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Seed Certification Methods in Soil Testing Laboratory at Department of Agriculture, Villupuram

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Abstract

This review discusses seed certification methods adopted in Seed Testing Laboratory, Villupuram. Different processes are carried out to test the quality of seeds like purity, drying, moisture content and seed germination. This helps us to understand in detail how the seeds are subjected to testing in various aspects and certified for planting for further agricultural production or consumption.

Keywords: Pollen shelters, Shedding tassels, Boerner divider, riffle divider, seed certification.

Introduction

Through sustainable development goals, the global community is committed to arrive at a world that is free of hunger by the year 2030 by sustained food production than the current scenario. Apart from land and water resources need for the increased agricultural production, crop varieties are the major factor to support the farmers¹.

The International seed Testing Association (ISTA) is a nonprofit association that provide certain methods and seed testing services for seeds of international trading standards. The purpose of ISTA is to develop standard methods for sampling and testing seeds of all types as a seed's quality is especially important for the farmer as well as the company (ISTA) for better agricultural farming, seeds, soil, and climate are basic ingredients. When the seeds are tested, they are studied for what purpose they can be used, to pass legal standards ex. trading. 'seed quality', 'crop variety' and 'quality seed are different in their aspects. There are few attributes where seeds are being tested which are

then selected for planting.(1) Physical purity (2) Incidence of noxious weed seed (3) Germination or viability (4) Provenance or origin (5) Density (weight per volume or number) (6) Moisture content (7) Varietal purity (8) Vigor (9) Incidence of seed-borne diseases (10) Efficacy of various seed treatments (11) Homogeneity. Among these, only three attributes, Physical purity, weed seeds presence and germinations are routinely tested.

Seed certification can also be defined as a legal sanction system of seed production for specific requirements produced under the supervision of seed certification officials². The purpose of the seed testing laboratory was to certify the seeds that

Table 1.The Inseparable Crop Plant

Crops	Designated inseparable Crop Plant
Wheat	Barley, Oats, Gram and Triticale
Barley	Oats, Gram, Wheat and Triticale
Oats	Barley, Wheat, Gram and Triticale
Triticale	Wheat, Barley, Oats, Gram and Rye

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Table 2. The Common Weed in Crops

Crop	Name of The Weed Species	Botanical Name Of The Weed Species
Paddy	Wild rice	<i>Oryza sativa</i> L. Var. <i>Fatua prain</i>
Wheat	Wild morning glory	<i>Convolvulus arvensis</i> L. <i>Phalaris minor</i> Retz
Rape Mustard	Mexicana prickly Poppy (Satyanashi)	<i>Argemone mexicana</i> L
Taramira	Poppy (Satyanashi)	<i>Argemone mexicana</i> L
Sunflower	Wild sunflower Orabanche	<i>Helianthus spp.</i> <i>Orabanchecumana</i>
Safflower	Wild safflower	<i>Carthamusoxyacantha</i>

were being marketed in the shops³. To maintain and make high-quality seeds available to the public. Seed Certification is also designed to achieve prescribed standards. Inseparable crop plants and lists of common weeds in crops are listed in tables 1 and 2.

Materials and Methods Adopted

The following seed testing methods were carried out at



Seed Testing Laboratory, Joint Agricultural Office, Biocontrol lab, Villupuram. The seed testing process is done through several methods that are involved in seed testing and they are discussed below.

Types of Seeds

There are different types of seeds like Breeder Seed, Foundation Seed Stage I and II, Registered seeds and Certified Seeds.

Types of seed sample

There are different types of seed sample type that come to the seed testing laboratory.

- Service sample is the Sample received from the farmers.
- Certified sample is the Sample received from certification agencies or officers.
- Official sample is the Sample received from the seed inspectors.

Seed sampling

Seed lots are not completely homogeneous due to



Fig.1 Equipment for Purity Analysis
A. Seedblower B. Hand Lens and Spatula

several reasons. A representative sample of seed lot should be subjected to testing. If the sample is a good representative of the whole lot the analysis will reflect the true quality of the seed.

Sources of contamination

Contaminants were responsible for poor quality seeds. Contaminants might be as genetic or physical. Genetic contaminations may be Off-types, Pollen shelters, Shedding tassels. Physical/Genetic contaminations be Inseparable other crops plants, objectionable weed plants, diseased plants

Purity analysis

A purity test consists of separating the sample into four components: pure seed, other crop seeds, weed seeds, and inert matters. The sample is divided into a sub-sample consisting of roughly 2,500 seeds. We use a divider to indiscriminately select the seeds that we will test. Equipment used for Analysis Purity are work board, Seed blower, Spatula, Hand lens, Stereomicroscope. Some of the equipments are shown in Fig.1

Dust testing

Dust testing is also a method of seed testing where it is done by studying its characteristics like distinctness, uniformity, stability

Mixing and dividing of seeds

The main objective was to obtain the representative homogenous seed sample for analysis by reducing the submitted sample.

Types of Dividers

Boerner divider, mechanical dividing, riffle divider, centrifugal or Gamet divider, random cup method, modified halving method, spoon method, hand halving method. The equipment used for dividing are shown in the Fig.2.

Seed drying

Process of elimination of moisture from seed to a safe level through evaporation.

Different methods of drying

The process of seed drying is done either Physically or Mechanically.



A. Riffle Divider



B. Boerner Divider

Fig.2 Equipment for Dividing



Fig.3 Determination of moisture content in crops by moisture meter

- (i) Physical drying (or) natural drying (or) sun drying
- (ii) Mechanical (or) artificial drying
 - a) Drying with forced natural air
 - b) Drying with forced artificially heated air
 - c) Drying with desiccants
 - d) Drying with infrared

Moisture content determination

The quantity of water present in the seed was referred to as seed moisture content and is expressed in percentage on a wet weight basis using moisture meter. The moisture content depends on varied with crop species, kind of seed, seed size & environmental condition particularly RH & temperature. The instrument used for the determination of moisture is shown in Fig.3.

Seed germination

It is defined as the emergence and development of the seed embryo, of those essential structures, indicates its ability to produce a normal plant under favorable conditions^{4,5}. Germination tests shall be conducted with a pure seed fraction in a prefabricated seed germinator. Seeds are Counted and arranged equally on the substratum by a hand/



Fig. 4 Prefabricated germination chamber

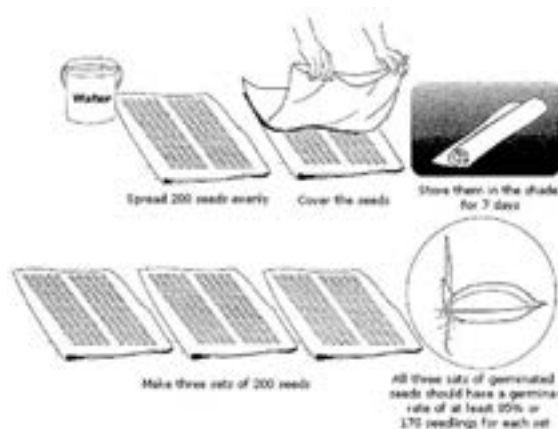


Fig. 5 Steps in seed germination

vacuum counter/counting board. The substrates are placed in the germination room/germinator (Fig. 4). A minimum of 400 seeds are required in 4 replicates of 100 seeds each or 8 replicates of 50 seeds each depending on the size of the seed and size of containers of a substrate. The test is conducted under favorable conditions of moisture, temperature, suitable substratum, and light if necessary. No pre-treatment to seeds is given except for those recommended by ISTA. The Substratum serves as a moisture reservoir and provides a surface or medium for which the seeds can germinate, and the seedlings grow. Steps are illustrated in Fig.5.



Fig.6 Seed germination in paper& sand substrates

Substratum

Sand/soil and paper are commonly used substratum. The seed germination in sand and paper will show in Fig.6. Paper substrates for germination used are Filter, blotter, or paper towel are generally used as substrates. The method of sowing is been followed in germination steps. The seeds are sowed in sand/soil substrates with certain dimensions. Seeds in sand (s) are sowed at 1 or 2cm depth by just pressing the topsoil.

Dust testing

The dusting of seeds is conducted to characterize the seeds that are being subjected to the following steps. They are characterized in Fig.7.

Distinctness

If a variety was distinguishable by at least an essential characteristic from any other variety in any country at the time of filing the application.

Uniformity

If subject to the variation that might be expected from

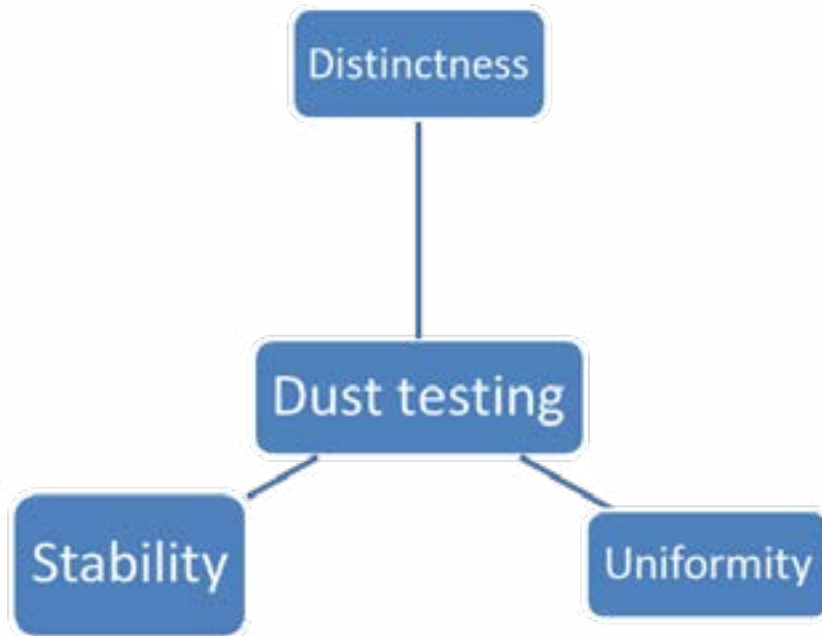


Fig.7 Seed dusting characteristics

the features of its propagation it was sufficiently uniform in its essential characteristics.

Stability

If, its essential characteristics remain unchanged after repeated propagation or, in the case of a cycle of propagation, at the end of each such cycle

Moisture content estimation

The sample should be weighed again, and the moisture content may be calculated by using the following formula, $M = \frac{m2 - m3}{m2 - m1} \times 100$

m1=weight of the container with lid (g)

m2=weight of the container with lid and sample before drying(g)

m3= weight of the container with lid and sample after drying (g)

Seed Germination

In paper substrates, Capillary movement of water takes place in the vertical direction at a velocity of 30mm/min. This type of substrates is free from pathogens or toxic substances. At 1st and 2nd counts, the seedlings which fulfill normal seedling conditions are removed,

counted, and discarded. All hard seed, diseased and abnormal seedlings, non-germinated seeds are left until the final count when their number is recorded. Diseased seed and seedlings which may affect healthy seeds may be removed before the final count. ISTA classified the seedlings into different categories based on the development of essential structures. Seeds were collected randomly from pure seed fraction.

Categories of seedlings

Upon germination, the seedlings could be inferred as Normal seedlings, Abnormal seedlings, Hard seeds, Fresh ingeminated seeds, Hard seeds are included as germinated seed and it should be reported in the analyst report or certificate.

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