UK COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY — COLLEGE OF AGRICULTURE

Grain Amaranth

Introduction

Amaranth is a versatile warm-season, broadleaf plant that can be grown as a grain, ornamental, leafy vegetable, or forage crop. In the U.S. it is grown almost exclusively for its grain, which is produced on large, brightly colored seed heads. Most grain amaranth grown in the States is *Amaranthus hypochondriacus*; however, *A. cruentus* is grown to a lesser extent.

The seeds are high in lysine, fiber, and protein; low in saturated fats; and gluten-free. Amaranth can be ground into flour, popped like popcorn, or flaked like oatmeal. Because many of amaranth's uses are similar to that of cereal grasses, amaranth is often referred to as a pseudo-cereal. Products containing amaranth include breakfast cereals, granola, crackers, breads, cookies, and other flour-based products. Amaranth grain can also be used as a feed ingredient for poultry if a heat treatment is applied to it prior to feeding.

Marketing

The main wholesale amaranth buyers in the United States at the date of this publication are: Arrowhead Mills in Texas, Health Valley in California, and Nu-World Amaranth in Chicago. Transportation costs to these markets would be excessive for production in Kentucky. Because the largest consumer of amaranth is the health food industry, growers may be able to tap into that local market, including health food stores and restaurants. Since amaranth is gluten-free, it can be used as a wheat-substitute for those with a gluten allergy. Some growers in other states market bags of grain or ground flour directly to consumers and local bakeries needing a gluten-free product.

Market Outlook

One of the major drawbacks to amaranth production is the small market. However, amaranth is increasing in favor with people wanting gluten-free products. Prospective growers should consider amaranth production only after they have identified and locked in a market, and preferably have a written contract in hand. Growers with storage facilities could have a marketing edge. Additionally, organic and transitional organic growers may be in a better position for marketing their grain. The best opportunity for marketing amaranth in Kentucky could

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be for growers willing to process their own grain and develop a direct marketing strategy targeting interested customers.

Production Considerations

Cultivar selection

Amaranth can grow to a height of 2 to 8 feet, depending on the species and cultivar. Varieties may differ in flower, leaf, and stem coloration, with maroon and crimson as the most common colors. There are a limited number of varieties available, most notably some early Rodale lines (such as K432) and later a University of Nebraska Experiment Station release (Plainsman). Plainsman is available through certified seed channels.

Site selection and planting

Amaranth prefers fertile, well-drained soils and will not tolerate poorly drained soils. Since it is initially a poor competitor with weeds due to its slow growth, amaranth should not be planted in fields with difficult-to-manage noxious weeds. Amaranth works well in a rotation with corn and soybeans. However, sites with possible triazine carry-over should be avoided due to the potential for injury. Amaranth is related to pigweeds, waterhemp, and Palmer amaranth, so herbicides that control those weeds may injure amaranth.

Due to the small seed size, amaranth can be difficult to establish in a uniform stand. Plant into a tilled, fine, firm seed bed where there will be good seed-to-soil contact. A low 40 to 60 percent emergence rate is not uncommon. Adequate moisture is essential for rapid germination, emergence, and early growth of the small, fragile seedlings. Crusting soil can result in reduced emergence. Once established, amaranth is drought-tolerant.

Seeding rates vary from ½ to 4 pounds per acre; 2 pounds per acre is most often recommended. Research trials conducted in Missouri indicate this crop performs best at a row width of 30 inches. Amaranth shades the ground well at this spacing and the wide rows allow a row cultivator to be used for weed control. Compared to narrower spacings tested, the wider rows also provided the highest yields. Vegetable planters with small seed plates work well for this crop. Some growers seed amaranth using the in-furrow insecticide application boxes commonly found on row crop planters.

Pest management

Few diseases are known to cause serious crop losses in amaranth production. The most commonly reported diseases include damping-off and seedling blights due to *Pythium*, *Aphanomyces*, and *Rhizoctonia*. Stem cankers due to *Rhizoctonia* and *Phoma* have also been reported. Diseases are managed through proper site selection and by following good cultural practices; there are no fungicides labeled for use on amaranth.

Amaranth can tolerate considerable insect leaf feeding without affecting yields; however, blister beetles and alfalfa webworm have been known to cause economic losses in Missouri. Other insect pests identified on amaranth include tarnished plant bug (*Lygus*), flea beetle, and amaranth weevil. Although there are no synthetic insecticides labeled for this crop, various organic compounds can be used.

Weed management can be a challenge since there are no herbicides registered for amaranth. The first step in effective weed control is to avoid planting into fields with heavy weed populations, particularly pigweed and lambsquarters. Along with site selection, site preparation should be aimed at making sure existing weeds are under control prior to planting. Adjusting the planting date may aid in weed management. Once amaranth reaches a height of 10 to 12 inches, plants will be able to out-compete later emerging weeds. Cultivation and hand weeding are the primary methods for reducing weed problems during the growing season.

The lack of synthetic pesticides registered for amaranth coupled with the low disease and insect

pressure could make amaranth a good candidate for organic production.

Harvest and storage

Amaranth grain is usually harvested with a combine a week to 10 days following a killing frost. Because stems and leaves are high in moisture content, amaranth needs the hard freeze to aid in drying plants sufficiently for harvest. Otherwise the small seeds can be lost when they adhere to the wet plant material, as well as the insides of the combine. Waiting too long to harvest after frost can result in yield losses due to shattering and lodging. Cleaning grain prior to sale or storage is important. Amaranth grain needs to be dried to 10 to 12 percent moisture for storage in wooden bins or heavy duty paper bags.

Labor requirements

Labor needs are approximately 4 hours per acre. This may vary considerably according to the scale of production and handling time incurred by the producer.

Economic Considerations

Initial investments include land preparation and purchase of seed and fertilizer. Seed cleaning, transportation, and marketing costs may also be incurred by the producer.

Production costs for amaranth are estimated at $100 per acre, with additional harvest and marketing costs varying from $20 to $200 per acre, according to the market channel selected. Total expenses per acre, including both variable and fixed, would come to approximately $230 to $410. Presuming gross returns of $320 to $650 per acre, returns to land, capital, and management could range from $100 to $250 per acre. Producers should be mindful of the fact that, with few local wholesale outlets, markets will saturate quickly.

Selected Resources

- Amaranth (University of Kentucky) http://www.ca.uky.edu/smallflocks/Feed_ingredients/Grains.html
- Alternative Field Crops Manual: Amaranth (University of Wisconsin and University of Minnesota, 1989) http://www.hort.purdue.edu/newcrop/afcm/amaranth.html
- Amaranth (Agricultural Marketing Resource Center, 2011) http://www.agmrc.org/commodities__products/specialty_crops/amaranth.cfm
- Amaranth Production (ATTRA, 2003) https://attra.ncat.org/attra-pub/summaries/summary.php?pub=368
- Grain Amaranth (Kansas State University, 1990) http://www.agmrc.org/media/cms/mf953_8015982E8D7E7.pdf
- Amaranth: New Crop Opportunity (R.L. Myers, in *Progress in New Crops*, 1996) https://www.hort.purdue.edu/newcrop/proceedings1996/V3-207.html
- Market Opportunities for Grain Amaranth and Buckwheat Growers in Missouri (Missouri Department of Agriculture and Thomas Jefferson Agricultural Institute, 2003) http://www.agmrc.org/media/cms/MO0368_B0464844F26A0.pdf

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