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भारतीय मानक मसौदा

बीज/अनाज प्रसंस्करण और भंडारण —
परिभाषिक शब्दावली

Draft Indian Standard

**SEEDS/GRAIN PROCESSING AND STORAGE —
GLOSSARY OF TERMS**

ICS 65.060

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| Agriculture and Food Processing Equipment Sectional Committee, FAD 20 | Last date of comment: 14 April 2024 |
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FOREWORD

(Formal clause will be added later)

Seed processing holds great importance for the seed industry and its associated stakeholders to ensure optimal germination percentage, genetic purity, physical purity, and overall viability for enhanced propagation. The absence of a proper classification of seeds and definitions for each type, along with terms used in seed processing operations, makes it challenging to comprehend the entire workflow and management of the seed processing.

Therefore, a need was felt to develop an Indian Standard to define all the classes of seeds, unit operations, equipment used in seed processing along with the seeds/grain storage-related terminology to establish a common understanding among all stakeholders.

This standard has been developed based on recent practices and terms developed and used by experts from seed breeding research institutes, seed processing R&D institutes, and industries.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2: 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1 SCOPE

This standard prescribes the terminology for seeds/grain processing and its storage. It also prescribes definitions for various terms commonly used in the seeds/grain processing trade for denoting meaning and quality.

2 REFERENCE

The Indian Standards given reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated.

| <i>IS No.</i> | <i>Title</i> |
|---------------|--|
| IS 2813: 2018 | Terminology for Foodgrains (<i>third revision</i>) |
| IS 9981: 2020 | Agricultural Produce Processing Equipment — Glossary of Terms (<i>second revision</i>) |

3 TERMINOLOGY

In addition to the terminology prescribed in IS 2813 for food grains and in IS 9981 for processing equipment prescribed, following definition are used for the purposes of seeds and grains processing.

3.1 Aeration — The process of movement of ambient air through grain at low air flow rate.

3.2 Agricultural Grains — Grains used mainly for consumption (food and feed) and industrial use.

3.3 Air Cooled Seed Store — The structure where cold air generated from a suitable refrigeration/humidifier mechanism is forced to circulate uniformly through the grain/seed mass during storage to remove the heat of respiration and lower the temperature of the mass below ambient, without increasing the moisture content.

3.4 Air Cooled Store — The insulated structures on ground but partly underground which are cooled by circulation of colder air. These are widely used for the storage of most of the vegetable seeds.

3.5 Air Screen Cleaner cum Grader — An equipment used to clean and grade the seeds/grains where cleaning is done using air to separate light impurities like dust, chaff, stalks, diseased and broken, damaged small size seeds/grains based on the difference in terminal velocity. Grading is done using the perforated sieves based on size (length, thickness, diameter, etc.).

3.6 Ambient Humidity — The prevailing relative humidity of the ambient air, expressed in percent.

3.7 Artificial Drying — The artificial process of exposing moist grain/seed mass to hot conditions through elevated temperature of the surrounding above ambient temperature to remove the moisture/water.

3.8 Aspirator — A mechanism which removes/separates the lightweight materials (impurities) from the grain/seed mass by suction from a blower/fan.

3.9 Bag Storage — Grains/seeds are stored by holding in bags of specified size/quantity. Gunny bags, poly woven bags, cloth bags, paper bags, poly lined bags, etc. are in practice. Bag storage has merits and demerits over bulk storage.

3.10 Blending of Seeds and Grains — Proportionate mixing of seeds and grains to make it uniform in properties like germination, physical purity, and high quantity of same crop and variety grains to ease in handling. Blending is done for same crop and variety of seeds to increase availability of seeds in case of shortage.

3.11 Breakage of Seeds — The damage caused to the seeds by external forces, mostly during the harvest and post-harvest operations. Such seeds will fail to germinate. Also referred as damaged seeds.

3.12 Breeder Seeds — Seeds produced from nucleus/nuclear seeds under the supervision of a qualified plant breeder in a research farm. Breeder seed is monitored by a joint inspection team of scientists and officials of certification agency and National Seed Corporation. The genetic purity of breeder seed is maintained at 100 per cent.

3.13 Bucket Elevator — The machine used to vertically convey seeds and grains in small containers (Buckets) fixed on moving belt pulley from ground/plinth/floor/mezzanine floor to feed seeds and grains to cleaning, grading, sorting, and packing machines.

3.14 Bulk Storage — Storage of food grains/seeds in bulk in silos, storage bins, tank etc.

3.15 Bulking of Seeds and Grains — Mixing of two or more lots of different quality/variety of same crop grains to increase the quantity of single crop. It makes the bag size lot uniform for handling or distribution of grains.

3.16 Certified Seeds — The progeny of foundation seed produced by the State and National Seeds Corporation and private seed companies on the farms of progressive growers under supervision of seed certification agencies to maintain the seed quality as per minimum seed certification standards. This is the commercial seed which is available to the farmers and its genetic purity is maintained at 99 per cent. It is also known as registered seed.

3.17 Cleaned Seeds/Grains — Seeds and grains without physical impurities like dust, chaff, stalks and soil particles and any other foreign matter, stones, etc.

3.18 Color Sorting Machine — An equipment with an electronic device to sense the colour of the grains/seeds. This sorter is used to separate the impurities from the desired grains/seeds, which differ in colour. The colour of the desired grains/seeds will be used as reference and the grains/seeds/impurities in other colours will be rejected (*removed*).

3.19 Controlled Atmosphere Storage — Storage of grains/seeds in an atmosphere under a desired level of oxygen, nitrogen and carbon di-oxide, and maintained throughout the storage period. The proportion of oxygen will be less with higher level of other gases.

3.20 Damaged Seeds — Seeds which are broken or immature.

3.21 De-bearder — An equipment used to remove appendages (awn) from seed that are difficult to clean with air-screen separators. It is also known as Deawners.

3.22 Debearding — The action of removing the appendages (awn) using a De-bearder/Deawner.

3.23 Decorticator — An equipment used to break open the pods (decorticate) to separate the kernel/grains. Example – ground nut, red gram pod, etc.

3.24 Dehumidified Storage — Storage of grains/seeds at low relative humidity conditions. This method is practiced to remove or prevent accumulation the moisture during storage. This method may be combined with low temperature also for the heat sensitive materials.

3.25 Dehumidified Store — An alternative system for refrigeration in which suitable desiccants are used for the dehumidification of seed stores. Silica gel is usually used for seed store systems as it can absorb the water up to 40 per cent of its own dry weight.

3.26 Dehusker — An equipment used to remove the outer layer (husk) of the grains/seeds of any produce, Example – paddy, coconut, etc.

3.27 Desiccant — A substance or chemical that absorbs or attracts moisture from the desired ambient/chamber, causing a state of dryness (desiccation) in its vicinity. Calcium oxide and silica gel are the commonly used desiccants. Humectant is the opposite of desiccant.

3.28 Desiccation — Desiccation is the process of removal of moisture from the desired ambient.

3.29 Destoner — Equipment used to separate heavy material like stones, soil particles, heavy metals, from seeds and grains to make it free from these heavy impurities for human, animal consumption and industrial use.

3.30 Devitalization of Seeds — A procedure to deprive of the seeds of its life, vigor, or effectiveness. Commonly, heating or autoclaving is used as procedures to degrade the protein and/or DNA rendering the seed unfit as a reference material. The other novel methods for devitalizing seeds involve hydration, freezing in liquid nitrogen, and lyophilization.

3.31 Dicot Seeds — Dicot seeds (also known as dicotyledon seeds) are seeds with two embryonic leaves and cotyledons. Opposite of dicot seeds is monocot seeds.

3.32 Disc Separator — Seed processing equipment used to separate the good seeds from the broken based on length. The discs will have pockets of varying configurations to suit seeds of various crops.

3.33 Dockage — The term used for the place where loading and unloading of materials is done into wagons.

3.34 Dodder Mill — A pair of rollers with velvet type of smooth materials as surface, separates the seeds based on surface roughness. It is also called roll/roller mill.

3.35 Dunnage — A durable padding material used to protect goods during shipping and storage.

3.36 DUS Protocol for Seed Testing — Protocols and procedures for testing the distinctiveness, uniformity and stability (DUS) of certain agricultural and vegetable plants.

3.37 Field Fungi — Fungi that invade the seeds before harvest while the crop is still in the field. Field fungi may affect the appearance and quality of seed or grain. Most field fungi are more prevalent when rainfall is above normal during grain fill and harvest.

3.38 Foundation Seed — The progeny of breeder seed produced by the public sector, *viz.*, State Farm Corporation of India, National Seed Corporation, State seed Corporation, *etc.* and private sector (registered seed companies & farmers) under technical control of qualified plant breeders or technical officers. Its production is supervised and approved by certification agency. The genetic purity of foundation is maintained at 99.5 per cent.

3.39 Fragile Seeds — The seeds that get damaged or broken easily during handling and require much care during handling.

3.40 Fumigation — Method of pest control or the removal of harmful microorganisms by completely filling an area with gaseous pesticides, or fumigants, to suffocate or poison the pests within.

3.41 Genetic or Varietal Purity — The percentage of contamination by seeds or genetic materials of other varieties or species. The genetic purity of any commercial agricultural product propagated by seed begins with the purity of the seed planted.

3.42 Germination Percentage — An estimate of the viability of a population of seeds. The number of seeds germinated over the total number of seeds and expressed as percentage.

3.43 Germination Rate — Provides a measure of the time course of seed germination.

3.44 Germination Rate Index (GRI) — The sum of the percentage germination of seeds on each day from sowing divided by the corresponding number of the day.

3.45 Good Seeds/Grains — Seeds/grains which are uniform in size and shape, bold, cleaned and graded.

3.46 Graded Seed — Seeds separated from foreign materials, other crop seeds, other variety seeds, damaged seeds, etc. This upgrades the quality of seeds and improves seed vigour.

3.47 Grain Cooling — The reduction of rise in temperature of grains/seeds due to respiration during storage by circulating the ambient air using an appropriate mechanism.

3.48 Grain Respiration — The process by which food grains/seeds get oxygen from the air and burn food from its endosperm. This process liberates heat, water vapours and carbon dioxide. Respiration in grains, during the storage period, causes a dry matter loss of upto 1% or more.

3.49 Harvest Maturity — Seeds are ready for harvest after the attainment of physiological maturation. It is the stage of accumulation of maximum dry matter within the seeds. The moisture content of the seed at

this stage will be 25-30% and is expressed with maximum dry weight of seed, germination and vigour potential.

3.50 Heat-Sealable Barrier Pouch for Seeds — Heat-sealed pouches made of poly films used for packaging the seeds in small quantities for marketing. They are available in different sizes and thicknesses.

3.51 Hermetic Storage — A method to control moisture and insects in stored grains/seeds by using sealed, airtight units.

3.52 Humectant — A substance or chemical used to preserve/maintain the moisture content/water level in any material, by absorbing the moisture. This is opposite of desiccant.

3.53 Inclined Belt Separator/Inclined Draper — Separator that separates seed by their relative ability to roll or slide, which is in turn determined by the seed's shape and surface texture. The seed mixture is fed onto an inclined belt/drapper belt which is moving toward the high end.

3.54 Indented Cylinder Separator — The cylinder separator used for grading the seeds/grains by length. Thus in the seed lot the damaged/broken seeds are separated to improve the seed quality.

3.55 Insulated Seed Store — A seed storage which has insulated walls, floor, and ceiling as the inside temperature where relative humidity is regulated constantly throughout the year.

3.56 Impurities — The organic and inorganic matter like dust, chaff, stalk, soil particles, stones, other crops and other varietal seeds and grains not desirable in good quality standard seeds and grains.

3.57 Laboratory Testing of Seeds and Grains — A set of tests like germination, physical and genetic purity testing, DNA finger print testing and so on done in the laboratory wherein small equipment are set up for carrying out various tests.

3.58 Light and Heavier Seeds — The well matured crop yields bold and healthy seeds. Seeds which are immature and unhealthy will be light in weight. The bold seeds are heavier.

3.59 Magnetic Separator — An equipment used in separating iron impurities form seeds/grains. However, the broken/damaged grains/seeds are also separated from the good grains/seeds using magnetic separator where these are coated with iron powder and come in contact with a magnetic surface.

3.60 Marketable Seeds (Commercial Seeds) — Seeds of any crop produced and sold after quality upgradation for crop raising purposes other than the production of propagating material.

3.61 Mobile Seed Processing Plant — It comprises a series of seed processing equipment to separate the impurities and upgrade the quality of the seeds. To facilitate the farmers and processors, the seed processing unit will be installed in a transport system (wagon) and made as a mobile unit.

3.62 Modified Atmosphere Storage — Storage of grains/seeds in which the atmosphere is modified naturally by changing the level of oxygen, nitrogen and carbon di-oxide, due to respiration of grains/seeds and insects where the proportion of oxygen is lesser than other gases.

3.63 Moisture Content (Dry Basis) — The water/moisture content present in the seeds expressed in percentage on the basis of the dry weight.

3.64 Moisture Content (Wet Basis) — The water/moisture content present in the seeds expressed in percentage on the basis of the wet weight.

3.65 Moisture Meter — An electronic device used to determine the moisture content of grains/seeds. This is an indirect method where any electric/di-electric properties of the seeds/grains which depend on the moisture content is utilized.

3.66 Monocot/Monocotyledon Seeds — The seeds with single embryonic leaves and cotyledon. Opposite of monocot seeds is dicot seeds.

3.67 Natural Drying — Drying of crops/seeds at ambient condition by sun drying by spreading on floor.

3.68 Non-Viable Seed — A non-viable seed is one which fails to germinate even under optimal conditions, including treatments for the removal of dormancy.

3.69 Noxious Weed Seeds — The seeds of the harmful weed or injurious weed (noxious weed/ invasive species/exotic species/alien species), which are non-native plants that are highly invasive and ecologically destructive. The presence of these seeds will affect the crop production.

3.70 Nuclear Seed — The hundred percent genetically pure seed with physical purity and produced by the original breeder.

3.71 Ordinary Seed Store — The place of retail sale of seeds in the seed marketing network. The retailer is expected to maintain all the requirements for seed storage following the legal requirements.

3.72 Orthodox Seed — The seeds which are capable of being dried to final seed moisture of less than 12% and stored at freezing temperatures, and surviving. The opposite is recalcitrant seeds, which cannot survive after drying and/or freezing.

3.73 Packaging Machine — Machine used to weigh and fill various types of containers like pouches, gunny bags, plastic bags, cloth bags, *etc.* with variable weight.

3.74 Pelleting of Seeds and Grains — The process employed to achieve uniform shape and size, uniform coloration, or to apply an additional coating on seeds/grains for protection against insects, pests, or as a nutritive supplement to enhance plant vigour during growth in soil.

3.75 Pests and Diseases — Any living stage of insects, mites, nematodes, other invertebrate animals, bacteria, fungi, viruses, or any organism resembling or related to the aforementioned, as well as any infectious substance, capable of directly or indirectly causing injury or damage to plants or their components, including processed, manufactured, or other plant-derived products.

3.76 Plenum — Plenum is a major component of a mechanical dryer. The bin holding the seed/grain is placed in or above the plenum and where the hot air is sent for drying.

3.77 Pneumatic Seed Grader — Seed separation of seeds/grains based on the difference in the terminal velocity between the good seeds and impurities. The difference in terminal velocity exists between the good grain/seed and the impurities at the same moisture content due to their weight or specific gravity.

3.78 Raw Seed — The seed received after the harvest and threshing/extraction. These seeds will undergo drying, pre-cleaning and further processing to make them suitable for crop production.

3.79 Re-circulatory Grain Dryers — Mechanical dryers where hot air passes through the seed/grain bed and exits after removing the moisture. This air will also have the heat depending on the heat utilized for drying. This exhaust is re-circulated along with fresh hot air.

3.80 Recalcitrant Seed — The seeds which do not survive drying and freezing during ex-situ conservation. By and large, these seeds cannot resist the effects of drying or temperatures less than 10 °C (50 °F), thus, they cannot be stored for long periods like orthodox seeds because they can lose their viability.

3.81 Refrigerated Seed Store — Storage of seeds at below ambient temperatures under refrigerated conditions (above 0°C).

3.82 Respiration Quotient — The ratio of the volume of carbon dioxide (CO₂) produced to the volume of oxygen (O₂) used.

3.83 Respiration Rate of Seeds — The amount of CO₂ generated per unit weight of the product per unit time. The rate of respiration depends upon abiotic factors including temperature, oxygen and CO₂ levels and exposure to light.

3.84 Rubber Roll Sheller/Dehusker — A dehusker used to dehusk the paddy and separate the husk and unpolished rice. This sheller/dehusker will have a pair of rubber rolls rotating at different speeds in opposite direction, inward. In the clearance between the rollers, less than the thickness of paddy, the paddy gets dehusked.

3.85 Scalper — The processing equipment used to remove the larger size impurities from the seeds.

3.86 Scalping — The unit operation to remove the larger size impurities present in the seeds/grains. In this operation, grains/seeds are dropped through screen openings and large size impurities, viz. trash, clods, etc. are scalped off over the screen into a separate outlet.

3.87 Seed Cleaning — An activity in seed processing to remove the large size, heavier, small size and light weight impurities. This is done by scalping and air screen cleaner.

3.88 Seed Coat — The outermost covering of the seed which protects the internal parts of a seed. The seed coat has two layers, the outer layer is thick and known as the testa. The inner layer is thin and known as tegmen. A thick seed coat protects the seed from sunlight and water.

3.89 Seed Deterioration — An irreversible, cumulative and inexorable process that can cause the build-up of cellular damages, and result in delayed seedling emergence, reduced ability to withstand stresses, and ultimately loss of viability. It is also known as Seed ageing.

3.90 Seed Dormancy — The state in which seed is unable to germinate, even under ideal growing conditions.

3.91 Seed Dressings — The method of treatment of various crop seeds with fungicides and/or insecticides in order to combat soil-borne fungal diseases and above and below ground insects. The seed is dressed with either a dry formulation or wet treated with a slurry or liquid formulation.

3.92 Seed Drill — An implement used for sowing the seeds in a continuous stream in furrows at uniform rate and at controlled depth with an arrangement of covering the seeds with soil.

3.93 Seed Extractor — An equipment used to extract seeds from the seed bearing part of the plants/crop like fruits, vegetables, nuts, beans, etc which functions on the principles of both wet and dry extraction.

3.94 Seed flow — Movement of the seeds fed into the seed processing equipment with awns, beards and other plant parts present in the seed.

3.95 Seed Germinator — A machine which germinates different types of seeds in laboratories by creating artificial environment with controlled temperature, humidity and light responsible for germination of seeds.

3.96 Seed Longevity — The time period in which the seeds can remain viable.

3.97 Seed Lot — A specified quantity of the seed of one cultivar of known origin as physically identifiable.

3.98 Seed Moisture — The amount of water present in the seed.

3.99 Seed Moisture Meter — The instrument used to determine/measure the moisture content of the seeds.

3.100 Seed Multiplication Ratio — The number of seeds produced from a single seed sown and expressed as a ratio. The seed multiplication ratio for different crops ranges from 1: 4 to 1: 400.

3.101 Seed Planter — An equipment used for sowing those seeds which are larger in size and cannot be handled by seed drills. It maintains the row to row and plant to plant spacing.

3.102 Seed Processing — The activity of quality upgradation of seeds by removing the impurities, other crop seeds, other variety seeds, weed seeds, damaged seeds, etc. and make the seeds suitable for plant propagation.

3.103 Seed Quality — The possession of seed with required genetic and physical purity that is accompanied with physiological soundness and health status.

3.104 Seed Rate — The quantity of seed of a crop required to sow a unit area of land to maintain optimum plant population in the field for higher yield harvest.

3.105 Seed Recovery — The percentage of the seeds obtained after seed processing over the raw seeds taken for processing.

3.106 Seed Scalping — The process of removing larger particles in initial stages of seed processing.

3.107 Seed Shape — The shape of the seed at its natural rest position as seen from the top like round, oblong, ellipse, ovate, etc.

3.108 Seed Storage Fungi/Moulds — A fungi which invade seeds during storage. Small quantities of spores of storage fungi may be present on grain going into storage or may be present on spilled grain present in harvest, handling and storage equipment or structures. The development of storage fungi in stored grain is influenced by the moisture content of the stored grain, the temperature of the stored grain, the condition of the grain going into storage, the length of time the grain is stored and the amount of insect and mite activity in the grain. The most common storage fungi are species of *Aspergillus* and *Penicillium*.

3.109 Seed Temperature — The temperature of the seed lot.

3.110 Seed Treatment — Application of fungicide, insecticide, nutrients or a combination of all to seeds in order to disinfect them from seed-borne or soil-borne pathogenic organisms and storage insects.

3.111 Seed Viability — Seed viability refers to a seed's capacity to germinate and produce a healthy seedling.

3.112 Seed Vigour — An estimate to determine the potential level of activity and performance of the seed during germination and seedling emergence. It refers to how quickly seeds germinate, or the inherent germination, growth and production potential of the seed.

3.113 Seed Vigour Index — Calculated by multiplying germination percentage and seedling length.

3.114 Seed Winnowing Equipment — An equipment which separates the bold seeds and other impurities based on the difference in the terminal velocity using blast of air from a blower.

3.115 Seed Yield — The quantity of the marketable seeds obtained from a unit crop area.

3.116 Seeds — Agricultural grains having standard germination ability and varietal genetic purity to give rise to agricultural plants and used for multiplication of varietal identity plants.

3.117 Seeds and Grains Pelleting Machine (Seed Pelletizer) — An equipment used for coating seeds and grains with thick nutrient or protectant so as to make the irregular shape seeds and grains uniform, round and with attractive colour of coating to improve aesthetics of seeds and grains.

3.118 Seeds and Grain Processing Plant — The civil structure and processing machines installed for cleaning, grading, sorting, packing of seeds and grains.

3.119 Seeds and Grain Sampling — Small quantity of seeds and grains taken out from each lot to form a representative sample for testing and analysis.

3.120 Seeds and Grain Storage Unit — The ware house with and without controlled conditions used for long-term and short-term seeds and grains storages for protecting from diseases and pests and weather conditions to preserve quality of seeds and grains for further use.

3.121 Seeds and Grain Treater or Coating Machine — This machine mixes proportionately seeds and grains with protectants to save from diseases and insect pests. Colour treatment can also be done with the coating machine.

3.122 Shelf Life of the Seed — The period till the seeds maintain their vigour as per relevant standards. which varies with the crops and the storage conditions.

3.123 Shelling — A unit operation for removal of grain/seed from the pod by a mechanical action.

3.124 Sheller — An equipment used to remove the outer layer (shell, husk, bran, etc.) from the grains/pods.

3.125 Silo — A storage structure for long term storage of seeds/grains. Normally the silos will be taller and bigger than the storage bins.

3.126 Sorted Seeds and Grains — Seeds and grains of same colour, size and shape looking aesthetically uniform and bold.

3.127 Sorting — Separation of good seeds and grains from different colour, size and shape of seeds and grains to have uniform colour, size and shape where the pure seeds and grains get sorted out.

3.128 Specific Gravity Separator — An equipment which separated the impurities, both light and heavy weight, based on the difference in the weight/density between the bold seeds and impurities.

3.129 Spiral Separator — The machine works on the principles of gravity and separates seeds/grains based on the difference in roundness or sphericity between seeds/grains, and the impurities.

3.130 Storage — Preservation of seeds/grains in the safe storage conditions so as to protect them from diseases and pests to keep fit for its objective or purpose.

3.131 Storage Pests — These include mostly beetles or moths, infest the stored grain or seed. These infested seeds result in physical damage, leading to deterioration in the weight, quality, vigour, and reduction in the germination of the grain, thus leading to the loss of market value.

3.132 Truthfully Labeled Seeds — The category of seed produced by cultivators, private seed companies, and sold under truthful labels. But field standard and seed standard should be maintained as per *Seed Act*, 1968 and certified seed stage. Under this act, the seed producer and seed seller are responsible for this seed.

3.133 Ware House — A large size storage facility for goods and produces. Grains and seeds are also stored safely in warehouses for longer periods.

3.134 Weevilled Seeds — The seeds which are partially or wholly bored or eaten by weevils or other insects.

3.135 Wet Seed Processing — The process of extraction of seeds from the fruits/vegetables by pulping. The process involves, scooping out the seeds or mashing the fruit/vegetables, washing the seeds and removing the pulp and drying the washed seeds.