

Amaranth is an ancient high-protein grain originating in Central America, but nowadays also found across Asia, Africa, and the Americas. It has a high nutritional value, containing 15-17% high quality protein [1], and it can thrive under adverse climatic conditions, particularly in dry climates [2]. In Northern Europe, it is not yet produced on a commercial scale and is often seen as a weed rather than a crop.

Crop Description

An annual crop similar to quinoa, with brightly coloured leaves and panicles that reach up to 2 m high. It produces seeds of 1-1.5 mm in diameter, ranging in colour from white to red to black [3]. As it is a new crop to Denmark, a number of Danish amaranth lines were tested at the University of Copenhagen.

- **Life cycle:** 5-6 months
- **Protein content:** 14-19 %
- **Yields:** 0.66-1.38 t/ha
- **TKV:** 0.6-0.83 g

Market Potential

Amaranth can be used both for grain (like quinoa) and as a leafy vegetable. Trials found that amaranth leaf can be used as a vegetable at up to 50% leaf harvest, with no damage to the grain yield, and improved nutritional qualities [2]. There is a potential niche market for provision of leaf amaranth to upmarket restaurants or vegetable box companies in Denmark. 43% of vegetarian consumers in Denmark would like amaranth to be included in more plant based foods [4].

Besides being consumed for food, it is also used as a fodder crop. Saponins can vary between amaranth species, so it is important to pick lines with low saponin levels for less processing requirements.

Amaranth is marketed as a health food in Denmark, as it is gluten free and high in protein. The grains seeds are available in a range of supermarkets. Currently most amaranth is imported from external markets, however, it has potential for production across Europe.

“A new, high quality protein crop for leaf and grain consumption.”



Challenges

Major diseases and pests: Amaranth is a new crop in Denmark so there are not yet approved methods for pest and disease control. However no significant losses from pests or diseases were observed in five years of trials in Taastrup.

Recommendations

Land preparation: Amaranth should be sown in a good seed bed of well-draining soil.

Soil types: Sandy clay soil of slightly acidic nature is recommended. It can tolerate moderate levels of drought [5].

Seeds: Amaranth traditionally has a long growth cycle, up to 6 months. The lines tested at the University of Copenhagen can adapt to the Danish growing season (April to October).

Sowing date: Early sowing is recommended, as soon as there is no risk of frost, as amaranth is frost sensitive [1]. Warmer, coastal areas of Denmark may be best suited to Amaranth production. Growing time was reduced by a month when sowed in mid-May compared to mid-April. No yield differences were observed when sowed in different dates.

Sowing depth and distances: Sowing at 50 cm row spacing allows for mechanical weed control, but narrower rows may help to reduce weeds. Sowing density 100 plants/m² and at 0.5 cm plant depth.

Fertilisation: Amaranth responds well to moderate fertilisation, of up to 90 kg/ha, or less if after legume production [1].

Harvesting: It is recommended to harvest before seed shattering begins, and to dry the grain as soon as possible. Harvest in mid-October if sowing took place between mid-April and mid-May.

Trial Results

Table 1. Data from University of Copenhagen field trials under a low input production system in Taastrup, DK.

Line name	Yield (kg/ha)	Protein (%)	TKV (g)	Seed colour
Maria	1377	17.5	0.82	Black
Katia	1235	15.0	0.81	Black
Cecilia	943	19.0	0.59	Red
Francoise	836	15.4	0.83	White

The table shows average results in Taastrup over 5 years, however 2 t/ha was the maximum yield achieved. Other trials in Aarhus University in 2012 achieved similar yields of 2 t/ha [6].

Summary of Benefits

- Dual-use crop (leafy greens and seeds)
- High quality protein ingredient with diverse food uses
- Increased popularity related to health benefits
- Adapted to Danish environment

References

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Note: Results of Protein2Food trials at Copenhagen University are in orange.

Trials were run from 2015-2019 in Taastrup under a low-input system



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