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Microsphaera trifolii: Causing powdery mildew of peas in a greenhouse environment

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In the past some pea breeding lines performed inconsistently in terms of resistance to powdery mildew in the greenhouse and under field production conditions. We compared powdery mildew populations collected from the greenhouse and production fields on the basis of morphology and DNA sequences. Isolates displayed small morphological differences. ITS sequences of greenhouse isolates from 2005, 2006 and 2007 showed maximum similarity to those of *Microsphaera trifolii*, while sequences from the greenhouse 2004 isolate and field isolates from 2006 and 2007 were most similar to *Erysiphe pisi*. Results suggest that *Microsphaera trifolii* can parasitize peas under greenhouse conditions. The precise roles of these two powdery mildew species in causing disease under greenhouse versus field production conditions remain to be determined. These findings help explain the variable results of previous assessments of pea breeding lines and indicate that efforts to breed resistant pea varieties for the Palouse region of eastern Washington and northern Idaho should take into account the presence of both powdery mildew pathogens.

Soil coring approach for study of crop root systems

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Experiments were conducted at the Semiarid Prairie Agricultural Research Centre, Swift Current, SK, to determine root morphologies and their distribution patterns during the growing season and at the various depths of soil profile. Soil coring approach was employed where a hydraulic system was equipped with a heavy-duty grader. Metal cylinders (15.25cm ×120cm) were pushed into the soil with minimum disturbance to soil physical properties, and the soil-root matrix was cored for the analyses of root and soil properties.

Effects of *Penicillium bilaii* on rooting patterns of pulse crops

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Penicillium bilaii Chala. has been shown to increase inorganic P uptake, dry matter accumulation, and yield in several crops, but little is known about the possible mechanisms responsible for the enhanced productivity in pulse crops. Experiments were conducted at Swift Current, SK, to determine the effects of *Penicillium bilaii* on

root growth and tipping characteristics of three pulse crops (lentil, chickpea and field pea) under Saskatchewan growing conditions. Preliminary results indicate that the number of root tips was significantly increased for all three pulse crops due to inoculation of *Penicillium bilaii*.

Comparisons of root morphology among alternative crops and cereal crop in different water regimes

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Benefits from pulse and oilseed crops in rotation with cereal crops have been widely recognized in North America, but little is known about the contribution of rooting systems of non-cereal crops to the increased rotational benefits. Experiments were conducted at Swift Current, SK, to determine root morphologies of pulses, oilseeds, and cereal crops under different water conditions (rain-feed *vs.* rain-feed + irrigation) at various growth stages. Win RHIZO STD 1600$^+$ scanner and associated software "Win RHIZO" (Regent Instruments Inc.) were used to analyze root samples and produce various outputs of root parameters (root diameter, root length, root volume, tips, etc).

Relationship between chlorophyll fluorescence and higher productivity under drought stress in chickpea

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Chlorophyll fluorescence has been used for many years for monitoring photosynthetic performance in plants. Its role for screening plants for stress tolerance is also suggested by some researchers. About 155 recombinant inbred lines derived from a cross between drought tolerant and susceptible genotypes of chickpea were screened for chlorophyll fluorescence and chlorophyll content under drought conditions in the field in Syria.

Towards mapping lentil resistance to rust, stemphylium and sclerotinia stem rot

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In order to map lentil resistance to rust (*Uromyces fabae*), stemphylium blight (*Stemphylium botryosum*) and sclerotinia white mold (*Sclerotinia sclerotiorum*), three lentil recombinant inbred line (LRIL) populations (LRIL 21, 22 and 45) were developed and progressed up to F7 generation through single seed decent. Phenotyping of rust and stemphylium blight were performed in Bangladesh. Three inoculation techniques were compared for sclerotinia white mold screening and the mycelial plug method in mist chamber was found suitable for screen-ing inbred lines. For genotyping, isozymes and four types of molecular markers (PSMPS, SSR, RFLP and gene specific markers) were applied to the LRIL populations. The phenotypic and genotypic data will be presented.

Selenium-enriched red lentils as a possible whole-food solution for improved human health

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Lentils are a source of many essential dietary components and trace elements for human health. We found that western Canadian soils are rich in selenium and that lentils grown in Saskatchewan have the potential to be marketed as a natural source of this essential element. Here we present data on selenium concentrations and chemical species of different lentil growing soils of Saskatchewan. We also present data on the bioavailable forms of selenium in the embryo, cotyledon and seed coat of the red lentil cultivar CDC Robin grown in Saskatoon, Saskatchewan, and show them to be an excellent source of selenium.

Application of a detached leaf assay to evaluate resistance to *Phoma medicaginis* var. *pinodella* in pea (*Pisum sativum* L.)

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Phoma medicaginis var. *pinodella* contributes to the Ascochyta blight complex of pea. Fall-sown peas are exposed to cool moist conditions in the spring which are favorable for development of the disease. Thirty-five registered cultivars, and breeding lines were evaluated for disease development based on a detached leaf assay. Significant differences in lesion expansion were observed and ranged from 2.6 to 173.1 mm^2 9 days after inoculation. These results indicate that genetic resistance can be exploited in breeding programs and identifies mapping populations which can be used to validate and expand our knowledge of published QTL for resistance.