Seed Processing

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Introduction

Seed is not ready for sale immediately after harvest because it needs to undergo special technical treatment in order to meet certain quality standards. This technical treatment is composed of several stages namely: drying, cleaning and, grading, testing, treating, bagging and labeling. All these stages together are called 'processing'.

The objective of processing is therefore to give marketable seed that has been cleaned, graded, treated, packaged and tested. This means that during processing, the following types of undesirable materials are removed from seed: inert material, common weed seed, noxious weed seed, other crop seed, deteriorated seed, other cultivar seed, damaged seed and off-sized seed. The following sub-sections give brief remarks on the processing stages that a seed lot has to pass through.

Drying

Seed must be dried to an appropriate moisture level in order to facilitate processing, to prevent losses in germination and to reduce the chances of insect attack during storage. Drying generally involves the removal of moisture distributed inside the whole seed. The moisture first reaches the surface by capillary action from where it evaporates. Thus, drying of seeds is a relatively slow process. Seeds may be dried either (a) naturally or (b) artificially.

a. Natural drying : Natural drying is done by spreading the seeds on trays, floors or fields in the open sun. Air movement and heat generated by sun rays dry seeds provided weather conditions are favourable. In case of unfavourable weather conditions, drying must be done artificially.

b. Artificial drying : It involves passing of heated or unheated air through the seeds to remove moisture. In unheated drying, normal atmospheric air is passed through the seed. For effective drying, the air should have low moisture humidity; therefore, it is not effective in moist weather.

Heated air method involves passing of heated air through the seed. This method is quicker, faster and requires less drying space than the unheated air method. Drying is not affected by weather conditions as is the case with the unheated air method

Cleaning and Grading

The seed from threshing floor is mixed with seeds of other crops and of weeds, pieces of straw, gravel, soil etc. Further, the seed is not of uniform size, but it contains seeds of several sizes from some of which are undersized, shrivelled and unfit for use as seed. Separation of inert matter, weed seed and seeds of other crops from the seed is known as cleaning. Seeds from different crops differ in size, shape, weight, specific gravity, surface smoothness, colour, electrical properties, stickiness, etc. The specific gravity separators divide seeds on the basis of their weight and size; pneumatic separators separate seeds on the basis of their resistance to air flow; spiral separators separate them on the basis of seed shape; velvet-roll separators on the basis of surface smoothness; electronic separators on

the basis of electrical properties of seeds; and electronic colour separators on the basis of seed colour.

Grading is the removal of smaller and shrivelled seeds from the well filled healthy seeds. Air and screen machine uses air current for separating seeds on the basis of their resistance to air stream and uses sieves to separate seeds on the basis of their size and shape. Commonly, the air and screen machine has either two or three screens; the size of screens varies depending upon the crop.

Testing

After cleaning and grading, the seed lots are tested for percentage of pure seed, weed seeds, seeds of other crops, inert matter and germination. This is known as seed testing, and is done in a seed testing laboratory. Seed testing is an integral part of every seed certification programme and is used as a check on the quality of seed to be marketed. The seed certification agency carries out seed tests on the seed lots presented for certification.

Seed tests are done in seed testing laboratories. Almost every state has seed testing laboratory, which performs the following functions.

- Conducting research on seed testing methods.
- Training of personnel in seed testing.
- Determining the standards for seed purity and seed quality for various crops.
- Seed testing for certification and for implementation of seed laws of the country.
- Before certification, seed lots are subject to seed tests in seed testing laboratories. Generally, the following tests are conducted to determine the quality of seeds: (a) Purity test, (b) Germination or seed viability test, and (c) Moisture content test.

Sampling

Seed tests are conducted on small samples generally drawn from processed seed lots. It is essential that the samples used for seed tests are representatives of the lot.

Purity test

Purity denotes the percentage of seeds belonging to the variety under certification. The working sample is closely examined, often with the help of a magnifying glass, to classify it into the following components.

Pure seeds

Seeds of the variety under certification.

- Seed of other varieties of the same crop
- Seeds of other crops.
- Seeds of weed/objectionable weeds.
- Inert matter: Sand, straw, stones, pebbles, soil particles etc.

Defective seeds

Broken and shrunken seeds.

A broken seed that is larger than half of its original size and has intact embryo is classified as pure seed. Defective seeds are classified as inert matter. Impurity percentage is also referred as dockage.

Cultivar purity test

Determination of the amount of seeds of other varieties of the same crop in a seed lot is under certification is often more difficult than that of other impurities, e.g., other crop seed, weed seed etc. For this purpose, samples from seed lots are compared with an authentic seed sample of the cultivar in question. The seed sample is subjected to the following three types of tests as follows:

a. Examination of seed in the Laboratory: The seeds are analysed using one or more of the following tests.

- Examination of morphological features of seeds.
- KOH-Bleach Tests for Sorghum.
- NaOH Test for Wheat
- Peroxidase Test for Soybean.

- Phenol Test for Wheat.
- Poly Arylamide Gel Electrophoresis (PAGE)
- Molecular marker

b. Examination of seedling: Seedlings from the test and the authentic samples are grown under the same controlled environment and their characteristics are compared.

- Coleoptile colour
- DDT Resistance
- Size and shape of leaflets

c. Field Plot Test or Grow-out Test: These tests are much more useful in self-pollinated than in cross pollinated crops. The authentic sample is planted after every 10 test samples for a close comparison. Observations are made both on qualitative and quantitative traits of the test and the authentic sample plots during the entire growing period. A grow out test is quite comprehensive, but is rarely used in this country as it requires a much longer time, an excellent greenhouse/off-season nursery facility, and a much greater efforts and funds than the tests based on seed and seedling characteristics.

Seed Viability or Germination Test

Germination is determined as percent of seed that produce or are likely to produce seedlings under a suitable environment.

a. Germination test

Germination test determines the percentage of seeds that produce healthy root and shoot. In most of the cases, seeds are germinated on wet filter papers placed in Petri dishes. The Petri dishes are kept under controlled conditions in an incubator or in a culture room. For most species, a temperature between 18-22^{o}C is adequate. The duration of germination test varies from 7-28 days depending upon the crop species.

b. Tetrazolium Method

This method determines the percentage of viable seeds, which may be expected to germinate. The chemical 2,3,5-triphenyl tetrazolium chloride, is colourless, but it develops intense red colour when it is reduced by living cells. This phenomenon is used to determine the percentage of viable seeds in a seed sample.

Moisture content

Moisture content is determined as per cent water content of the seeds. Optimum water content reduces deterioration during storage, prevents attack by molds and insects and facilitates processing. The moisture content is determined by drying the seed samples in an oven or with the help of a moisture meter.

Moisture meters measure the resistance of seeds to an electrical current; the electrical resistance of seeds varies with the moisture content. The use of moisture meters requires calibration and a certain degree of technical skill on the part of user. But moisture meters are very efficient and extremely rapid a large number of samples can be handled in a relatively short period.

Treating

Before bagging, seeds are treated with a suitable fungicide, often in combination with an insecticide. Seed treatment is helpful in the following ways:

(a) It is helpful in controlling seed borne diseases, such as bunt in wheat, grain smut in jowar, seedling blight in maize, rice, jowar and wheat, Fusarium wilt of jowar and wheat etc.

(b) It protects seeds from seed and seedling rots caused by Pythium and Rhizoctonia commonly present in soil,

(c) It protects against damage by storage pests, and

(d) It protects from damage by soil insects in the field.

Bagging and Labelling

After seed treatment, seeds are distributed in bags of appropriate size, the process is known as bagging. Each bag is labelled with appropriate label, which carries the following information:

(a) kind of seed

(b) name of the variety

(c) purity

(d) per cent germination

(e) date of germination test

(f) per cent weed seed

(i) per cent inert matter

(j) name and address of seller

(k) period of validity of the certification

(l) any other information pertinent to the seed. Accurate labelling is important to the purchaser as it provides the necessary details about the seed. Seed laws require that accurate information be provided on the label.

Conclusion

Good quality seeds of improved varieties are the milestone for the green revolution, carrier and catalyst of agro-technologies. A successful and profitable crop production is only through quality seeds. Its production, availability and quality play a significant role in achieving the higher agricultural production. The quality seed is basically dependent the metabolic and synthetic efficiency during seed development and maturation, which in turn is reflected upon the germination and vigorous of the resultant seedling.

Harvesting is one of the agronomic management practices that require technical knowledge on maturity of the crops. This knowledge is much important in seed production than in commercial production. It is the process of removal of economic produce from the mother plant.

Reference

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