

First field experiments using biocyclic humus soil for processing tomato and sweet potato

By Lydia Eisenbach

At the Agricultural University of Athens a new research field has been introduced by comparing yields and other quality relevant characteristics between crops cultivated in humus soil and ordinary soil, while adopting different cultivation methods such as organic (biocyclic vegan) and conventional.

During the 2017 growing season from May till September a field experiment was conducted at the organic experimental field of the Agricultural University of Athens. In the experiment, which took place on a big 145.8 m² site, Processed tomato and sweet potato were used to evaluate the effects of humus soil on total yield parameters and other physicochemical characteristics. Processed tomato was chosen because it is an important crop for the Greek food industry, and there is also an increasing interest in organic production. Sweet potato was selected because it is a relatively new crop for Greece with a growing demand for exports, especially of organic quality. It is also important to note that this has been the first experiment in Greece cultivating sweet potato.

It is also the first time that humus soil has been tested in a field experiment, and thus the purpose of the trial was to get first indications of how crops react to being cultivated on humus soil - this helps to design future research. Humus soil is characterised as a mature compost which has gone through a post-maturing process. The stability of this material creates the possibility of directly growing young plants and seedlings as it is very root-friendly.

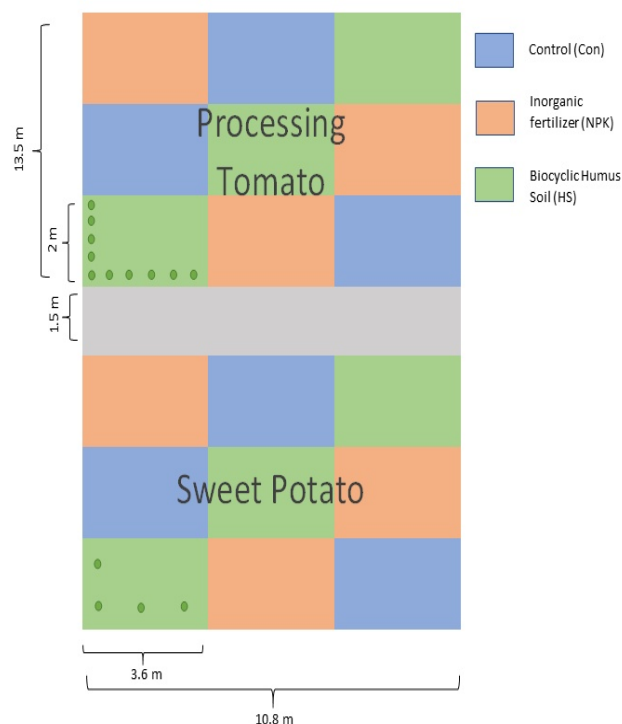
According to the Biocyclic Vegan Standards all materials used for the production of humus soil should be of plant origin. In this experiment biocyclic humus soil - which consists of olive pomace (30%), olive tree leaves (50%) as a by-product of olive mills equipped with two-phase centrifugal decanters, grape marc (10%) and ripe humus soil (10%) - was used to derive a mature compost of rotting degree V. After a windrow composting procedure, a post-maturing process was followed for three years to obtain a substrate maturity. In this soil-like stadium humus soil can be used especially in horticulture for direct planting, which is an essential point according to the Biocyclic Vegan Standards.

Three fertilisation treatments were used for both plants: the

first one with the biocyclic humus soil, the second one was an inorganic fertiliser in form of urea (42-0-0) and the last one was an untreated control. Inorganic fertiliser was applied in a quantity corresponding to 200 kg N/ha and a quantity of 8 and 15 litres of biocyclic humus soil for each tomato and sweet potato plant respectively. The soil of the experimental field is characterised as clay loam (29.8% clay, 34.3% silt and 35.9% sand) with pH (1:1 H₂O) 7.29.

The trial was arranged in a Completely Randomised Design with three replications, which means that nine experimental plots (7.2 m²) were used for every plant. The experimental design is shown below.

Tomato seedlings were planted on 5th May in a density of 60 x 40 cm and harvested on 18th August. Sweet potato slips



(rooted sweet potato two-leave cuttings) were planted into their end position on 8th May in a density of 120 x 60 cm, and sweet potato tubers were harvested on 22nd September (137 days after planting).

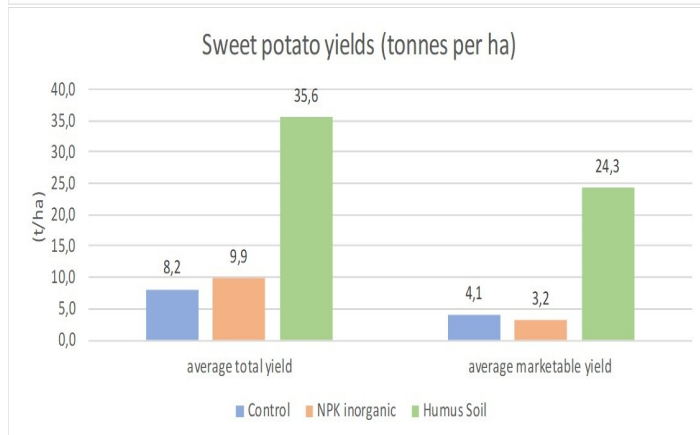
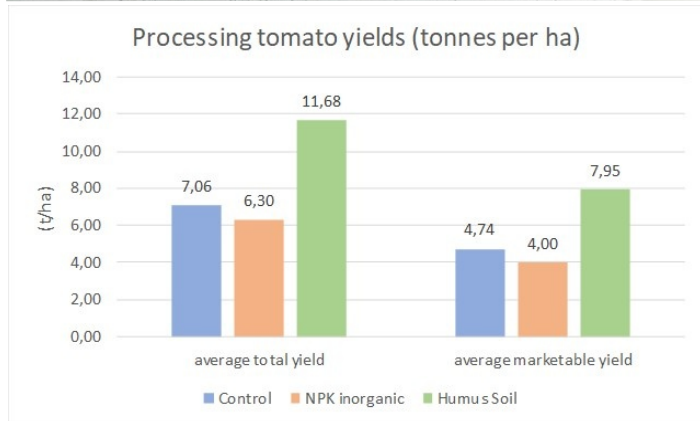
During the experiment, among others, total and marketable yields of tomato and sweet potato were measured but also some quality parameters referring to processing tomato as

Tomato field 13/06/2017





Harvested sweet potato plant (humus soil)



fruit firmness (kg/cm^2), Total Soluble Solids ($^{\circ}\text{Brix}$, Titratable Acidity (% citric acid w/w).

For the sweet potato tubers, compression and puncture tests were performed to determine their texture, and the total content of nutrients as Nitrogen (N), Potassium (K), Iron (Fe), Calcium (Ca) was measured.

Statistically the most significant differences between the treatments were observed for total and marketable yields for both plants with a remarkable advantage for the plants growing with humus soil. For processed tomato an average yield of 7.95 t/ha for the humus soil treatment falls into the conventional average yields in Greece for the period 2004-2015 which were between 6 and 9 t/ha. The big difference in yield between sweet potato grown in humus soil and sweet potato treated conventionally probably has to do with the fact that the structure of soil, which is a clay loam soil, was too compact for the cultivation of sweet potato, a disadvantage which has been compensated by using humus soil as substrate while substituting soil.

This experiment shows us that it is worth developing further research to generate more knowledge about both - the usage of humus soil in agriculture and the characteristics of humus soil as such.

Summarising the above findings, we can state that the use of humus soil results in higher yields in comparison with conventional fertilisation.

Another aspect of using humus soil is that it can compensate for adverse growing conditions with certain crops, eg sweet potato in an inadequate soil environment. This trial was part of the master's thesis of Lydia Dorothea Eisenbach and the bachelor's thesis of Charikleia Zisi at the Institute of Agronomy in the department of Crop Science, and Prof. Dimitrios Bilalis took on the scientific supervision of the survey.

Special thanks have to be addressed to all those who helped to implement the project, and especially to the Biocyclic Park in Kalamata for providing the humus soil, the company D. NOMIKOS S.A for providing the tomato seedlings, and also the Institute of Food Technology, Hellenic Agricultural Organization-Demeter (N.AG.RE.F.) for their cooperation.

Further results of the research regarding sweet potato will be published soon in the AgroLife Scientific Journal, or please contact Lydia Dorothea Eisenbach at lydia.eisenbach@gmail.com

Charikleia Zisi and Lydia Dorothea Eisenbach holding sweet potato tubers

