Enhanced Weed Management for Organic Vegetable 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 few products, with limited weed control efficacy, are currently acceptable for organic agriculture.

OBJECTIVES

The objective of this research was to evaluate the weed control potential of bioactive, non-synthetic, natural products to provide weed control efficacy and crop safety data resulting in enhanced weed management for organic vegetable growers.

MATERIALS AND METHODS

- Field studies were conducted at the Simcoe Research Station in 2016.
- Walsher fine sandy loam; 73% sand; 24% silt and 4% clay. Soil pH 6.7; soil OM 1.7%; CEC 6.6.
- Randomized complete block design with four replications.
- Herbicides applied at 600 L/ha with CO_2-pressurized back-pack sprayer @ 240 kPa.
- Tomato and peppers planted 45 cm apart in 1.5 m rows on June 2.
- Sweet corn seeded in 1.5 m rows at 60,000 plants per ha on June 2.
- POST treatments for between-row weed management applied on June 24 and July 14, 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.
- Pepper, sweet corn and tomato harvested by hand at maturity on August 11, 15 and 19, respectively.
- Data subjected to ANOVA. Means compared using Fisher's Protected LSD test.

RESULTS AND DISCUSSION

Post emergence (POST) treatments of Weed Zap (clove & cinnamon oil), Manuka oil (leptospermum scoparium) and Munger Horticultural Vinegar (acetic acid) gave 48, 49 and 56% weed control, respectively, on June 30. However, weed control with Manuka oil, tank mixed with Weed Zap or vinegar gave 79 and 86% weed control, respectively. This was a 30 to 31% improvement in weed control, compared to each product used alone. Finalsan (ammonium soap of fatty acids) gave 85% weed control. Suppress (caprylic/capric acid) gave 70 to 81% weed control while AEF 12-01 (pine oil) gave 66 to 68% weed control. By August 02, weed control was generally reduced, except for Manuka oil, tank mixed with Weed Zap or vinegar and Suppress. Most treatments gave sweet corn yields that were not significantly different from the hand weeded control. Tomato yields were reduced except for Manuka oil, tank mixed with Weed Zap, and Suppress. Pepper yields were significantly reduced for all treatments, likely due to severe drought and significant late season weed competition.

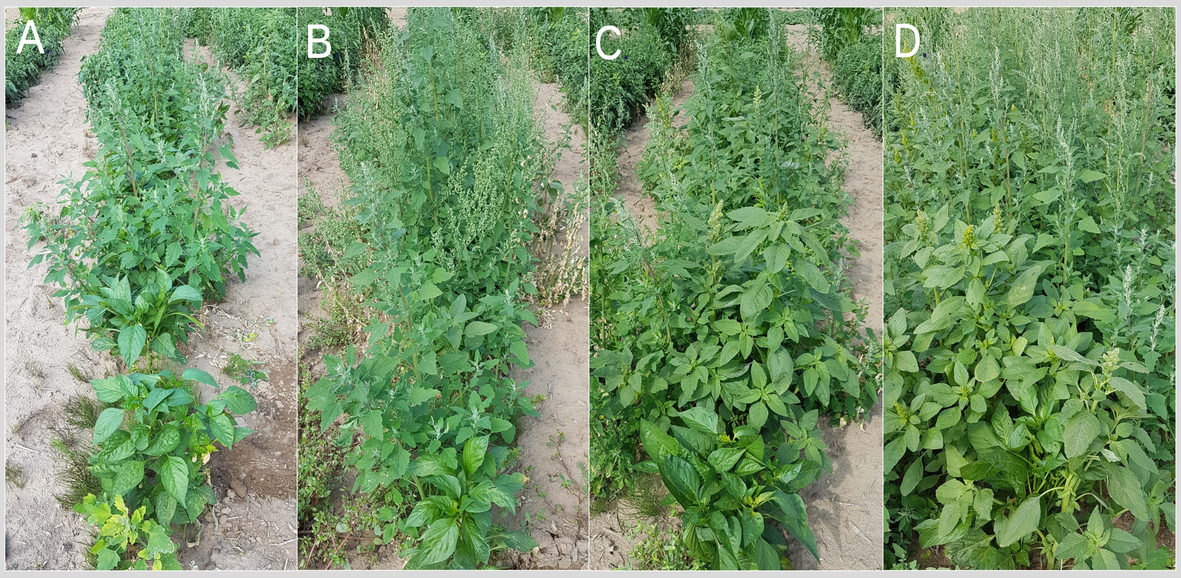

Fig. 1 The effect of Manuka oil plus Munger Horticultural Vinegar (A), Munger Horticultural Vinegar (B), Manuka oil (C) compared to the non-weeded control (D) on weed control in pepper and tomatoes.

RESULTS AND DISCUSSION

Table 1. Effect of organic herbicide on weed control efficacy and yield

		Weed Control (%)		Yield (t/ha)		
Treatment*	Rate	June 30	Aug 02	Tomato	Sweet corn	Pepper
Manuka oil Nu-film P	1% v/v 1% v/v	49 d	39 c	26.1 b	7.2 bc	1.7 b
Weed Zap Nu-film P	5% v/v 1% v/v	48 d	28 c	25.9 b	7.2 bc	1.9 b
Weed Zap Manuka oil Nu-film P	5% v/v 1% v/v 1% v/v	79 abc	80 ab	37.2 ab	7.9 bc	1.5 b
Horticultural Vinegar Nu-film P	100% 1% v/v	56 cd	39 c	27.5 b	9.5 ab	0.9 b
Horticultural Vinegar Manuka oil Nu-film P	100% 1% v/v 1% v/v	83 ab	79 ab	32.9 b	8.7 abc	1.1 b
Finalsan	16.6 %v/v	85 ab	71 b	31.4 b	8.1 abc	1.9 b
Suppress	3% v/v	70 bcd	76 ab	30.8 b	10.1 ab	2.9 b
Suppress	6% v/v	81 abc	80 ab	38.1 ab	11.0 ab	2.2 b
AEF 12-01	10% v/v	66 bcd	38 c	27.6 b	9.3 abc	1.2 b
AEF 12-01	15% v/v	68 bcd	36 c	27.5 b	8.4 abc	1.0 b
Weeded Control		100 a	100 a	53.4 a	15.5 a	11.6 a
Non-weeded Control		0 e	0 d	28.9 b	4.7 c	0.9 b

* All treatments applied directed post emergence on June 24th and July 14th

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 Munger Horticultural Vinegar. These combinations gave weed control that was significantly improved compared to either product used alone and gave a level of weed control that was comparable to the weed-free control. Manuka oil is the first natural product herbicide 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

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