

## Traditional Seed Treatment and Storage Methods of Northeastern Region of Karnataka

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### Abstract

*The study on traditional seed treatment and storage methods was conducted in five villages of Northeastern region of Karnataka state in India. The region comprises six districts. Various methods used by the villagers were documented and scientific analysis was done on exactly how these methods were effective. Seed treatment and storage were important as farmers did not use any chemicals. They used materials available in the farm like cow dung slurry, cow urine, common salt, powders of various plant materials, leaf extracts, etc. These seed treatment methods have been used by generations and are similar to those mentioned in ancient texts such as Brihat Jataka, Vrikshayurveda, Arthashastra, and Krishi-Parashara. The treatments were used for good germination, breaking of dormancy, protection against storage pests and diseases, good plant stand, hindering seed ageing, and enhancing the longevity of the seeds. A separate set of experiments was conducted and the documented techniques were followed to know their effectiveness of these methods. Also the methods mentioned in ancient texts were examined.*

Seed treatment and storage are two important aspects of agriculture. Good seed treatment helps in getting good germination, plant establishment, and crop protection in early stage of crop growth. Seed storage helps in enhancing the longevity of the seed for sowing in the following season. Traditionally farmers followed various methods of seed treatment and storage as mentioned in ancient texts such as Parashara's Krishi-Parashara, Surapala's Vrikshayurveda, Kautilya's Arthashastra, and Varahamihira's *Brihat Jataka*. These

methods were not expensive as farmers used materials available locally. The Northeastern region of Karnataka in India comprises six districts namely Raichur, Yadgir, Gulbarga, Bidar, Koppal, and Bellary. The main crops are paddy, sorghum, chili, sunflower, and pulses. Because of high production the region is considered as "rice and pulse bowl" of the state. The farmers growing paddy, *jowar* (sorghum), and pulses use their own saved seeds or varieties which can be multiplied on their own. Farmers use traditional methods of treatment and storage

which were considered more sustainable. These methods are not harmful to people handling them and are more eco-friendly.

## Methodology

To document and analyze various traditional methods of seed treatment and storage, five main villages of Raichur district were selected namely Kalmala, Ankush Doddi, Karlakunti, Mattur, and Jalihal. The data on various methods was collected from farmers, elderly men and women, farmers' groups, self-help groups, and youth clubs. The information was collected through questionnaires, baseline survey, and checklists. The data and information were collected by the trainees of 2010–11 batch who were undergoing RAW (Rural Agricultural Work Experience) program of University of Agricultural Sciences (UAS), Raichur. The trainees were placed in these villages and used interview method to collect data and information. To collect such information some of the indicators were developed such as name of the method, crop, effectivity against pests/diseases, method of preparation, raw materials used and approximate cost. Each group of trainees was provided with cameras to photo-document various methods. Some of the methods were

replicated in the Department of Seed Science and Technology at UAS, Raichur and an effort was made to find a scientific rationale for important methods with available scientific literature.

## Results and discussion

The important traditional methods of seed treatment and storage were tabulated and analyzed and are presented in Table 1. These methods have scientific bases and also are mentioned in the ancient Indian texts. For example, drying and storing of seeds in airtight conditions is mentioned in *Krishni-Parashara* where Parashara opined that storing of visually uniform and properly dried seeds in strong bags improves the longevity. The use of flours to store seeds is an ancient practice and mentioned in *Varahamihira's Brihat Jataka*. In this text Varahamihira mentioned about pelleting seeds with paste of sesame, and flour of paddy and even using turmeric powder for fumigating. In *Surapala's Vrikshayurveda* the classification and preservation of seeds is mentioned in *Beejotpathi Vidhi* (Sadhale, 1996). The use of cow dung, honey, and ghee for seed treatment is mentioned along with sowing seasons in *Kautilya's Arthashastra*.

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**Table 1. Traditional methods of seed treatment and storage used by farmers in Raichur district of Karnataka, India.**

Crop	Method of seed treatment and storage	Scientific interpretation
Paddy	Seeds stored for one or two years were immersed in salt water (1:10), stirred, and kept aside (generally for 2 kg of seed, 1 kg of salt and 10 L of water is effective). After an hour, light and chaffy seeds which were floating were removed and hard seeds that settled down were dried in shade.	Adding salt to water increases its density and helps in separation of light and chaffy seeds. This also helps in increasing germination (Johnston <i>et al.</i> , 1978).
	Seeds were soaked in water overnight, dried in shade, and placed in a pit containing tree saw dust and sheep manure. The pit was made airtight. Seeds were removed after two days, dried, and used for sowing.	Keeping seeds along with sheep manure in an airtight container creates heating inside the pit which is required for initiation of germination. Chemical reactions inside the seed prefer warm conditions to start (Gashaw and Michelsen, 2002).
	A small bag containing seeds (approximately 10–15 kg) was placed at the entrance of the house instead of a door mat. This can be stored for 1 to 2 years.	Whoever enters the house will step on the bag. This repeated stepping on the bag disturbs insects which are trying to establish and feed on the seed.
	Seed bags of 10 kg were dissolved in 1:10 solution of salt and water. The seeds were dried and used for sowing within 72 hours.	The salt treatment of seed helps in breaking dormancy and tolerating drought stress (Mehmet Demir Kaya <i>et al.</i> , 2006).
Sorghum	Seeds were treated with dried cow dung powder and cow urine before sowing. For one kg of seed approximately 100 g cow dung powder and 250 ml cow urine were used for better germination. Cow dung powder was also used for storage of seeds.	Cow urine contains 2.5% urea which is known to break dormancy and improve germination (Kundu <i>et al.</i> , 1993). Cow dung powder protects the seed from humidity and hence improves longevity of seed. Cow dung was used with ghee and honey in ancient times for treating seeds as documented by Kautilya in Arthashastra (Nene, 2002).
	Seeds were treated with lime water. One kg of lime was dissolved in 10 L of water and kept for 10 days. The superficial water was collected and seeds were soaked in it overnight. The seeds were dried in shade and used for sowing.	Lime or calcium hydroxide is known to protect seed against seedborne diseases such as smut and bunt (Smith and Secoy, 1976).

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Table 1. *continued*

Crop	Method of seed treatment and storage	Scientific interpretation
	Good ear heads were selected and kept open in fog in <i>rabi</i> (postrainy) season and kept inside a pot containing neem leaves.	The neem leaves protect seed from seed borer and beetles (Karthikeyan <i>et al.</i> , 2009). The exposure to fog may result in breaking of dormancy and bring drought tolerance (Shigihara <i>et al.</i> , 2008).
	Good ear heads were harvested along with awns and kept in the center of dried paddy grass heap (called <i>banave</i> ).	Seed along with awns create hindrance for insect activity and thereby protect seed from insect damage. The selection of good ear heads and drying of seeds is an ancient practice to ensure seed longevity (Nene, 1999).
Pigeonpea	Seeds were kept along with horse gram seed and plant dust in an airtight container. Dust and seeds are separated before sowing.	The dust of horse gram is known to absorb excess moisture in the seeds and helps in storage for longer duration.
	Seeds were coated with fine red soil of the village pond or hill, dried in shade, and stored. For 10 kg of seed, 1 kg of soil is used.	The fine red soil smeared on seed creates a hard surface which is impermeable and protects seed against attack of storage pests. It also resists moisture permeability.
	Seeds were treated with pongamia leaf extract and dried before sowing.	Strong odor of pongamia leaves repels storage insects (Karthikeyan <i>et al.</i> , 2009).
	Seeds were kept in a gunny bag along with <i>Guntur</i> chili powder and neem leaf powder.	The chili powder contains capsaicin which is known to inhibit lipid peroxidation which in turn slows down seed ageing (Dey and Ghosh, 1993). The <i>Guntur</i> type is known for its high pungency. The neem leaf powder acts as a repellent.
	Seeds were kept with powder of bitter gourd or drumstick seed extract for 3–6 months.	The toxic nature of drumstick and bitter gourd seeds not only repels insects but also protects from pathogens associated with seed (Batabyal <i>et al.</i> , 2009).
Chickpea	Seeds were stored along with mint leaves ( <i>pudina</i> ) or sweet flag ( <i>baje</i> ) root powder.	Strong odor of sweet flag repels storage insects (Karthikeyan <i>et al.</i> , 2009).
	Seeds were treated with citronella leaf oil, cotton seed oil, soybean oil, or castor seed oil; 500 ml of oil was used for 100 kg of seed.	The strong odor of these oils repels storage pests and microbes like <i>Alternaria</i> and <i>Fusarium</i> (Nguefack <i>et al.</i> , 2008).

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Crop	Method of seed treatment and storage	Scientific interpretation
Pigeonpea and chickpea	Seeds of these crops were kept along with small millets like pearl millet or foxtail millet or finger millet and stored in an earthen pot. The pot was made airtight by smearing cow dung. For 5 kg of seed, 1 kg of millets was used.	The coarse seed surface of minor or small millets absorbs moisture of seed of pulses and helps in better storage (Almekinders <i>et al.</i> , 1994).
Green gram	Seeds were kept on a layer of ash in an earthen pot and covered with another layer of ash. Then another pot was kept on it and cow dung was smeared to make it airtight.  Ten kg of seed was mixed with 250 g chili powder and 1 kg of <i>ragi</i> or finger millet flour, and then kept in a bamboo pot along with paddy husk.	The insects inside the seed will be suffocated and die and also the seed can be stored for a longer period since seeds will not absorb moisture from outside (Wambugu <i>et al.</i> , 2009).  Chili powder provides repellence against storage pests while flours prevent attack of secondary pests. The use of flours to preserve seeds is an ancient practice as mentioned in Varahamihira's <i>Brihat Jataka</i> (Suryanarain Rao, 1986).
Chili	Seedlings of chili were removed from the nursery bed and treated with 1:3 solution of cow urine and water.  A gunny bag was immersed in hot water and seeds were placed in it and kept for a day. The seeds were then used to sow on the seed bed.	Cow urine helps in protecting seedlings against damping-off caused by <i>Rhizoctonia solani</i> (Ashlesha <i>et al.</i> , 2011).  The pre-germinated seed when sown on the seed bed helps to get more usable transplants and improve vigor (Venkatasubramanian and Umarani, 2007).
Sunflower	Seeds were kept inside the dried fruits of sponge gourd after removing the seeds. These fruits were kept in an airtight container.	The fruits of sponge gourd act as protective capsules against insect pests and protect sunflower seed during storage.
Cotton	Seeds were treated with ash and cow dung slurry and dried in shade before sowing.	Cow dung slurry helps to remove the fiber attached to the seed and thus facilitate sowing. Ash along with cow dung slurry is known to control diseases caused by <i>Rhizoctonia solani</i> (Ashlesha <i>et al.</i> , 2011). Cotton and other hard seeds were smeared with cow dung before sowing as in Kautilya's Arthashastra (Nene, 2002).

## Conclusion

The farmers in the study area used traditional seed treatment and storage methods along with improved seed. These methods have been followed for a very long time and have not changed but improved over the years. These methods were in line with ancient texts which are scientific. The methods were scientifically true and logical. The available literature shows the scientific base for these methods. These methods were cost-effective and viable in small farm situations and can be used as alternative ways for non-chemical seed treatment and cost-effective short-term seed storage.

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