INTERACTIONS OF TEMPERATURE AND WATER POTENTIAL ON DISPLACEMENT OF *FUSARIUM PSEUDOGRAMINEARUM* FROM CEREAL RESIDUES BY FUNGAL ANTAGONISTS

Dalvinder P. Singh and D. Backhouse
School of Environmental Science and Natural Resource Management,
University of New England, Armidale, NSW 2351, Australia.
Corresponding author; email: dSingh3@une.edu.au

INTRODUCTION

*Fusarium pseudograminearum* (*Fp*) is a stubble-borne fungus that causes crown rot in wheat. It has been reported from all wheat growing regions in Australia and significantly limits yields of winter cereals. The incidence of disease is determined by the quantity of infested stubble. There is potential for manipulating microbial antagonists to increase the rate of mortality of *Fp* in cereal residues. We are studying the occurrence of different species of fungi in stubble to find antagonists that can displace *Fp*. In these experiments we examined the effect of temperature and water potential on the effectiveness of antagonists.

MATERIALS AND METHODS

The antagonists used in this experiment were *Trichoderma harzianum* (*Th*), *Alternaria infectoria* (*Ai*), *F. equiseti* (*Fe*) and *F. nygamai* (*Fn*). The water potential of 1/4 PDA or SNA was adjusted to -0.3, -1, -2 and -5 MPa with NaCl and cultures were grown at 5°, 10°, 15°, 20°, 25°, 30° and 35°. Growth rates of individual fungi were measured on 1/4 PDA and for dual cultures *Fp* plugs were placed 2.5 cm apart from each antagonist. The relative growth rate was estimated for each species at each combination of water potential and temperature. The distance that *Fp* and each antagonist grew in dual culture before contact was measured and compared with the expected distance based on individual growth rates. Displacement of *Fp* from precolonized barley straw pieces placed on SNA cultures of each antagonist was recorded after 4 weeks, using an index based on the proportion of length of the straw from which *Fp* could be isolated.

RESULTS

*Th* grew better than *Fp* at high temperatures and high water potentials, but was less antagonistic in dual culture than expected under cold wet conditions and more antagonistic than expected under hot dry conditions. Displacement of *Fp* from straw by *Th* was highest at temperatures above 20° and at water potentials above -2 MPa (Fig. 1).

*Ai* grew well under a broader range of temperatures and water potentials than *Fp*. However, it was not antagonistic to *Fp* and did not displace *Fp* from straw.

*Fe* had similar growth to *Fp* under wet and warm conditions. However, it grew more slowly under the combination of temperatures below 20° and water potentials below -2 MPa. *Fp* and *Fe* competed equally in dual culture. Temperatures from 25 – 35° were best for *Fe* to displace *Fp* from straw pieces at all water potentials except -5 MPa, where displacement was reduced at all temperatures.

*Fn* grew best at moderate temperature and high water potential, and grew relatively slower than *Fp* at less than -1 MPa. It was more antagonistic in dual culture than expected at 30°. Displacement of *Fp* from straw was greatest at high temperature, and was reduced at -5 MPa (Fig. 2).

REFERENCES