

New Innovative Weed Management Products for Organic Crop Production



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INTRODUCTION

The application of synthetic herbicides has become the primary method for weed management in conventional agriculture. The perception of increased weed pressure and inadequate weed control methods in organic systems are major barriers to adopting organic crop production practices. Weed control remains a major concern for organic farmers. Only a limited number of products are currently acceptable in organic agriculture and these have limited efficacy.

OBJECTIVES

The objective of this study was to evaluate improved biological and lower-risk, natural products, that are appropriate for use by organic growers, to provide enhanced weed management for organic vegetable growers.

MATERIALS AND METHODS

- Field studies were conducted at the Simcoe Research Station in 2015.
- Watford fine sandy loam; 47% sand; 43% silt and 10% clay. Soil pH 6.4; soil OM 1.3%; CEC 5.1.
- Randomized complete block design with four replications.
- Herbicides applied at 1000 L/ha with CO₂-pressurized back-pack sprayer @ 240 kPa.
- Tomato and peppers planted 45 cm apart in 1.5 m rows on June 11.
- Sweet corn seeded in 1.5 m rows at 40,000 plants per ha on June 12.
- Directed POST treatments for between-row weed management applied on July 3 and July 28, when the weeds were in the 2 to 3-leaf stage.
- Visual weed control ratings (0-100%) taken at 7-day intervals, starting 3 days after first application.
- Sweet corn, tomato and pepper harvested by hand at maturity on August 26, September 3 and 4, respectively.
- Data subjected to ANOVA. Means compared using Fisher's Protected LSD test.

RESULTS AND DISCUSSION

Postemergence (POST) treatments of Manuka oil, Weed Zap or Vinegar gave 86, 79 and 78% weed control, respectively, on July 15. However, weed control with Manuka oil, tank mixed with Weed Zap or Vinegar gave 97% control. This was an 11 to 19% improvement in weed control, compared to each product used alone. Finalsan and Avenger gave 81 and 13% weed control, respectively. Avenger tank-mixed with Manuka oil gave 76% weed control. This was a 63% improvement in weed control, compared to Avenger used alone. Callisto gave 91% weed control and 95% control when applied with Vinegar. The same pattern was evident with weed control on Aug. 31.

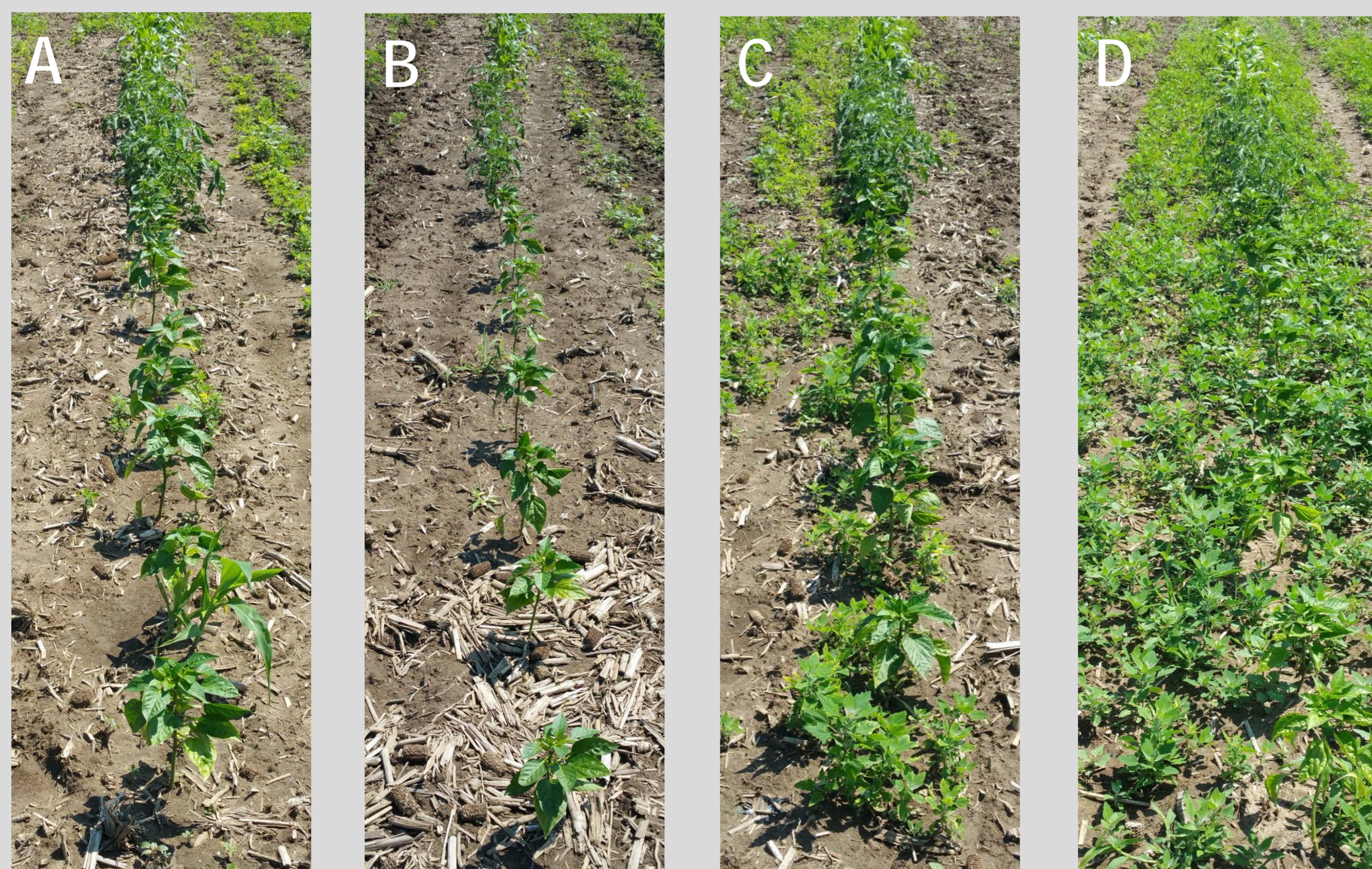


Fig. 1 The effect of Manuka oil plus Weed Zap (A), Manuka oil plus Vinegar (B), Manuka oil (C) compared to the non-weeded control (D) on weed control in pepper and tomatoes.

RESULTS AND DISCUSSION

Manuka oil, tank mixed with Weed Zap or Vinegar gave significantly improved tomato, pepper and sweet corn yields. These yields were generally comparable to yields obtained with Callisto plus Vinegar and the hand weeded control.

Table 1. Effect of natural-product herbicides on weed control efficacy and yield of tomatoes, sweet corn and pepper in 2015.

Treatment*	Rate	Weed Control (%)		Yield (t/ha)		
		July 15	August 31	Tomato	Sweet corn	Pepper
Manuka oil Nu-film P	1% v/v 1% v/v	86 bc	66 de	46.0 ab	11.4 bc	6.6 de
Weed Zap Nu-film P	5% v/v 1% v/v	79 cd	67 de	41.9 ab	9.1 c	1.8 fg
Weed Zap Manuka oil Nu-film P	5% v/v 1% v/v 1% v/v	97 a	83 c	56.5 a	15.3 abc	12.5 bc
Vinegar Nu-film P	100% 1% v/v	78 cd	57 e	31.4 bc	10.7 bc	4.1 ef
Vinegar Manuka oil Nu-film P	100% 1% v/v 1% v/v	97 a	85 c	54.7 a	16.8 ab	13.9 ab
Finalsan	16.6 %v/v	94 ab	78 cd	28.6 bcd	10.4 bc	4.5 ef
Avenger Nu-film P	1% v/v 1% v/v	13 e	29 f	10.6 d	1.7 d	0.2 g
Avenger Manuka oil Nu-film P	1% v/v 1% v/v 1% v/v	76 d	60 e	42.9 ab	10.8 bc	7.2 cde
Callisto Nu-film P	144 g ai ha ⁻¹ 1% v/v	91 ab	84 c	39.3 ab	14.3 abc	10.4 bcd
Vinegar Callisto Nu-film P	100% 144 g ai ha ⁻¹ 1% v/v	95 ab	95 b	59.6 a	19.8 a	19.6 a
Weeded Control		100 a	100 a	56.3 a	21.2 a	19.7 a
Non-weeded Control		0 f	0 g	11.2 cd	4.0 d	0.4 g

* All treatments applied directed post emergence on July 3 and July 28
Means followed by the same letter do not significantly differ (P ≥ 0.05, LSD)

CONCLUSIONS

The best overall weed control was from applications of Manuka oil tank-mixed with Weed Zap or Vinegar. These combinations gave weed control that was improved compared to either product used alone and gave a level of weed control that was comparable to Callisto or the weed-free control. Manuka oil is the first weed control natural product that has soil activity, is systemic and, when mixed with other approved products, enhances weed control activity. Outcomes from this research will improve weed management in organic farms by identifying specific organic weed management practices, appropriate for use by organic growers. This will increase productivity, will significantly improve weed management, will help growers to find solutions to the long standing issue of managing weeds in organic crop production and will address the limitations of currently-approved products.

ACKNOWLEDGEMENTS

This research was supported in part by financial support from Rijk Zwaan, Canada, Ontario Processing Vegetable Growers, London, ON, Agriculture and Agri-food Canada (Organic Science Cluster II Program) and the Ontario Ministry of Agriculture and Food and Rural Affairs, Guelph, ON, Canada.

