

The effect of effective microorganisms on yield and quality of peas

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Introduction

Effective microorganisms (EM) comprise a mixture of live cultures of microorganisms isolated from fertile soils in nature that are useful during crop production. The principle of EM is to increase the bio-diversity of soil microflora, thereby increasing crop yield. Photosynthetic bacteria, the major components of EM, are reported to work synergistically with other microorganisms to provide the nutritional requirements of the plant and to reduce disease. EMs interact with the soil-plant ecosystem to suppress plant pathogens and agents of disease, to solubilise minerals, to maintain soil microbial-ecological balance, and to fix biological nitrogen. The aim of present investigation was to evaluate the effect of EMs on the yield and chemical composition of peas.

Materials and methods

Experiments were carried out in the fields of at Estonian Crop Research Institute in 2014. In present investigation field pea variety 'Mehis' was grown.

Treatments: 1. with EM – 1:500 activated EM solution; 2. control – with water. In EM variant the plants were sprayed with EM 1:500 solution from 21.05.2014 to 25.06.2014 with weekly intervals. The plants in control were at the same time sprayed with water.

A completely randomized experiment design was used with 4 replicates. Plot size was 10 m². Soil humus content was 3.15% and pH was 5.76. Soil type was soddy-calcareous podzolic soil according to the Estonian classification system, soil texture - sandy-clay. The preceding crop was winter rye. Conventional cropping system was used with ploughing in autumn 2013, and cultivation twice before sowing. Seeds were sown on 28 April 2014 at a rate of 120 seeds per m² for all varieties and a depth of 4 cm. Plant spacing was 12.5 × 6.7 cm.

Fertilization was done with Yara Mila 7-12-25 (300 kg ha⁻¹) and weeds were controlled by Activus 330 (pendimethalin 330 g L⁻¹) EC 1.5 l ha⁻¹ + Basagran 480 (bentazon 480 g/l) 1.5 l ha⁻¹, on 21 May 2014. No control measures against insects and diseases were applied.

The weather during 2014 was characterized by a cold spring. Peas were harvested on 11 August 2014, dried and the yield data (determined at moisture content of 14-15%) recorded for each plot and finally calculated for t ha⁻¹. Samples were analyzed for their content of nitrogen, phosphorus, potassium and magnesium. Analyses of variance were carried out on the data obtained using the program Excel. Statistics was carried through with ANOVA using Excel and differences were deemed to be significant at $P < 0.05$.

Results and discussion

In most cases EMs increased the yield of vegetables crops (Olle and Williams 2013). Similarly in our investigation the yield of peas increased by 43% in the EM variant compared to the control treatment. Accordingly Olle (2013) found that the yield of Swedes increased by 27% and the yield of red beets by 31% in the EM treatment compared to control.

Application of Ems increased the nitrogen content increased by 2%, which can be explained by a higher nitrogen uptake from the soil solution (Subadiyasa 1997). The phosphorus, potassium and magnesium content increased by 28%, 8% and 12% respectively in the EM variant. EMs help to solubilize soil minerals (Subadiyasa, 1997) thus promoting a higher nutrient uptake of crop plants.

Conclusion

Effective microorganisms (Ems) increased yield and nutrient content of peas. Yield increases after EM application have been found in most investigations with agricultural crops. A higher nutrient content can be explained by solubilisation of soil minerals which is of special interest with respect to nitrogen.

Acknowledgements

This investigation was part of the project EUROLEGUME. It received funding from the EU 7th FP for Research, Technological Development and Demonstration under grant agreement no. 613781.

Literature

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