24. Seed testing

Seed testing is the cornerstone of all other seed technologies. It is the means by which we measure the viability and all the physical factors that regulate the use and maintenance of seeds. Everything that is done with seeds should have some test information to guide the work and ensure high quality. Seed tests tell if a crop of seeds is worth collecting, if handling procedures are correct, and how many potential seedlings are available for regeneration. Seed testing is the science of evaluating the planting value of seed. Seed quality in India is legally controlled by the Seed Act, 1966. The seed Act is enforced by Govt. of India through the Central Ministry of Agriculture and Co-operation and State Department of Agriculture. According to this Act all the seeds of notified varieties / kinds when sold to farmers must meet the minimum standard of germination, genetic purity and physical purity. The seed should be packed in a suitable container and a label has to be affixed on the container. Information about germination, physical purity, variety, date of test and name of the seed producer has to be given on the label. The germination as given on the label is valid for 9 months and after which it has to be revalidated.

Objectives

1. To determine their quality, that is, their suitability for planting.
2. To identify seed quality problems and their probable cause.
3. To determine the need for drying and processing and specific procedures that should be used.
4. To determine if seed meets established quality standards or labelling specifications.
5. To establish quality and provide a basis for price and consumer discrimination among lots in the market.

Brief history of seed testing

International

Organised seed testing started more than a hundred years ago as to avoid unscrupulous practices prevalent in the seed trade during the nineteenth century. The first lab for seed testing was established in Thrandt, in Saxony, Germany, in 1869 under the direction of Frederick Nobbe. A few years later in 1871, a seed testing laboratory was opened in Copenhagen, Denmark, under the direction of E. Moller Holst. Seed testing spread rapidly in Europe during the next twenty to thirty years. At the beginning of the twentieth century (1900) about 130 seed testing stations were operating in Europe. In the United States, the first seed testing laboratory was opened in 1876. In India, the first seed testing station was established in 1961.

International Seed Testing Association (ISTA)

As seed testing developed, it necessitates for the establishment of common methods of testing that would secure uniformity in evaluation and test results. This leads to the formation of the International Seed Testing Association in 1924.

The primary object of ISTA is to develop, adopt and publish standard procedures for sampling and testing seeds, and to promote uniform application of them for the evaluation of seeds moving in the international seed trade. In addition, it also promotes research in all aspects of seed science and technology, including sampling, testing, storing, processing and distribution, ISTA, developed the International Rules for Seed Testing based upon scientific evidence.

The ISTA Rules for testing seeds are followed by its member countries. In carrying out seed testing work. The introduction of the International Seed Analysis Certificate, widely used in the international seed trade, is another important achievement.

Association of Official Seed Analysis (AOSA)

The need for standardization of seed testing methods led to the formation of an organization in 1908, then known as Association of Official Seed Analyst of North America. The basic objectives of AOSA are to develop, adopt and publish rules for testing seeds, and to encourage research in seed technology.

Seed Testing Laboratory

The seed testing laboratory is the hub of seed quality control. Seed testing services are required from time to time to gain information regarding planting value of seed lots. To carry out these responsibilities effectively, it is necessary that seed testing laboratories are established, manned and equipped in a manner such that whatever samples are received could be analysed in the least possible time, so that the seed quality control work and the need of seed industry are effectively met.

Routine tests in STL

- Purity
- Germination
- Moisture

Types of samples received at STL

Service sample - Sample received from the farmers

Certified sample - Sample received from certification agencies or officers

Official sample - Sample received from the seed inspectors.

Seed sampling

Seed sampling is to draw a portion of seed lot that represents the entire seed lot.

Seed lot - It is a uniformly blended quantity of seed either in bag or in bulk.

Seed Size	Maximum quantity per lot
Larger than wheat and paddy	20,000 kg
Smaller than wheat and paddy	10,000 kg
Maize	40,000 kg

Method of obtaining working sample from seed lot

- Primary sample
- Composite sample
- Submitted sample

Working sample – used for actual testing is done in Seed Testing Laboratories

Sampling intensity

a. For seed lots in bags (or container of similar capacity that are uniform in size)

I. up to 5 containers	Sample each container But never < 5 Primary sample
6-30 "containers	Sample atleast one in every 3 containers but never > < than 5 P. S.
31-400 "containers	Sample atleast one in every 5 containers but never < 10 P. S.
401 or more	Sample atleast one in every 7 containers but never < 80.

II. When the seed is in small containers such as tins, cartons or packets a 100 kg weight is taken as the basic unit and small containers are combined to form sampling units not exceeding this weight e.g. 20 containers of 5 kg each. For sampling purpose each unit is regarded as one container.

b. For seeds in bulk

Up to 500kg	-	At least 5 Primary sample
501 - 3000 Kg	-	1 Primary sample for each 300 kg but not less than 5 Primary samples
3001-20,000 Kg	-	1 Primary sample for each 500 kg but not less than 10 Primary samples
20,001 and above	-	1 Primary sample for each 700 kg but not less than 40 Primary samples

Principles of sampling

Sample is obtained from seed lot by taking small portion at random from different places and combining them. From this sample smaller samples are obtained by one or more stages. In each and every stage thorough mixing and dividing is necessary.

Methods of sampling

a. Hand sampling

This is followed for sampling the non free flowing seeds or chaffy and fuzzy seeds such as cotton, tomato, grass seeds etc., In this method it is very difficult to take samples from the deeper layers or bag. To over come this, bags are emptied completely

or partly and then seed samples are taken. While removing the samples from the containers, care should be taken to close the fingers tightly so that no seeds escape.

b. Sampling with triers

By using appropriate triers, samples can be taken from bags or from bulk.

1. Bin samplers

Used for drawing samples from the lots stored in the bins.

2. obbe trier

The name was given after Fredrick Nobbe- father of seed testing. This trier is made in different dimensions to suit various kinds of seeds. It has a pointed tube long enough to reach the centre of the bag with an oval slot near the pointed end. The length is very small. This is suitable for sampling seeds in bag not in bulk.

3. Sleeve type triers or stick triers

It is the most commonly used trier for sampling: There are two types

viz., 1. with compartments 2. Without compartments.

It consists of a hollow brass tube inside with a closely fitting outer sleeve or jacket which has a solid pointed end. Both the inner tube as well as the outer tube has been provided with openings or slots on their walls. When the inner tube is turned, the slots in the tube and the sleeve are in line. The inner tube may or may not have partitions.

This trier may be used horizontally or vertically. This is diagonally inserted at an angle of 30^0 in the closed position till it reaches the centre of the bag. Then the slots are opened by giving a half turn in clockwise direction and gently agitated with inward push and jerk, so that the seeds will fill each compartment through the openings from

different layers of the bag, then it is again closed and with drawn and emptied in a plastic bucket. This trier is used for drawing seed samples from the seed lots packed in bags or in containers.

Types of samples

1. Primary sample

Each probe or handful of sample taken either in bag or in bulk is called primary sample.

2. Composite sample

All the primary samples drawn are combined together in suitable container to form a composite sample.

3. Submitted sample

When the composite sample is properly reduced to the required size that to be submitted to the seed testing lab, it is called submitted sample. Submitted sample of requisite weight or more is obtained by repeated halving or by abstracting and subsequently combining small random portions.

4. Working sample

It is the reduced sample required weight obtained from the submitted sample on which the quantity tests are conducted in seed testing lab.

Weight of submitted sample

The minimum weights for submitted samples for various tests are as follows

1. Moisture test

100 g for those species that have to be ground and 50 g for all other species.

2. For verification of species and cultivars (genuineness of variety)

Crop	Lab only (g)	Field plot & Lab (g)
Peas, beans, maize, soybean and crop seeds of similar size	1000	2000
Barley, oats, wheat and crop seeds of similar size	500	1000
Beet root and seeds of similar size	200	500
All other genera, seed potato, sweet potato and other vegetatively propagated crops	100	250

3. For other tests like purity and count of other species

Crop	Size of seed lot (kg)	Size of submitted sample(g)	Size of working Sample for purity (g)	Sample count of other species(g)
Brinjal	20,000	1000	140	1000
Chillies	10,000	70	7	70
Bhendi	10,000	7	7	7
Tomato (variety)	10,000	100	10	100
Tomato (hybrid)	10,000	100	10	100
Cabbage	10,000	100	10	100
Cucumber, muskmelon and longmelon	1000	150	70	150
Bitter gourd	2000	1000	450	1000

The samples taken may be packed in bags, sealed and marked for identification. For moisture testing the samples should be packed separately in moisture proof polythene bag and kept in the container along with the submitted samples.

Information to accompany the sample:

Date…… Kind…… Variety ……

Class of seed…… Lot No. ……

Quantity of seed in lot (kg) ……

Tests required (1) Purity…… (2) Germination…… (3) Moisture ……

Senders Name and Address……

Mixing and dividing of seeds

The main objective of mixing and dividing of seeds is to obtain the representative homogenous seed sample for analysis by reducing the submitted sample to the desired size of working sample.

Method of mixing and dividing

1. Mechanical dividing
2. Random cups method
3. Modified halving method
4. Spoon method
5. Hand halving method

1. Mechanical method

The reduction of sample size is carried out by the mechanical dividers suitable for all seeds except for chaffy and fuzzy seeds.

Objective of mechanical dividing

- To mix the seed sample and make homogenous as far as possible
- To reduce the seed sample to the required size without any bias
- The submitted sample can be thoroughly mixed by passing it through the divider to get 2 parts and passing the whole sample second time and 3rd time if

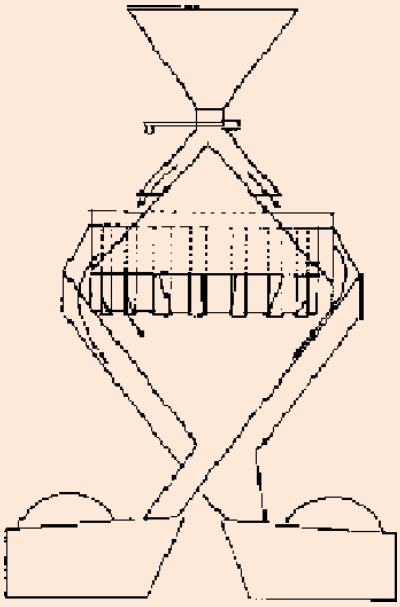
necessary to make the seeds mixed and blended so as to get homogenous seed sample when the same seeds passed through it into approximately equal parts.

- The sample is reduced to desired size by passing the seeds through the dividers repeatedly with one half remain at each occasion.

Types of mechanical dividers

a. Boerner divider

It consists of a hopper, a cone and series of baffles directing the seeds into 2 spouts. The baffles are of equal size and equally spaced and every alternate one leading to one spout. They are arranged in circle and are directed inward. A valve at the base of the hopper retains the seeds in the hopper. When the valve is opened the seeds fall by gravity over the cone where it is equally distributed and approximately equal quantity of seeds will be collected in each spout. A disadvantage of this divider is that it is difficult to check for cleanliness.



b. Soil divider

It is a sample divider built on the same principles as the Boerner divider. Here the channels are arranged in a straight row. It consists of a hopper with attached channels, a frame work to hold the hopper, two receiving pans and a pouring pan. It is suitable for large seeds and chaffy seeds.

c. Centrifugal or Gamet Divider

The principle involved is the centrifugal force which is used for mixing and dividing the seeds. The seeds fall on a shallow rubber spinner which on rotation by an electric motor, throw out the seeds by centrifugal force. The circle or the area where the seeds fall is equally divided into two parts by a stationary baffle so that approximately equal quantities of seed will fall in each spout.

2. Random cup method

This is the method suitable for seeds requiring working sample upto 10 grams provided that they are not extremely chaffy and do not bounce or roll (e.g.) *Brassica spp*.

Six to eight small cups are placed at random on a tray. After a preliminary mixing the seed is poured uniformly over the tray. The seeds that fall into the cup is taken as the working sample.

3. Modified halving method

The apparatus consists of a tray into which is fitted a grid of equal sized cubical cups open at the top and every alternate are having no bottom. After preliminary mixing the seed is pouted evenly over the grid. When the grid is lifted approximately half the sample remains on the tray. The submitted sample is successively halved in this method until a working sample size is obtained.

4. Spoon method

This is suitable for samples of single small seeded species. A tray, spatula and a spoon with a straight edge are required. After preliminary mixing the seed is poured

evenly over the tray. The tray should not be shacked there after. With the spoon in one hand, the spatula in the other and using both small portions of seed from not less than 5 random places on the tray should be removed. Sufficient portions of seed are taken to estimate a working sample of approximately but not less than the required size.

5. Hand halving method

This method is restricted to the chaffy seeds. The seed is poured evenly on to a smooth clean surface and thoroughly mixed into a mound. The mound is then divided into 1/2 and each half is mound again and halved to 4 portions. Each of the 4 portions is halved again giving 8 portions. The halved portions are arranged in rows and alternate portions are combined and retained. The process is repeated until the sample of required weight is obtained.