Use of biodiesel byproduct in agriculture

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Contaminated glycerol as a byproduct from biodiesel production is available in increasing amounts. The conventional utilization of glycerol can not be substantially increased, therefore investigation of alternative ways of useage should be searched for. The contamination content of the glycerol byproduct mainly consist of useful materials from plant seeds and potassium hydroxide catalyst, which enhance potassium structure of soil and compensate soil acidity. Methanol can also be present as a toxic substance, which is used for transesterification. Glycerol such as sugars represents an easily accessible source of energy for microorganisms in soil. It is well known that if nitrogen poor organic matter (e.g. straw) added into the soil, it can cause, trough assistance of microbes, temporary reduction of the nitrogen supply. This could inhibit plant growth.

The aim of our experiments was to examine how the soil nitrogen management can be regulated by a biodiesel byproduct which contains glycerol. For this purpose a pot experiment was established with ryegrass (*Lolium perenne* L.). Our research has not only studied the impact of biomass productions, but variations in the rate of plant growth as an effect of different treatments were observed as well.

In our previous investigations we found that glycerol and byproduct which contains glycerol are significantly delayed the plants emergence, slowed down the growth and decreased the amount of avaible green mass which can be seen on Fig. 1.

We examined the effect on germination as well. We have found that the increasing glycerol and byproduct concentrations increasingly inhibit the germination.

In this work we have examined the change of the growth inhibition ability of the glycerol and byproduct for different periods of incubation.

The following figures show that without incubation (Fig. 1.), after 1 week incubation (Fig. 2.), after 2 weeks incubation (Fig. 3.) and after 3 weeks incubation (Fig. 4.) how the different amount of glycerol treatment influences the growth of ryegrass.

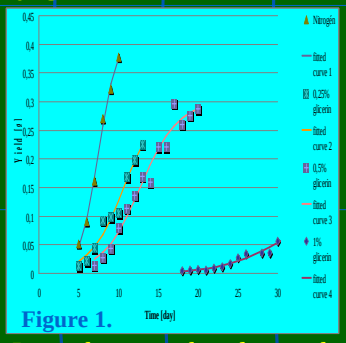


Figure 1.

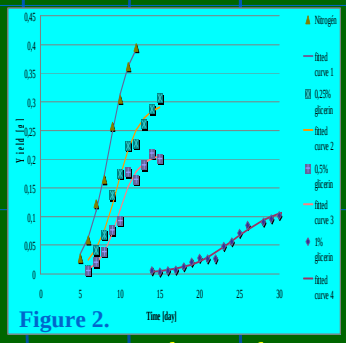


Figure 2.

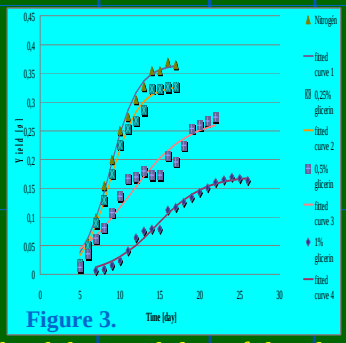


Figure 3.

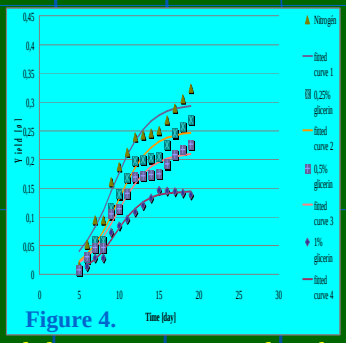


Figure 4.

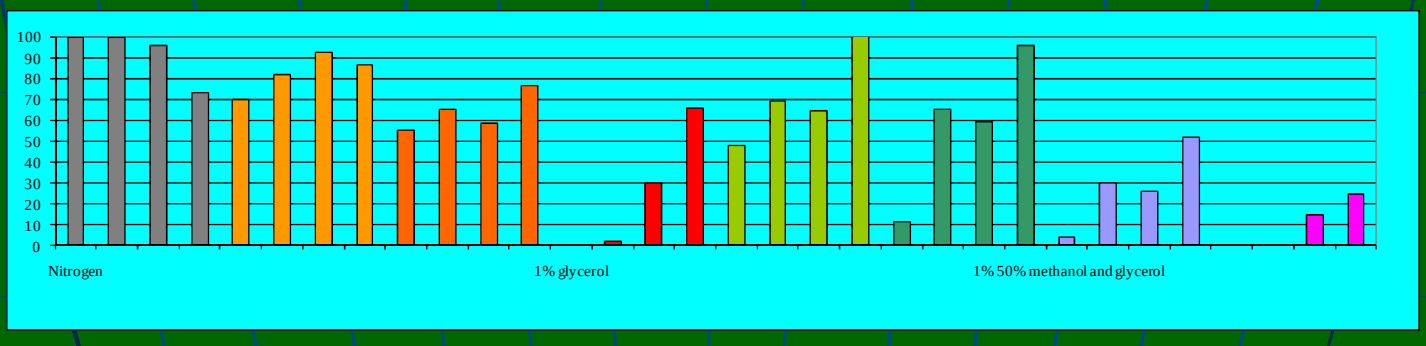
It can be seen that due to the increasing incubation the growth inhibition ability of the glycerol decreases compared to the nitrogen-treated control group.

A logistic function was fitted to the measured points, which is the corresponding model to describe the growth of plant green mass.

$$y = \frac{A}{1 + e^{-k \cdot (t - t_0)}}$$

y	is the yield of ryegrass (g)
A	is the maximum of yield (g)
k	is the growing constant
t	is the elapsed time from sowing(day)
t0	is the day of maximum growth

The effect of all applied treatments can be seen on Fig. 5. Here the achieved produce is shown expressed in the percentage of the control treatment at the end of the second week after the sowing.



Based on our investigations we found that the soil nutrient management can be effectively regulated by industrial byproduct glycerol usage to soil.

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