Annual Report #2

Project title: Seed treatment for enhancing the performance of pulse crops under excessive moisture stress

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Brief Background

Pulse crops and soybeans are among the most important crops grown in Manitoba. However, the production of these crops is hampered by a variety of stress factors including excessive moisture. The use of plant growth regulators is a common practice in crop production either to alter the growth nature of a plant or to confer tolerance against stress conditions. Previous studies with other crops species have also shown that treatment of seeds before planting with plant growth regulators improves germination, seedling growth and ultimately their yield under stress conditions including excessive moisture.

Experimental outline

The study used three plant growth regulating (GR) compounds. Peas and soybean cultivars commonly grown in Manitoba were used as experimental plants. To examine the effect of these plant growth regulators in enhancing the performance of pulse crops under excess moisture stress, mature pea and soybean seeds were treated with solutions containing specific concentrations of the different growth regulators. Treated and control germinated seeds were grown under above normal soil moisture conditions. The effects of these treatments on the germination, and seedling growth and physiological responses under excess soil moisture condition were evaluated.

Activities and Results

Seed germination

Pea (*Pisum sativum L.*) seeds of cultivar CDC Meadow were treated with specified concentrations of the three growth regulating compounds, designated hereafter as GR1, GR2 and GR3, compounds and then subjected to germination tests. Seed germination was recorded based on the protrusion of the radicle through the seed coat. Under normal conditions, treated and untreated seeds show similar germination percentage.

Seedling performance under excess moisture

Seeds germinated in the presence and absence of the growth regulating compounds were transplanted into pots and grown in a greenhouse. The transplanted seedlings were subjected to two different types of treatments: control and excessive soil moisture conditions. Under normal soil moisture condition seedlings from control untreated seeds had similar performance in terms of shoot and root growth with those grown from seeds treated with the compounds/growth regulators designated as GR1, GR2 and GR3. However, under excess soil moisture conditions the seedlings resulted from seeds treated with the GR compounds, especially those treated with GR2 and GR3, showed better growth in terms of shoot and root weight and length than those grown from untreated seeds.

Growth regulators improve the growth and performance of seedlings under a variety of stress conditions such as excess soil moisture by enhancing their physiological response. In this study, we compared five physiological parameters between treated and untreated control plants. The results show that treatment of seeds with two of the growth regulating compounds, GR2 and GR3, enhanced the physiological responses of pea seedlings growing under excess water

conditions, and these physiological effects have the potential to confer seedlings the capacity to withstand stress induced injuries.

Soybean

The soybean (*Glycine max* L.) cultivar 25-10RY was used in this study as this variety is commonly cultivated in Manitoba. Treatment with the same growth regulators described above did not have a significant effect on germination capacity under normal germination conditions; however, seedlings grown from treated seeds show better performance in terms of root and shoot growth under excess soil moisture conditions as compared to those grown from the control untreated seeds.

Conclusion

The activities performed are very important to identify growth regulating compounds that can be used to treat seeds of pulse crops for their better performance under excess soil moisture conditions. The findings of this work will be published in international scientific journals, and also be presented in upcoming pulse crop related conferences. Further experiments are ongoing to see the effects of treatments with the above specified and other growth regulators on the performance of different pulse crops (at different stages of development) under excess soil moisture. These experiments are being carried out by an MSc student, who started her program in January 2014.