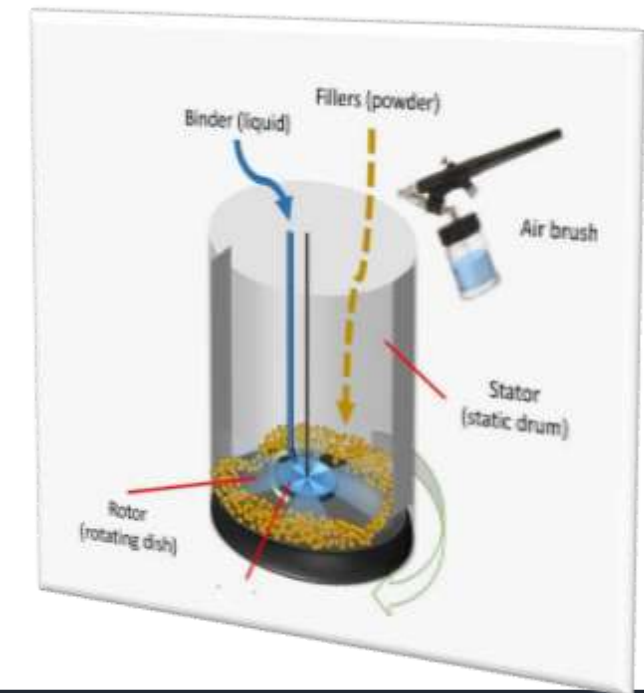
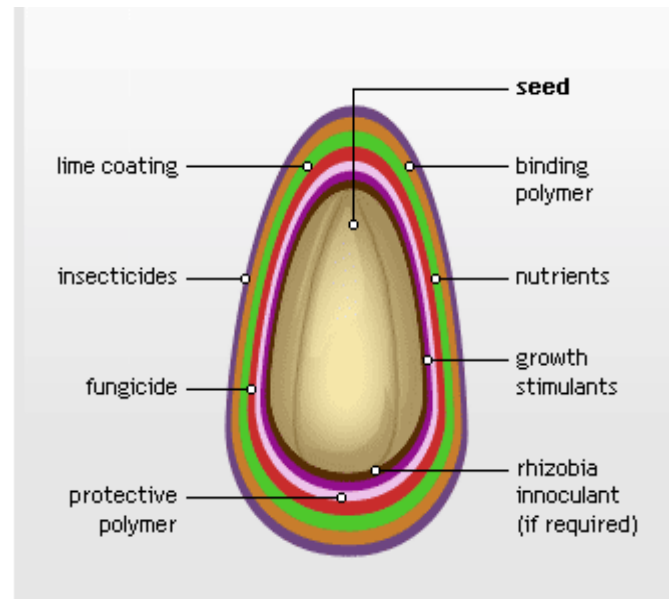




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Session 54: Seed coating



Seed coating

Seed coating is the application of seed coating substances to enhance seed placement and performance without altering shape or placing chemicals on the seed coat which regulate and improve germination

Copeland and Mc Donald, 2001

Seed coating is the coating applied to seed that does not obscure its shape. It may be fungicides, microbes, micronutrient and plant growth regulators

Its major benefit is to apply the seed enhancement materials directly to the seed as compared to broadcasting

Seed coating offers the most promising system for a precise *Arbescular mycorrhiza fungi* (AMF) and *Trichoderma horzionum* (Th) application on a seed directly. This offers reduction in coast, best growth potential of crop, increased plant drought and salt tolerance and improved flowering and fruit yield

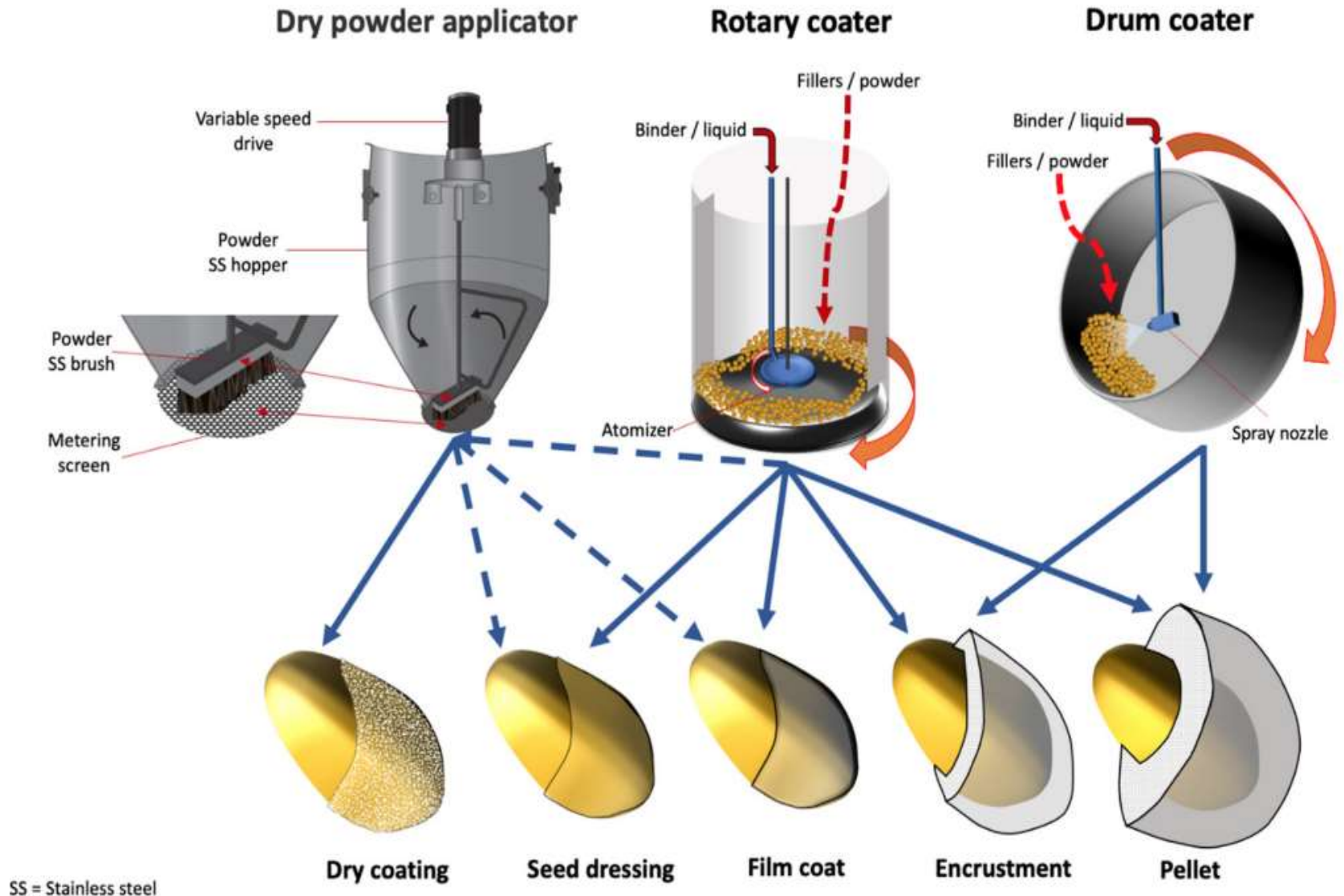


Seed coating equipments

The three major types of seed coating equipment:

1. Dry powder applicator,
2. Rotary coater and
3. Drum coater

All are used to produce five seed coatings: dry coating, seed dressing, film coat, encrustment and seed pelleting



Types of seed treatment/coating equipment systems

Two types of seed treatment/coating equipment systems: batch treater and continuous flow treaters:

Batch treater matches a known amount of seed with seed treatment and coating material at one time,

while the **continuous flow treats** a known amount of seed with seed treatment and coating material at a given flow rate

Dry powder applicator or rotary coater may be either a **batch or continuous flow** based in equipment design,

while most drum coater technology used for small-seeded vegetable crop seeds is performed on a **batch basis**

Seed Treatment Active Components and Other Coating Materials

Active Components	Liquids	Solid Particulates
Biostimulants • SYN, NP, BIO (OR)	Water	Binders
Plant nutrients • SYN, MIN (OR)	Colorants • SYN, NP (OR)	• Also, under Liquids • Soy flour: NP (OR)
Abiotic stress: Drought and Salinity • SYN, BIO (OR)	Adjuvants • SYN (OR)	Fillers • Diatomaceous earth (DE): MIN (OR) • Limestone: MIN (OR) • Gypsum: MIN (OR) • Bentonite: MIN (OR) • Vermiculite: MIN (OR) • Talc: MIN (OR) • Zeolite: MIN (OR) • Silica: MIN (OR) • BaSO₄: MIN
Plant Protectants • SYN, NP, BIO, MIN (OR)	Binders • Polyvinyl alcohol (PVOH) and Polyvinyl acetate (PVAc): SYN • Methyl cellulose: SYN • Carboxymethyl cellulose (CMC): SYN • Plant starches: NP (OR) • Gum Arabic: NP (OR)	
Inoculants • BIO, MIN (OR)		

Note: Synthetic chemicals (SYN), Natural products or derivatives from natural products (NP), Biological agents (BIO) and Minerals mined from the earth (MIN)

Dry powder coating

Dry Powder Coating is a seed coating method used for mixing seeds with a dry powder

The most common dry powders are talc and graphite

The recent research revealed that soy-based protein is an environmentally friendly and cost-effective seed lubricant that improves flow and singulation during planting without creating dust.

Thus, the use of soy-based protein has the potential to reduce the risk of negative impact on pollinators and people

The dosage of dry coating powders applied to seeds is limited by their adherence onto seeds, and ranges from 0.06 to 1.0% of seed weight

Seed dressing

Seed Dressing is the most widely used method for low dosages of active components onto seeds

The most commonly used device is the rotary coater

Here, liquids are applied onto a spinning disc and atomized onto seeds that are spinning inside a metal cylinder, then the freshly treated seeds are discharged

The dosage of liquid seed treatment formulations typically ranges from <0.05 to 1.0% by weight

Film coating

Film coating originally developed for the pharmaceutical and confectionary industries was adapted as a seed coating method

Film coating consists of producing a continuous thin layer over the seed surface.

The rotary coater is the primary seed coating equipment used for film coating

Film coating polymers (liquid components) are formulated to dissolve/dispense active ingredient prior to application on seeds

Film coating has gained in use and is the most adaptable among all seed applied technologies.

Film coating improves flow-ability of seed during treating/processing and sowing operations

The weight increases for film-coated seed, ranges from 2 to 5% of seed weight

Encrusting

Encrusting is a seed coating method with the addition of liquids and solid particulates that results in a coated seed that is completely covered, but the original seed shape is retained

Encrusted seeds can be referred to as mini-pellets or sometimes as coated seed

The addition of large amounts of water during encrusting requires that the freshly coated seed be dried to back to its original seed moisture content prior to packaging and storing. The weight increase after encrusting can range from 8 to 500%

The seed coating thickness or percent build-up may impact germination rate, and encrusted seed requires more time to germinate as compared to film-coated seed

The amount of binder used in producing encrusted coatings changes mechanical properties including integrity, compressive strength and time to disintegrate after soaking

Seed pelleting

Seed pelleting is the process of enclosing a seed with a small quantity of inert material just large enough to facilitate precision planting or It is the mechanism of applying needed materials in such a way that they affect the seed or soil at the seed soil interface (Halmer,2006)

Seed pelleting is frequently performed on high-value, small-seeded horticultural crops (e.g., onion, lettuce, carrot, tobacco, and tomato)

The percent weight increase after pelleting and drying ranges from 500 to >5000 percent

Why inert material?

It creates natural water holding media and provide small amount of nutrients to younger seedlings (Halmer,2006)

Biostimulants

The term “biostimulants” was adopted in the 21st century and provides a better definition and grouping of materials that serve to enhance plant performance

Biostimulants may be defined as natural compounds that trigger physiological and molecular processes modulating crop yield and quality

Few biostimulants applied as seed coatings on some important crops seed

Active Components (Source *)	Crop	Application Mode/Type of Experiment	Main Findings
Soy flour: NP	Broccoli	Application of plant-based protein to the seeds	All treatments with >30% soy flour in the coating had greater fresh and dry weight, leaf area compared with the control
Arbuscular Mycorrhizal Fungi: BIO	Chickpea	A mixture of equal proportions of five <i>R. irregularis</i> isolates	Increased pod (160%), seed numbers (148%), and grain yield (140%) in field compared to the control
Amino acid mixtures: NP	Cucumber	Application of 5 deferent amino acid mixtures to seeds	Total leaf area and dry weight were 35–50% and 26–30% higher for all amino acid mixtures (containing proline, hydroxyproline or their combination, amino acid mixture without proline and/or hydroxyproline) in comparison with no amino acid in coating

Nutrient Coating

Adequate nutrient availability is very important starting at the early stages of plant growth.

Conventional broadcasting of fertilizers exhibited higher cost and losses, while coating with an equivalent rate of nutrients significantly produced higher yield of cereal crops

Seed coating with appropriate amounts of macro- and preferentially micro-nutrients can reduce nutrient losses by placement on the seed, and also reduce competition from weeds

Losses of nutrients by seed coating reduced the cost of production as compared to soil applications

In rice seeds, **boron (2 g/kg seed)** was applied as seed coating and significantly increased grain yield and boron contents over a control

Slow release **nutrient (N-P-K) coating on maize seeds** resulted in improved emergence and yield attributes as compared to conventional compound fertilizer application in the field

In wheat, seed coating with **Zinc sulfate and Zinc chloride ($\text{ZnSO}_4 + \text{ZnCl}_2$) ZnSO_4 SYN (OR), ZnCl_2 SYN** improved chlorophyll a and b contents. Enhanced grain yield and Zn contents

Advantages and disadvantages of seed coating

Advantages:

Enables accurate and even dose of chemicals and reduces chemical wastage
Improve the appearance and dust free handling

To apply fungicides, insecticides, micro and macro nutrients directly to seed

Allow easy flow of seed in automatic seedling

Act as a temperature switch and water intake regulator

Disadvantages:

Coated seeds fetch high cost than the bare seed

Improper coating and improper dilution of coating material may be deteriorate the whole seed lot



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*Thank
you*

