

Indigenous methods of seed conservation and protection in Uttarakhand Himalaya

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In Uttarakhand Himalaya traditional agriculture is the mere way to meet the subsistence needs of the local farming communities. In traditional system of agriculture, local seed material of traditional crop varieties plays an important role for crop production. In such a situation, the protection of seed material and its conservation for future needs is also of very paramount importance. In order to protect the seed material and food grains, local practices by using indigenous plant material and other articles are very useful, eco-friendly and sustainable. In the present study, the investigators have surveyed the entire Uttarakhand Himalaya for documenting the indigenous seed and grain protection practices of the farm households. The indigenous practices are discussed here in the light of Western science.

The present investigation was undertaken with the aim of objectives to provide protection to the knowledge of local farmers and document it before it's lost under the onslaught of development. Another important objective was to pave the way for values addition in the indigenous knowledge by the scientists, researchers and development workers for sustainable development.

Keywords: Indigenous pest control, Indigenous seed protection practices, Uttarakhand Himalaya

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Conservation of seed is the conservation of planet (*Srishti*). Seed contains the basic DNA, which is capable to produce the plant of the same kind. For protection of seed material, the practices of our ancestors are evident from pre-historic, historic and *vedic* periods. Storage of seed in cylindrical pits dug in earth or in granaries or in containers made of ropes and plastered with mud or in well baked clay pots, scaring away birds with sling balls, initiation of mixed cropping technique, controlled use of water irrigation in fields, etc. are the some specific practices found in use during these periods¹. The pest problems continue to persist and the human tragedies to protect do occur periodically in various parts of the country. The traditional knowledge left by our fore fathers appears important to protect the seed material at this juncture, which has resulted in availability of different biological preparations, particularly microbial pesticides. Our predecessors have used varieties of plant based products, crop residues like husk, shell, ash, animal products like cow urine and cow dung, milk and minerals like red earth, sand etc.². Most of the above materials sayings, information, etc. are available

around the villages and proved safe, biodegradable and less persistent.

Many examples of crop and seed protection such as making din and noise for bird scaring in maize fields, setting traps or digging pits and fix traps in the fields to keep away the wild animals. Use of cow dung, milky juice of *Solanum indicum*, coconut water, *Embllica ribes*, cow urine and *ghee* (butter oil), etc. for treatment of seed material were practiced during vedic era. An ancient Indian text *Vrikshayurveda* enumerates a large number of plants used as remedies of crop protection³.

Some innovations of farmers were cited in Udaipur, Rajasthan. For control of pulses bruchid (*Callosorbruchus chinensis*) the oil of *Mentha spicata*, or *M. arvensis* or *M. piperita* was found very useful. Gunny bags are used for bulk storage of cowpea (*Vigna unguiculata*) seeds. For prophylactic treatment, these bags are soaked in 15% concentration of leaf extracts of *Pongamia pinnata* or *Justicia gendarussa*⁴. Indigenous botanical knowledge in agriculture with reference to seed treatment, pest control, seed storage, horticulture, etc. was traced records of ancient text of India, viz. *Varahmihira*, *Brihatsamhita* (5AD), *Vrikshayurveda* of *Lokpakakra* (5AD) and

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Sarangdhara Samhita (13 AD) in respect of plant protection techniques⁵⁻⁷.

In view of the above, it is very important to promote, document and revitalize the age old traditional remedies, which were eco-friendly and economic for the poor farm communities. In Uttarakhand hills, farmers mostly dependent upon herbal and other local treatments for control of storage pests in general and particularly for seed material, which they preserve for the next crop season. In order to document and promote the utilization of indigenous pest protection practices, the present study was undertaken.

Materials and methods

For collections of information on methods of storage seed protection in Uttarakhand Himalaya a planned structured as well as unstructured interview schedule was developed. Techniques of seed protection methods and use of plant parts were collected from individual farm household levels in all 13 districts Almora, Bageshwar, Chamoli, Champawat, Dehradun, Haridwar, Nainital, Pauri, Pithoragarh, Rudraprayag, Tehri, Udham Singh Nagar and Uttarkashi of Uttarakhand representing all socio-economic groups. In each district 10-15 villages were randomly selected for documentation and interview of farmers. During the investigation (1999-2003) in study area a non-participant observation method was also applied. The gathered information was validated with the help of knowledgeable and old aged farmers particularly women folk who are considered the manager of seed material in this Himalayan region.

Results

The study reveals that the storage bins in the entire Uttarakhand hills are made with the help of wooden splinters of Pine (*Pinus roxburghii* Sarg.), Deodar (*Cedrus deodara* Roxb. ex D. Don G. Don, Kataunj (*Castanopsis tribuloides* J.E. Smith), Bamboo (*Dendrocalamus strictus* Roxb.), *Ningal* (*Thamnocalamus spathiflora* Trinius), *Cheura* (*Diploknema butyracea*), *Tooni* (*Cedrella toona*) and tin sheets.

More than 80% storage bins are made up of wooden material and rest are made of tins. The bins made of wooden splinter are locally known as *Bhakar*. The bins made of Bamboo and *Ningal* are called *Topare* or *Doke*. The seed/grain protection measures are applied at two stages by the farm households. In the first stage, the storage bins made

up of plant material are plastered with the help of cow dung, mud, mustard cake and carbon from *Tawa* (*Chapati* baking iron plate). These items are mixed in the cow urine and made a paste. This paste is used to plaster the storage bins on both sides and sun dried very well. This mixture of four items in cow urine is acts as a repellent of storage insect pests. This is one of the oldest indigenous practice of grain storage in Uttarakhand.

At the second stage, as a measure to protect the seed material and grains, the farmers use the plant parts, ash, oils, etc. which they have identified and learnt from their ancestors. The important methods of storage grain/seed protection applied by the local farming communities of Uttarakhand Himalaya are described here in Table 1.

For safe storage of seed material first of all selection of healthy and disease free material is done by the experienced old aged women folk. The selected material is harvested, threshed and kept separately. After threshing, the material is sundried to reduce the moisture content of seeds. The moisture content of the

Table 1—Plant parts and other materials used for seed/grain protection in Uttarakhand Himalaya

S No	Materials used for pest control	Crops	Types of material
1	<i>Bach</i> (<i>Acorus calamus</i> L.); rhizome and leaves	Cereals and pulses	Seeds and grains
2	Peach (<i>Prunus persica</i> L.); leaves	Cereals and pulses	Seeds and grains
3	Neem (<i>Azadirachta indica</i> A. Juss); leaves	Cereals, oil seeds and pulses	Seeds and grains
4	<i>Timur</i> (<i>Zanthoxylum armatum</i> DC.); leaves	Cereals, pulses and oils seeds	Seeds and grains
5	Walnut (<i>Juglens regia</i> L.); leaves	Cereals and pulses	Seeds and grains
6	<i>Bakayan</i> (<i>Melia azadiracta</i> L.); leaves	Cereals and pulses	Seeds and grains
7	Turmeric (<i>Curcuma longa</i> L.); leaves	Cereals and pulses	Seeds and grains
8	Lemon (<i>Citrus limon</i> L.); leaves	Cereals and pulses	Seed and grains
9	Wooden ash	Wheat, barley and rice seed material	Seeds
10	Cow dung ash	Cereals	Seeds
11	Cow dung + cow urine	Cereals and pulses	Seeds
12	Kerosene oil	Pulses	Seeds
13	Lime powder	Pulses	Seeds
14	Mustard oil	Pulses	Seeds and grains
15	Red roasted soil	Cereals and pulses	Seeds

seed material is tested by crushing the seed with the help of teeth. If it breaks with hard sound it is considered that the seed material contains optimum moisture for storage. Then the wooden or cow dung ash is mixed in the seed material approximately at the rate of 50 gm per kg of seeds. The ash is mixed carefully very well with the help of hands. After mixing of ash, 4-5 leaves of Peach (*Prunus persica* L.) or Neem (*Azadirachta indica* A. Juss), Timur (*Zanthoxylum armatum* DC.) or Walnut (*Juglens regia* L.) or Bakayan (*Melia azadirachta* L.) or Turmeric (*Curcuma longa* L.) or Lemon (*Citrus limon* L.) or Bach (*Acorus calamus* L) rhizomes or leaves, whatever is available around the farmers surrounding are mixed in per kg of seed material. Carefully mixing of ash and leaves the seed material is kept in the containers. The container is made airtight with a dried piece of cloth and its mouth is plastered with mud, cow dung and cow urine paste. For storage of pulses such as black gram [*Vigna mungo* (L.) Hepper], cowpea (*Vigna unguiculata* L., Walpers), green gram (*Vigna radiata* L., R. Wilczek), horse gram [*Macrotyloma uniflorum* (Lam.) Verdc.], lentil (*Lens culinaris* Medikus), etc. the use of a small quantity of mustard [*Brassica juncea* var. *juncea* (L.) Hook. f. & Anderson] oil is found very effective. In one kg of seed material 10-15 drops of mustard oil is mixed and rubbed over the seed coat with the help of hands. It protects the seed material from bruchid (*Callosobruchus chinensis*), which a major insect of storage pulse. In place of mustard mustard oil somewhere farmers use the few drops of kerosene oil to protect the pulse seed material. The use of kerosene oil is restricted merely to the material stored for seed purpose in the next season. In many areas, farmers apply the lime powder in the pulses for safe storage to be kept for seed purposes in the next cropping season.

Use of red baked soil as an important tradition of control the storage pests was found in vogue in Jaunpur and Jaunsar tribal region of Garhwal Himalaya of Uttarakhand. The preparation of soil as pesticide itself is an important indigenous technique. The soil is dug and stones/pebbles are removed from it. There after kneaded in to dough. The dough is flattened and baked into a kiln. After baking, the soil is split in to small pieces then ground in the local water mills in the form of a fine reddish brown powder. The fine powdered soil is then used by local farmers as seed dresser against storage pests of food grains (wheat, barley, rice and pulses).

Discussion

Indigenous farm practices for protection of seeds as well as grains by using various plant parts, ash, oils, etc. are very old and based on some scientific principles. The use of wooden and cow dung ash and red baked soil as seed dresser because the quantity of silica in these might have deterred the egg formation and larvae feeding. The use of ash and soil as indigenous pesticides is reported in so many literatures. Similarly the uses of *Vitex negundo*, *Azadirachta indica*, *Eucalyptus* are very common and effective treatments⁸. The uses of various plant parts as storage pesticides, because these plant parts emit a pungent type smell. This is because of availability of essential oil in the plant parts. The emission of a kind of smell acts as a repellent of insect and deters their survival. Bach (*Acorus calamus* L.) contains 1.5-3.5% of yellow bitter aromatic volatile oil (*Asarone* etc.), peach (*Prunus persica* L.) contains hydrocyanic acid, tannin like substance (8%), quercetin kaempferol, caffeic acid, etc., neem (*Azadirachta indica* A. Juss) contains meliacin, nimbin, nimbinene, nimbandiol and azadiractin, timur (*Zanthoxylum armatum* DC.) contains pipevine, phenolic constituents, monoterpenes, linalool 5.7%, walnut (*Juglens regia* L.) leaves contains ascorbic acid, carotene and juglone. Bakayan (*Melia azadirachta* L.) contains meliacin, turmeric (*Curcuma longa* L.) contains phenolic compound known as curcuminoides, lemon (*Citrus limon* L.) contains lemon oil, citric acid and pectin and mustard oil contains allyl isothiocyanate. All these substances found in the above plant materials have been reported to be antifeedants against several pests⁹⁻¹⁵.

The indigenous techniques and uses of indigenous substances are reducing very fast in all over the world, but in case of Uttarakhand Himalaya, these are still the back bones of seed conservation for the next cropping season. Consequently, our indigenous methods of seed and grain protection are becoming more popular because of their eco friendly and harmless nature for the whole environments. These eco friendly pesticides may provide the alternatives to the chemical pesticides and also can provide a sustainable base for the conservation of plant genetic resource. By using indigenous methods of plant protection, we can protect our environment in many ways. Indigenous methods of plant protection have largely been used in developed agrarian societies. Chemical control methods are more popular for

providing quick solution, but these are neither sustainable nor eco-friendly for the universe.

Conclusion

The study revealed that the indigenous methods of seed conservation are very effective and eco-friendly. Local inhabitants do not use any chemical pesticides for storage and seed protection. The fifteen methods, using locally available material are also cost effective. A poor farmer can also apply it without involving any cost in terms of currency. Thus it can be concluded that the innovations of our ancestors were based on scientific rationales, which are still being practiced popularly.

The study is also very useful for scholars, scientists, researchers and development agents because, it paves the way for further investigation and analysis of the material. In addition of it, the techniques and methods of utilization can also be refined by addition of values. In this way some organic pesticides can be developed, which can be very useful and cost effective for the farmers and ultimately for our society.

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