

Updates on Epidemiology and Resistance to Sclerotinia Head Rot In Wild Sunflower Species

Khalid Rashid¹ and Gerald Seiler²

¹AAFC, Morden Research Station, Morden, Manitoba. ² USDA, ARS, Northern Crops Research Laboratory, Fargo, North Dakota.

The potential in transferring the genetic resistance to Sclerotinia from the wild sunflower species into commercial sunflower hybrids will save the growers, the processors, and the consumers millions of dollars by avoiding losses in seed yield and quality

Sunflower head rot results from infections by ascospores that are produced by carpogenic germination of sclerotia of *Sclerotinia sclerotiorum* under saturated soil moisture conditions. Lack of genetic resistance has led to a steady rise in prevalence and severity of head rot (up to 80%) in the Red River Valley in recent years. This study aimed to understand the epidemiology of head rot in wild sunflower species, and identify sources of resistance in the wild population.

MATERIALS and METHODS

Field experiments were conducted in 2002-2005 on 400 accessions of the wild sunflower species *Helianthus maximiliani* and *H. Nuttallii* from Manitoba (Figure 1).

Figure 1. Perennial wild sunflower accessions



Figure 2. Accessions divided into 4 treatments. One type of inoculum & 4 head covers: paper, pollinating, plastic bags, and open control



In 2002-2003, 96 accessions were tested in a split-split plot design with 4 replicates. Main plots were inoculum type, inoculation dates were secondary plots, and head coverings were tertiary plots for a total of 384 plots. Plots consisted of a group of 10-15 plants grown in hills at 0.5 m apart. Inoculum consisted of: ascospores applied at 2×10^5 per ml with 15 ml per plot; ground mycelia applied at 15 ml of suspension per plot, and ground infected millet seed dusted at the rate of 3 grams per plot. Plots were covered with a light brown paper bag, a thin transparent plastic bag, a perforated pollinating bag, or left open (Figure 2). Artificial inoculation was done at early flowering (week 1), mid flowering (week 3), and late flowering (week 5).

In 2004-2005, 400 accessions were tested for reaction to artificial inoculation by Sclerotinia using the ascospores and ground sclerotinia-infected millet seed at the mid-, and late-flowering stages. Plots were assessed weekly for head and stem infections starting one week after inoculation based on a scale of 0 to 5; 0 is no sign of infection and 5 is heavy infections on 50% or more of the heads or stems. The area under the disease progress curve was calculated for each treatment.

RESULTS and DISCUSSION

Typical symptoms observed were shredded stems and peduncles below the heads, and shriveled infected heads with little seed setting (Figure 3). Wild sunflower heads are very small and mature rapidly.

Figure 3. Infected stems and shriveled heads



Similar results were obtained from the various inoculation treatments in different years. There were no observed differences in the reactions of *H. maximiliani* and *H. Nuttallii*. The sclerotinia-infected ground millet resulted in the highest disease indices followed by the ascospores and fresh ground mycelia (Figure 4). Light brown paper bags provided the most favourable conditions for infection.

Figure 4. Disease index with types of inoculum

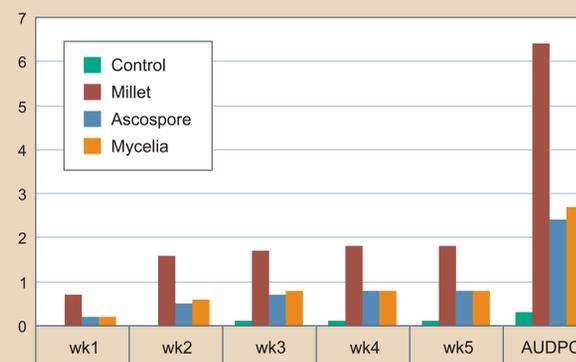
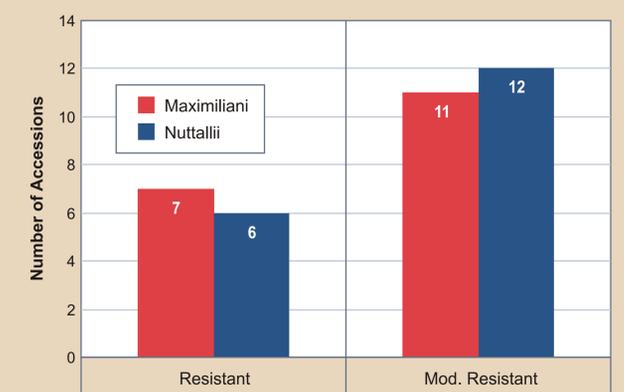


Figure 5. Resistant and susceptible reactions



Figure 6. Resistant accessions, 400 tested



Inoculations at mid-, and late flowering produced better results than at early flowering. The four-years testing of all the accessions showed consistent differences in the reaction of the resistant and susceptible accessions to sclerotinia head rot (Figure 5). Seven accessions of *H. maximiliani* and six of *H. Nuttallii* were identified with no sclerotinia infection to heads and mid-stems (Figure 6).

CONCLUSIONS

- Standard methodology for testing wild sunflower species has been developed: inoculation with ground Sclerotinia-infected millet seed or ascospores at mid-flowering, and covering with light brown paper bags
- Identified 13 accessions with resistance and 23 with moderate resistance to *S. sclerotiorum* head rot in wild sunflower species.

ACKNOWLEDGEMENT

Financial support: National Sclerotinia Initiative, USA (NSI), National Sunflower Associations of USA and Canada (NSA & NSAC), and the Matching Investment Initiative (MII), Agriculture and Agri-Food Canada. Technical assistance by L. J. Wiebe, M.D. Penner, and T.M.L. Walske.