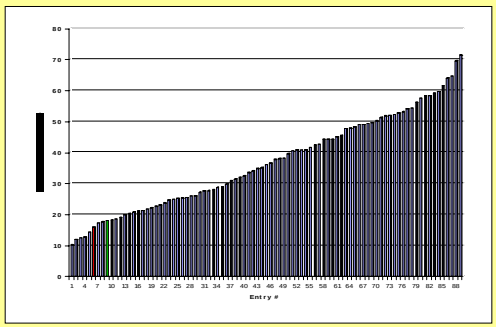
Sclerotinia Stalk Rot & Head Rot of Sunflower: Development of Resistant Germplasm and Evaluation of Commercial Hybrids

Tom Gulya and Jerry Miller
USDA Sunflower Research Unit, Fargo, ND

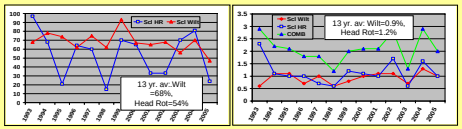
Newest *Sclerotinia* mist plot at Fargo, ND, with 'FargoDome' in background. Mist cycle is monitored, but not controlled by leaf wetness sensors. This nursery is used to evaluate breeding material (including interspecific hybrids, amphiploids), identify resistant plants for molecular marker studies, and to evaluate fungicides..



Sclerotinia stalk rot severity at maturity on 76 commercial hybrids. Data averaged from three inoculated field trials. Red bar indicates check hybrid made from USDA inbreds, with green bar a similar hybrid made with INRA (French) developed, resistant parental lines.

ABSTRACT

Sclerotinia diseases continue to be the major diseases affecting U.S. production in 2005, with head rot and stalk rot found in 20% and 27% of fields surveyed in seven states, respectively, and affecting 1.6% and 2.3% of the U.S. crop. Regarding germplasm development, two oilseed maintainer lines (HA 451 and 452) and three oilseed restorer lines (RHA 453, 454, 455) with improved tolerance to Sclerotinia head rot and stalk rot were released in the spring of 2005. The lines were derived from Russian and French sources, and thus will expand the diversity in Sclerotinia resistant germplasm. The lines in testcross hybrids had Sclerotinia head rot infection ranging from 8 to 23%, when compared with the check hybrid SF 270 which had 73% infection. Additional oilseed releases of two maintainer and three restorer lines are planned for the spring of 2006. A new breeding program has been initiated to incorporate Sclerotinia head rot and stalk rot resistance into the large-seeded confection sunflowers, with initial germplasm releases projected for the fall of 2006. To provide information for growers and private breeders, 89 experimental and released commercial hybrids were tested for resistance to Sclerotinia stalk rot at five locations in North Dakota and Minnesota using artificial inoculation (as well as being tested for head rot reaction by Dr. Robert Henson, PI of another project). Three locations gave statistical sound stalk rot ratings, with disease incidence of individual hybrids at maturity ranging from 10 to 71%. An experimental hybrid, using USDA lines developed for Sclerotinia resistance (HA 412 x RHA 409), was the sixth best entry with 16% stalk rot, averaged over three locations. Among the top ten entries were one released confection hybrid and two released NuSun hybrids. Retests of the 20 best entries from 2004 trials (at five locations for stalk rot and two locations for head rot) confirmed that a few commercial hybrids were consistently good for both head and stalk rot.



Incidence (left)(percent of affected fields), and severity (right) (% of affected plants across all fields) of Sclerotinia head rot and stalk rot (wilt) during the last 13 years in Manitoba sunflower fields (data compliments of K. Rashid). The incidence of wilt (stalk rot) has remained more constant while the incidence of head rot fluctuates annually depending upon the amount of rainfall during August and September. Incidence and severity in North Dakota fields are similar, but we lack the consecutive annual survey data.

Inoculation for evaluation of sunflower stalk rot resistance uses *Sclerotinia sclerotiorum* mycelium grown on millet (center), with 600 pounds of inoculum used for five field plots in 2005. The inoculum is metered via a tractor-drawn granular chemical applicator (right), and deposited in a furrow made by an anhydrous ammonia shank (left) ~ 3-4" deep and 10" from the sunflower plants at the V-6 stage (4-5 wk old)

Acknowledgements

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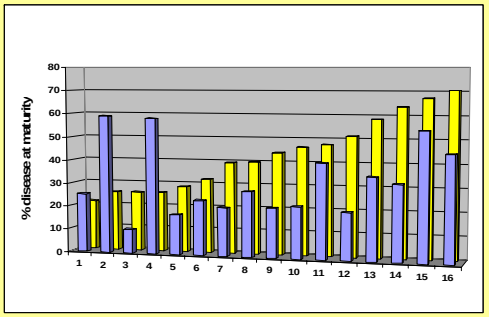
Inoculated field test at Carrington, ND showing susceptible row on right, wilting due to Sclerotina stalk rot, and highly resistant row on lef.



Sclerotinia stalk rot (blue) and head rot (yellow) ratings of most resistant entries from 2004, retested in multiple inoculated field trials in 2005. This graph illustrates the independant nature of resistant to head rot and stalk rot.