EFFECT OF APHID INJURY AND CONTROL ON CANOLA SEED YIELD AND QUALITY IN THE SOUTHERN UNITED STATES

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ABSTRACT

Aphids have been associated with damage of winter grown canola-quality oilseed rapeseed in the southern United States. The turnip aphid, *Lipaphis erysimi* (Kaltenbach) and green peach aphid *Myzus persicae* (Sulzer) occur from seedling emergence through flowering with damage usually being associated with *L. erysimi*. Aphid injury reduced canola plant growth, height, grain yield and grain oil content. Yield losses exceeded 30% at two sites with oil content being reduced by 2% at one site. Yield losses were largest when injury occurred during the rosette stage of plant development. Sampling and control efforts should target seedling and rosette stage plants.

INTRODUCTION

Canola-quality oilseed rape, *Brassica napus* L., has been grown since the late 1980's as a winter crop in the southern United States. In this area, aphids have been recognized as the most important insect pest of canola. The primary foliage-inhabiting aphids are: turnip aphid, *Lipaphis erysimi* (Kaltenbach); green peach aphid, *Myzus persicae* (Sulzer); and cabbage aphid, *Brevicoryne brassicae* (L.) (Buntin 1991). Turnip and green peach aphids occur from plant emergence through flowering whereas the cabbage aphid usually is present during the bloom period (Buntin and Raymer 1994). Damage typically is associated with *L. erysimi*. Aphids, mostly *L. erysimi* and *B. brassicae*, are important pests of oilseed *Brassica* crops in the Indian subcontinent, China, Australia and New Zealand where yield losses can exceed 50%, but aphids are minor pests at higher latitudes such as northern Europe and Canada (Bakhetia 1983, Lamb 1989). My objective was to examine the effect of aphid injury and control on canola grain yield and oil content.

MATERIALS AND METHODS

Experiments were conducted at sites located near Plains, Griffin, and Calhoun, Georgia in the 1990/1991 season. Canola was planted with a grain drill in 18-cm rows at each site using standard tillage and fertility practices. 'Bingo' canola was planted on 19 October at Plains, and 'Ceres' canola was sown on 1 to 13 October at Griffin and Calhoun. Aphid control treatments were no control or control during the rosette (autumn, 40 days after planting), bud/early flower and late-bloom/beginning-pod stages of plant development. A factorial combination of bud

and pod sprays were arranged in a randomized complete block design with four blocks. Rosette treatments were assigned randomly to split plots measuring 3.0 by 6.1 m. Aphid were controlled using dimethoate at the rate of 560 g (AI)/ha applied with CO_2-powered backpack sprayer and calibrated to deliver 250 l/ha.

Aphids were sampled by counting aphids on 10 to 15 plants per plot from plant emergence until 5 leaves per plant. Larger plants were sampled by counting aphids on 15 leaves per plot, and after stem elongation, 100 terminal racemes per plot were inspected for aphids and the percentage of infested terminals calculated. Final plant height and plant populations were measured before harvest. Plots were harvested with a small-plot combine and grain was cleaned and dried at 60°C. Grain oil content was determined using an NMR procedure (Robertson and Morrison 1979). Grain yield and oil content were calculated for a standard 8.5% moisture content. Results were analyzed by location with and analysis of variance for a split plot design. If main effect F values were significant ($P < 0.05$), means were separated using least significant difference (LSD).

RESULTS

Large aphid infestations occurred during the rosette and bloom periods at Plains and Griffin, but infestations were small at Calhoun. Rosette-stage spray greatly reduced aphid numbers during autumn and winter at all locations. This suppression persisted through flowering with the percentage of aphid infested racemes being reduced by 79 and 75% at Plains and Griffin, respectively. Rosette-stage control also reduced the number of aphids per infested raceme at the beginning bloom by 57% at Plains. Dimethoate applied at beginning bloom also greatly reduced aphid populations during bloom. Few aphids were present on plants at the end of bloom when the third spray treatment was applied.

Spray treatment during pod stage did not significantly affect final plant height, grain yield or oil content at any location (Table 1). Aphid injury during the rosette stage reduced plant height at Plains (-17%) and Griffin (-6%), but plant height was affected by the early bloom spray only at Plains (-7%) (data not shown). Grain yield also was reduced by aphid injury during the rosette stage at Plains (-22%) and Griffin (-22%) and during the bud/early flower period (-10% at Plains and -12% at Griffin) (Table 1). Rosette and bud/early bloom sprays also affected grain oil content at Plains (-2%) but did not affect oil content at Griffin (Table 1). Late bloom/pod spray treatments did not affect grain yield and oil content at either location.

These results and those of previous studies (Buntin 1991, Buntin and Raymer 1994) demonstrate that aphids are an important limitation to canola production in the southern United States. Aphid injury adversely affected plant survival, growth, height, grain yield and oil content. Furthermore, injury during the rosette stage in autumn and winter had the greatest affect on yield. Effective control during the rosette stage persisted throughout the winter and flowering. Efforts are being directed at developing economic thresholds for different plant growth stages with emphasis on rosette stage plants.

Table 1. Effect of period of aphid control grain oil content of canola at three locations in Georgia in 1990/1991.

Treatment							
Rosette stage	Bud/flower stage	Grain yield (kg/ha)			Grain oil content(%)		
		Plains	Griffin	Calhoun	Plains	Griffin	Calhoun
Unt	Unt	1517	691	930	39.9	37.1	39.1
Unt	Trt	1823	884	847	40.8	37.5	38.8
Trt	Unt	2093	982	986	40.9	37.3	39.0
Trt	Trt	2183	1027	895	41.5	37.3	39.1
F-values							
Rosette		**	**	ns	**	ns	ns
Bud/flower		**	*	ns	**	ns	ns
Interaction		ns	ns	ns	ns	ns	ns

* and ** indicate significant F value at $P < 0.1$ and $P < 0.05$, respectively.

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