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Seed Health

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What is Seed Health????

- ❖ Seed health refers to the presence or absence of disease-causing organisms such as fungi, nematodes, bacteria, viruses and insects, and to the status of seeds in a seedlot.
- ❖ Seed health concerns the overall condition of seeds. It includes pathogenic infection of seed, insect infestation, morphological and physiological disorder, inert matter etc.

Seed born diseases

The term 'seed born' merely indicates that the pathogen and the seed are associated in one of the following ways.

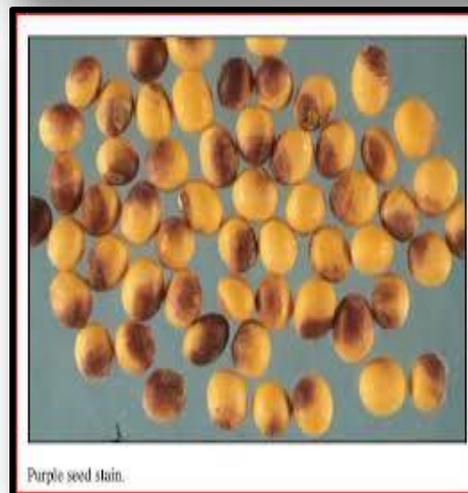
1. Accompanying- the pathogen may independently accompany the seed without being attached to it. **E.g.- ergot, sclerotia, smut, balls etc.**

2. External- the pathogen may be carried passively on the surface of the seeds, such as **fungus spores, nematode larvae or a virus.**

3. Internal- it carried imbedded in plant parts essential for the production of the seedlings, for example **loose smut of wheat** (imbedded in embryo)

The seed borne pathogens may result in

- (i) Loss in germination
- (ii) Discoloration and shriveling
- (iii) Development of plant diseases
- (iv) Distribution of pathogen to new areas
- (v) Introduction of **new strains or physiologic races** of the pathogen along with new germplasm from other countries
- (vi) Toxin production in infected seed etc.



Purple seed stain.



Prescott, J.M., P.A. Burnett, E.E. Sauer et al. 1966. *Wheat Diseases and Pests: A Guide for Field Identification*. CIMMYT, Mexico, D.F., Mexico.

Methods for Detecting Seed Borne pathogens

- Visual examination- with or without stereomicroscope
- Water Agar method
- Standard blotter method
- Examination of seed soaked in water
- Examination of seed washing.
- Embryo count method
- Rolled paper towel method
- Examination of dry seeds
- Growing on test- *Xanthomonads* and *pseudomonad's*.
- Phage plaque method
- PCR
- ELISA
- Electron microscopy

Important seed borne diseases

Crop	Disease	Causal organism
Brinjal	Fruit rot	Phomopsis vexans
Carrot	Black root rot or Seedling blight	Alternaria radicina A. dauci
Onion	Damping off Downy mildew Purple blotch Stemphylium Blight	Botrytis allii Peronospora destructor Alternaria porri Stemphylium vesicarium
Pepper and chilli	Anthraco nose or fruit rot	Colletotrichum capsici
Radish	Grey leaf spot Leaf spot	Alternaria brassicae A. Raphani
Crucifers	Grey and black leaf Spot	Alternaria brassicae A. Brassicicola
Tomato	Buck eye rot Damping off Early Blight Late blight or Fruit rot	Phytophthora parasitica Phythium aphanidermatum Alternaria solani Phytophthora infestans

Crops**Diseases****Causal organism**

Wheat

Loost smut

Ustilago segetum var. *tritici*

Karnal smut

Neovossia indica

Flag smut

Urocystis agropyri

Rice

Bunt

Neovossia horrid

False Smut

Ustilaginoidea virens

Stack burn

*Pyricularia oryzae**Trichoconiella padwickii*

Maize

Black kernel rot

Botryodiplodia theobromae

Cob rot

Fusarium Moniliformae

Southern leaf blight

Drechlera maydis

Pearl millet

Downy mildew

Sclerospora graminicola

Smut

Tolyposporium penicillariae

Sorghum

Anthracnose

Colletotrichum graminicola

Kernel or grain smut

Sphacelotheca sorghi

Downy mildew

Peronosclerospora sorghi

Cotton	Anthracnose Wilt Alternaria blight	Colletotrichum indicum F.oxysporum f.sp.vasinfectum Alternaria macrospora
Sugarcane	Red rot Wilt Pineapple Disease SMUT Mosaic(s)	Colletotrichum falcatum Fusarium moniliforme Ceratozystis paradoxa Ustilago Scitaminea Virus
Groundnut	Charcoal rot Crown rot Yellow mould/Aflatoxin	Macrophomina phaseolina Aspergillus niger Aspergillus flavus
Sunflower	Alternaria blight Downy mildew Charcoal rot	Alternaria helianthi Plasmopara halstedii Macrophomina phaseolina
Soybean	Anthracnose Pod & stem blight Purple seed stain	Colletotrichum dematium Phomopsis sojæ Cercospora kikuchii
Chickpea	Ascochyta blight Wilt Gray mold Alternaria blight	Ascochyta rabiei Fusarium oxysporum f.sp. Ciceri Botrytis cinerea Alternaria circinum

Viral diseases

Virus name	Crop
Tobacco mosaic virus	Tomato
Alfa-alfa mosaic virus	Alfa-alfa
Crinkle virus	Black gram
Cucumber mosaic virus	Cucumber
Sugarcane grassy stunt virus	sugarcane
Citrus ring spot virus	Citrus
Banana bunchy top virus	Banana
Cowpea mosaic virus	cowpea

MANAGEMENT OF SEED BORNE DISEASES: AN INTEGRAL APPROACH

- A) Seed selection
- B) Quarantine
- C) Seed treatments
- E) Cultural practices.
- F) Cultivation of resistant varieties

Approved sources for quality seeds



Plant Quarantine: All activities designed to prevent the spread of quarantine diseases and pests to ensure their official control

"Plant Quarantine is legal enforcement of measures planned to prevent pests and diseases from spreading to new areas, or to prevent them from multiplying and spreading further incase if they have already found entry"



Domestic quarantine regulations were in vogue for the following pests

Sl. No.	Pest	Prohibited from
1	Banana bunchy top	Assam, Kerala, Orissa, Tamil Nadu, West Bengal
2	Mosaic disease of banana	Gujarat and Maharashtra
3	Potato wart (<i>Synchytrium endobioticum</i>)	West Bengal
4	Apple scab (<i>Venturia inequalis</i>)	Jammu and Kashmir

SEED TREATMENTS FOR DISEASE MANAGEMENT

- ❖ Physical seed treatments
- ❖ Chemical treatments
- ❖ Biological seed treatments

Physical seed treatments

Hot water treatment :

- Temperature should be sufficiently high to kill the associated pest/pathogen but not the host. However, in most cases, margin of safety is very narrow and, therefore, the temperature should be very accurately controlled. Some recommended hot water treatments (Kahn, 1977) are:
- *Against nematodes:* chrysanthemum- 48° C for 25 min; potato tubers- 45° C for 5 min
- *Against insects and mites:* strawberry runners- 46° C for 10 min;
- *Against viruses:* Grape vine, 45° C for 120-180 min; sugarcane sets- 50° C for 120 min; potato tubers- 50° C for 17 min;
- *Against fungi:* Celery seed, 50° C for 25 min; wheat seed, 52-54° C for 10 min;

Chemical seed treatment

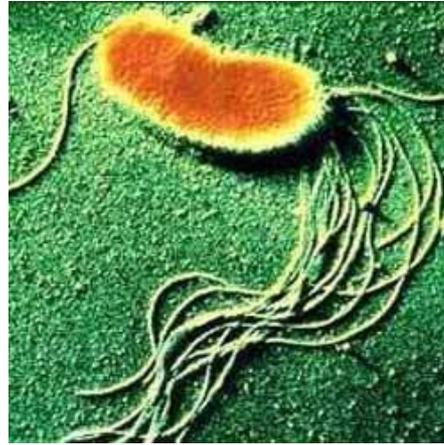
Important chemicals used for seed treatment

Technical Names	Available formulation
Captan	50% WP
Carbendazim	50% WP
Deltamethrin	2.8 % EC
Imidacloprid	70% W _s , 48% F _s
Metalaxyl	35% W _s
Thiamethoxam	70% W _s , 30% F _s
Thiram	75% W _s

Biological seed treatment



Trichoderma viride



Pseudomonas fluorescens



Bacillus subtilis

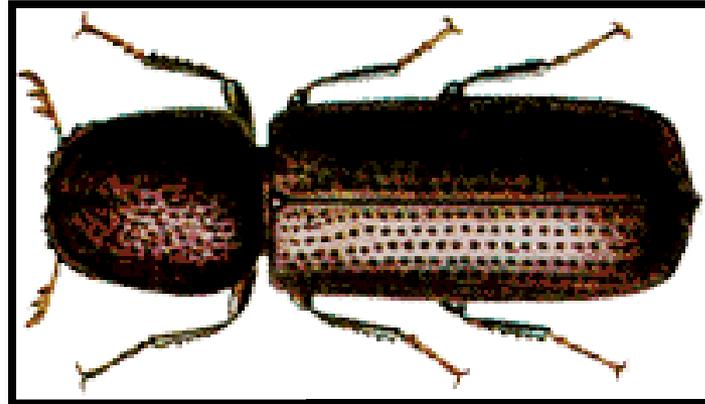
RECOMMENDATION OF BIOCONTROL AGENTS AS SEED TREATMENT IN DIFFERENT CROPS

Name of crop	Pests/diseases	Seed treatment
Rice	Root rot disease, other insects/pests, bacterial sheath blight	<i>Trichoderma</i> 5-10 g/kg. seed (before transplanting) <i>Pseudomonas fluorescens</i> 0.5% W.P. 10 g/kg.
Wheat	Termite, bunt/false smut/loose smut/covered smut	Treat the seed before sowing. <i>T. viride</i> 1.15 % WP @ 4 g/kg.
Gram	Wilt, damping off	Seed treatment with <i>Trichoderma viride</i> 1% WP @ 9 g/kg seeds
Sunflower	Seed rot, jassids, whitefly	<i>Trichoderma viride</i> @ 6 g/kg seed.
Pigeon pea	Wilt, blight and root rot	<i>Trichoderma</i> spp. @ 4 g/kg. Seed
Pea	Root rot, White rot	Seed treatment with <i>Bacillus subtilis</i> or <i>Pseudomonas fluorescens</i>
Sugarcane	Root rot, wilt	<i>Trichoderma</i> sp. 4-6 g/kg.

Coriander	Wilt	<i>Trichoderma viride</i> @ 4 g/kg seed.
Brinjal	Bacterial wilt	<i>Pseudomonas fluorescens</i> @ 10g/kg.
Leguminous Vegetables	Soil borne infection, Nematode	<i>Trichoderma viride</i> @ 2 g/100g seed.
Cruciferous vegetables (cabbage, cauliflower, broccoli, knol-khol, radish)	Soil / seed borne diseases (Damping off) Root knot nematode	Seed treatment with <i>Trichoderma viride</i> @ 2 g / 100 g seeds <i>Pseudomonas fluorescens</i> and <i>Verticillium</i> <i>clamydosporium</i> @ 10g/kg seed as seed dresser
Capsicum	Root knot nematode	<i>Pseudomonas fluorescens</i> 1% WP, <i>Paecilomyces</i> <i>lilacirius</i> and <i>Verticillium chlamydosporium</i> 1% WP @ 10g/kg as seed dresser.
Chillies	Anthraco nose spp. damping off	Seed treatment with <i>Trichoderma viride</i> 4g/kg
Bhendi	Root knot nematode	<i>Paecilomyces lilacinus</i> and <i>Pseudomonas fluorescens</i> @ 10 g/kg as seed dresser.
Tomato	Soil borne infection of fungal diseases, early blight, damping off, wilt	<i>T. viride</i> @ 2 g/100g seed. <i>Pseudomonas fluorescens</i> and <i>V. chlamydosporium</i> @ 10g/kg as seed dresser.

Pest of stored grains

- Insects
- Pathogens (fungi)
- Rodents
- Birds



STORED GRAIN PESTS

❖ About 500 species of insects have been associated with stored grain products. Nearly 100 species of insect pests of stored products cause economic losses

❖ Storage insect pests are categorized into two types viz.

- **Primary storage pests** : Insects that damages sound grains (Internal and External feeders)
- **Secondary storage pests**: Insects that damage broken or already damaged grains

Primary storage pests

Common name	Pest (Scientific name)
Internal Feeders	
Rice weevil	<i>Sitophilus oryzae</i> , <i>S. zeamais</i> , <i>S. granarius</i>
Lesser grain borer	<i>Rhyzopertha dominica</i>
Angoumois grain moth	<i>Sitotroga cerealella</i>
Pulse beetle	<i>Callosobruchus chinensis</i> , <i>C. maculatus</i>
Cigarette beetle	<i>Lasioderma sericorne</i>
Drug store beetle	<i>Stegobium paniceum</i>
Tamarind Beetle	<i>Pachymeres gonagra</i>
Sweet Potato weevil	<i>Cylas formicarius</i>
Potato tuber moth	<i>Phthorimoea operculella</i>
Arecanut beetle	<i>Araecerus fasciculatus</i>

Primary storage pests

Common name	Pest (Scientific name)
External Feeders	
Red flour beetle	Tribolium castaneum, Tribolium confusum
Indian meal moth	Plodia interpunctella
Fig moth or almond moth	Ephestia cautella
Rice moth	Corcyra cephalonica
Khapra beetle	Trogoderma granarium

Secondary storage pests

Common name	Pest (Scientific name)
Saw toothed grain beetle	<i>Oryzaephillis surinamensis</i>
Long headed flour beetle	<i>Latheticus oryzae</i>
Flat grain beetle	<i>Cryptolestus minutas</i>
Grain lice	<i>Liposcelis divinatorius</i>
Grain mite	<i>Acarus siro</i>

