

RESEARCH REPORT

In search of short season northern grain amaranth varieties: A screening trial of grain amaranth (*Amaranthus* spp)

Farmer-Researchers

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IN A NUTSHELL

Amaranth is climate-resilient and nutrient-dense, and is an important Indigenous plant of the Americas. To learn which varieties of amaranth are best suited for their region of southern Ontario, Ronaldo and Myriam compared five varieties of amaranth in an unreplicated screening trial.

- They observed differences among the varieties in germination, flowering times, flowering patterns and yield and think that Grain Amaranth from Richters Herbs and Atitlan Dorado from IMAP Guatemala merit consideration for a replicated trial.

MOTIVATION

Ronaldo and Myriam have a desire to generate a greater understanding and support for the cultivation of grain amaranth in southern Ontario because they believe this plant has an important story to tell. It is a highly versatile crop – it grows prolifically and is well-known for its capacity to tolerate a range of weather conditions. It has been touted as “superfood” due to its unusually high protein, fiber, and iron content; its gluten-free properties give it tremendous value-added potential; and its greens and seeds were an important staple of the many cultures in the Americas. For example, *A. retroflexus* (pigweed) is a traditional potherb eaten by indigenous nations in Ontario, though amaranth grain has not traditionally been eaten.

There are three species of the genus *Amaranthus* which produce

large heads of edible seeds. *A. cruentus* is native to Central America, specifically Guatemala and southern Mexico; *A. hypochondriacus* is native to Mexico; and *A. caudatus* is native to the Andean regions of South America including Ecuador, Peru and Bolivia.

Ronaldo is Kakchiquel, one of the indigenous Maya peoples of the midwestern highlands in Guatemala who have been growing amaranth for thousands of years, and he and Myriam have worked in Guatemala to promote the cultivation of amaranth. Amaranth was so important to indigenous people of this area that the Spanish Crown outlawed the growing of amaranth in the 1500s.

Climate-resilient and nutrient-dense, amaranth has a huge potential to support food sovereignty in Ontario and around the world. It also provides a unique opportunity to

learn about Indigenous knowledge, particularly Ronaldo’s Kakchiquel knowledge, and plants native to the Americas. These seed trials enabled Ronaldo and Myriam to determine which is the best species (*A. hypochondriacus* or *A. cruentus*) and variety of amaranth to promote in their region.

DESIGN

Ronaldo and Myriam planted a screening trial with one replication of each of the five varieties of amaranth, as outlined in **Table 1**. Though replicated trials provide greater confidence that the results are accurate, screening trials are useful for evaluating whether a variety merits consideration for a replicated trial, checking for trueness-of-type or other seed quality concerns, identifying potential strengths or weaknesses of a variety, and observing a larger number of varieties than is practical in a replicated trial (reference 1).



Under field conditions without irrigation, Ronaldo planted two rows of amaranth per bed at a distance of 20 inches (ca. 51 cm) between rows and 10 inches (ca. 25 cm) in rows. He planted one hundred plants per variety (**Photo 1**).



Photo 1. Amaranth seedlings emerging from the soil 1 month post seedling.

Ronaldo and Myriam recorded seeding, flowering and harvest date and rated each variety on germination; disease, insect and drought resistance; yield, vigour, popping rate, flavour and seed size; and overall performance.

They harvested all grain on September 23, 2020 (114 days after planting), then threshed and winnowed; and then popped and tasted (**Photos 2 & 3**).

FINDINGS

There were no noticeable differences in the disease, insect and drought resistance between the five varieties and all varieties had the same popping rate and the same flavour quality.

Plainsman is a release of the University of Nebraska Experiment Station, which is a selection of a grain amaranth from the Rodale Institute's breeding program that they called 'K-343', and was from a cross of a white seeded *A. hypochondriacus* L. from Mexico and a black seeded *A. hybridus* L. from Pakistan (reference 2).

Table 1. Species name and source of the amaranth varieties that Ronaldo and Myriam used in this trial.

Variety Name	Species Name	Source
Plainsman	<i>Amaranthus hypochondriacus</i> x <i>hybridus</i>	La Société des Plantes
Grain Amaranth	<i>Amaranthus hypochondriacus</i>	Richters Herbs
Burgundy Amaranth	<i>Amaranthus</i> spp (probably <i>hypochondriacus</i>)	Greta's Organic Gardens-
Opopeo Amaranth	<i>Amaranthus hypochondriacus</i>	Annapolis Seeds
Atitlan Dorado	<i>Amaranthus cruentus</i>	IMAP Guatemala

In Ronaldo's review of literature on amaranth in North America, Plainsman kept coming up as one of the best varieties; however, in this trial it had the lowest production yield (1.1 lbs per 100 plants) germination (30-40%) and poor vigour. It was also the shortest variety, and it bloomed earlier so it was the driest to harvest.

The **Grain Amaranth** from Richters Herbs was the earliest variety to flower and the highest yielding with 6.25 lbs per 100 plants, and was the highest rated variety overall. Which also made it the highest rated variety overall. However, it was not uniform as some plants had different flowering patterns than others. Some had a branching form compared to the majority that had one main stock. Some of the branching plants did not have seeds present. The seeds of this variety had longer bracts and the flower was a bit 'spiny' that was very evident when harvesting by hand. This could mean that this variety is more closely related to its wild relative.

Burgundy Amaranth from Greta's Organic Gardens was the only true dark red variety as well as the

only with presence of caterpillars but no major damage. This variety was one of the later to flower. At the time of harvest, this variety was not completely dry but the frost made it look like it. This could have been the reason that it only yielded 1.9 lbs per 100 plants.

Opopeo Amaranth from Annapolis Seeds is an heirloom from Opopeo, Mexico. Ronaldo noted that "it has the perfect trait mix from a red and green variety (perhaps a cross of *A. hypochondriacus* and *A. cruentus*)". This variety bloomed late and was not completely mature when harvested. It yielded 3.0 lbs per 100 plants.

Atitlan Dorado was the only *A. cruentus* variety. This variety came from Guatemala with Ronaldo and Myriam and it was the first time it was grown in Canada. Because it is a long season variety, it was one of the varieties that flowered later, and was not completely dry when harvested. However, it had the second best yield with 4.25 lbs per 100 plants. Ronaldo and Myriam gave this variety the second highest overall rating.



Table 2. Yield and overall rating of the six varieties of amaranth in this screening trial. Without replication, they don't know if the observed differences among varieties hold true.

Variety Name	Yield <i>Pounds of seed per 100 plants</i>	Overall Rating (1=poor 5=excellent)
Plainsman	1.1	2
Grain Amaranth	6.25	5
Burgundy Amaranth	1.9	2
Opopeo Amaranth	3	3
Atitlan Dorado	4.25	4

TAKE HOME MESSAGE

Rony and Myriam observed differences among the five varieties of amaranth. With only one replication of each variety, however, they don't know if the differences they observed are reliable, or if they happened by chance and would not occur again. Understanding the limitations of unreplicated trials, they used the observations from this screen trial along with their intuition as experienced amaranth growers narrow their variety selection for future evaluation to Grain Amaranth and Atitlan Dorado.

NEXT STEPS

After years of growing amaranth in the highlands of Guatemala, this screening trial allowed Ronaldo and Myriam to see how amaranth performs in southern Ontario and also gave them an idea of what varieties they'd like to use in a replicated trial in the future. They would grow **Grain Amaranth** and **Atitlan Dorado** again.

Join Ronaldo for a workshop on small-scale amaranth growing, harvesting, and processing for food in January 2021! He will also talk about the cultural importance, the nutritional value, and agronomic potential of this crop. See efao.ca/events for details in the new year.



Photo 2. Ronaldo in the field at harvest time.



Photo 3. Myriam threshing seed heads.



Photo 4. A bowl of popped grain amaranth ready for eating.

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