

Spinach Seed Production in Denmark

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Abstract

The Danish climate and soil conditions together with the very skilled farmers secure a quite unique quality spinach seed production. In 2005 the production area was close to 4,500 ha. Approximately 70% of the world's spinach seed is produced in Denmark. The seed is widely used all over the world for industry, fresh market and baby leaf.

Research within spinach seed production has been carried out for several years covering aspects such as irrigation, fertilisation, sowing methods, crop rotation, disease and weed control. In the latter case there is a constant need for research and efficacy evaluations of new products. In 2005 a new five-year programme focusing on seed quality in spinach was initiated.

Introduction

The history of Danish vegetable seed production is several hundred years old. In the beginning, the production mainly ensured self-sufficiency for the grower, but in the second part of the 18th century the market gardeners developed a more organised, commercial production.

Today, approximately 70% of the world's spinach seed is produced in Denmark. In 2000, spinach seed production was carried out on approximately 3,500 hectares, producing a total of 7-8,000 tonnes of seed. Figures in 2005 were close to 4,500 and the production area was further increased in 2006. Spinach is widely used for industry, fresh market and the rapidly increasing baby leaf market.

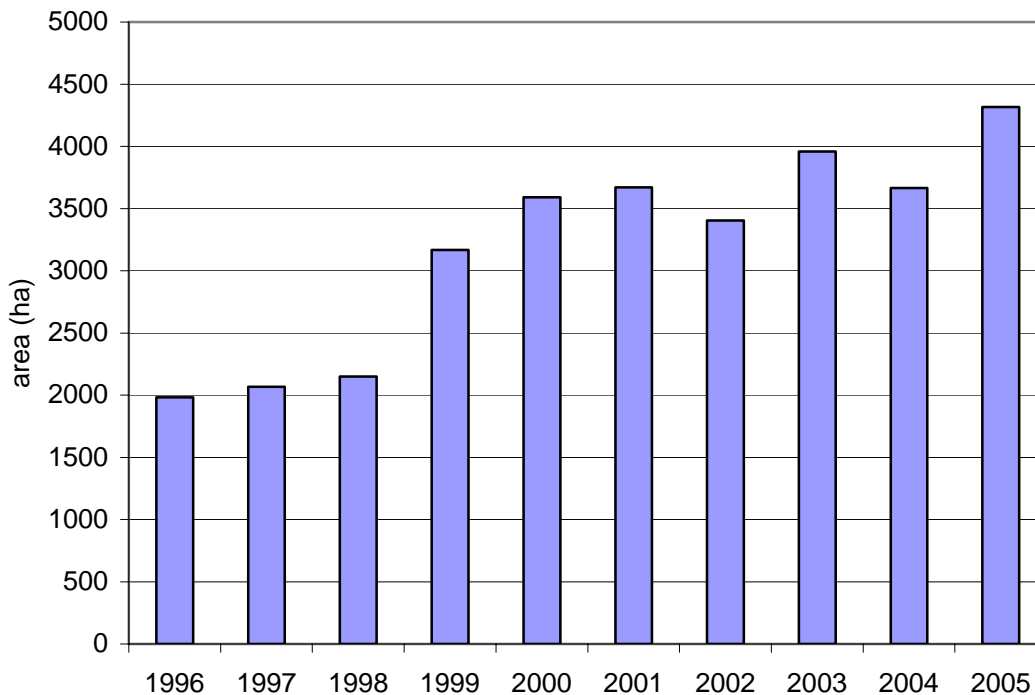


Figure 1. Danish area (ha) with spinach seed in the years 1996-2005.

Spinach seed production

There are several reasons why Denmark has this remarkable position within spinach seed production – climatic conditions, the soil, quality aspects, price, trust and last but not least – the farmers.

Breeding today focuses on late flowering varieties. The growing season in Denmark is characterized by long days and a cool coastal climate, which favours this kind of production. In the growing season the plants get 16-18 hours of daylight, with temperature averages of between 12-16° C and the monthly rainfall is 40-60 mm. The Danish soils are glacially created sandy loam soils – moraine soils originating from the last ice age 10,000 years ago. The pH value in these soils is quite high (7.5-7.8). These are all parameters, which, together with superior farmer competence, create an ideal environment for spinach seed production of the late flowering varieties.

Ninety percent of the production is with hybrids. The pollination of the hybrids is eased by the fairly long flowering period, and favoured by sowing the male lines 2-3 times. Since spinach is pollinated by wind, cross-pollination easily occurs, if isolation distances are not maintained. For open-pollinated varieties the demand is 1200 m between fields and for hybrids 1500 m between fields in the same group and up to 10,000 m between different groups. Open-pollinated varieties are only grown in the northwestern part of Denmark, where no hybrids are grown.

Isolation of the cultivars has not been a problem. Most of the production is carried out on the islands or is divided between round or prickly-seeded species in selected areas.

The quality demands are very high. A maximum of three weed seeds are allowed in a sample of 250 grams and no soil or plant material is allowed in the sample. The purity must be 99.9%. Most companies in Denmark clean their spinach seeds by additional use of a colour cleaner.

Research approaches

More formalised research within spinach seed production began in 1948 at the request of the Royal Danish Agricultural Society. For the last ten years, research within production methods has been co-financed by the seed industry. A new five-year programme on seed quality has been initiated in 2005.

During recent years much work has been done within chemical control of weeds. Many well-known products have been taken out of production and there is a need for new products.

Investigations on when and where spinach can be placed in the crop rotation has had a high priority. The relative seed yield is found to decrease the more frequent spinach occurs in the crop rotation, mainly due to the propagation of root-pathogenic fungi. The recommendations from the trials are a crop rotation with 5-6 years between two spinach seed crops.

Irrigation during flowering has been found to have an important effect on the seed quality, and could improve seed yield by approximately 500 kg ha⁻¹ in dry years.

A series of trials with different nitrogen management strategies supported earlier trials on optimum nitrogen amounts.

Trials with organic seed production showed that the seed yield was reduced by 1/3 compared with conventional farming.

New research programme

Recent investigations have shown a remarkable yield increase by the use of Opera (pyraclostrobin 133 g a.i.l⁻¹ + epoxiconazol 50 g a.i. l⁻¹) and Signum (pyraclostrobin 67 g a.i.l⁻¹ + boscalid 267 g a.i. l⁻¹). However, no clear effect on the seed quality was found.

Seed quality will be the focus of a new research programme initiated in 2005.