



RESEARCH ARTICLE

Traditional techniques in management of stored grain pests from Goa

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ABSTRACT

Post-harvest losses of food grains are due to unscientific storage, insects, rodents, micro-organisms etc. (Ministry of Consumer Affairs, Food & Public Distribution). In Goa, though the Production is less the food grains are stored for home consumption throughout the year. The climatic condition of Goa is hot and humid which is favourable for the incidence of several stored grain pests. Major stored grain pests observed in Goa are Rice weevil, Rice moth in cereals i.e. in paddy and nagali, Pulse beetle in cowpea and other stored pulses, Red rust flour beetle in flour or suji. The increasing public awareness of the environmental contamination by toxic chemical residues has necessitated the research and development of non-chemical methods of pest management. Traditional agricultural practices have profound effect on modern day agriculture. So, this research aimed to find out traditional techniques used by Goan farmers for Post-harvest Storage. Farmers have developed various storage structures viz., Mudi, Vurlo, Kado, kadtari etc., used for safer storage of Agricultural produce. Various traditional techniques including some plant products, ash used by local farmers as an additive for prolonged storage of seed grain were explored.

Keywords: Stored grain pests, traditional techniques, storage structures, additives

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INTRODUCTION

Agriculture is one of the important economic activities of the people of Goa state. About 18% of the total work force is engaged in agricultural activities. Paddy is a major cultivated crop in Goa (31,000 hectares) followed by Cucurbits, Pulses, Tubers etc. (Maruthadurai et al., 2015). Post-harvest storage loss is increasing day by day due to attack of stored grain pests. After harvesting, grain is dried until their moisture contents are less than 9%, which is considered ideal for storage. Warm and humid environment are highly conducive for fast growth and rapid multiplication of insect pests of stored grain. Almost all the insect pests of stored grain have a remarkably high biotic potential and within one season, they may destroy 7-10% of the grain and contaminate the rest with undesirable odour and residue (Thakur et al., 2011).

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In India, there are about a dozen species of stored grain insect pests. Our efforts to combat these pests by indiscriminate use of the pesticides have created several environmental hazards and these necessitated the reorientation of our strategies to pest and disease management in an eco-friendly manner. Traditional agricultural practices and cultivars have profound effects on modern day agricultural and plant materials. It is of prime importance to know and understand the Indigenous Technical Knowledge (ITK) available with the farming community in the country. ITK refers to the unique traditional local knowledge existing within and developed around the specific conditions by women and men indigenous to particular geographic areas (Lal, 2004). ITK has gained through a series of observations and they are passed generation to generation orally and keep on changing after receiving constant stimuli from outside (Chamber et al., 1989). ITK is developed by people of a particular region through their own experience (Gadgil et al., 1993). Farmers have tested these traditional technologies in their own fields and developed them in such a way that they are totally self-reliant and sustained with these technologies. Over the ages farmers of Goa have evolved and perfected a number of sanitary methods of cultivation and storage suitable for different agro-climatic conditions of the state.

MATERIALS AND METHODS

The present study, was therefore, initiated to document the relevant Indigenous Technical Knowledge belonging to Goa. Studied area is situated between latitude 14⁰ 53' 54" N and 15⁰ 40' 00" N and longitude 73⁰ 40' 33" E and 74⁰ 20' 13" E. Information about the different indigenous techniques used for storage of grains and to protect them from pests was collected. The Interactive Participatory Rural Appraisal (PRA) techniques were used to assemble the required information by using the format approved by the Indian Council of Agricultural Research (Anonymous, 2000).

Under the present study, different cereals and pulses, their insect pests and traditional innovative technology employed for their safe storage in South and North districts in Goa has been studied. In the studied area, main cereals were *Oryza sativa* L. (Paddy) cultivar Jaya, Jyoti, Goadhan-2, Goadhan-3, Goadhan-5, *Eleusine coracana* L. (finger millet). Major pulses grown by local people in the studied area were *Vigna unguiculata* (Alsando).

The ingredients used for the production of this innovative product called Taste Enhancer are bamboo shoot, king chilli, aromatic ginger, lakadong turmeric, star anise, naga garlic and maroi nakupi. These ingredients were collected from different parts of North East India. Then it was washed, dried, powdered and packaged for further processing.

Raw materials were collected from various parts of North-east India. Seven different ingredients are used namely bamboo shoot from Arunachal Pradesh and Meghalaya, king chilli and lakadong turmeric from Meghalaya, aromatic ginger and star anise from Arunachal Pradesh, Naga garlic from Nagaland and Maroi nakupi from Manipur and were collected from local markets of the mentioned places. All the ingredients harvested fresh were carefully selected to be uniform in appearance, fresh and free from any defect.

RESULTS AND DISCUSSION

Identified stored grain Pests from both district of Goa

Stored grain pests were identified from studied area: Cereals and legumes were main source of food and constitute an important part of people's diet (Table 1).

Table 1: Stored grain pests were identified from studied area

Name of the pest	Targeted food grain
Rice moth <i>Corcyra cephalonica</i>	Paddy, Jawar, Maize
Rice weevil <i>Sitophilus oryzae</i>	Paddy, Wheat
Pulse beetle <i>Callosobruchus chinensis</i>	Cowpea, Green gram, lentil, Peas, Chickpea
Red Rust flour beetle <i>Tribolium castaneum</i>	Processed wheat

Indigenous technical knowledge for safe storage food grains

In Both the district of Goa different indigenous techniques were in use for safe storage of cereals and pulses. Rural farmers have designed structures and methods for storing grains with locally available materials. These structures have been identified by comprehensive survey of the studied area. In studied area, a few crops of food grains were grown and were found infested by some storage insect pests. Farmers of Goa have evolved techniques suitable for agro-climatic conditions of the state over a period of time. These are storage structures and additives.

Storage structures

Kadatari is Storage structure made up of rattan plant (*Calamus sps.*) or Bamboo. It is mainly used for storage of paddy after proper drying. The cylindrical structure is prepared as per the capacity needed. The bottom of the structure is covered with a layer paddy straw. After filling grains, the top is covered with gunny bags or thick plastic sheets or piece of cloth. This structure protects the paddy from pest and disease infestation.

Vurlo is also made up of *Calamus sps.* it is a traditional structure used by Goan farmers for storage of Nagali. This pot like structure could be used for a longer period if pasted with cow dung. Size of the structure varies with the needs of the farmer.

Mudi is prepared with dried paddy straw and threads of local plants. Basically, the mudi is round in shape and the top part is open. The open top will be closed after filling the grains. Paddy straw protects the grain from moisture so postharvest losses will be avoided.

Kado is prepared by using bamboo mat and plastered with cow dung. After drying both the ends of the mat are brought together and tied to bamboo stick with the help of rope. Plastic sheet is used to cover the bottom of the structure. Generally, the capacity of the structure is 20 gunny bags. Size varies with the need of the farmers.

Earthen pots- Earthen pots are used for the storage of Cereals, pulses and tubers for seed purpose. Storage devices for the storage of cereals and pulses have been reported by Thakur et al. (2011)



Kado



Mudi



Vurlo



Kadatari

Fig 1: Different storage devices

Additives

Use of Plant/Tree products-

1. *Azadirachta indica*, Neem leaves
2. *Murraya koenigii*, Curry leaves,
3. *Vitex negundo*, Nirgudi leaves
4. *Sapindus mukorossi*, Soapnut leaves.
5. *Mentha piperita*, Pudina leaves
6. *Adhatoda Vasica*, adulsa leaves
7. *Anacardium occidentale*, Cashew leaves
8. *Lantana camera* leaves
9. *Allium sativum* rhizomes
10. *Annona reticulata*, custard apple tree leaves
11. *Piper nigrum*, Indian pepper- scrapped berries
12. *Zanthoxylam resta*, Tirfala

Above dried leaves having insecticidal or fungicidal properties are added in stored paddy. They may act like repellent, antixenosis or Insect growth regulator. Use of leaves of different plants for controlling stored grain pests have been reported (Karthikeyan et al., 2006 and Thakur et al., 2011). Shankar and Abrol (2015) have reviewed use of different botanicals for the management of Stored grain pests.

Use of ash

Ash is commonly obtained by burning the wood. It is mixed with Cowpea. The ash has crystalline property and may cause wounds in insects' body, which leads to dehydration and ultimately insects die after some time (Thakur et al., 2011). Karthikeyan et al. (2006) have reported that use of ash in stored grains controls post-harvest losses up to 80%.

Turmeric and chilli powder

Turmeric and chilli powder are added to stored rice to repel the different stored grain pests. Jilani and Su (1983) have reported that a 2% powder mix with rice and wheat can protect from attack by storage pests. These substances act as insect repellent, antifeedant and oviposition deterrents. This practice protects the grain from insect pests up to few months (Reddy, 2006).

Ginger powder

Ginger powder is mixed with pulses. The pungent taste of ginger gives protection to the stored seeds of Pulses. Ho (1995) had reported that Ginger causes adult mortality in *C. chinensis* and repels *T. castaneum*.

All these traditional techniques are cheap, technically feasible, compatible with components of the existing farming system and internal resources of household, eco -friendly, avoidingspoilage of stored grain, check insect pests, simple and easy to apply.

CONCLUSION

The above documented ITK methods for stored grain pest management are eco-friendly, less expensive, easy to apply, need no formal training, have no adverse effect on human health and helps in strengthening the sociocultural and environmental aspects among the farming community. On the other hand, use of chemical pesticides leads to increased environmental pollution, Soil and water pollution, impart adverse effects on human health and insects also develop resistance to pesticides resulting in Pest resurgence and Pesticide residue. Keeping in view the advantages of ITK, the agricultural extension workers should encourage and disseminate the use of indigenous technical knowledge methods on target scale in farming community.

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