Studies on pathogenicity of *Sclerotinia sclerotiorum* and susceptibility of *Brassica napus* to stem rot

Yong Liu[1,2], Yingze Niu[3], V. H. Paul[1], P. Dapprich[1], H. Buchenauer[4]
[1]Laboratory for Biotechnology and Quality Assurance, Department of Agriculture,
Fachhochschule Südwestfalen / University of Applied Sciences. 59494 Soest, Germany
yongliu@fh-swf.de, paul@fh-swf.de, Dapprich@fh-swf.de
[2]Institute of Plant Protection, Sichuan Academy of Agricultural Sciences,
610066, No 20 Jing Ju Si Road, Chengdu, P.R.China, liuyong65@hotmail.com
[3]Sichuan Agricultural University, 625014 Ya'an, P.R.China, niuyz@hotmail.com
[4]Institut für Phytomedizin, Universität Hohenheim
Otto-Sander-Straße 5, D-70599 Stuttgart, hbuchen@uni-hohenheim.de

ABSTRACT

Stem rot (*Sclerotinia sclerotiorum* (Lib.) de Bary) is one of the most important diseases in the world. It seems that resistant breeding is a environmental benefit and pollution free control strategy against stem rot. In this paper, 41 isolates of *S. sclerotiorum* isolated from rapeseed, tobacco, cabbage, potato, linseed, sunflower which collected from 7 countries, including China, Denmark, Germany, France, Holland, Poland and Sweden, where the disease incidences, growing years were different. Among them, 12 isolates were isolated directly by a single-ascospore from a single sclerotium. The susceptibility of 70 oilseed rape cultivars or lines against stem rot was evaluated under 12°C~18°C and 100% RH.

The results showed that the length of lesions varied from 0 mm to 70 mm among 41 *S. sclerotiorum* isolates, 3 of 41 isolates were almost inefficient infestation. Meanwhile, the length of lesions varied from 22 mm to 76 mm among the different cultivars and lines. Among 66 cultivars and lines bred in China, 15 performed good tolerance to stem rot. The high aggressive isolates should be used in laboratory resistance tests against stem rot of oilseed rape.

Key words: Oilseed Rape Stem rot *Sclerotinia sclerotiorum* pathogenicity susceptibility

INTRODUCTION

Stem rot is in Germany as well as in China one of the most important diseases in winter oilseed rape. The only effective control until now is a fungicide application at flowering stage. Thus breeding for resistant cultivars against stem rot is of major importance as this is the best way for environmental friendly yield increase. To find resistant cultivars different breeding lines from China were tested in climate chamber trials. In parallel, different *S. sclerotiorum*-Isolates were tested for their virulence and aggressiveness to select the most powerful isolates for resistance testing.

MATERIALS AND METHODS

As plant material the German cultivars Bristol, Artus and Express and two Chinese cultivars Zhong Suan 4 and Zhong You 821,and 68 Chinese breeding lines were used.

41 Sclerotinia sclerotiorum-Isolates originating from different countries (China, Denmark, Germany, France, Holland, Poland, and Sweden), different agricultural regions, vegetation years and host plants (winter oilseed rape, tobacco, green salad, tomato, false flax, sunflower) were collected. Of these 12 isolates were grown from single ascospore preparations.

Resistance of winter oilseed rape cultivars and breeding lines was tested in a detached leaf test system at 12°C/10°C day/night and about 98 % rel. humidity. Plant material was grown at 18/14° day/night with 60 % to 85% rel. humidity until 4-leaf stage. Light conditions were in both cases 14 hours with 6000 lux. For the resistance test the second and third leaf was cut and put, with the cut end in moist filter paper to prevent early wilting, in a plastic mini greenhouse (40 x 60 x 20 cm). Inoculation occurred either by putting a well grown PDA-culture of *S. sclerotiorum* (8 mm diameter) or a drop of 25 µl of a well grown liquid culture on the leaf surface.

Disease scoring was done after three to six days after inoculation by measuring the leasion diameter. Statistics were performed using Excel and SPSS.

RESULTS

The results of the testing of the winter oilseed rape cultivars and breeding lines are given in figure 1. Similar letters represent different breeding lines of similar breeding origin. The first four columns (two Chinese and two German cultivars) were used as standard references. Inoculations were done with the Chinese isolate MianZu to assess resistance.

From the results so far it is clear to see that breeding lines with the same parents develop different degrees of stem rot resistance (e.g. HL 1 - HL 10 have the same parents).

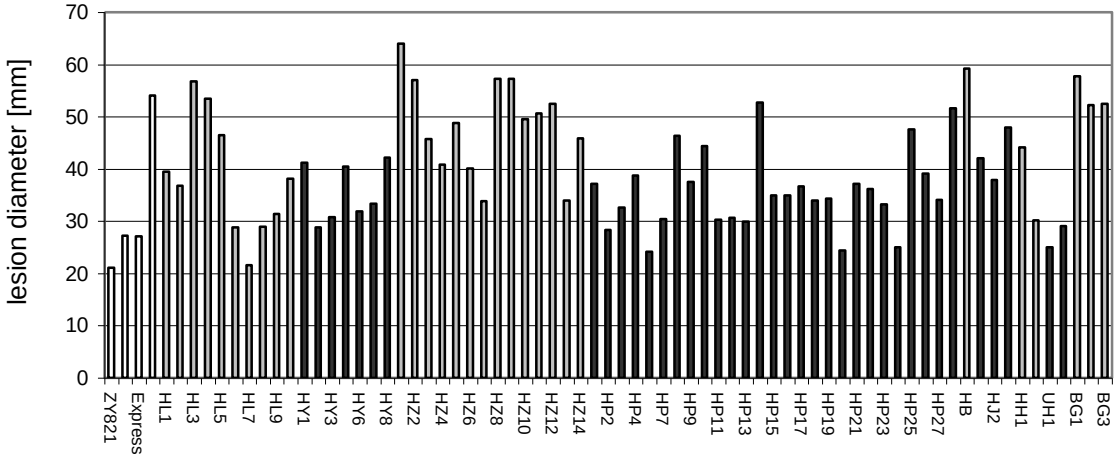

Figure 1: Response of winter oilseed rape cultivars / breeding lines to stem rot (*S. sclerotiorum*) in climate chamber experiments (5 days after inoculation, isolate MianZu from China, LSD 5%=7,5, LSD 1%=9,9 mm)

Figure 2 gives the response of 15 selected breeding lines to three different *S. sclerotiorum* isolates. The grey columns represent an isolate originated from the Chinese province Sichuan (MianZu), the white ones represent an isolate from Yaan (Yaan) and the black columns represent a German isolate from Rostock (Rostock). Here the necessity of isolate testing becomes evident. Isolate Rostck results in no significant differentiation of the breeding lines while the other two isolates result in a good differentiation of the plant material.

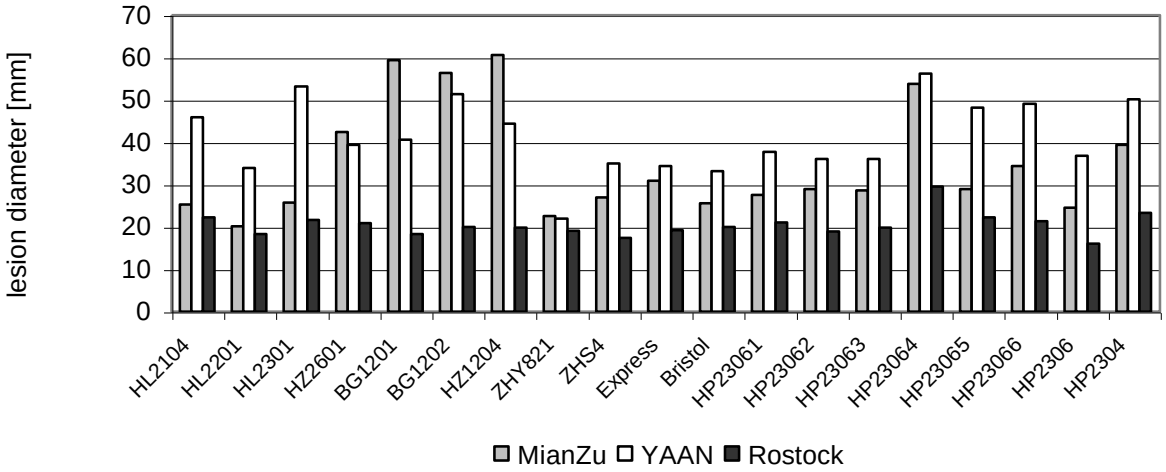

Figure 2: Response of 15 selected winter oilseed rape cultivars / breeding lines to three isolates of stem rot (*S. sclerotiorum*) in climate chamber experiments (5 days after inoculation; MZ: LSD 5%=6,6, LSD 1%=8,7; Ya: LSD 5%= 4,4, LSD 1%=5,6; Ros: LSD 5%=2,5, LSD 1%=3,2)

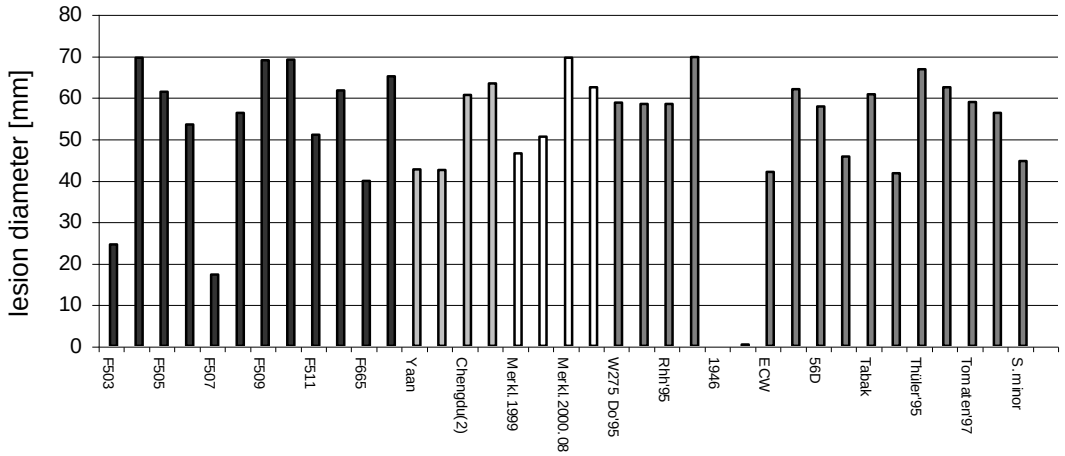

Figure 3: Aggressiveness of *S. sclerotiorum* isolates from different host plants and different geographical origin tested on the third leaf of winter oilseed rape (detached leaf test) 5 days after inoculation (cultivar: Bristol, LSD 5%=4,4, LSD 1%=5,8 mm)

The experiments for aggressiveness of different stem rot isolates showed that from the isolates available two were not or hardly pathogenic (1946, 266) to the cultivar Bristol whilst five were highly aggressive (F504, F509, F510, Merkl.2000.08, I106-1) (figure 3). Lesion diameter differed from 0 to 70 mm. This effect was also observed in the other cultivars and breeding lines.

DISCUSSION

The results presented in this study clearly indicate the need of systematic analysis of the aggressiveness of *S. sclerotiorum* isolates to be used in inoculation experiments. Different isolates may lead to different and even contradictory results. So only with a known highly aggressive isolate used in resistance experiments the success of the experiment can be guaranteed. This means that breeders need to co-operate with scientists in a very early stage of resistance breeding as this research is crucial to breeders trying to produce resistant and high yielding new cultivars.

ACKNOWLEDGEMENTS

This research was financially supported by the Ministerium für Wissenschaft und Forschung (MWF) des Landes NRW.

REFERENCES

Liu, Y., Liu, H., Niu, Y., and Paul, V. H., 2002: Laboruntersuchungen zur Virulenz von Sclerotinia sclerotiorum im Bezug auf die Resistenz von Brassica napus. Mitteilungen aus der Biologischen Bundesanstalt für Land- und Forstwirtschaft, 53. Deutsche Pflanzenschutztagung, 16.-19. September 2002, Bonn, Heft 390: 89