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ORGANIC WAYS FOR LONG TERM SEED PRESERVATION

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Seed is one of the key inputs for agriculture. Use of quality seeds assures good germination and vigorous seedling growth by reducing the seedling mortality and ensuring the high plant stand establishment. Harvesting and keeping the seeds inside storage for sowing in next season is a common and traditional farmers' practice. In general, seed quality deteriorates during the storage. During seed storage, a number of physiological and biochemical changes take place. Several experts have noted that the quality of seeds degrades over time as a result of environmental factors such as air conditions, pest and disease attacks, and storage-related irradiation. Degradation of seed quality is directly reflected in seed germination and on-field plant performance. To overcome the seed deterioration in storage and to preserve the seeds for long period by maintain its quality, it is therefore needed to use different technologies viz. use of proper seed packaging materials, seed invigoration with powdered materials, storage under controlled environment, regular monitoring etc. Powdered materials of various compositions (chemicals, crude plant materials, pharmaceutical powders, etc.) are useful in treating seed during storage as it helps to check seed quality deterioration and maintain seed longevity (Bhattacharya *et al.*, 2015; Guha *et al.*, 2012). Different storage containers can also play a key role in effective preservation of seeds. In today's climate change scenario, it is wise not to use of chemicals, synthetic and non-degradable materials for any farming activity. Therefore, organic ways of seed preservation can help the farmers to store the seeds and cultivate the crops in eco-friendly manner.

Organic Ways of Seed Preservation

Seeds are maintained in a natural, chemical-free environment. Organic materials are essential for seed preservation because they keep seeds alive, healthy, and chemical-free.

Utilizing organic materials supports environmentally beneficial and sustainable practises, which are good for the environment and the health of the seeds.

Functions of Organic Compounds in Seed Preservation

The main functions of organic compounds in seed preservation are as follows:

- Organic materials are preserved without the use of artificial chemicals, insecticides, or herbicides. By employing organic materials, contaminants can be prevented from potentially contaminating the seeds and affecting their quality and germination.
- Compared to non-organic alternatives, organic materials biodegrade more quickly and have less influence on the environment. Utilizing organic materials promotes sustainable gardening and seed preservation techniques while reducing waste.
- Organic substances with natural insect-repellent characteristics include neem leaf powder, garlic, citrus peels etc which safeguard the seeds during storage into seed preservation.
- Natural substances with the ability to absorb moisture include clay, silica gel, and grains of rice. By preventing mould growth or seed degeneration brought on by high humidity, these compounds aid in maintaining proper moisture levels during seed storage.
- Air may circulate inside seed storage containers made of organic materials like fabric, paper, or straw. For seeds to remain viable and to avoid suffocating, proper air circulation is crucial.
- The stored seeds receive nutrition from organic elements like compost or coconut coir. Nutrient-rich materials can help seeds during storage, resulting in better germination and early growth following planting.
- Biodegradable seed-saving envelopes, pots, or containers from of organic materials are made and placed straight into the ground, eliminating waste and minimizing transplant shock.
- Many organic components employed in seed preservation have been a part of conventional and tried-and-true procedures in many different civilizations. Over many generations, these techniques have been improved. Heirloom and conventional seed varieties are frequently saved as part of organic seed preservation. Organic materials help the retention of distinctive genetic features and improve total agricultural biodiversity by preserving a variety of seed stocks.

- The storage of seeds using organic materials is consistent with sustainable agricultural and gardening practices. It promotes ecological resilience and self-sufficiency while encouraging appropriate land stewardship.
- Organic materials can be used in sustainable agriculture since they are consistent with its guiding principles. Organic seed preservation promotes a more symmetrical and durable farming system by utilizing renewable and natural resources.
- Organic seed preservation promotes the use of materials that are readily available locally and that are sustainable. As a result, gardening and seed preservation procedures may have a less carbon footprint.
- Compost and coconut coir are two examples of organic compounds that support soil health. They also improve soil fertility. When seeds are kept in or near nutrient-rich materials, their chances of thriving when planted increase, producing plants that are stronger and healthier.
- The preservation of organic seeds frequently entails age-old methods that have been handed down through the generations. Adopting these methods contributes to the preservation of agricultural expertise and cultural legacy.
- Local communities can maintain control over their seed supply and lessen reliance on commercially manufactured hybrid seeds by encouraging the preservation of organic seeds. This empowerment promotes food independence and increases a community's capacity for resilience.

Organic Materials- Some Examples

Organic materials can be used to preserve seeds in a way that supports environmental sustainability and environmental health while simultaneously preserving seed quality and viability. Farmers may support a more wholesome and durable food system for future generations by adopting organic practices. To ensure that no dangerous chemicals or synthetic materials come into contact with the seeds when preserving them using organic methods, it is wise to utilize organic and natural materials. Here are some examples of common organic raw ingredients for seed preservation:

- **Organic cotton cloth or paper:** To create seed bags or envelopes, organic cotton cloth or paper can be used. There should be no synthetic chemicals or pesticides in organic cotton or paper. Bandanas made of organic cloth can be used as a breathable container to wrap and store seeds.

- **Organic silica gel:** It can be used as a desiccant to absorb moisture and stop the growth of mould while storing seeds.
- **Organic rice grains:** Organic rice grains can be used as a natural desiccant to absorb extra moisture in seed storage containers in place of conventional silica gel.
- **Organic clay:** When making seed balls, organic clay or terra cotta can be utilized. Clay, compost, and water are combined to cover the seeds, protecting and nourishing them up until planting. Seed saucers made of organic clay are used to store and protect seeds.
- **Organic charcoal:** To eliminate odours and guard against contamination, activated charcoal can be applied to seed storage containers. In many places, biochar prepared from controlled pyrolysis can also be used to preserve seeds.
- **Organic sand:** Sand can be used to aid in seed drying and storage for seeds that require a dry environment.
- **Organic plant oils:** Neem oil, garlic-infused oil and other natural plant oils, as well as essential oils, can be used sparingly to keep pests away during seed storage and during planting. One natural insect repellent used in seed storage is **organic citronella oil**.
- **Organic wood shavings:** These are used to store and package seeds as a natural substitute for plastic or other synthetic materials.
- **Organic sawdust:** It can be used as a cover for seeds while they are being stored.
- **Horse gram dust:** Seeds can be stored along with horse gram dust as it helps to absorb excess moisture from seeds (Mathod *et al.*, 2013).
- **Red soil:** Seeds were dried in the shade and preserved after being covered in fine red soil from the community pond or hill. 1 kg of soil is utilized for every 10 kg of seed (Mathod *et al.*, 2013).
- **Plant derived powder:** Seeds can be stored with bitter melon, drumstick seed powder, mint, sweet flag root powder etc (Mathod *et al.*, 2013).
- **Smearing of earthen pot:** Smearing of earthen pot with cow dung slurry is helpful to make the container air-tight for long term storage.
- **Organic citrus peels:** When placed close to seed storage, dried citrus peels can act as a natural insect deterrent.
- **Organic plant-based dyes:** Non-toxic dyes can be used to colour envelopes for storing seeds.

- **Malted organic barley** is a seed inoculant that can help the soil's beneficial microbial population flourish.
- **Organic gourd shells:** These serve as all-natural seed jars for preserving seeds.
- **Organic willow baskets or containers:** These eco-friendly seed storage options promote airflow. Handmade wooden boxes are used for keeping seeds.
- **Organic gourd shells:** These serve as a natural seed jar for preserving seeds.
- **Organic moss or lichen:** It is used to cushion and safeguard seeds while they are being stored.
- **Organic wool felt:** It is used to make seed bags or envelopes for storing seeds. **Organic felted wool pads** can be used to cushion seeds while they are being stored.
- **Organic hessian sacks:** These are used to store bigger quantities of seeds in bulk.
- Biodegradable stoppers for seed storage containers can be made from **organic wine corks**.
- Natural seed storage can be done with **organic bamboo containers** because of their sturdiness and sustainability.
- **Organic banana leaves** are used to make seed balls and envelopes for storing seeds.
- **Organic herbal sachets:** To naturally ward off pests, dried herbs like lavender or rosemary can be scattered near seed storage.
- **Organic wool or cotton pads:** These are used to cushion seeds while they are being stored.
- To tie seed bundles for storage or seed preserving, organic **hay or straw** twine can be used. Seed bundles can be tied using **organic hemp rope**.
- **Organic eucalyptus leaves:** Dried eucalyptus leaves have the ability to protect stored seeds from pests.
- **Organic chitosan** is a naturally occurring material formed from chitin that can be applied to seeds to increase disease resistance.
- **Organic pottery:** Due to its breathability, handmade pottery vessels can be used to store seeds.
- **Organic cattail fluff:** It can be used to protect delicate seeds during storage.
- **Wooden racks** can be used for organized seed storage and exhibition if they are made of organic wood.
- **Handwoven organic seagrass baskets** can be used to store seeds because they are breathable and natural.
- Natural seed storage containers can be made using **organic straw or hay bales**.

- **Ceramic or organic stone tiles** are suitable for use as labels on seed envelopes or storage containers.
- **Organic cinnamon sticks** can serve as a natural insect repellent when placed close to seed storage.
- **Sphagnum moss** made from organic materials is used as a cushion to keep seeds safe while being stored.
- **Organic dried flower petals:** These can be used as embellishments for containers or envelopes for storing seeds.
- **Crushed organic walnut shells** can be used to make natural colour for envelopes for storing seeds.
- **Organic herbal smoke:** In regions where seeds are stored, certain herbal smokes like mint, basil, lavender, chives, rosemary etc. can serve as free-acting insect deterrents.

Pre-requisites for Organic Ways of Seed Preservation

- Any material used should be eco-friendly and chemical-free.
- It is essential to use materials free of pesticides, herbicides, and other potentially dangerous substances as they can impair the health and viability of seeds.
- Maintaining the integrity of the seeds and promoting sustainable gardening techniques should be guaranteed by organic seed storage.
- The materials should be user friendly and compatible with the seeds.
- These materials must complement and fulfil the purpose of seed storage.
- These materials should not show any harm to the users, seeds and others.
- These materials should be fresh, uncontaminated, pure and should not show undesirable impacts on seed quality and should not interfere with cultivation practices.

Conclusion

By supporting sustainable agriculture, fostering biodiversity, and reducing environmental harm, organic materials are essential for seed preservation. However, these organic materials are less explored and remained mostly as ITK (indigenous technological knowledge) practices. Many of such ways lack scientific elucidation. Therefore, researches and scientific explorations on these organic ways/ materials are highly required to confirm their efficacy for preservation of different kinds of seeds. These materials should also be utilized adequately and demonstration, awareness etc. can be made through extension

workers because we can contribute to a healthier, more durable food system and a more sustainable future for agriculture by using organic seed preservation techniques.

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