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Seed Quality (Quality Control) in Processing - Handling & Damage Prevention - Rejects & Dust Control

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Presentation Outline

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Introduction

- Seed are rarely planted in the condition in which it comes from the growers since it contains weed or crop seed or inert material that make them unfit for sale without processing
- Seed processing in seed industry is responsible for upgrading seed, improving planting condition of seed, and applying chemical protectants to the seed.
- Quality seeds increases yield and promotes higher production per unit area to attain food security.
- Initially seed processing was done by **winning, hand picking and selection** to obtain some quality seeds



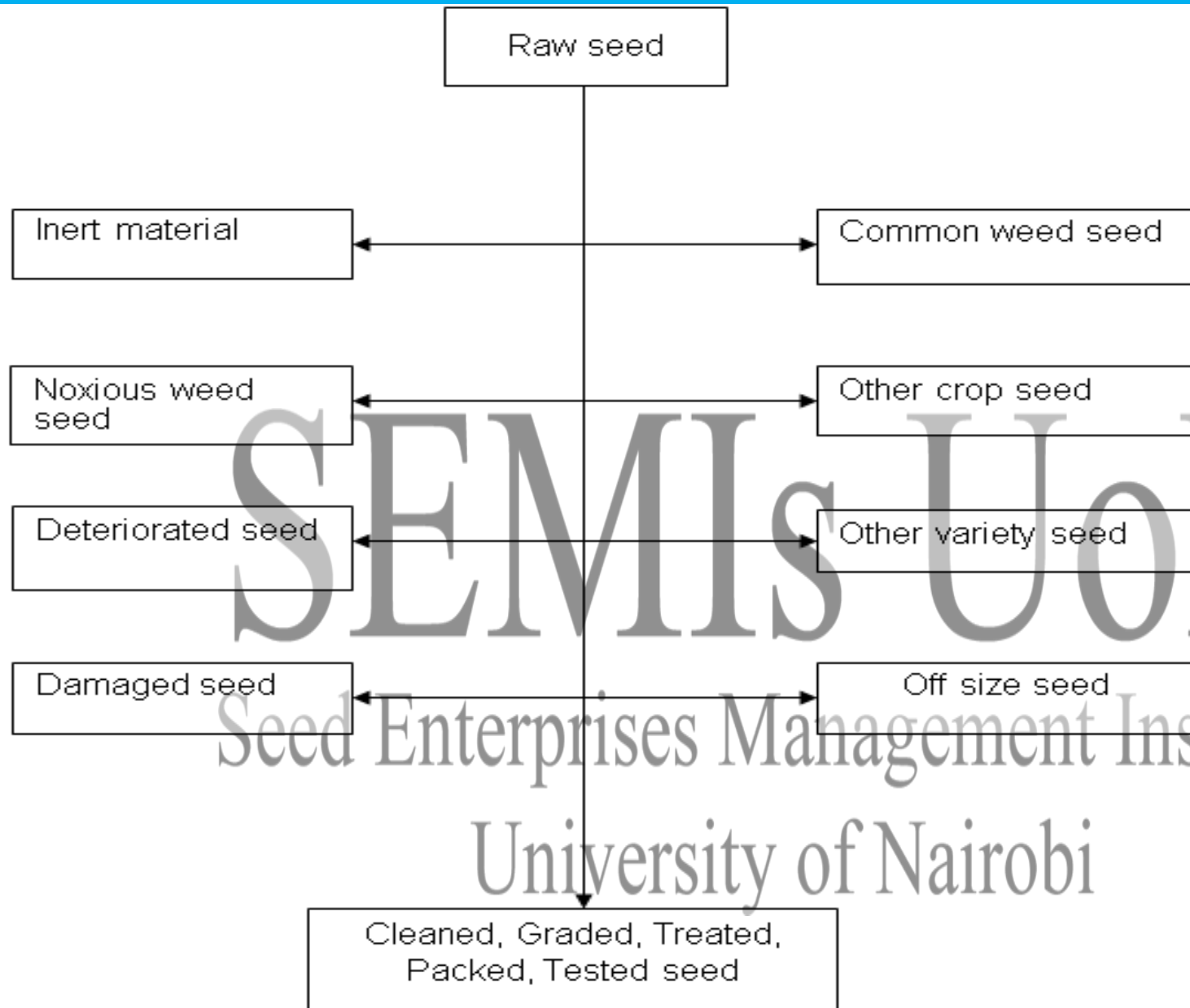
Components of seed processing

➤ **Seed processing includes:**

- Drying, shelling, cleaning, sizing or grading, Chemical treatment and bagging or storage.
- Modern technology has machines which combine these operations in a seed factory



Seed processing and removal of undesirable materials



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Quality control in seed processing

- **Involves**

- Removal of undesirable materials from seed,
- Application of protective chemicals,
- Packaging in easily handled and marketable containers

- **Encompasses altering seed conditions to improve;**

- Shelf life
- Germination and plantability,
- Rapid emergence, and vigorous growth

- **Quality seed**

- Is a seed that is varietally pure with a high germination percentage free from disease and organisms with a proper moisture content and weight

- **Seed quality control processes involves**

- To removal undesirable materials seeds are moved through machines that remove foreign materials and dust to improve seed quality.
- It includes hulling the seed to remove any appendages or large pieces of trash.
- The air-screen machines and blowers are used to remove dust
- Some seeds come from the field with specific contaminants e.g. contaminants from a bean seed field differ from those of a potato seed or maize seed fields.
- Separating and upgrading machines are used to remove specific contaminants by their differences in physical characteristics

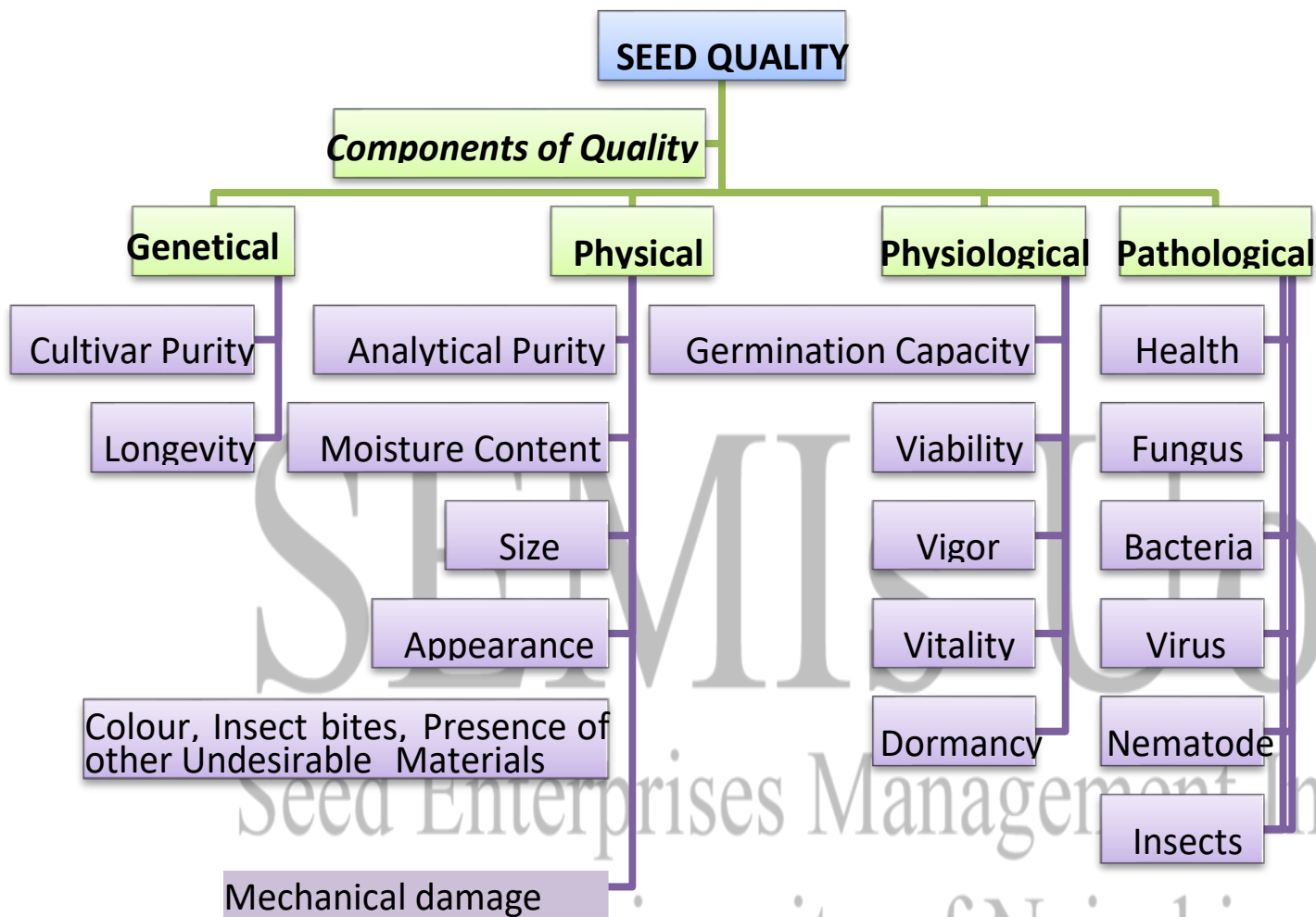


Importance of using quality seeds

- They are genetically pure - the genetic potential of the crop can be fully exploited with a high return per unit area.
- Reduces infestation by weed, diseases, insects or other crop seeds
- Quality seeds offer minimum seed rates due to fast and uniform seedling emergence
- Quality seeds can be adopted for extreme climatic condition
- seeds offer minimum seed rates due to fast and uniform seedling emergence
- Quality seeds can be adopted for extreme climatic condition
- They result to uniform plant population and maturity
- With quality seeds yield prediction is easy
- Good quality seed result in high value produce and marketability



Factors affecting seed quality



A structural concept of seed quality (Huda, 2001)

Physical seed quality

- **Physical seed quality**

- Refers to the percentage of pure seed of the right crop in a seed lot; sometimes seed size is also accounted for.
- It is measured by some components such as:
 - i. Analytical purity
 - ii. moisture content
 - iii. size
 - iv. appearance
 - v. Color
 - vi. Mechanical damage and breakages
 - vii. Insect bites, and presence of other undesirable materials or obnoxious weed



- Physical quality parameters such as seed uniformity, extent of inert material content, and discolored seed can be detected by visually examining seed samples.

Physical seed quality cont'

➤ Mechanical damage ;

- May Occur during harvesting, Shelling and threshing
- Seeds are damaged as they make contact with machine parts
- If the seed is subjected to an impact during harvesting, threshing, cleaning and packaging there may be fracturing of parts of the embryo or cracking, chipping, or flaking of the seed or seed coat.
- These injuries provide entry for pathogenic and saprophytic microorganisms.



Physical seed quality cont.'...

- *Bucket elevator cause impact as seed is thrown at the end
- *Pneumatic conveyors damage seed due to partial capacity as the seed knock on machine parts



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Physical damage cont.'..

➤ Best practices in handling :

- Reduce speed (RPM)!
- Avoid partial capacity e.g. in conveying
- Avoid varietal contamination

- mechanical shelling damage can be reduced by:

- a) shelling, optimum level of moisture content should be 13-20%.
- b) reducing mechanical damage or cracking of seeds, speed of shelling machine is needed to adjust.

Belt conveyors are much better and do not cause mechanical injury to the seeds mechanically



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Physiological seed Quality

- Refers to the ability of a seed to germinate and includes components of:
 - Germination capacity,
 - Viability
 - Vigor and
 - characteristic related to dormancy.



- **Germination capacity**

- Refers to the percentage by number of pure seeds which emerge and develop from the seed embryo of those essential structures which produce seedlings in a laboratory test (Thomson, 1979).

- **Viability**

- A given seed is either viable or non-viable, depending on its ability to germinate and produce a normal seedling.
 - Viability also denotes the degree to which a seed is alive, metabolically active, and possesses enzymes capable of catalyzing metabolic reactions needed for germination and seedling growth

Physiological seed Quality cont'..

➤ Vigor

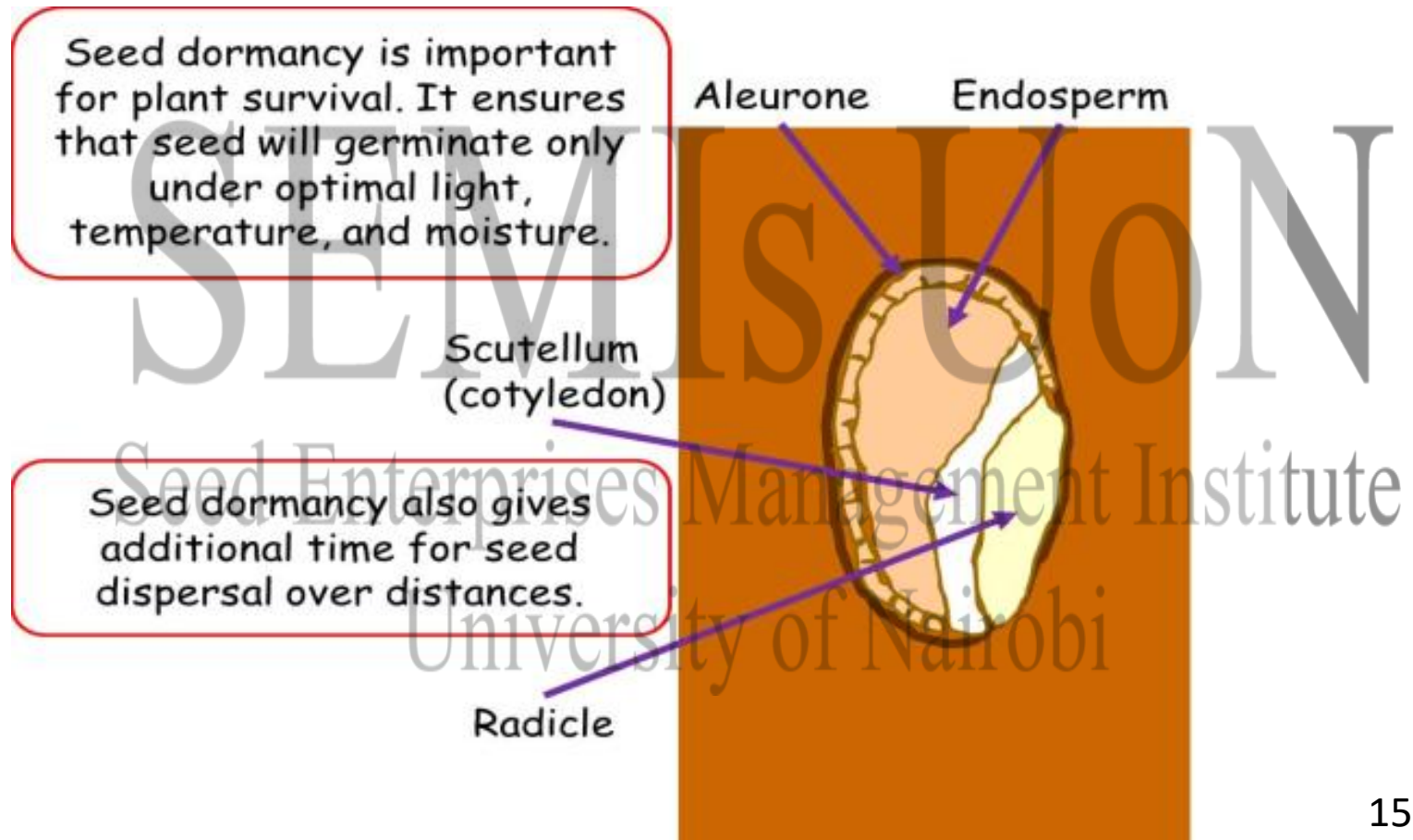
- That condition of active good health and natural robustness in seed which upon planting, permits germination to proceed rapidly under a wide range of growing conditions (Woodstock, 1969).
- Is the potential for rapid uniform germination and fast seedling growth under general field conditions and is checked in terms of :
- Speed and uniformity of germination and even development under non-uniform condition; Ability to emerge through crusted soil.



Physiological seed Quality cont'..

➤ Dormancy

- The ability of viable seeds to delay their germination until the time and place are right is an important survival mechanism in plants.
- Inability of a viable seed to germinate even under suitable conditions.



Pathological Quality

- Pathological seed quality refers to the presence or absence of plant disease in or on the seed i.e. seed health.
 - Health of a seed refers to the presence or absence of disease causing organisms, such as fungi, bacteria and viruses, and animal pests such as eelworms and insects, on or in the seeds.
 - Seed borne diseases and pathogens can be eliminated or their range of occurrence reduced by treating the seed with suitable chemical compounds, hot water, or fumigants.



- Seed borne pathogens result in abnormalities, discoloration, reduced seed size, seedrot and reduced market value of seeds

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Handling and Damage prevention

- Seeds are “living organisms” and improper handling or storage can greatly reduce their performance.
- Seeds have a hard, but fragile coating which can be damaged by rough handling, thus destroying the living organism within. Corn, pea and bean seed are especially susceptible to damage from rough handling
- Bags of these seeds should not be thrown or dropped because the seed coats and embryos can crack, resulting in poor quality seed that does not develop properly.
- During handling seed should be stored in a cool dry place in closed containers out of direct sunlight. High temperatures and humidity may reduce seed vigor and germination.
- Containers must be kept closed to prevent humidity from damaging the seeds during shipping.

Damage Prevention

- Seed dressing/Damage prevention using fungicides or insecticides treatment is a common practice before bagging seeds.
- Prevents Spread of Plant Diseases
- Controlling storage and Soil Insects
- Improves germination



Seed Coater

Portable Seed treatment machine



Quality Management in Seed Processing

➤ The basic steps in a simple quality control system include:

- Sampling all incoming field-run seed.
- Analyzing the samples to evaluate seed purity and germinability, and to identify all factors which reduce seed quality.
- Using this information to get more efficient processing, and to prevent recurrence of the problem.
- Sampling and analyzing at all stages to evaluate the effectiveness of each operation.

➤ **Maintain quality in storage:**

- Limit incoming moisture
- Limit Foreign Materials or damaged seeds
- Pre-clean seed before storage
- Properly aerate
- Careful drying to reach safe MC

Digital moisture meter



Quality Management cont' ...

- Storage warehouse should be fumigated to control storage insects, periodically
- Storage environment or warehouse should be dry and cool.
- Seeds should be dried to optimum moisture content
- Required R.H. and temperature should be maintained during storage.
- Seeds should be treated with fungicides before storage
- Suitable packaging materials should be used for packing.



Reject seeds

- Dealing with rejects can be guided by physical properties of seed. Quality seeds differ from rejects in terms of:
 - Size
 - Shape
 - Weight
 - Surface texture
 - Color and sometimes
 - Affinity for liquids or conductivity



Gravity separator

- **Size**
 - Is the most common difference between rejects and quality seeds. For instance air screen machine with perforated sheet metal separates seeds of different sizes with one or more air blasts
- **Shape**
 - Shape variations are common among seeds and seed rejects.
 - A spiral separator specifically separates round-shaped from flat-shaped reject seeds.
- **weight or specific gravity**
 - Seed reject differ in weight or specific gravity from quality seeds.
 - The gravity separator, the stoner, the aspirator, the pneumatic separator and
 - the air blast of the air-screen machine all make separations by weight differences



Reject seeds cont' ...

- **Color**

- Many seeds differ in color with rejects.
- Electronic color sorters can be used in these separations particularly for large crop seeds.
- If the seed color is accepted by the electronic sensing device it is allowed to fall into the good seed sprout otherwise if not within the acceptable range it is blown out through the discharge sprout

- **Conductivity**

- Quality and reject seeds differ in their ability to conduct electrical charge. Differences in conducting properties can be used to make separation.

- Poor conducting seeds absorb and hold charge
- while good conducting seed lose their charge readily and drop into a separate sprout in an electrostatic separator.



Seed Discard Procedure

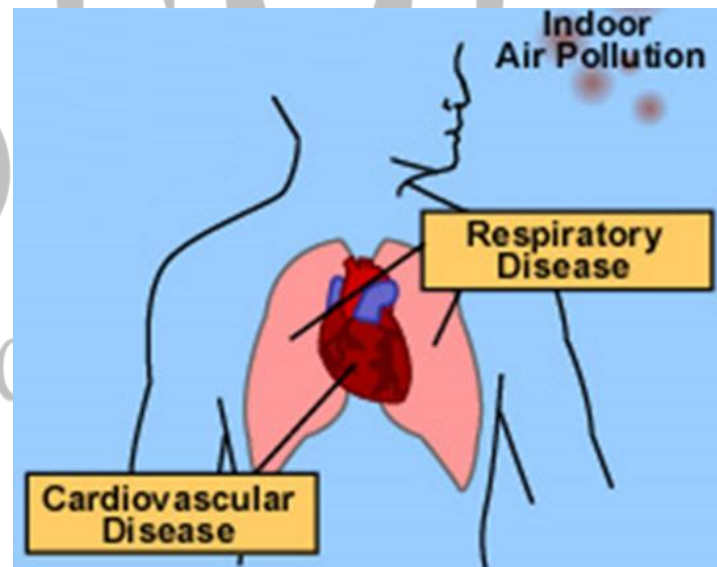
- Seed can be discarded by the seed enterprise because of seed germination loss during storage, mechanical mixture during drying or conditioning, or seed field rejection
- Enterprise should assure/ensure discarded seed does not find its way back into the market
- If the same seed is sold by enterprise to unscrupulous grain millers they should not try to sell it as seed rather than mill the discard
- A good discard procedure is to be utilized by all seed enterprises to diminish the possibility of discards reaching the farmers, to promote the concept of good quality seed.

Disposal of Treated Seed

- **The best and preferred method** is to plant leftover treated seed on fallow ground or on an unused parcel of land. Use an acceptable seeding rate so that the maximum rate per acre of the pesticide(s) is not exceeded and be sure seed is planted at a proper depth
- **If seed burial is allowed** on the seed bag label, avoid burial next to water sources.
- **If planting out leftover seed is not possible**, other potential options include 1) disposal in an approved municipal landfill, 2) use as a fuel source for a power plant or kiln, or 3) incineration by a waste management facility.
- **NEVER compost treated seed**, and **NEVER burn treated seed in a stove** that is used in the home, farm shop, etc

Dust control

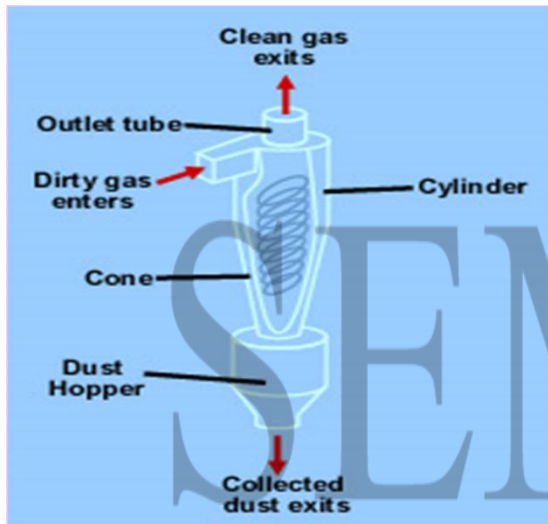
- Agricultural seed dust is a potential cause of organic dust toxic syndrome
- **Human Health Effects**
 - Seed dust cause irritation
 - Exposure to air pollution is associated with numerous effects on human health, including pulmonary, cardiac, vascular, and neurological impairments.
 - Solid particles can settle on the walls of the trachea, bronchi, and bronchioles.



- Various systems can be used to remove dust from seed

Dust control cont.'...

- Cyclones can remove Chaff and dust



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Dust Control

➤ Settling Chambers

- Settling chambers use the force of gravity to remove solid particles
- The gas stream enters a chamber where the velocity of the gas is reduced. Large particles drop out of the gas and are recollected in hoppers.
- Because settling chambers are effective in removing only larger particles, they are used in conjunction with a more efficient control device



➤ Venturi Scrubbers

Venturi scrubbers use a liquid stream to remove solid particles

➤ Fabric Filters

Fabric filters, or baghouses, remove dust from a gas stream by passing the stream through a porous fabric.



END

THANK YOU FOR LISTENING

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