Fungicidal Seed Treatment for Pulse Crops.

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Introduction

Pulse crops in western Canada, mainly lentil (*Lens culinaris* Medikus), field pea (*Pisum sativum* L.), and chickpea (*Cicer arietinum* L.) are affected by a number of diseases caused by seed borne and soil borne pathogens (Morrall et al., 1995; Platford and Kurtz, 1997). Seed rot, root rot, and seedling blight are caused by *Pythium spp.* (Hwang, 1997)*, Fusarium* (Claudios and Mehrotra, 1973*), Rhizoctonia* (Shukla et al., 1972), and *Botrytis* (Kaiser, 1992). In western Canada, *Pythium spp*., *Fusarium,* and *Rhizoctonia* are mainly soil borne diseases, while *Botrytis* is primarily a seed borne disease. These diseases can be grouped into seed and seedling diseases, wilt and root rot. Pulse crops resistant to these diseases are not yet available to producers in western Canada. Incidence and severity of these diseases varies from location to location and year to year depending on seed infection, crop rotation, and environmental conditions. Infected fields usually have low emergence, poor stand, and seed yield reduction higher than 50% when infection is severe. These diseases could become more serious with an expanded cultivation of pulses and shortening of crop rotation. Therefore, fungicidal seed treatments are important tools in reducing the incidence of these diseases in pulse crops.

Seed Treatments for Peas

Apron FL, with the active ingredient metalaxyl, provides excellent control of *Pythium spp*. on field peas (Table 1). Apron FL has been evaluated in western Canada since 1977. Increases in emergence and seed yield, as well as seed safety have been studied. Field peas treated with Apron FL yielded 23% higher than untreated field peas (Hwang, 1997).

Mechanically damaged field peas seed are susceptible to infection by *Pythium spp*. Losses of 10% to 60% can occur. Mechanical damage can result from low moisture content, too many augering or drops from high heights. Seed germination and vigor are reduced by mechanical damage, but it is the *Pythium spp*. disease that is the ultimate cause of loss in emergence. In six station years field trials, conducted by the Gustafson Research Team in western Canada, Apron FL increased seedling emergence of mechanically damaged field pea seed by 141% as compared

to the damaged untreated control. Apron FL targets *Pythium spp*. In cases where other fungi may play a role in causing disease, the use of a broad-spectrum fungicidal such as Vitaflo 280 is recommended as a partner for Apron FL.

The Canadian Pest Management Regulatory Agency has approved a label expansion to register Vitaflo 280 (Vitavax plus Thiram) for use on field peas. In 20 station year field trials conducted in western Canada, Vitaflo 280-increased seedling emergence of field pea 23% and seed yield 15% as compared to the untreated control. Vitaflo 280 and Apron FL are compatible with field pea inoculants. Results of ten station year field trials showed no significant differences in nodulation of field pea treated with Apron FL or Vitaflo 280 as compared to the untreated control. For best results it is recommended to apply the fungicidal first, followed by the inoculant, just before seeding.

In western Canada, field pea is often sown in late April early May when soils are usually cool and moist. This practice has been adopted so that the crop matures before the early frost. Seeding field pea into cool wet soils may delay germination resulting in infection of seed by soil fungi and poor crop stand. Treating early sown field pea with Apron FL significantly increased seedling emergence and seed yield (Hwang et al., 1997).

Seed Treatments for Lentils

Apron FL provides excellent control of *Phytium spp*. on zero tannin lentils (Table 2). In forty two stations year field trials conducted in western Canada, emergence of Apron FL treated zero tannin lentil increased 47% and seed yield 11% as compared to the untreated control (Matus and Slinkard, 1993). In cases were pathogens such as *Fusarium, Rhizoctonia,* and *Botrytis* play a role in causing disease, the use of the broad-spectrum fungicidal Crown is recommended as a partner for Apron FL. In addition, Crown controls seed-borne *Ascochyta* in lentil and performs very well as a sticker for inoculants.

Crown fungicidal seed treatment contains the systemic fungicide carbathiin (Vitavax) and thiabendazole (TBZ). Crown controls seed borne A*scochyta,* seed rot, and seedling blight caused by *Botrytis, Fusarium* and *Rhizoctonia*. *Ascochyta* infects a lentil crop through infected seed or spores produces from lentil crop residues. Crown controls only the seed borne infection phase. It does not control infection from spores produced on infected crop residues or adjacent infected plants. In field trials conducted by Gustafson Research Team Crown has resulted in

emergence being increased by up to 60% and seed yield up to 10% as compared to the untreated control.

The Canadian Pest Management Regulatory Agency has approved a label expansion to register Vitaflo 280 (Vitavax plus Thiram) for use on lentil crop. The approval gives pulse growers access to a versatile fungicidal seed treatment that offers a one-step dust free application method. In 129 station year field trials conducted by Gustafson throughout western Canada Vitaflo 280 significantly increased percent emergence of lentil by 14% as compared to the untreated control. In 37 station year trials it was observed that by treating seed with Vitaflo 280 seed yield of lentil significantly increased by 7% as compared to the untreated control. Similarly, Vitaflo 280 increased percent emergence of CDC Gold (zero tannin lentils) by 25% as compared to the untreated control. Vitaflo 280 is compatible with rhizobia inoculants. Research conducted in 1993 by ESSO Chemicals showed no effect of Vitaflo 280 on either nodule number, location of the nodules or nitrogen fixation of Enfix-P-treated plants (Russ Hynes, AGRIUM, personal communication).

Seed Treatments for Chickpeas

Two types of chickpea are grown in western Canada. The Desi type has a thick colored seed coat with colored flowers. The Kabuli type (garbanzo bean) has a thin, white seed coat with white flowers (Vandenberg and Slinkard, 1998). In Saskatchewan, chickpea production limitations are the long growing season requirements for current varieties and plant diseases such as blight caused by *Ascochyta rabiei*, seed rot, root rot, and seedling blight caused by *Pythium spp*., *Rhizoctonia, Fusarium*, and *Botrytis* (Saskatchewan Agriculture and Food, 1997). Several fungicidals have been evaluated in Western Canada for treating chickpea diseases. Some fungicidals control only one plant pathogen while others have a wider spectrum of control (Table 3).

Apron FL provides excellent control of *Pythium spp*. on Kabuli chickpea, reducing damage caused by early season seed rot and seedling blight. In field trials conducted in western Canada Apron FL increases seedling emergence of Kabuli chickpea by 50 % and seed yield by 93% over the untreated control. In addition, in ten field trials over three years, seed treatment with Apron FL increased Desi chickpea emergence by 14% over the untreated control. Suggesting that

despite their thick seed coat and presence of phenolic compounds Desi chickpea benefits from fungicidal seed treatment.

Vitaflo 280 provides an excellent control of seed rot, root rot, and seedling blight of chickpea caused by *Fusarium, Rhizoctonia*, and *Botrytis*. On average of three years trials Apron FL increased Kabuli chickpea emergence by 26% over the untreated control, whereas, the combination of Apron FL plus Vitaflo 280 increased Kabuli chickpea emergence 110% over the untreated control. Emergence of Desi chickpea increased 24% by treating seed with a combination of Apron FL and Vitaflo 280. Suggesting that the combination of Vitaflo 280 plus Apron FL is better than Apron FL alone.

References

Hwang, F.S., B.D. Gossen, K.F. Chang, and R. Howard. 1997. Cultural and chemical control of Pythium seed and root rot of field pea. Final Report for Saskatchewan Agriculture Development Fund. Project Number. R-94000089.

Claudios, J.R. and R.S. Mehrotra. 1973. Wilt and root rot diseases of lentil (*Lens sculenta*) at Sagar. Indian Phyt. **26**:268-273.

Kaiser, W.J. **1992.** Fungi associated with the seeds of commercial lentils from the U.S. Pacific Northwest. Plant Dis. **76**:605-610.

Matus, A., and A.E. Slinkard. 1993. Effect of fungicidal seed treatment on zero-tannin lentil. Lens Newsletter **20**:46-50.

Morrall, R.A.A., Reed, M., Paisley, J., and French, M. 1995. Seed-borne lentil diseases in Saskatchewan in 1994. Can. Plant Dis. Surv. **75**:150.

Platford, R.G. and Kurtz, R. 1997. Diseases diagnosed on commercial and special crops and ornamental trees and shrubs submitted to the Manitoba crop diagnostic center laboratory in 1996. Can. Plant Dis. Surv. **77**:29-38.

Shukla, T.N., Z.U. Ahmad, and K.G. Garg. 1972. Root rot of lentil. Indian Phyt. 25:584-585.

Saskatchewan Agriculture and Food. 1997. (http://www.vsource.com/saskpulse/cindex.htm)

Vandenberg. A. and A. Slinkard. 1998. Update on dry bean and chickpea varieties for Saskatchewan. 38-42. In: Proceeding of Pulse Day 1998. January 16, 1998. Crop Production Week. Saskatoon, SK.

Table 1. Fungicidals evaluated to control pea diseases*

Fungicide	*Pythium* (Soil borne)	*Fusarium* (Soil borne)	*Botrytis* (Seed borne)	*Rhizoctonia* (Soil borne)	*Ascochyta* (Seed borne)
Apron FL	Good	None	None	None	None
Vitaflo 280	Fair-Good	Fair-Good	Good	Good	Poor
Vitaflo 280+ Apron FL	Excellent	Fair-Good	Good	Good	Poor

*, Levels of control none, poor, fair-good, and excellent.

Table 2. Fungicidals evaluated to control lentil diseases

Fungicide	*Pythium* (Soil borne)	*Fusarium* (Soil borne)	*Botrytis* (Seed borne)	*Rhizoctonia* (Soil borne)	*Ascochyta* (Seed borne)
Apron FL*	Good	None	None	None	None
Crown	None	Good	Good	Good	Good
Vitaflo 280	Fair-Good	Fair-Good	Good	Good	Poor

*, Registered on Zero Tannin Lentil (CDC Gold).

Table 3. Fungicidals evaluated to control chickpea diseases.

Fungicide	*Pythium* (Soil borne)	*Fusarium* (Soil borne)	*Botrytis* (Seed borne)	*Rhizoctonia* (Soil borne)	*Ascochyta* (Seed borne)
Apron FL	Good	None	None	None	None
Crown*	None	Good	Good	Good	Good
Vitaflo 280*	Fair-Good	Fair-Good	Good	Good	Poor
Vitaflo 280+ Apron FL	Excellent	Fair-Good	Good	Good	Poor
Crown + Apron FL	Excellent	Good	Good	Good	Good

*, Not registered.