

Testing the effect of refined glycerol by-products on improving nutrition ability of soils

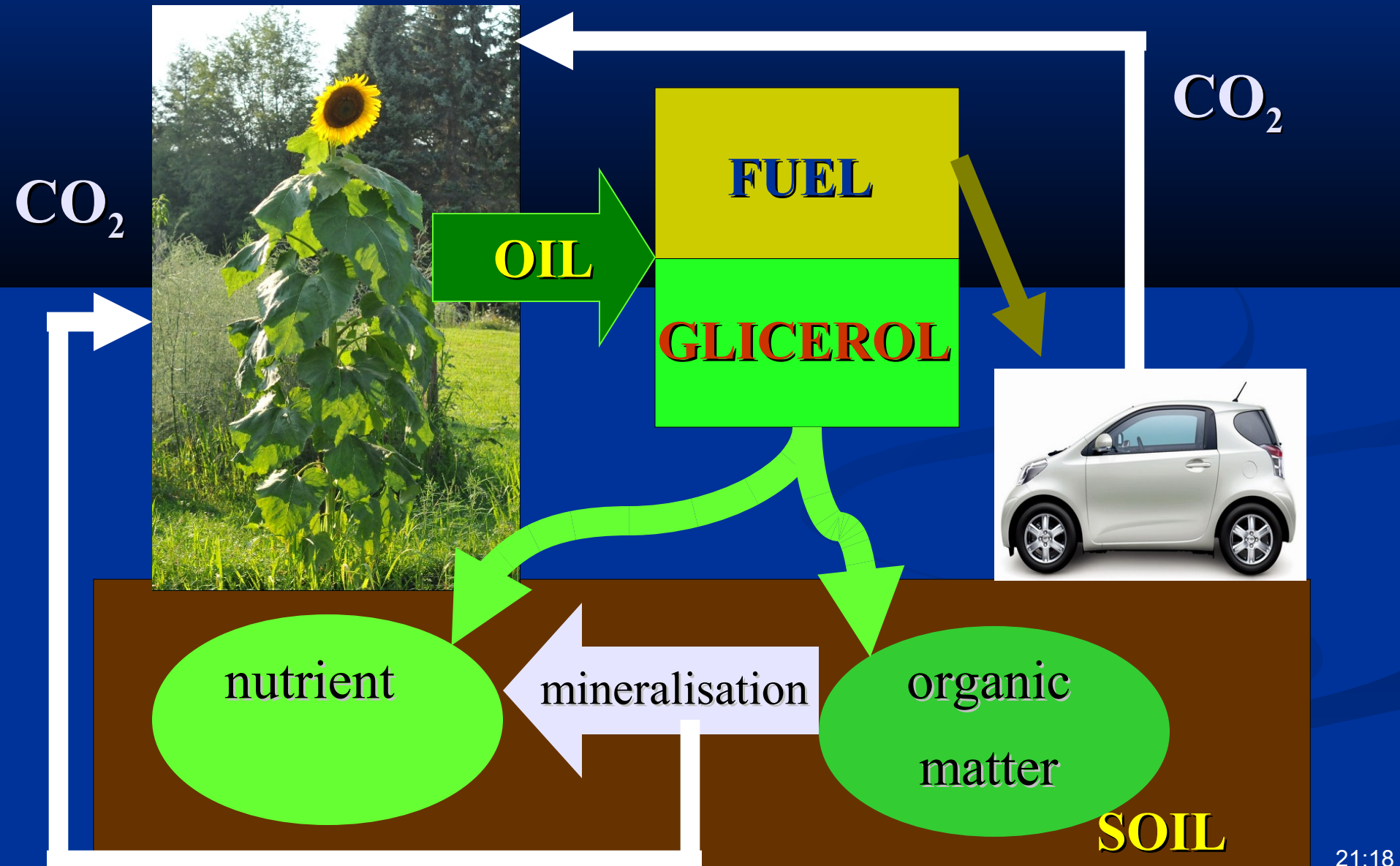
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Kata Tolner^A



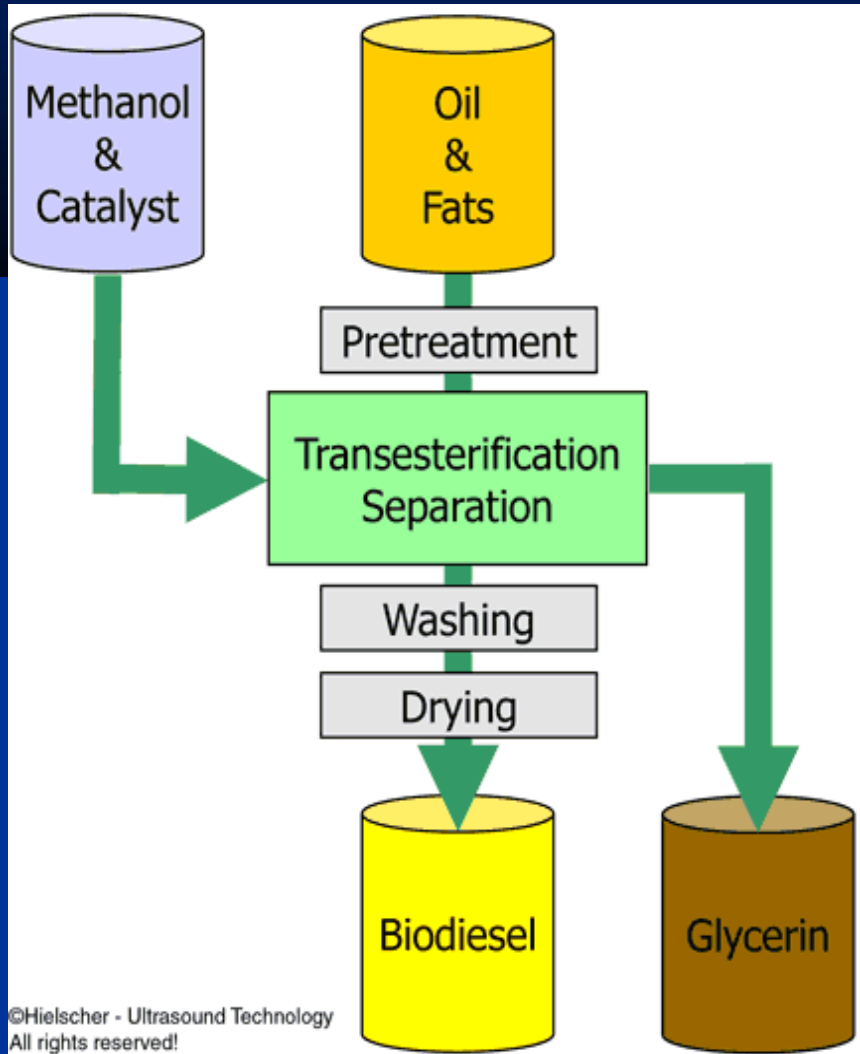
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Sustainable BIODIESEL product



Glycerol phase & plant nutrients



All not oil soluble materials are in the glycerol phase

■ N

proteins, mineral forms

■ P

phospholipids, organic phosphates

■ K

salts, catalyst (KOH)

Aim of our research

Hypothesis:

The Glycerol can be one of the important nutrients to microorganisms in the soil.

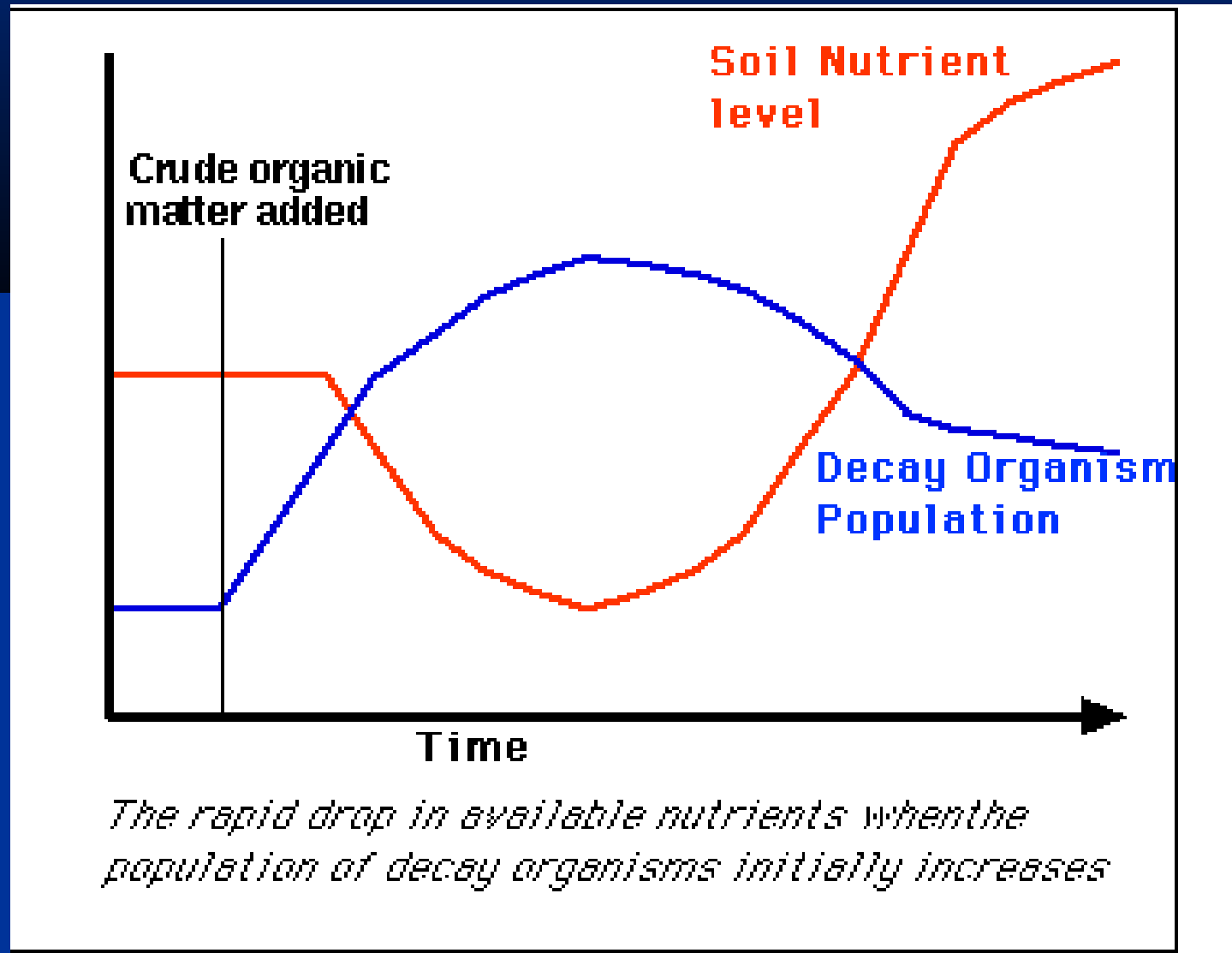
The residual Methanol is toxic.

Objectives:

- **Glycerol as microbial feed,**
- **Methanol as a bactericid,**
- **N,P,K content of glycerol phase as nutrients**
- **Directed in the soil have a strong effect on the nutrition providing abilities of the soil.**

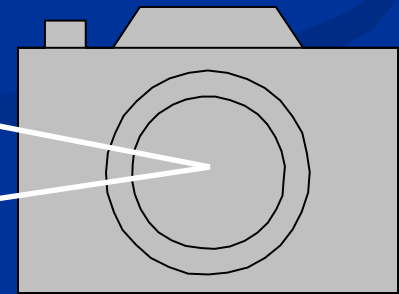
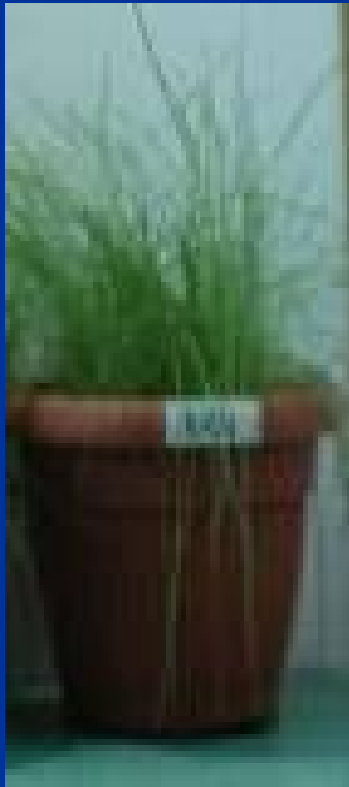
EXACTLY what is this effect ?

If the C/N rate of the fresh material moves on a wide scale, the nitrogen gets temporary immobilized



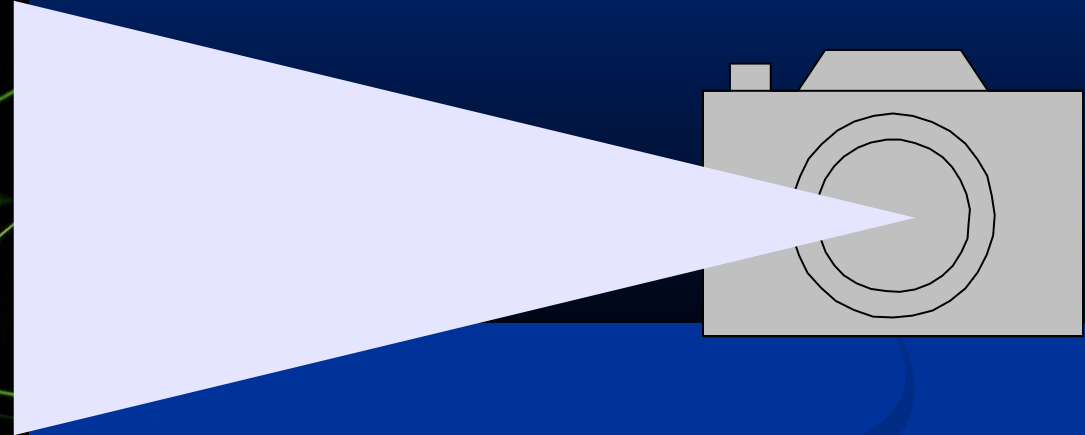
METHODOLOGICAL development

- For measuring plants grow, we developed a method, to avoid destruction of plant samples.



- Photo taken every second days

METHODOLOGICAL development

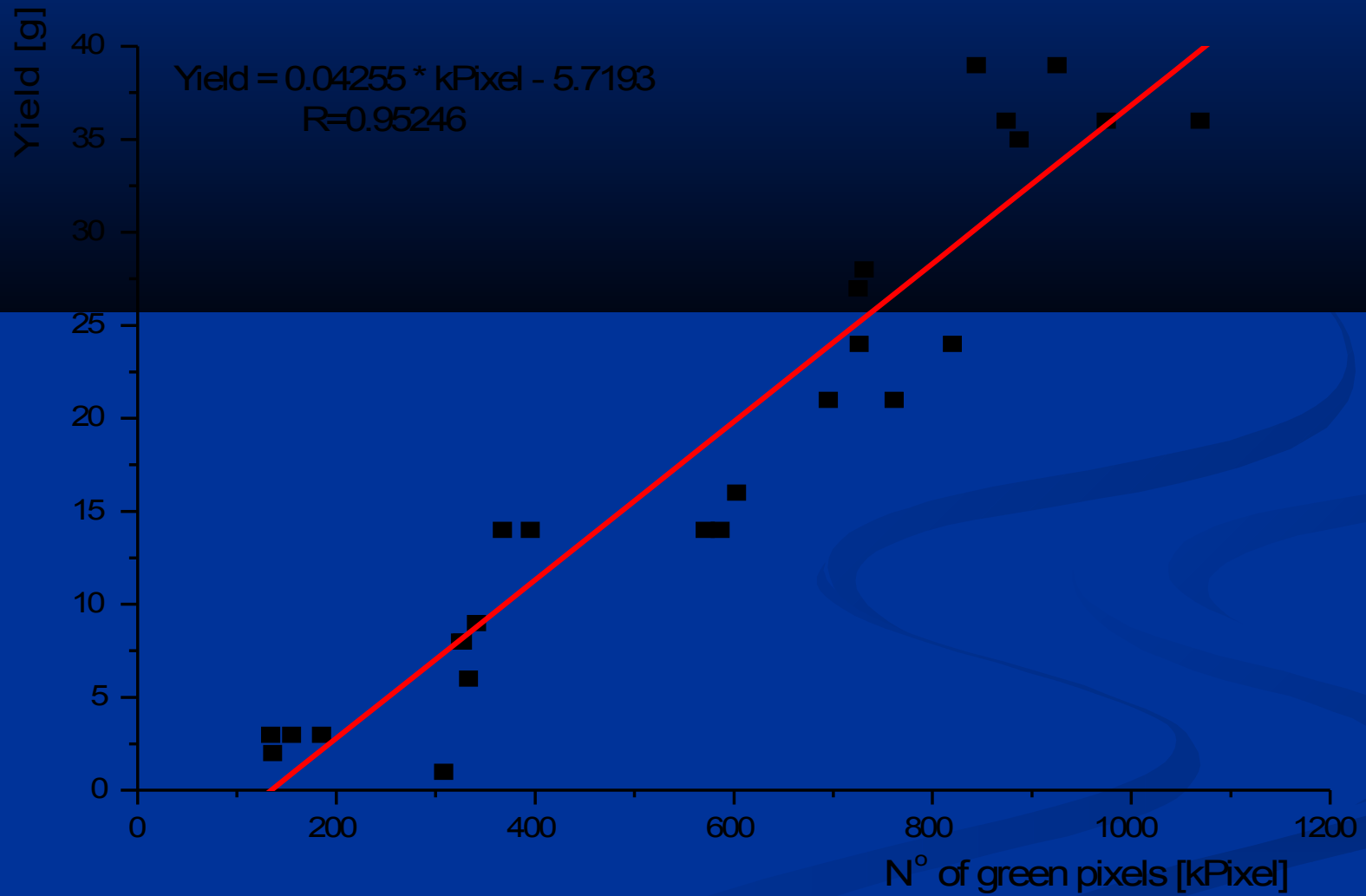


- Pictures of the pots with the growing plants were taken. Pots are placed in a container frame and pictures are captured from eight angles (45°)
- A computer program was developed to calculate the number of green pixels in front of a black background

Calibration

- 4 replications ($4 \times 10 = 40$ pots)
- 10 times taking photos and cutting four pots (4., 6., 8., 10., 12., 14., 16., 18., 20., 22. days)
- Calculation of the green pixels
- Drying the plant samples and measuring their weights
- Linear regression analysis between the green pixel number and mass of yield

Calibration



Glycerol experiment

- Calcareous sandy soil
- Continuous watering to maintain 60 % of saturation percentage
- Taking picture in every second days
- Calculation the green pixels
- Calculation the yield using the calibration function
- Investigation of 1m KCl soluble N content of soil

Glycerol experiment

Treatments:

PK: 100 ppm P_2O_5 and K_2O as KH_2PO_4 and K_2SO_4 ,

NPK: PK + 100 ppm N as NH_4NO_3 ,

Glycerol: NPK + 0,5 % C as glycerol,

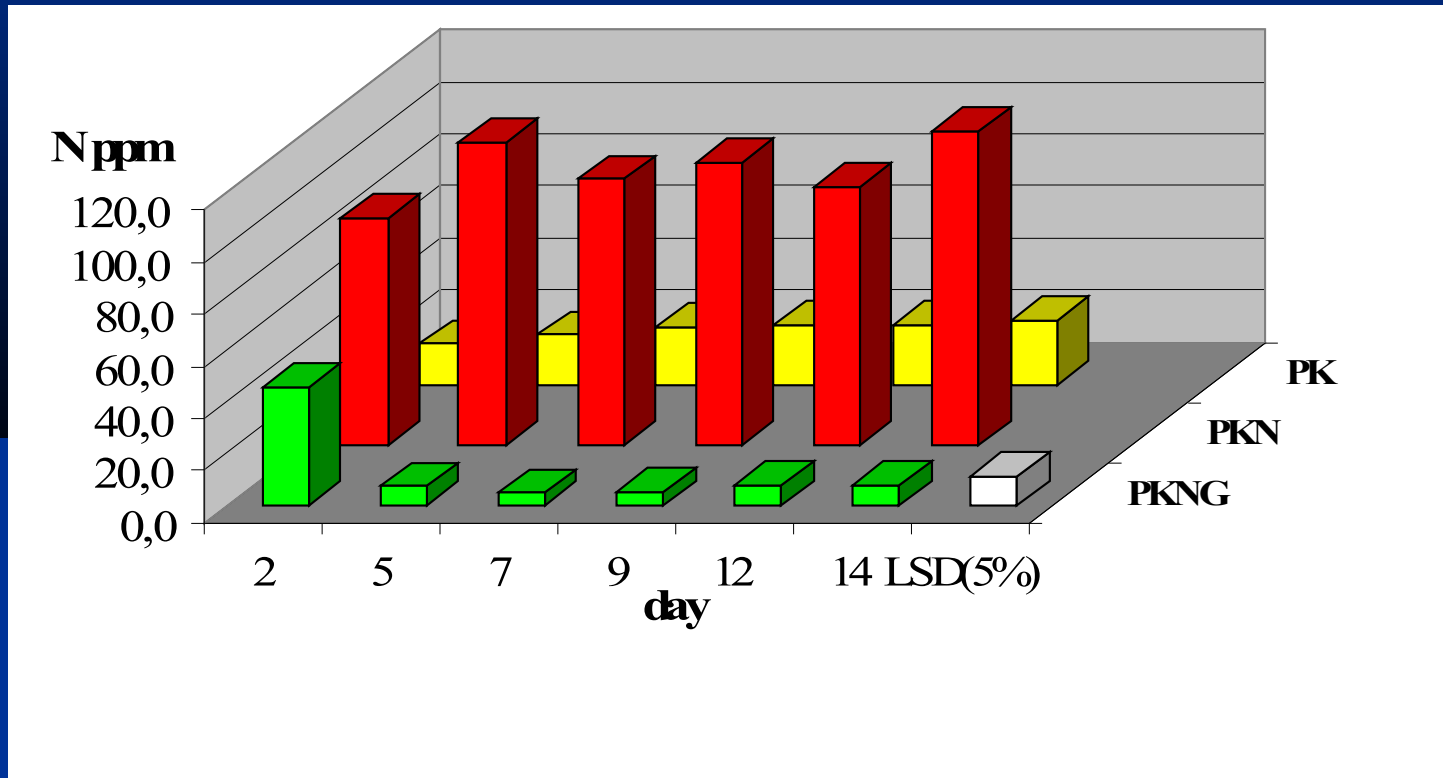
By-prod.: NPK + 0,5 % C as by-product,

Methanol: NPK + 0,5 % C as methanol,

G50-M50: NPK + 0,5 % C as glycerol(50%) and methanol(50%),

G85-M15: NPK + 0,5 % C as glycerol(85%) and methanol(15%).

Results – Soil N analysis



More organic compounds (glycerol)

→ Number of microorganism is increasing

→ The soil N is significantly decreasing

Without glycerol the 1m KCl soluble Soil-N does not decrease in two weeks experiment

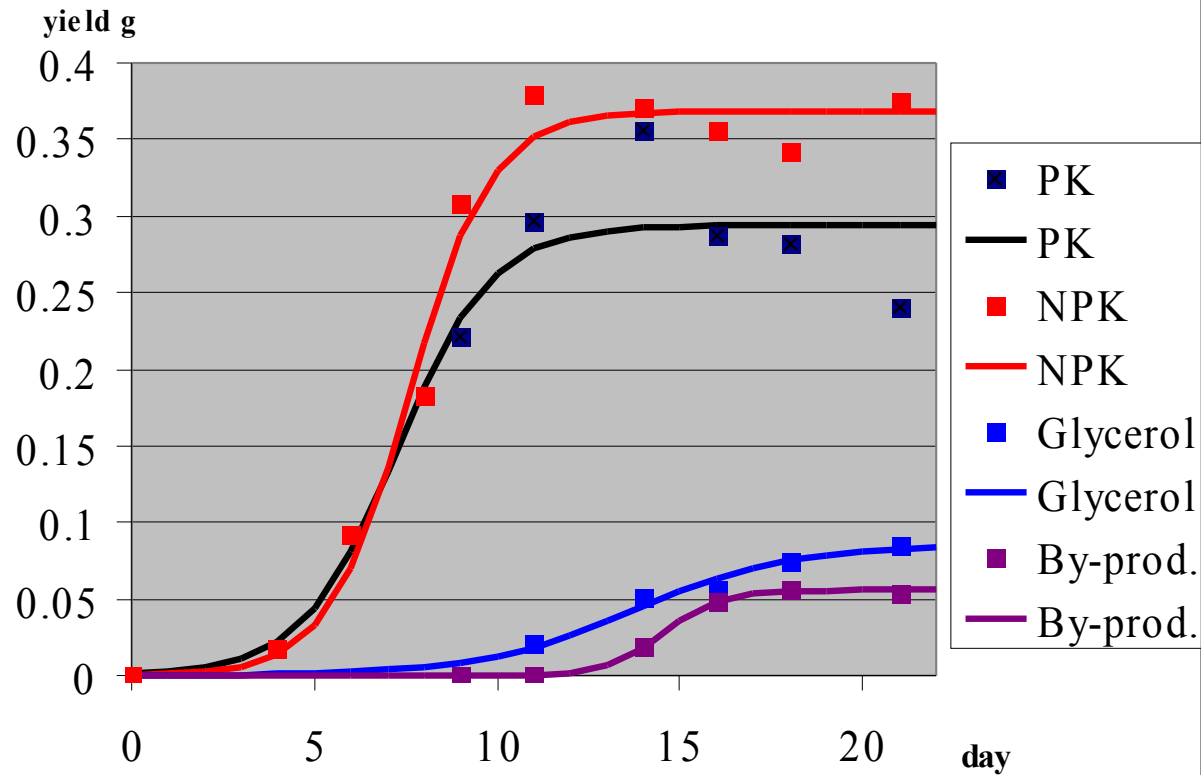
Results-Fitted function for yield

- Logistic function
- A - maximum yield [g]
- k kinetic parameter [day⁻¹]
- t₀ time of maximal grow [day]

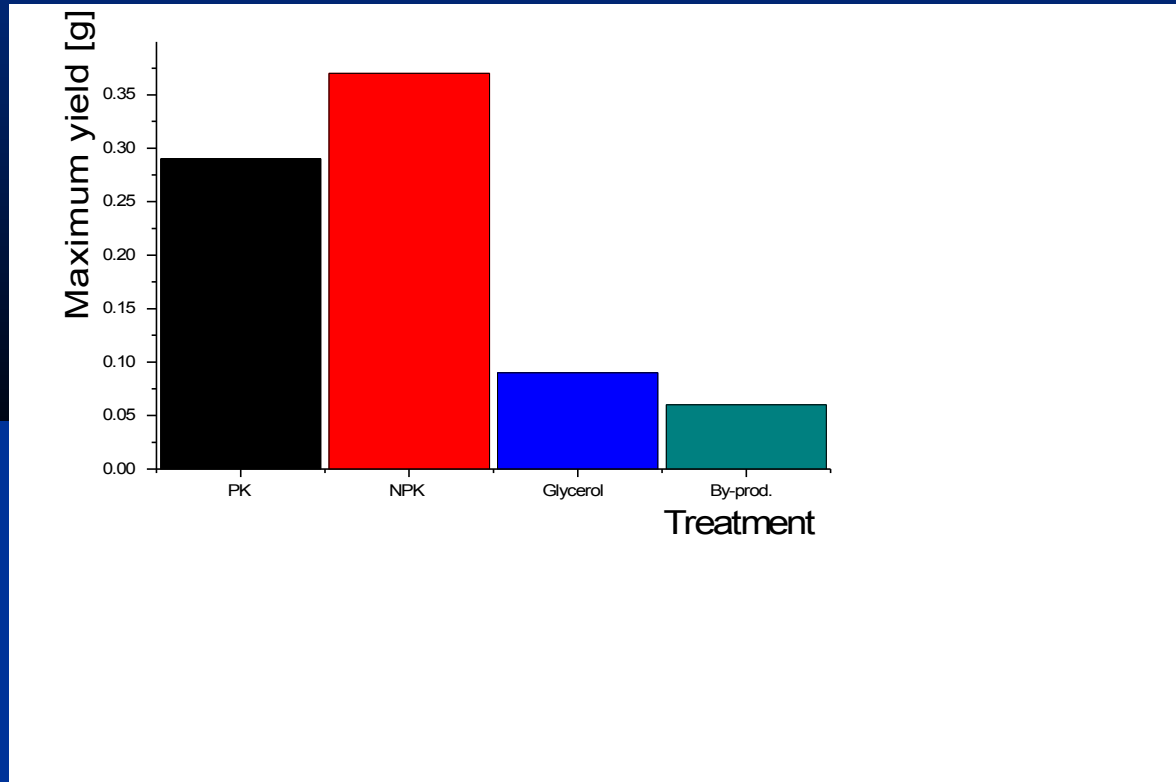
$$Y = \frac{A}{\left(1 + e^{k^*(t - t_0)}\right)}$$

	PK	NPK	Glycerol	Metanol	G50-M50	G85-M15	By-prod.
A	0.29	0.37	0.09	0.25	0.29	0.28	0.06
k	-0.77	-0.90	-0.47	-0.70	-0.49	-0.68	-1.29
t ₀	7.25	7.60	13.75	7.01	7.77	9.88	14.54

Results-Effect of glycerol



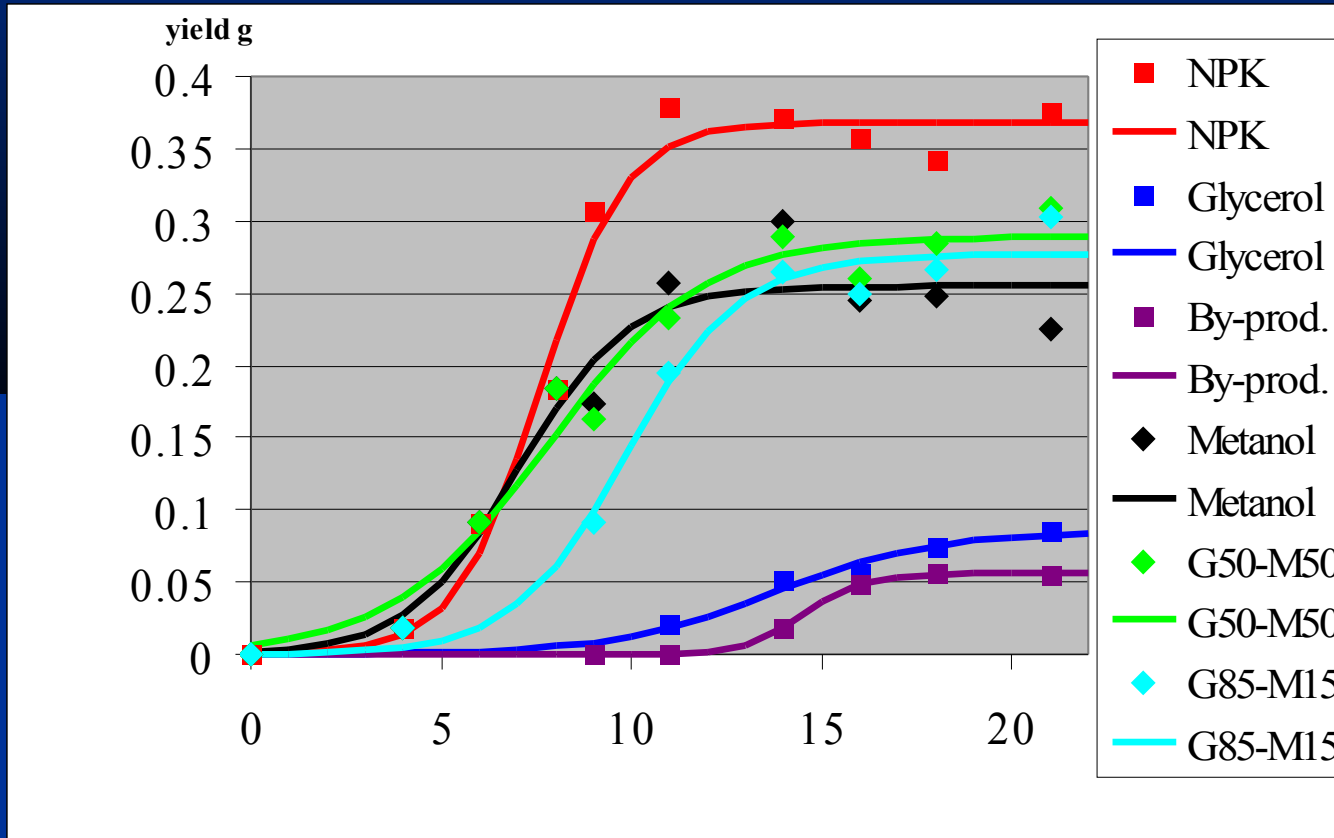
Results-Effect of glycerol



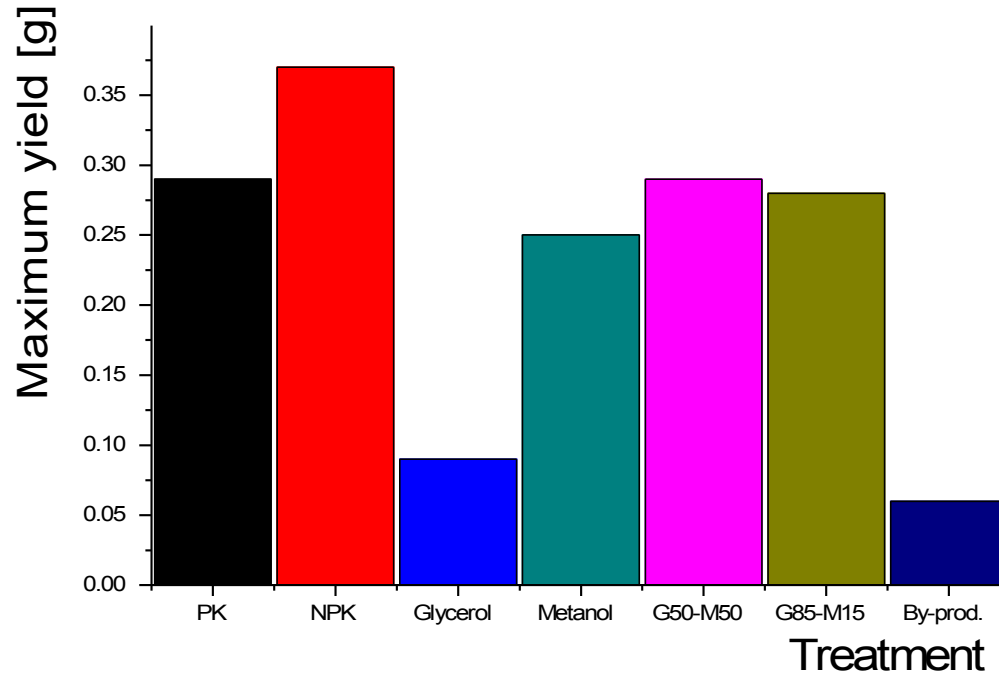
More organic compounds

- Number of microorganisms is increasing
- The available N to soil is decreasing
- The plant growing rate and the yield in given time are decreasing (t_0)

Results-Effect of glycerol-methanol mixtures



Results-Effect of glycerol-methanol mixtures



- The glycerol and by-product are decreasing the plant growth
- Methanol is **toxic to microorganisms**, there is no decreasing effect
- In G-phase by-product experiments **there was no microbial toxic effect of methanol observed**

CONCLUSIONS

- Plant production is temporarily decreasing as an effect of Glycerol treatment. The water soluble Soil-N is decreasing, because microorganisms consume the available N in soil.
- Methanol alone or mixed with glycerol inhibit the growth of microorganism therefore decreasing the plant depressing effect.
- In experiments with by-product there is no toxic effect of methanol, as a conclusion this constituted the most important influence: methanol controls microorganisms hunger for nitrogen and there remains available soluble N for plants.

CONCLUSIONS

Is this effect harmful ????? It is not sure !

- The immobilized nitrogen is prevented for leaching and after the death of microorganisms it is available again for the plants.
- It is important for the plant nutrition, and environmental protection.

Just we have to know it, and use it adequately



Thank you for your attention