Ekhaga slutrapportering - vetenskaplig rapport

Ekhaga diarienummer: 2003-36, del tomat, se brev 2003-10-14

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Effect of nitrogen form and supply on plant product quality: Vitamin C and antioxidants in tomato

Abstract
To meet Swedish environmental goals organic farming will play an important role in the development of a sustainable and high quality food production system. However, several conflicts exist, such as the achievement of high yields without the use of chemical fertilizers or pesticides and the minimization of nutrient losses.
In this thesis the effect of organic fertilizers compared to mineral fertilizers on plant product quality was investigated. Tomato yield and quality aspects such as taste and chemical composition were measured. Three greenhouse experiments were performed at the Swedish University of Agricultural Sciences in Uppsala during 2002 and 2004. Organic fertilizers, based on chicken manure or fresh grass clover mulch, were compared to mineral fertilizer nutrient solutions with ammonium or nitrate as the dominant nitrogen source. In both years yields from the mineral fertilized tomato plants were higher than from the organic fertilized ones. However, plant nitrogen status was similar for all treatments and the limiting nutrient in the organic grass-mulch treatment appeared to be sulphur, as the addition of mineral sulphur increased the yield. The effects on quality appeared to be more complex. While taste test scores and vitamin C contents in 2002 were highest in the organic or ammonium-fertilized tomatoes and lowest in the nitrate-fertilized tomatoes, in 2004 the results were contrary.
Taste is a complex quality aspect, affected by sugars, acids and other secondary compounds (aromatic flavour compounds), which apart from nutrient supply are affected by environmental conditions as sunlight and temperature that are beyond the grower's control. It was concluded that organic or mineral fertilizers are not the major factors affecting yield and product quality. A balanced nutrient supply is important for yield and quality, irrespective nutrient source. A combination of organic and mineral fertilizers should be considered in order to achieve a resource saving and balanced nutrient supply and a high quality tomato yield.

List of publications:

Thesis:

Heeb, A. 2005. *Organic or Mineral Fertilization - Effects on Tomato Plant Growth and Fruit Quality*. Doctoral thesis No. 2005:73, Faculty of Natural Resources and Agricultural Science, SLU.
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This thesis is based on the following papers:

I. Heeb, A., Lundegårdh, B., Ericsson, T. & Savage, G.P. 2005. Effects of nitrate-, ammonium-, and organic-nitrogen-based fertilizers on growth and yield of tomatoes. *Journal of Plant Nutrition and Soil Science* 168, 123-129.

II. Heeb, A., Lundegårdh, B., Ericsson, T. & Savage, G.P. 2005. Nitrogen form affects yield and taste of tomatoes. *Journal of the Science of Food and Agriculture* 85, 1405-1414.

III. Toor, R.K., Savage, G.P. & Heeb, A. 2005. Influence of different types of fertilisers on the major antioxidant components of tomatoes. *Journal of Food Composition and Analysis*, ***in press***.

IV. Heeb, A., Lundegårdh, B., Savage, G.P. & Ericsson, T. The nutrient balance of both organic and inorganic fertilizers affects yield, taste and nutritional quality of tomatoes, ***accepted after revision in*** *the Journal of Plant Nutrition and Soil Science*.