

Improving Fertilisation Strategies in Organic Apple Cultivation

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Abstract

Organic fertilisers for apple production are multi-nutrient fertilisers that may cause nutrient imbalances in the production system. We carried out investigations on new organic fertilisers to assess their suitability for apple cultivation with the goal of more balanced fertilisation. We compared biogas digestates, compost, peas, clover grass pellets and silage to commonly used horn grit, vinasse and an unfertilised control in 2018 and 2019 in an apple orchard near Lake Constance. No significant differences were detected with regard to fruit quality and yield. Highest values of mineral nitrogen in the soil could be seen in the digestates and the peas in May.

Keywords: apple, fertilisation, nitrogen mineralisation

Introduction

The fertilisers used in organic fruit production contain non-target nutrients in different ratios, which often do not match the nutrient output by the harvested products. Nutrient imbalances in the system are the consequence (Möller & Zikeli, 2018). The aim of our current research work is to find suitable, locally available, organic fertilisers for apple production, thereby contributing to a balanced and therefore more sustainable system.

Material and Methods

The trial was set up in 2018 at the Competence Centre for Fruit Growing at Lake Constance (KOB) and will continue until the end of 2020. Apple trees (variety Santana on rootstock M9) were fertilised at a target-level of 25 kg N ha⁻¹ at red bud stage in both years with biogas digestates, compost, clover grass pellets and silage, as well as winter and spring peas. These treatments were compared with horn grit, vinasse and the unfertilised control. Peas were sown in the tree row in October or March, respectively, and mulched in April. Soil samples were taken once a month in the tree row for mineral N (N_{min}) and S (S_{min}) measurements. Yield per tree was measured on five trees per repetition. Fruit quality parameters were determined, leaf and fruit samples were analysed for nutrient content.

Results and Discussion

In 2018, apple yields were comparatively low due to the high temperatures and intensive thinning (Figure 1). Sugar content and fruit firmness were higher than the target value for the variety (data not shown). Compared to 2018, fruits had a lower sugar content and an advanced starch degradation in 2019 (data not shown). There were no significant differences in the fruit quality and yield level between the fertilizer treatments in both years. However, the trend indicated that peas as N source (incorporated into the soil) showed the lowest yield levels.

N_{min} in the soil showed two peaks during the year – in May and August – with highest values per year in August 2018 and May 2019. Due to the weather in 2018, mineralisation was

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restricted early in the year due to shortage of soil water, while in 2019 more nitrogen was released in spring.

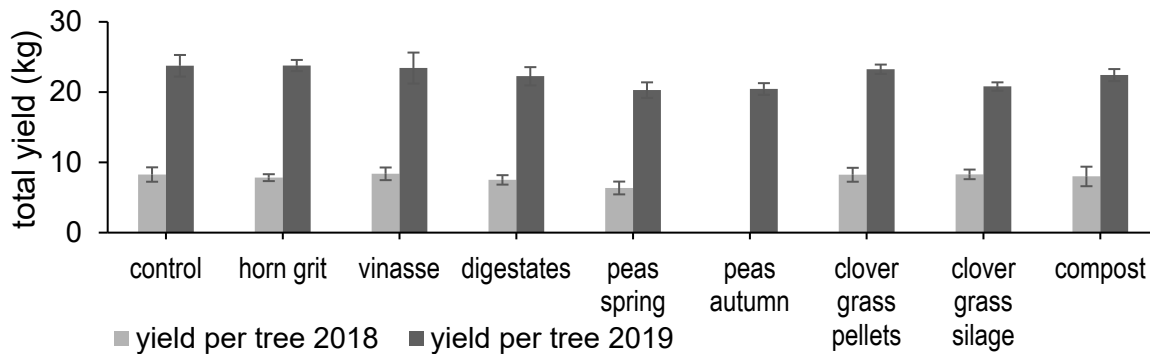


Figure 1: Yield per tree of both years with different fertilisation treatments. Peas autumn were first sown in autumn 2018 (n=4, \pm SE).

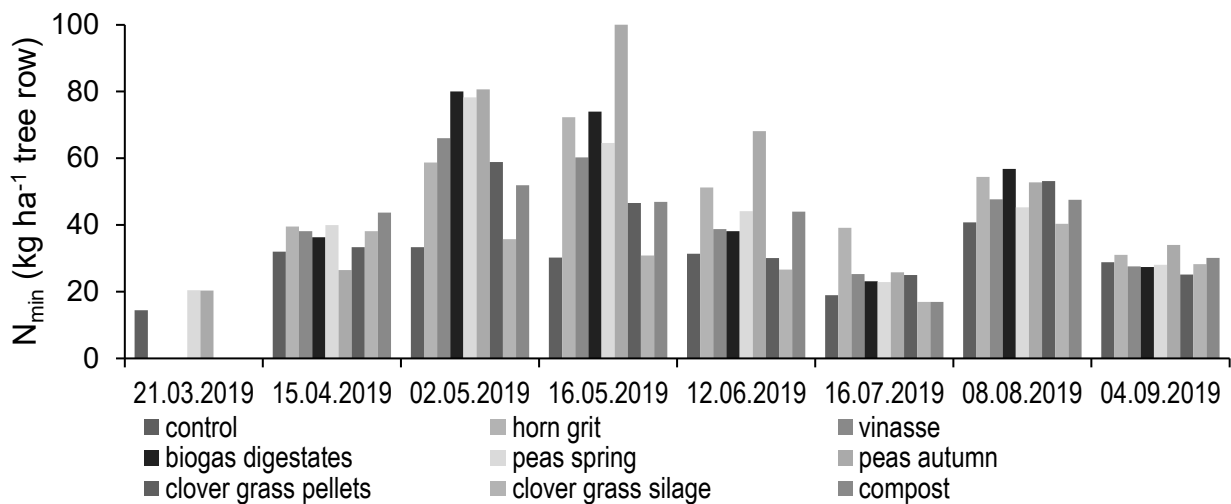


Figure 2: Mineral Nitrogen in the soil over the growing season 2019 in the different fertilisation treatments (n=4).

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