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TECHNOLOGY AND OVERVIEW OF FOREST SEED

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ABSTRACT

Advanced Seed Production Technology Is Essential For Providing Quality Seed Of Better Varieties. The best way to ensure fast-growing and healthy plantations capable of producing high-quality wood is to utilize sound seed from stands of high intrinsic quality. The quantity as well as the quality of seed production are critical. Seed quality is determined by a variety of variables, including the source, harvest time and methods, as well as processing and storage strategies. Unlike agriculture, forestry seeds vary greatly in size, shape, dormancy, viability, moisture content, and other characteristics. The collecting, handling, processing, and storing of seeds from a vast number of forest species necessitates the use of specialized methods. In natural stands, fluctuation in the amount of seed produced influences the forester's choice about which year to gather seeds and which trees to collect them from. Although physiologically sound seed may aid in the development of a plantation, it is of little use if it is slow-growing, poorly suited to the location, or yields the wrong sort of wood due to poor provenance or genotype selection. On the other hand, developing genetically enhanced seed at a higher cost is pointless if it is destroyed by poor handling methods and must be replenished or supplemented with inferior seed to meet planting goals. In addition to genetic enhancement, proper seed management is critical.

KEYWORDS: *Cleaning, Forest,Gradingseeds, Planting, Vegetable.*

INTRODUCTION

Forests are one of humanity's most important natural resources because they have a global component, in that their size, quality, and functions in one nation unavoidably impact the interests of people in other countries for a number of reasons. There isn't a single aspect of contemporary life where woods aren't necessary, whether it's physical, like lumber, paper, pulp, medicines and other chemical goods, land scraping, or intangible, like environment, recreation, and soil conservation. Deforestation and obliteration of vegetative cover and trees pose a danger to living creatures' existence. As a result, replenishing the loss via regeneration has become one of the top objectives in order to protect what remains of our forests. Trees are often grown from seeds, and the appropriateness and quality of the seeds used have a significant impact on the success of the plantations, afforestation, and reforestation programs that result. It is important to emphasize that excellent seed is seed that has a high viability and vigour, as well as being genetically well adapted to the location and the purpose for which it is planted[1]–[5].

The scarcity of high-quality seed is a significant impediment to forest regeneration. This issue may be solved by cultivating seed orchards that are designed to make seed collecting and access simple. Seed certification allows for rigorous quality control in the production, testing, and distribution of high-quality seed. A ripened ovule carrying an embryo in a halted stage of development, typically with a food reserve and a protective covering, is referred to as a seed. It is described as a mature ovule or a reproductive unit made up of an embryo, reserve food, and a protective cover produced from fertilized ovule. Forest tree seeds come in a wide variety of shapes, sizes, colors, and behaviors. It is critical to have a thorough understanding of seeds before purchasing them, since they must be completely matured, healthy, and true to type. It must be devoid of inert elements, as well as other seeds and weeds with high viability and germination potential. It is critical that it be clear of pests and illnesses, and that it is not damaged or broken.

Seed technology is a branch of research that studies how to improve the genetic and physical properties of seeds. Seed technology's main goal is to safeguard the biological entity (embryo) and ensure its survival. Various writers have characterized seed technology in different ways. The first and most essential prerequisite for the success of any afforestation operation is the availability of high-quality seed in seed technology. In the forestry sector, efforts are now being made to develop and utilize superior and high-quality seeds to guarantee the survival and development of plantations planted under different programs. Seed technology, in general, encompasses the creation of better enhanced varieties, their assessment and release, seed production or collecting, seed processing, seed storage, seed testing, seed certification, seed quality control, seed marketing, seed distribution, and associated research[6]–[8].

1.1. Seed Collection

The collecting of seeds is a crucial task and the first stage in every afforestation project. It is a huge operation that requires careful planning, the deployment of skilled personnel, the organization of transportation facilities, seed collecting equipment, worker safety measures, the packaging and labeling of materials, and the keeping of records, among other things.

1.2. Time Of Seed Collection

The gathering of seeds is influenced by time, which varies depending on the tree type. Before dispersing seeds, they should be gathered when they are mature. Seeds harvested before they are fully ripe or mature may have poor germination or may not germinate at all. Before collecting the seeds, several indications may be used to determine their maturity. Changes in color, softening of fruit tissues, drying of seeds, hardening of seeds, and other indications of maturity may be used. The seeds must be gathered when they are completely mature, and any delay will result in seed dispersion, making collecting difficult. The majority of cones, as well as several seed collecting techniques.

1.3. Seed Collection, A Complex Process, Is Usually Carried Out Adopting The Following Methods:

1.3.1. Collection Of Seeds From The Ground:

This technique may be used in situations when seeds naturally fall to the ground. This technique is used to gather species with big seeds or fruits. Only freshly fallen seeds should be gathered throughout the collecting process. Ailanthus, Anthocephalus, Artocarpus, Canarium, Dipterocarpus, Gmelina, Quercus, Tectona, and other large fruits/ seeds are simple to notice and pick up from the ground. It is a simple and low-cost technique for species with big seeds or fruits.

1.3.2. Collection Of Seeds From Felled Trees:

This technique is used on seeds that are likely to be damaged or scattered during the autumn. Trees from which seeds are to be gathered should be medium-sized, healthy, and well-formed, such as Acer, Morus, and others.

1.3.3. Collection Of Seeds From Standing Trees

This method is applied to seeds which are likely to get damaged during fall, or get dispersed. Trees from which seeds are to be collected should not be very tall instead, should be medium sized, healthy and well formed e.g. Acer, Morus, etc.

1.3.4. Seed Extraction And Processing:

Seed extraction is the technique of extracting seeds from fruit or pulp. The technique for extracting seeds is determined on the kind and nature of the fruit. Macerating/crushing and washing may be used to remove seeds from fleshy or pulpy fruits, while thrashing can be used to separate seeds from pods or husks. Other techniques, such as thrashing, de-winging, and plucking by hand, are employed depending on the shape of the seed/fruit. However, caution should be used throughout all of these actions to avoid causing harm to the seeds.

1.3.5. Seed Drying:

Drying is an essential technique for maintaining seed viability by controlling the optimal moisture content. Drying may be done in the sun or in the shade. Many species' seeds may be dried in direct sunlight, although this might be hazardous in certain instances. In reality, for various seeds, adequate understanding of the particular drying process is essential. Give an example of how appropriate understanding of a particular technique is essential to justify the final sentence in bold.

1.3.6. Cleaning:

Seed cleaning is the process of removing all extraneous material from seeds, including stones, twigs, cones, and husk. It may be done using various pore size sieves, air separation/winnowing, de-winging, liquid floatation, and so on.

1.3.7. Grading:

After washing, the seeds should be evaluated in order to distinguish between excellent and bad seeds. It lowers the risk of illness, the amount of seed required, and the cost of seed. It's done to get rid of seeds that are weak or damaged[9], [10].

*1.4.*Seed Storage:

Seed storage refers to the process of preserving viable seed after it has been collected or extracted until it is used for planting or germination. During poor seed years, it's critical to mitigate the unpredictability of seed production/availability. It protects seed from rodent and insect damage, slows degradation, and preserves viability. The ability of seeds to last is a species-specific trait. Most species' seed may be kept in sealed containers at a low temperature and low moisture content. To avoid moisture content fluctuations during storage, it is critical to dry the seed evenly. The moisture level of most seeds for storage is between 10% and 12%. The embryo's breathing continues at a low temperature, which is required to keep it alive. Some seeds need a ripening time before germinating, while others sprout quickly after dry storage. Forest seeds are classified into four categories based on their storage behavior.

*1.5.*Orthodox seeds:

Acacia, Anthocephalus, Betula, Duabanga, Eucalyptus, Fraxinus, Pinus, and Picea seeds may be dried to a low moisture content of about 5%-10% and effectively kept at low or sub-freezing temperatures for extended periods of time. Orthodox seeds can be dried to low moisture content without causing harm, and their lifespan improves in a measurable and predictable manner when seed storage moisture content and temperature drop in a broad variety of conditions.

*1.6.*Sub-Orthodox Seeds:

Abies, Juglans, Salix, and Poplar seeds lose viability in the open air after a few months. These may be kept in the same conditions as genuine orthodox, but only for six months to six years in certain instances, with viability losses of up to 34% when stored at -5 C to -20 C and moisture content of 5 to 10%.

*1.7.*Temperate-Recalcitrant Seeds:

Desiccation sensitive seeds of Acer, Aesculus, and Quercus may be dried to 35-50 percent moisture content of fresh weight. The storage temperature ranges from 3 to -3 degrees Celsius. Some species' seed coverings have evolved to prevent hazardous moisture loss, such as Acer pseudoplatanus. Seeds of these species may be kept for considerably longer lengths of time, for example, more than 3 years for oak (Quercus spp.) seeds stored wet at 3 C Cryopreservation is also employed to store these seeds, for example, seeds of Aesculus spp. Cryostorage in liquid nitrogen may preserve materials with moisture content as low as 12%..

*1.8.*Seed Dormancy:

Seeds are often generated during a favorable time, but they must frequently survive a dry or cold period before germinating the next growth season. To do so, they go into various degrees of dormancy, a state in which they stop growing and their physiological functions slow down. Many species' seeds have evolved to stay dormant and sprout only when the conditions of moisture and temperature are favorable. In nature, the circumstances under which they are kept or handled generally work to break dormancy at the appropriate moment, allowing them to germinate only when the conditions are favorable for survival. If seeds are kept under artificial circumstances, however, it may be essential to treat them in a manner that mimics natural germination processes. Many species' seeds do not become dormant in tropical rain forests because the circumstances are constantly favorable for development.

*1.9.*Seed Testing:

Seed testing is necessary for learning about many aspects, physical, and biological properties of seeds. Seed testing can only serve a useful purpose if it is based on the use of trustworthy, standard techniques of inspection to guarantee that consistent and repeatable findings are produced regardless of where it is performed. It is done to verify the authenticity of seeds, their quality (i.e., their appropriateness for planting), detect seed quality issues and their likely causes, and the necessity for drying and processing, among other things. Seed testing are typically performed soon after extraction and before to planting. The following are some of the most popular techniques.

1.10. Purity Test:

Purity refers to the percentage of seeds that are free of impurities of any type and shape. It evaluates what percentage of the seed sample is pure seed and what percentage is extraneous material based on weight. Pure seeds, other seeds, damaged seeds, and inert stuff such as seed wings, twigs, stone soil, or other non-seed elements are the four recognized components of a seed lot. Purity per cent is calculated using the formula below.

1.11. Seed Weight:

It is usually stated in terms of 1000 pure and complete seeds. This quantity may easily be translated to the number of pure seeds per gram or kilogram as needed. Weight may be established easily by counting and weighing 1000 seeds. Size, moisture content, and the percentage of complete seeds in the lot are all factors that influence seed weight. Moisture content is high at the time of seed collection, which increases the size of the seed and, as a result, seed weight. This is why seeds must be thoroughly dried before being stored, e.g. Terminalia sp., Cassia fistula, Dalbergiasissoo etc. It's usually determined by collecting 10 random 100-seed samples from a pure lot. Additional replicates should be drawn if the difference between any two replicates reaches 10% of the mean weight. The following formula is used to convert the number of seeds per kilogram.

1.12. Seed Treatment:

Many tree species' seeds sprout quickly when exposed to favorable moisture and temperature conditions, whereas many others have some degree of seed dormancy. In areas where dormancy is strong, seed treatment is required for artificial regeneration to achieve a high germination rate in a short period of time. When compared to the control, the best treatment resulted in a tenfold increase in germination after 10 days in Robinia. In other instances, such as in Pinustaeda, the primary variation may be in the rate of germination rather than the ultimate total. Some of the most popular seed treatment and conquering techniques.

1.13. Synthetic Seeds:

Plant propagation through artificial or synthetic seeds derived from somatic rather than zygotic embryos offers up new avenues in seed science. Transgenic plants, non-seed producing plants, polyploidy with elite characteristics, and plant lines with seed propagation issues may all benefit from artificial seeds. Because the method is clonal, it avoids the time-consuming selection process of traditional recombination breeding and may bring biotechnology to the farmer's doorstep in a cost-effective way. Synthetic seeds are artificially encapsulated somatic embryos, shoot tips, axillary buds, or any other meristematic tissue used for planting as seeds that have the capacity to transform into complete plants in vitro and in vivo and retain their potential after preservation. It may also refer to enclosed buds or any other kind of meristem that can grow into a plant in a wider sense. Artificial seed technology involves the creation of somatic embryos generated from tissue culture and coated in a protective covering. Somatic embryos are bipolar structures having apical and basal meristematic areas that may produce a shoot or a root, respectively. Ambling is a term used to describe a plant that is produced from a somatic embryo.

2. DISCUSSION

Synthetic seeds provide a number of benefits, including ease of handling, storability, decreased propagule size, and transportability. Synthetic seeds may be used to efficiently preserve germplasm. Mass multiplication of elite plant genotypes at a low cost, as well as a route for novel transgenic plants created using biotechnological methods to be transmitted straight to the greenhouse or field. Due to several major issues, such as asynchronous development of somatic embryos, improper maturation of somatic embryos, poor conversion rate of somatic embryos, lack of dormancy, and limited production of viable mature somatic embryos, commercial scale production of synthetic seeds is limited to only a few species. Conversion of synthetic seeds into plant-lets is a significant issue for commercial use in certain plant species (trees). Artificial or synthetic seeds produced from somatic embryos or other vegetative propagules may be used to propagate plants, opening up new possibilities in agriculture and forestry. Synthetic seeds in plant propagation have been investigated successfully in a variety of plant species, including.

3. CONCLUSION

The first and most essential prerequisite for the success of any forest-related initiative is the availability of high-quality seed. It is critical to know diverse information about tree species in regards to seed collecting and processing, storage and testing, dormancy breaking, and various seed treatment techniques to improve germination. In every tree development effort, high-quality seed is essential. Because there is so much variety in forestry, there is a lot of room for excellent seed production. Nowadays, efforts are being made to produce superior and high-quality seeds in order to guarantee the survival and development of tree species as they evolve into various forests. Different variables influencing seed quality, such as source, harvest time and methods, processing and storage practices, should all be taken into account when improving seed quality. Synthetic seed production has opened up new vistas in plant propagation technology, since it provides numerous beneficial benefits for tree multiplication on a commercial scale.

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