

**Utilizing DNA-Based Techniques to Evaluate  
Genetic Diversity of Common Dandelion  
(*Taraxacum officinale* Weber)  
In Michigan and the United States**

**Project Number: GR03-050**

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**Project Justification**

Common dandelion has developed into a troublesome agronomic weed for no-tillage corn and soybean producers in Michigan. An increased understanding of genetic differences in common dandelion in Michigan may lead to population-specific management recommendations which will reduce the likelihood of common dandelion control failures and increase profitability and adoption of no-tillage cropping systems in Michigan. Successful application of these genetic techniques to common dandelion management could serve as a role model for other weeds.

**Objectives**

1. Characterize genetic diversity among common dandelion populations throughout Michigan and the United States.
2. Correlate common dandelion DNA-based molecular markers with a phenotypic response to glyphosate.

**Results and Accomplishments**

**Objective #1.**

Genetic analysis of 26 different common dandelion collections from 16 counties in Michigan and nine additional states was conducted to determine the level of genetic diversity among the collections. There were a total of 44 repeatable polymorphic DNA fragments that were scored using 9 random primers. Genetic similarity among common dandelion collections was calculated and a dendogram (Figure 1) was generated to demonstrate the relationship among the common dandelion collections. The diversity of RAPD banding patterns observed indicates that there is a high level of genetic diversity in common dandelion in Michigan and the other states examined. There was no discrete separation among common dandelion collections from Michigan and those collected from other states.

Geographical location and genetic similarity did not appear to be related when comparing common dandelion collections. Evaluation of a field population of common dandelion revealed a similarly high level of genetic diversity. When the progeny from selected maternal plants were evaluated there was no genetic diversity among progeny or

between the progeny and the maternal plant, confirming the apomictic nature of common dandelion.

Additional data was collected on morphological characteristics of the common dandelion collections, including plant size and reproduction potential. Differences were observed for these morphological characteristics; however there was no apparent relationship between genetic similarity and morphological characteristics.

### **Objective #2.**

A total of nine common dandelion collections were selected to represent both genetically similar and dissimilar collections. These collections were grown in the greenhouse where their growth rates were measured and they were treated with varying rates of glyphosate. Distinctly different rates of growth were observed for the nine collection of common dandelion (Table 1). There was no observable relationship between genetic similarity and growth rate. Also, geographical locations from which the common dandelion was collected and rate of growth were unrelated. Collections originating from adjacent counties in Michigan did not grow at similar rates.

There was no apparent relationship between genetic similarity (or dissimilarity) and response to glyphosate. Collections that were genetically similar did not respond similarly to glyphosate. Conversely, genetically dissimilar collections often responded similarly to glyphosate. However, sensitivity to glyphosate was strongly related to plant size at the time of herbicide application. Those collections that were smaller at the time of the glyphosate application were more sensitive. Common dandelion response to glyphosate is likely to be a quantitatively inherited trait that is controlled by more than one gene.

### **Impacts**

1. Molecular techniques were developed for DNA-based genetic analysis of common dandelion. These techniques can now be applied to other weed species.
2. This research determined that common dandelion is a genetically diverse weed species.
3. Data from this research indicate that sensitivity to glyphosate is probably a quantitatively inherited trait.
4. It was concluded that population-specific management of common dandelion is probably not a viable option, given the high level of genetic diversity within individual fields.
5. Effective management of common dandelion appears to be more dependent on timing of herbicide application than common dandelion genetics.
6. This project may serve as a model for research partnerships between the Michigan Agricultural Experiment Station and Michigan commodity groups.

### **Summary**

Common dandelion has a high level of genetic diversity within individual fields, which indicates that population-specific management of this weed is unlikely. Effective management of common dandelion in no-tillage cropping systems will require control strategies by producers that include timing of herbicide application and proper herbicide selection.

## Funding Partnerships

Corn Marketing Program of Michigan FY2003: \$14,165

Michigan Soybean Promotion Committee FY2003: \$14,165

Table 1. Comparison of leaf area for 9 collections of common dandelion grown in the greenhouse.

Collection	Leaf Area cm <sup>3</sup>
Alger Co. MI	432 a
Berrien Co. MI	244 cd
Ingham Co. MI	394 ab
Luce Co. MI	216 d
Monroe Co. MI	387 ab
Newaygo Co. MI	266 cd
Shiawassee Co. MI	409 a
St. Clair Co. MI	319 bc
Vermillion Co. IL	310 bc

<sup>a</sup> Means followed by the same letter are not significantly different according to Fisher's Protected LSD ( $\alpha = 0.05$ )

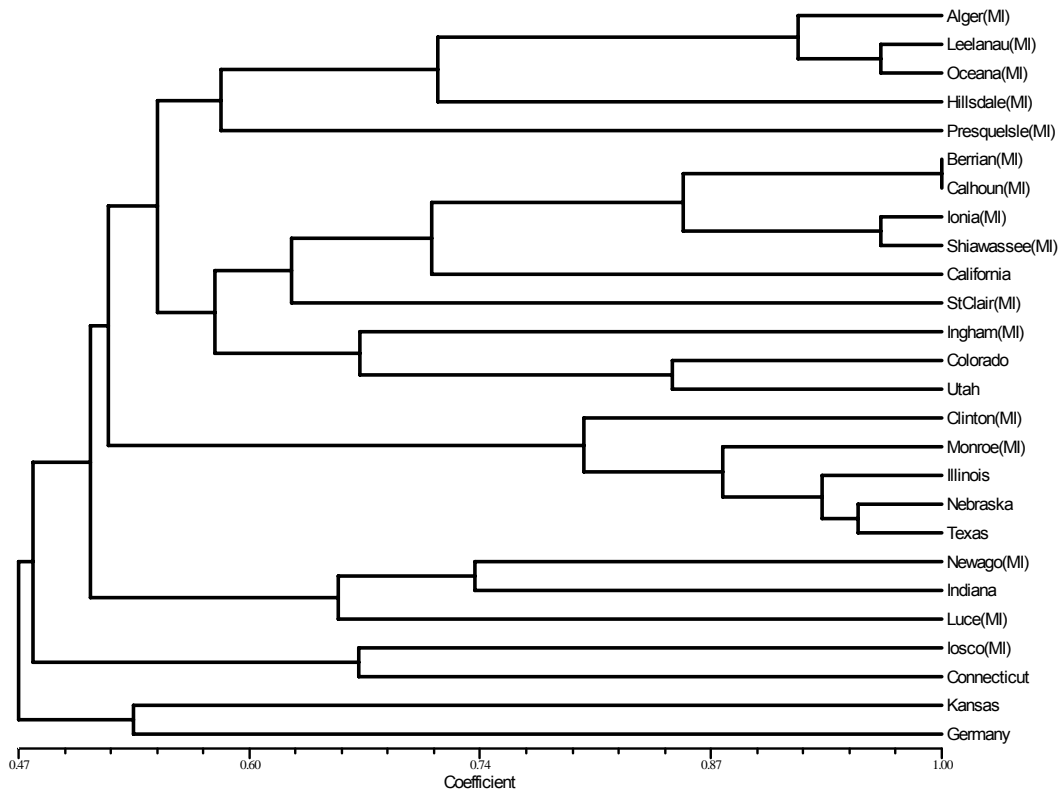


Figure 1. Dendrogram for RAPD analysis of 26 collections of common dandelion.