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FINAL REPORT

CHARACTERIZATION AND MANAGEMENT OF <i>RHIZOCTONIA</i> IN CANOLA AND LUPIN IN CROPPING SYSTEMS OF THE WESTERN CAPE PROVINCE
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SUMMARIES

Chapter 1

Effect of cropping system on composition of the *Rhizoctonia* populations recovered from canola and lupin in South Africa

Rhizoctonia spp. anastomosis groups (AGs) associated with canola and lupin grown in crop rotational systems in the southern and western production areas in the Western Cape province of South Africa were recovered during the 2006 and 2007 growing seasons and identified using sequence analyses of the rDNA internal transcribed spacer regions. The effect of crop rotation systems and tillage practices on the recovery of *Rhizoctonia* spp. was evaluated at Tygerhoek (southern Cape, Riviersonderend) and Langgewens (western Cape, Moorreesburg) experimental farms. Isolations were conducted from canola planted after barley, medic/clover mixture and wheat, and lupin planted after barley and wheat, with sampling at the seedling, mid-season and seedpod growth stages. In the 2006 study, 93.5% of the *Rhizoctonia* isolates recovered were binucleate and 6.5% multinucleate; in 2007, 72.8% were binucleate and 27.2% were multinucleate. The most abundant AGs within the population recovered included A, Bo, I, and K, among binucleate isolates and 2-1, 2-2 and 11 among multinucleate isolates. Crop rotation sequence, tillage and plant growth stage at sampling all affected the incidence of recovery of *Rhizoctonia*, but certain effects were site specific. The binucleate group was more frequently isolated from lupin and the multinucleate group from canola. AG-2-1 was only isolated from canola and AG-11 only from lupin. This study showed that important *Rhizoctonia* AGs such as AG-2-1, 2-2 and 11 occur in both the southern and the western production areas of the Western Cape province and that crop rotation consistently influences the incidence and composition of the *Rhizoctonia* community recovered from the cropping system.

Chapter 2

Evaluation of strategies for the control canola and lupin seedling diseases caused by *Rhizoctonia* anastomosis groups

Several methods with potential for the management of *Rhizoctonia* diseases of canola and lupin such as disease resistance, seed treatment and biological control using binucleate *Rhizoctonia* anastomosis groups (AGs) were evaluated under glasshouse conditions. Screening included the examination of resistance of eight canola and eight lupin cultivars/selections to damping-off and hypocotyl/root rot caused by the multinucleate *Rhizoctonia* AG-2-1, 2-2, 4 and 11. . The canola cultivars included were the conventional cultivars, Comet, Outback, Spectrum and 44C11, the clearfield cultivars Rocket and 44C73 and the triazine tolerant cultivars Thunder and Tornado. Cultivars/selections of three lupin spp. were included viz. Cedara 6150 and E16 (*L. albus*), Mandelup, Tanjil, Quilinock and E42 (*L. angustifolius*) and E80.1.1.2 and E82.1.1 (*L. luteus*). All canola cultivars were highly susceptible to AG-2-1, although they differed in their reaction. However, Spectrum and 44C73 were more resistant to AG-4 than the other cultivars. On lupin, AG-2-2 and 4 were most virulent and the cultivar Cedara 6150 and selection E16 were most resistant to AG-2-2, and Cedara 6150, E16, Mandelup and Quilinock were also more resistant to AG-4 than the other cultivars/selections. The *Lupinus luteus* selections, E80.1.1.2 and E82.1.1 were most susceptible to AG-2-2, 4 and 11. Seed treatment with the fungicides, Cruiser OSR (a.i. difenconazole, fludioxonil, metalaxyl-M, thiamethoxam) and SA-combination (a.i. iprodione, metalaxyl, thiram) significantly increased survival of canola (cvs Muster, Rocket and Thunder) and lupin (cultivar/selection Cedara 6150, E82.1.1 and Mandelup) seedlings, decreased hypocotyl/root rot and improved the percentage healthy seedlings, with SA-combination being significantly more effective than Cruiser. The binucleate *Rhizoctonia* AGs (A, Bo, K and I) significantly increased the survival of lupin seedlings inoculated with AG-2-2 and 4. A low inoculum ratio of the binucleate AGs [1:1 (multinucleate AG :binucleate AG)] was less effective than a high inoculum ratio [1:10 (multinucleate AG :binucleate AG)]. It appeared that AGs-A, Bo and I were more effective than AG-K in protecting lupin from infection by *Rhizoctonia solani*. This is the first report of the potential of binucleate AGs to protect

lupin seedlings against multinucleate AGs. Results obtained in this study can significantly contribute to management strategies that can be employed against *Rhizoctonia* diseases of canola and lupin in the Western Cape province of South Africa.

Chapter 1

Effect of cropping system on composition of the *Rhizoctonia* populations recovered from canola and lupin in South Africa

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Abstract

Rhizoctonia spp. anastomosis groups (AGs) associated with canola and lupin grown in crop rotational systems in the southern and western production areas in the Western Cape province of South Africa were recovered during the 2006 and 2007 growing seasons and identified using sequence analyses of the rDNA internal transcribed spacer regions. The effect of crop rotation systems and tillage practices on the recovery of *Rhizoctonia* spp. was evaluated at Tygerhoek (southern Cape, Riviersonderend) and Langgewens (western Cape, Moorreesburg) experimental farms. Isolations were conducted from canola planted after barley, medic/clover mixture and wheat, and lupin planted after barley and wheat, with sampling at the seedling, mid-season and seedpod growth stages. In the 2006 study, 93.5% of the *Rhizoctonia* isolates recovered were binucleate and 6.5% multinucleate; in 2007, 72.8% were binucleate and 27.2% were multinucleate. The most abundant AGs within the population recovered included A, Bo, I, and K, among binucleate isolates and 2-1, 2-2 and 11 among multinucleate isolates. Crop rotation sequence, tillage and

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Keywords

Binucleate, Crop sequence, Multinucleate, Sampling time, Tillage practice