Seedborne fungi isolated from pulse crop Seeds in Montana

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Abstract

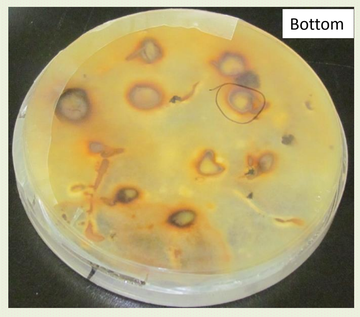
To determine the prevalence of seedborne fungal pathogens in pulse crops in Montana, the newly established Regional Pulse Crop Diagnostic Laboratory in Bozeman, MT screened 265 seedlots samples (141 field pea, 103 lentil, and 21 chickpea) sent by growers/producers. The result obtained showed high to moderate prevalence of fungi: *Alternaria* (76%-84%), *Cladosporium* (47.6%-77%), *Penicillium* (35-52.4%), *Ascochyta* (14%-63%), *Rhizopus* (8—29%), *Botrytis* (7-19%), *Stemphylium* (11%-19%), *Fusarium* (14-22%), *Nigospora* (8-19%), *Diaporthe* (4-14.3%), *Aureobasidium* (9-23%), *Sclerotina* spp. (3.3%-3.7%), and *Collectotrichum* (0-5%), in chickpea, field pea, and lentil. Incidence of *Alternaria* spp. in individual seedlots was as high as 47% in pea and 43.0% in lentil. Growers can manage these fungal diseases if they know the health status of their seedlots. We recommend growers request for fungal scan of their seedlots from seed testing laboratories.

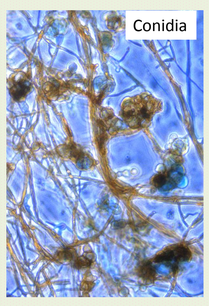
Introduction

- Pulse crops include chickpeas, lentils, and dry peas
- Montana leads in the production of dry peas and lentils in U.S.A.
- In 2015, Montana produced 48% , 48%, and 23% of U.S. dry peas, lentils, and chickpeas, respectively
- As acreage of any crop increases, so do the opportunity for diseases and other pests that could reduce yield and seed quality
- Most pulse crop growers in Montana test their seedlots almost exclusively for Ascochyta, a well-known global threat to pulse crop production
- This practice has kept very poor seedlots from being planted, and increased the overall health of the crop
- However, there are reports of other important seedborne fungal diseases, including alternaria blight, gray mold, white mold, and fusarium wilt
- To determine the prevalence seedborne pathogens in Montana, the newly established Regional Pulse Crop Diagnostic Laboratory screened chickpea, lentil, and field pea seedlots samples for seedborne fungi

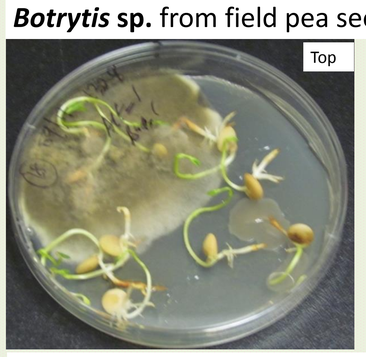
Materials & Methods

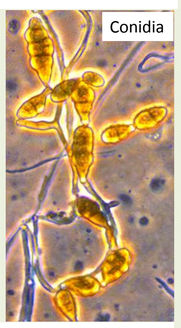
- Surface sterilize 400-500 seeds in 1% free-chlorine solution for 10 min
- Plate 10 seeds/PDA plate. 40 -60 plates per sample
- Incubate plates at 20 C for 10-14 days, 12-h light
- Check for fruiting bodies under a stereo microscope
- Prepare slides of fungal culture using tape method
- Examine slides under phase-contrast light microscope
- Determine the genus of fungi from their fruiting bodies
- If no fruiting bodies are visible or there are doubts, amplify & sequence fungal ITS region using ITS1 & ITS4 primers
- Compare DNA sequence with those in database



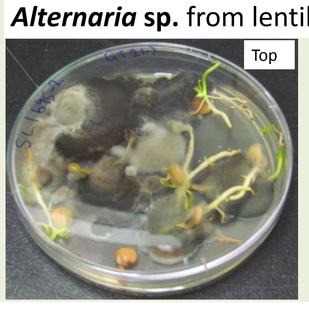


***Botrytis* sp.** from field pea seeds on PDA plate & fruiting bodies





***Alternaria* sp.** from lentil seeds on PDA plate & fruiting bodies



***Curvularia* sp**. from lentil seeds on PDA plate & fruiting bodies

Establishment of the Regional Pulse crop Diagnostic Laboratory

http://plantsciences.montana.edu/pulsecropdiagnosticlab/

Established:
Sept. 2014
Funded:
USDA Farm Bill since 2014
Crop Mandate - Diseases diagnosis:
✓ Chickpea,
✓ Lentil,
✓ Field peas
Target Markets:
MT, ND, SD, NE, WA, OR, ID.
Lab Location:
Montana State University, Bozeman.

Results & Conclusion

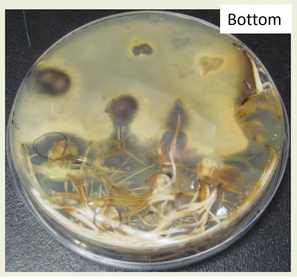
Seedborne fungi detected in chickpea, lentil, and field pea in Montana included *Ascochyta*, *Alternaria*, *Cladosporium*, *Rhizopus*, *Botrytis*, *Fusarium*, *Stemphylium*, *Sclerotina*, *Rhizoctonia*, *Aspergilus* spp, which have been previously reported on these crops. This is the first report of the following seedborne fungi of the crops: *Aureobasidium*, *Arthinium*, *Curvularia*, *Diaporthe*, *Microsphaeroposis*, *Epicoccum nigrum*, and *Pezziza* spp.

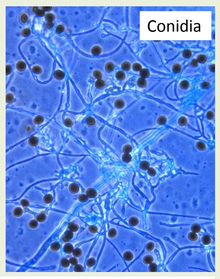
We don't know the diseases some of the new fungi cause. There are no data on disease thresholds to justify fungicides treatment of all the fungi except for Ascochyta.

Growers should request "Fungal Scan" test for their seedlots meant for planting. Plant "healthy" seeds is advised for the management seedborne diseases.

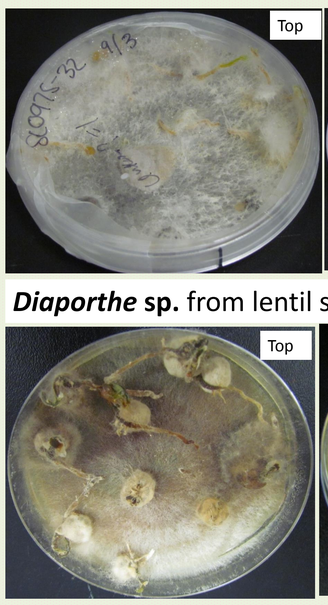
Table 1. Fungi Detected in Pulse Crop Seedlots from Montana

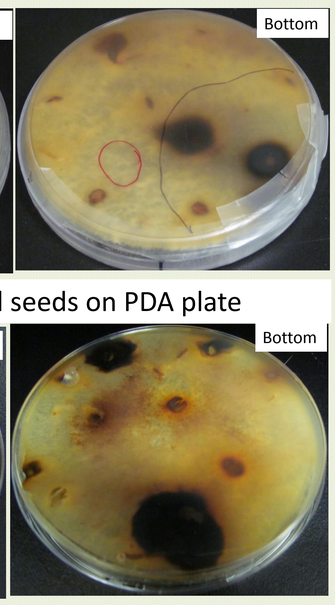
Seedborne Fungi	Chickpea n=21		Lentil n=103		Pea n=141	
	% Prevalence	% Incidence	% Prevalence	% Incidence	% Prevalence	% Incidence
Alternaria spp.	76.2	0-2	84	0-43	84	0-47
Ascochyta spp.	38.1	0-2.2	14	0-1.6	63	0-29
Cladosporium spp.	47.6	0-1	62	0-11.8	77	0-25
Penicillium spp.	52.4	0-9.8	35	0-25	47	0-28
Rhizopus spp.	28.6	0-1.6	8	0-4.3	11	0-1
Botrytis spp.	19	0-6.2	7	0-0.5	11	0-8
Nigrospora spp.	19	0-1	8	0-1	10	0-1.5
Fusarium spp.	14.3	0-0.4	22	0-2.8	22	0-10
Diaporthe spp.	14.3	0-0.4	5	0-1	4	0-1
Stemphylium spp.	14.3	0-0.2	19	0-14	11	0-1.5
Aureobasidium pullulans	14.3	0-0.3	23	0-2.8	9	0-4
Collectrichum spp.	4.8	0-0.2	0	0	1	0-1.5
Sclerotina spp.	0	0	1	0-0.5	1	0-5
Rhizoctonia spp.	0	0	1	0-0.2	0	0
Aspergillus spp.	0	0	2	0-0.3	4	0-0.5
Epicocum nigrum	0	0	1	0-0.2	0	0
Peziza spp.	0	0	1	0-0.2	0	0
Microsphaeropsis spp.	0	0	1	0-0.2	0	0
Curvularia spp.	0	0	1	0-0.2	0	0
Arthrinium spp.	0	0	0	0	1	0-1





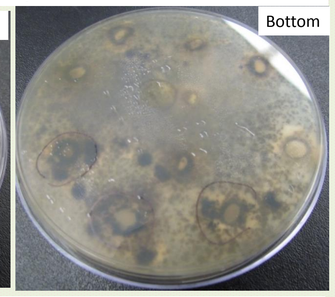
***Nigospora* sp.** from chickpea seeds on PDA plate & fruiting bodies



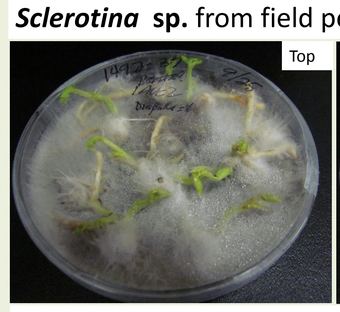


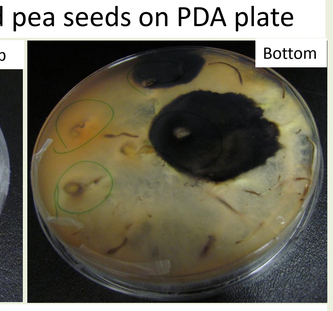
***Diaporthe* sp.** from lentil seeds on PDA plate

***Rhizoctonia* sp**. from field pea seeds on PDA Plate

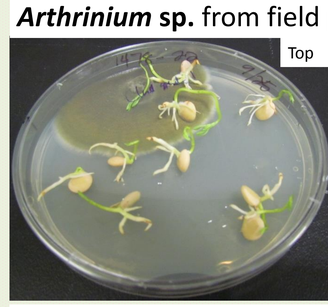


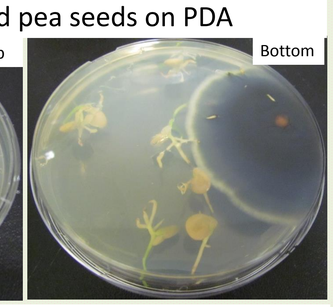
***Sclerotina* sp.** from field pea seeds on PDA plate



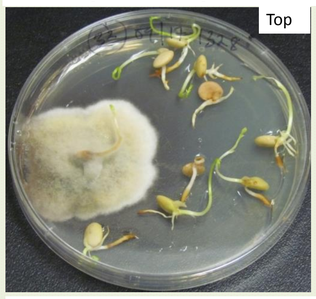


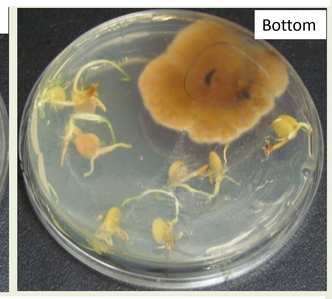
***Arthrinium* sp.** from field pea seeds on PDA





***Cladosporium* sp** from lentil seeds on PDA plate





***Stemphylium* sp.** from lentil seeds on PDA plate

Acknowledgments

USDA Farm Bill Grant