Leaf Amaranth Variety Trial

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Introduction

The origin of amaranth cultivation is at least 8000 years ago in the Americas, where it was grown mainly for grain. When Spanish conquistadors came to the Americas in the 1500s, they prohibited amaranth production, and to this day it is not a major crop in the region. However, after the 1500s, amaranth was carried around the globe, and production was both as a grain crop and a leaf/vegetable crop. Today, leaf amaranth (*Amaranthus tricolor*) is a popular food crop throughout Asia, Africa, China, and the Caribbean (Figure 1). While leaf amaranth is not common in most regions of the U.S., it is popular at farmers markets in some areas (Figure 2), especially in regions where immigrants are concentrated. The market for leaf amaranth has potential to grow due to its high nutritional value – it is rich in protein, iron, vitamin A and C, and minerals − and its ability to thrive in hot temperatures.

Green leaf amaranth is traditionally eaten as a cooked vegetable, much like spinach, and may also be eaten fresh, though it can be somewhat bitter. Red leaf amaranth may have potential as a baby leaf salad green as it may be faster growing than beet greens. In Washington, leaf amaranth may have potential as a new crop, especially in urban areas with ethnic populations. However, western Washington has cooler average summer temperatures than regions where leaf amaranth has been demonstrated to grow well. A study in Fort Valley, GA found that ideal soil and air temperatures for amaranth growth are 25^{o}C, and that maximum leaf biomass was produced when the crop grew during the hottest part of the summer. In order to gather information about how amaranth performs in a region with cooler temperatures, this preliminary study was conducted. In this study, the days to first harvest and yield of 26 varieties of leaf amaranth were measured at WSU Mount Vernon NWREC in summer 2016.

Materials and Methods

Leaf amaranth was grown on a raised bed with black plastic mulch and drip irrigation. Fertilizer (Nutri-rich, D. Stutzman Farms, Canby, OR) was applied to the soil on 3 May at 80 lb N, 20 lb P and 40 lb K per acre, prior to bed shaping. Plants were also fertilized via drip irrigation (Drammatic One, Dramm Corporation, Manitowoc, WI) 6 times during the growing season at the rate of 4.5 lb N, 4.5 lb P and 1.1 lb K per acre per application. Total fertilizer application was 107 lb N, 47 lb P and 46.6 lb K per acre. Drip irrigation was applied from 22 July to 1 September, at the rate of 0.34 gallons per minute per 10 feet, with a total of 3.24 inches of water applied over a total of 11 applications.

Plots were a single raised bed 10 feet long, and were direct seeded on 10 June, 2016. Each variety was randomly assigned to a plot, and half a gram of seed of each variety was scattered by hand as evenly as possible into 6 planting holes per plot, arranged in a single row spaced 8 inches apart, then seeds were covered lightly with soil. The exceptions to this planting method were the varieties Green Calaloo, Red Calaloo, Skao Duen, and Mercado, which were seeded in

a 5 foot row (plastic mulch was cut open and pegged) (Figure 3). Plants were first harvested when they were 6-8 inches tall, and were cut about 3 inches above the soil surface. Plots were harvested 3-6 times based on plant growth, on 8, 21 and 29 July, and 9, 24 and 31 August. At the first harvest of each variety, the number of plants was counted.

Results and Discussion

First harvest date for 17 varieties was 28 days after seeding, and these varieties were harvested a total of 6 times with an average yield of 412 g per harvest and an average total yield of 2.5 kg (Table 1). First harvest date for 6 varieties was 41 days after seeding, and these varieties were harvested a total of 5 times with an average yield of 295 g per harvest and an average total yield of 1.5 kg. First harvest date for 2 varieties was 49 days after seeding, and plants were harvested a total of 4 times with an average yield of 93 g per harvest and an average total yield of 370 g. First harvest date for 1 variety was 60 days after seeding, and plants were harvested a total of 3 times with an average yield of 53 g per harvest and an average total yield of 160 g.

Of the 9 green varieties, the average yield per harvest was 390 g, and the average total yield was 2.2 kg. The 2 green and red varieties (on the same plant, some leaves were entirely green and some were entirely red) had an average yield of 214 g per harvest, and average total yield of 1.2 kg. The 10 green/red (varigated) varieties had an average yield of 340 g per harvest, and average total yield of 2.0 kg. The 5 red varieties had an average yield of 337 g per harvest, and average total yield of 2.0 kg.

Of the 17 varieties first harvested 28 days after seeding, the average plant count at harvest was 105 plants. Of the 6 varieties first harvested 41 days after seeding, the average plant count at harvest was 28 plants. Of the 2 varieties first harvested 49 days after seeding, the average plant count at harvest was 28 plants. Of the 1 variety first harvested 60 days after seeding, the plant count at harvest was 4 plants.

Table 1. Days to first harvest, number of harvests, average weight per harvest, plant count at first harvest, and leaf color of 26 leaf amaranth varieties at WSU Mount Vernon NWREC in 2016.

Variety	Days to First Harvest	Number of Harvests	Avg Wt / Harvest (g)	Plant Count	Leaf Color
Aurelia's Verde	28	6	513	40	Green
Golden Giant	28	6	324	72	Green
Green Calaloo	28	6	663	143	Green
Green Thumb	28	6	455	197	Green
Juana's Orange	28	6	441	145	Green
Mercado	41	5	459	18	Green
Orange Giant	28	6	238	77	Green
Skao Duen	60	3	53	4	Green
White Leaf	41	5	363	11	Green
Opopeo	28	6	332	13	Green&Red
Poinsettia Mix	49	4	97	6	Green&Red
Dreadlocks	28	6	324	97	Green/Red
Elena's Rojo	28	6	454	64	Green/Red
Elephant Head	28	6	377	194	Green/Red
Love Lies Bleeding	28	6	289	43	Green/Red
Love Lies Bleeding Green	28	6	345	59	Green/Red
Miriah	41	5	405	25	Green/Red
Pygmy Torch	28	6	352	177	Green/Red
Red Beauty	49	4	89	2	Green/Red
Red Calaloo	28	6	506	141	Green/Red
Red Leaf	41	5	257	91	Green/Red
All Red Leaf	41	5	207	16	Red
Hopi Red Dye	28	6	607	171	Red
Molten Fire	41	5	79	9	Red
Oeschberg	28	6	422	63	Red
Red Garnet[1]	28	6	368	91	Red

[1] Red Garnet was from 2 seed sources, and each was planted in a separate plot. Both plots were first harvested on the same day, and the average weight per harvest and plant count are presented here.

Figure 1. Leaf amaranth in Mozambique in October 2016.

Figure 2. Leaf amaranth for sale at a farmers market in San Francisco, CA in August 2016.

Figure 3. Two planting methods, holes and row, for leaf amaranth at WSU NWREC in 2016.

Figure 4. Examples of amaranth varieties: (A) green-leaf Orange Giant, (B) green and red-leaf Poinsettia Mix, (C) green/red-leaf Miriah, (D) red-leaf Oeschberg.