A systematic review of Canada thistle (*Cirsium arvense*) control and management studies in organic and diversified cropping systems for the Northern Great Plains region

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Executive Summary

Management of perennial weeds is one of the greatest challenges to the long-term sustainability of organic agriculture in the Northern Great Plains (NGP). Canada thistle (*Cirsium arvense*) is a particularly problematic perennial weed because it reproduces not only by seed, but also through an extensive underground root system that is difficult to target using organic methods. Researchers have explored many different approaches to manage Canada thistle in organic systems, but no clear solutions or recommendations exist. Most management recommendations focus on depleting carbohydrate reserves in its extensive root system, and include methods such as mechanical and cultural techniques as well as grazing management and biological control. Despite the variety of potential management techniques, more research on approaches to manage Canada thistle in organic systems is needed. We systematically reviewed previous research to determine which aspects of non-chemical Canada thistle management warrant further study and to highlight best management practices for its control.

Our literature search revealed that little research has been conducted about non-chemical management of Canada thistle in the NGP. Only 11 papers out of 74 in our analysis were conducted in this region. We included research from around the globe in our analysis, and we were able to determine which research areas appear promising and to highlight management practices that may be useful for grower in our region. Our main research findings from the systematic review were:

- Overall, integrated management, where two or more control methods are combined to manage Canada thistle, holds the most promise. For annual cropping systems, integrated management of Canada thistle in the NGP using competitive vegetation combined with

other management techniques such as tillage would be a beneficial area for future research.

- Dense stands of annual forage crops were effective in suppressing Canada thistle. However, none of the studies in our analysis were conducted in the NGP, and the success of this method in other areas warrants investigation in our region.
- Repeated soil cultivation can decrease Canada thistle abundance. However, only one study in our analysis was conducted in the NGP. Due to the risk of erosion, research about the best methods of mechanical control of Canada thistle for the NGP which balance soil health and weed abundance would be beneficial.
- Shading with plastic mesh material reduced Canada thistle biomass to the greatest degree of any method we researched for this analysis and it may be a potential management technique to consider for small areas. Similarly, solarization caused a large reduction in Canada thistle abundance, but it was only implemented in one study where the effects were only recorded over a one year period. It may be beneficial to investigate longer-term effects of these management techniques in the NGP.
- In our analysis of perennial systems few methods decreased Canada thistle abundance. Overall, establishing a stand of competitive perennial vegetation emerged as a good technique for decreasing Canada thistle abundance in habitats such as hay fields and pastures.
- Modifying grazing strategies has been effective for reducing Canada thistle abundance in other areas of the world, but information about grazing management to reduce Canada thistle abundance in the NGP is lacking.

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