



An assay for detecting Palmer amaranth DNA in individual and mixed samples

A method and kit for determining whether a sample contains *Amaranthus palmeri*, a prohibited noxious seed in multiple states, plant material.



Technology ID

2020-183

Category

All Technologies

Agriculture & Veterinary/Ag

Biotechnology

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IP Status: US Patents Issued; Patent No. 11,866,793 and 9,963,750

Applications

- Seed Purity Testing
- Agricultural Management
- Invasive Species Diagnostics

Key Benefits & Differentiators

- **High Purity Testing:** Capable of detecting a single palmer Amaranth seed in a pool of at least 200 *Amaranthus* species.
- **Highly Sensitive and Specific Detection:** The sensitivity of the three tests the inventors developed ranged from 99.8 to 100%, and the specificity ranged from 99.59 to 100%. Accuracy for all three tests was >99.7%.
- **Easier to Use:** The method can be performed with any PCR machine and plate reader.
- **Cost-effective:** Low cost for each test performed.

Technology Overview

Amaranthus palmeri (Palmer amaranth) is an invasive annual weed with a severe impact on agricultural systems. Effects on corn and soybean yields are most severe, with reports finding yield losses as high as 91% in corn, 68% in soybean, and 54% in cotton. For these reasons, prevention of *A. palmeri* establishment is a high priority, with several states that experienced large crop loss requiring the certification of any amaranth type seed as Palmer amaranth-free. Mature *Amaranthus* plants share enough morphological characteristics to be confusing for non-

experts to identify and morphological identification of *A. palmeri* seeds from seeds of related *Amaranthus* spp. is even more challenging. The difficulty of both field tissue and seed identification led to a demand for genetic testing to identify *A. palmeri* against other *Amaranthus*. Existing tests were validated against a much more limited representation of Palmer *Amaranthus* genetic diversity. Additionally, existing tests are limited to testing 50-100 seeds at a time due to insufficient sensitivity. Thus, there remains a need for methods of genotyping *Amaranthus* that have improved sensitivity and can detect rare alleles in mixed genetic pools.

Researchers at the University of Minnesota and Colorado State University have co-developed a method and kit for identifying *Amaranthus palmeri* plant material using genetic markers. This method and kit were developed by examining a comprehensive genotyping-by-sequencing dataset from the largest and most genetically diverse panel of *Amaranthus* populations sequenced to date. This test is able to detect a single palmer *Amaranthus* seed in a pool of at least 200 *Amaranthus* species with a sensitivity ranging from 99.8 to 100%, and a specificity ranging from 99.59 to 100%. The accuracy for all three tests is >99.7%. This technology represents a marked improvement over existing commercial assays resulting in an identification assay that is (i) accurate, (ii) robust, (iii) easy to interpret and (iv) applicable to both leaf tissue and pools of up to 200 seeds.

Phase of Development

TRL: 6

Demonstrated reliable detection of a single *A. palmeri* seed in a pool of 200 *Amaranthus* sp. seeds

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact [Jessy McGowan](#) at [CSU Strata](#) to share your business' needs and learn more.

Researchers

- [Donald L Wyse, PhD](#) Professor, Agronomy and Plant Genetics
- [Anthony Brusa, PhD](#) Researcher 5, Agronomy and Plant Genetics

References

1. Anthony Brusa, Eric L Patterson, Todd A Gaines, Kevin Dorn, Philip Westra, Crystal D Sparks, Don Wyse (14 January 2021), <https://onlinelibrary.wiley.com/doi/10.1002/ps.6278>, <https://onlinelibrary.wiley.com/journal/15264998>, 77, 2477-2484