AN EVALUATION OF THE INFLUENCE OF BIODYNAMIC PRACTICES INCLUDING FOLIAR-APPLIED SILICA SPRAY ON NUTRIENT QUALITY OF ORGANIC AND CONVENTIONALLY FERTILISED LETTUCE (*LACTUCA SATIVA* L.)

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Abstract

Evidence for the role of silica in plants is reviewed with respect to the application of silicate based sprays in biodynamic agriculture. There is research indicating improved resistance to pests, disease, drought and other stresses on plants from application of silica fertilisers and sprays. There is also evidence of improved nutrient uptake.

Experiments with field grown lettuce were undertaken to evaluate the effects of the biodynamic field-spray preparations and organic composts on lettuce yield, nutrient uptake, nitrogen metabolism, antioxidant activity and soil organism activity. Higher fresh yields of field lettuce were observed with organic composts than with a mixture of diammonium phosphate and calcium ammonium nitrate applied at similar N and P application rates.

Although lettuce yields were higher when the compost and plants were treated with biodynamically prepared silica sprays, the variation in lettuce fresh yield in the field was high (c.v. 28%) and the effects of the sprays were not statistically significant (p 0.05). Irrespective of fertiliser source, composts or soluble fertiliser, silica sprays produced lettuce at harvest (47 DAT) with higher dry matter content and crude protein in fresh leaves. However, application of silica spray had no statistically significant effect on lettuce fresh head yield, N uptake, plant sap nitrate concentrations, NO_3 to TKN ratio, and amino acid content.

Further investigation of management practises, such as the use of biodynamic field sprays, which may contribute to nutrient uptake and assimilation and improved product quality within an organic system, is recommended.

Keywords: Biodynamic; organic; compost; lettuce; light absorption; nitrate; protein; silica;

Introduction

Adoption of organic and biological systems is increasing, as farmers recognise their contribution to farming sustainability and because they can often obtain price premiums for certified organic produce. Organic producers work with whole systems. This involves many factors such as climate, improving soil conditions, and cultivation timing, rather than treating a crop independently of its surroundings. One of the reasons for adopting an organic system is that many people assume that using an organic system should lead to more nutritious plant and animal products. However, from numerous comparative research trials that measured product nutrient content, results have been very variable and inconclusive. Some reasons for this are the many factors involved in managing whole systems, including soil type, climate, planting and harvest date, all of which can affect nutritional value irrespective of farming system (Bourne, 1994). Past studies have used different methodologies; some compared the whole system of growing over a number of years, whereas many others compared different treatments of various organic and soluble fertilisers (Woese *et al*., 1997). Further consideration is needed of what management factors within a whole system might make a difference to nutritional value, and what parameters should be measured to assess this.

Bloksma *et al*. (2001) investigated many plant growth and food quality parameters in apples, and they postulated that good food quality requires integration of the growth processes that result in high yield and the differentiation processes that lead to fruit and seed production and formation of secondary metabolites (e.g., antioxidants). Most organic growers focus on growth processes through improving soil health, whereas a biodynamic system works with both these growth processes; and with the wider environmental influences of planets and stars on plant differentiation and quality.

A biodynamic system incorporates organic practises such as composting to build and maintain soil health. These are supplemented with applications of biodynamic preparations. Some of these preparations are