then stored in jute gunny bags and the bags were stitched. Due to this practice, insects were kept away from the stored grains Natarajan and Govind (2006). As salt had abrasive action on insect grain prevents its movement inside the storage containers. Farmers believed that this practice stored red gram grains, for short-team duration of 6-8 months. Farmers perceived this practice to be moderately effective and affordable in cost.

Ash seed treatment in sorghum :

Ash was mixed with the sorghum (*Sorghum bicolour*) seeds at the ratio of 1:4. After the ash treatment, sorghum seeds were tied airtight the jute gunny bags. During storage, grains were subjected to losses by various insects. e.g rice weevil (*Sitophilus oryzae*), redents (*Tatera indica*) and mite (*Oligonychus indicus*). Farmers strongly believed that ash application controlled these losses considerably up to an extant of 80 per cent. Farmers using this technology stored the sorghum grains for 6 months without any storage pest problems (Sashidhar *et al.,* 1992).

Storage of grains using camphor :

Both cereals and pulses attracted a wide range of storage pests (Shukla, 2000). Hence, farmers indigenous practiced simple method in grain storage. In this practice, about 1 g of camphor piece per 5 kg of grains was placed as such in the jute gunny bags. This practice of placing camphor inside the grain storage bag repelled the storage pests due to the strong odour emanated from camphor. A short-team storage of grains up to 3 months was possible with this traditional storage method and after that the grains were to be un-dried and then kept with fresh camphor pieces for subsequent storage.

Storage of seeds with lime :

Farmers traditionally followes a practices of storing pulse grains along with lime powder (Dhaliwal and Singh, 2010). In this practice, farmers dusted about 10 g of lime per kg of grains. After through mixing they stored them in use gunny bags. The lime had a properly of emitting irritating odour that repelled insects and prevented the grains from damage. By this way, grains could be stored for even the year.

Gingelly seeds storage with paddy seeds :

Post-harvest losses are notoriously high in oil seed storage like gingelly (*Sesamum indicum*) seeds (Natarajan and Govind, 2006). At farm level storage, farmers through their experience practiced many simple method of pest control. In gingelly seeds storage, mixing a handful of (nearly 100 g) paddy (*Oryza sativa*) in storage container significantly reduced the infestation of Indian meal moth (*Plodia interpunctella*) and prevented the damage of seeds for the next three month storage period. This was possible because the larvae of indian meal moth had a habit of webbing the gingelly seeds with its secretion. Just before pupation, larvae pass through a 'wandering' phase spinning more silk threads, which in heavy infestations could from webbing that completely cover the grain surface. But paddy being sharp edged prevented the larvae in webbing of gingelly seeds (Kanwar and Sharma, 2003). Hence, these pests avoid the feeling

of gingelly seeds stored along with paddy. Farmers when needed gingelly seeds, used sieves to separate seeds from paddy.

Neem oil in seed storage :

Farmers practiced indigenous post harvest procedures that usually not required a high degree of technical skills and much cost. One such practice was the use of neem (*Azadirachta indica*) oil in the seed storage treatment (Jelle, 2003). For 11 kg of pulses seed 20 lt. of neem oil was used. Manually farmers applied the neem oil over the seeds to cost the seeds uniformly. Neem oil acted as repellent against several insects such as weevils, red flour beetles (*Tribolium castaneum*), Long headed flour beetle (*Tritheticus oryzae*) and fig moth (*Ephestia cautelle*), etc. It destroved a variety of insects mostly attacking legurarly at the egg stage itself. The farmers had perceived the specific properties of neem oil like repellance, feeling and ovi positional deterrence, growth inhibition, etc. and used them against the storage pests. Some farmers used neem oil mixed with coconut oil/castor the storage pests.

Neem seed kernel extract dip jute gunny bags :

Farmers preferred jute gunny bags in the short-team storage of grains used as seed materials for future sowing. The practice of treating the jute gunny bags with neem (*Azadirachta indica*) seed kernel extract was followed among the farmers (Singh and Verma, 1998). The practice involved the preparation of neem seed kernel extract (NSKE) and then treating the jute gunny bags with NSKE solution before storage. For this practices, about 10 kg of neem seed kernals was powdered well and soaked in 100 lt. of water for nearly 24 hrs. After that, the extract was filtered. Jute gunny bags to be used in storage were then dipped in the NSKE solution for 30 min and shade dried. Later, these NSKE treated jute gunny bags were used in storing seed materials of paddy (*Oryza sative*), pulses and oil seeds Farmers believed that the strong odour of neem would repel the storage pests. Another advantage revealed by the farmers was that seeds stored in jute gunny bags would be the better performers in terms of germination and quality.

Storage of vegetable seeds with cow dung :

Vegetable growers stored the seeds in ingeniously, which may be later used for sowing in next season. Farmers had their own methods for assessing the amount of moisture in seeds. Some of these provided a fairly reliable estimate of seeds suitability for safe storage. These methods include pressing the seed with the thumb; biting the seed, obtaining the feel of the grain by smelling a handful and shaking in with long experience farmers could judge whether the seed was suitable for storage (Natarajan, and Govind, 2006). After proper drying, the seeds were stored in cow dung. Farmers collected fresh cow dung and made plate like round shaped structures over topping it with hand locally called varati. Vegetable seeds such as ash gourd (*Benincasa hispida*), bitter gourd (*Momordica charantia*), bottle gourd (*Lagenaria siceraria*), etc. were then embedded in the cow dung and then dried under sun for 2-3 days. After dying, the seeds get sticked on to the Varati. These varsities were then stored in open / inside wooden boxes. The farmers stored the vegetable seeds by this method even up to one year. Farmers believed that cow dung has pesticide property, which would keep the seeds away from storage pests (Nagnur *et al.*, 2006). They also believed that cow dung's immune stimulant properties increased the germination (90%) and viability of the seeds considerably. Fresh cow dung has to be used for effective storage.

Pungam leaves in paddy storage :

In this age old practices, fresh pungam (*Pongamia glabra*) leaves were placed as layers in between the gunny bags arranged one above other in storerooms. These leaves acted as a repellent against Angoumois grain moth (*Sitotroga cerealella*) and rice weevils (*Sitopnilus oryzae*). The strong adour released from pungam leaves avoided the pest attack. Some farmers placed these pungam leaves directly in the gunny bags and stored the grains.

Neem leaves against storage pests :

Both pulses and oilseeds attracted a wide range of storage pests, *viz.*, pulse beetles (*Callosobruchus maculates*), lesser grain borers (*Rhyzopertha dominica*), etc. Farmers, hence, practiced an indigenous method of keeping neem (*Azagirachta indica*) leaves along with the stored grains in gunny bags. From time immemorial farmers were aware of the insecticidal properties of neem the farmers were of the opinion that when neem leaves was added with the grains during storage, it repelled storage pest effectively. Farmers

perceived this method to be very economical and moderately effective (50 %) in protecting the storage grains from pests pulse beetles (*Callosobruchus maculates*), lesser grain borers (*Rhyzopertha dominica*) and other borers (Sivasrinivasu, 2001). Grain could be stored in this method even up to one year.

Pulse grains storage with ash :

This was an age old practice being practiced for more than 50 yrs. Farmers indigenously stored pulse grains in earthen pot to its 3/4th volume and then remaining top 1/4th top was then covered with ash (wood/ cow dung ash) (Baskaran and Narayansamy, 1995). By this way, wide ranges of storage pests like pulse beetles (*Callosobruchus machlatus*) and fig moth (*Ephestia cautella*) were kept under the control for a period of 6-8 months. After 6 months, the grains were exposed to sun and then the ash was spread above the grains surface and kept for storage.

Storage of grains with sweet flag :

This method was being practiced for more than 40 yrs. Farmers practiced an indigenous way of storing grains with sweet flag (*Acorus calamus*) (Baskaran and Narayansamy, 1995). In this practice, sweet flag was powered and mixed with grains and seeds of pulses, cereals and oil seeds. For treating 1 kg of grain, about 10 g of sweet flag powder was used. The grains could be stored effectively for 6 months without any pest attack (Kartikeyan *et al.*, 2009). The strong odour

Fig. 1 : Different storage techniques followed for food grains and seeds in Bidar district of Karnataka state

emitted from sweet flag aced as a repellent against all the storage pests.

Conclusion :

The protection of store agricultural products against insect attack is essential for safe and steady supply of high quality food. Insect damage in stored grains and pulses may amount to 10-40 per cent in the pest; insect infestation was often a less serious problem because farmers cultivated traditional varieties, which, although low yielding, were generally more resistant to attack by insects. However, the introduction of high yielding varieties has resulted in increased storage losses, as these varieties are usually susceptible to insect damage. Hence, storage of grains and seeds without pest infestation is essential. Indigenous practices have advantage over outside knowledge. It has little and no cost and is readily available.

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