



“ProEMgen” – a new technology for greater efficiency in various economic sectors using EMF (pulsed electromagnetic fields)

- ▶ Presentation
- ▶ **Inter-Trade Praha spol. s r.o.**

ProEMgen — EMF GENERATOR



EMF applications using the “ProEMgen” generator



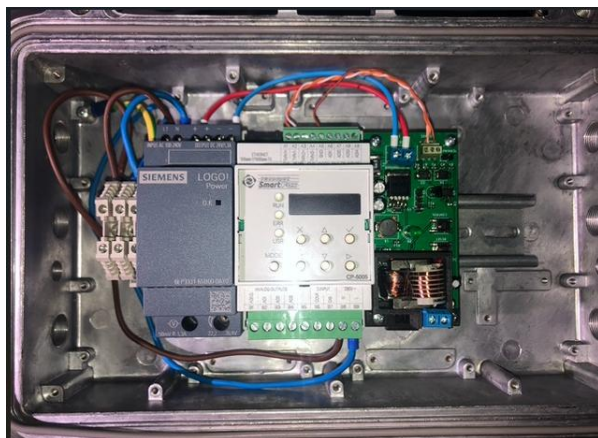
An affordable solution for:

- increasing chlorophyll levels in plants in field and greenhouse conditions and maintaining them under stress,
- accelerating germination of seeds of various crops: cotton, wheat, oats, barley, cucumbers, poppy and soybean,
- increasing root and shoot growth (weight) in favourable conditions and under stress,
- improving nitrogen (protein) uptake and content in plants and seeds,
- increasing yield and growth quality.

Automated and remote control of the EMF system using the ProEMgen generator

- The potential for automated and remote control of the EMF system using the ProEMgen generator will lead to further improvements in remote control to meet practical application requirements in future versions:
- adding a humidity sensor (and other necessary sensors)
- adding a LoRaWAN radio module for wireless communication
 - for generator installation in greenhouses or in the field
- adding consumption monitoring to detect possible problems and faults

MODIFIED ProEMgen-3



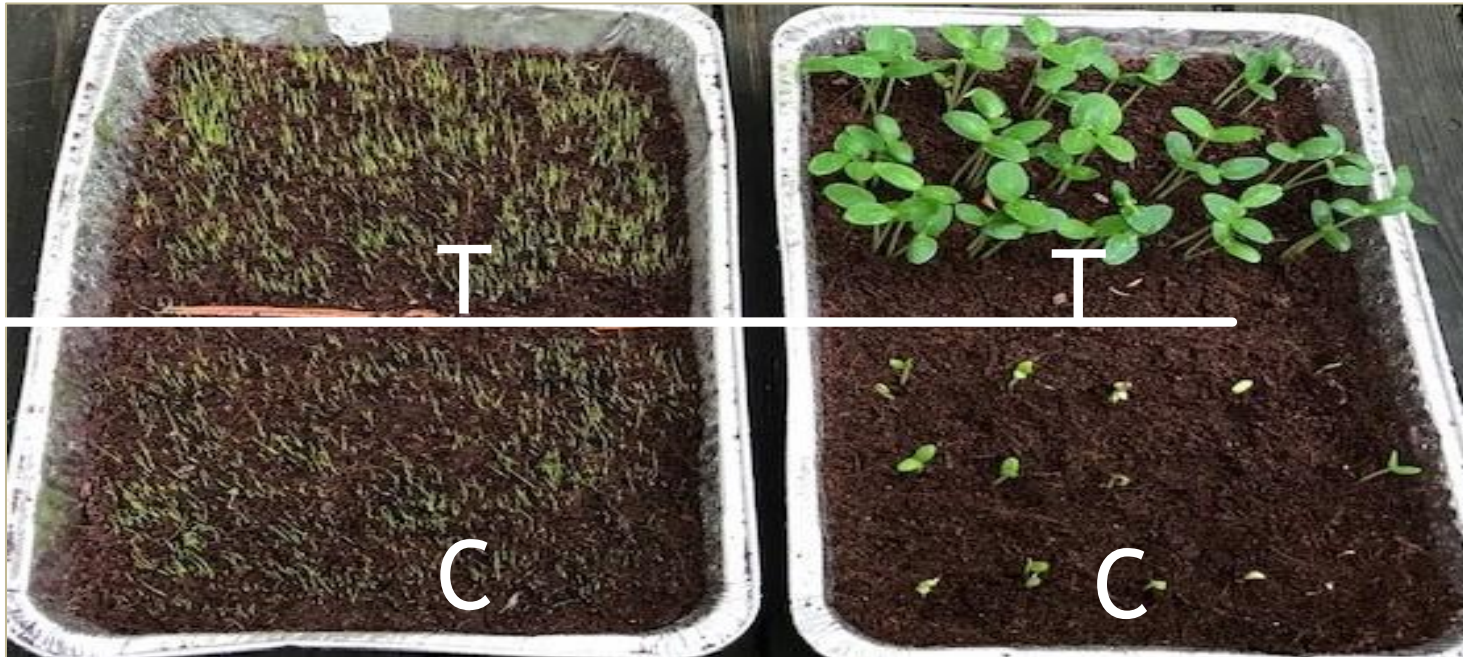
Inside an EMF generator
assembled with an
Internet-controlled module.

EMF APPLICATION TO SEED GERMINATION

- ▶ Seed treatment before sowing 4 Hz 20 min
- ▶ C — control, untreated
- ▶ T — treated seeds

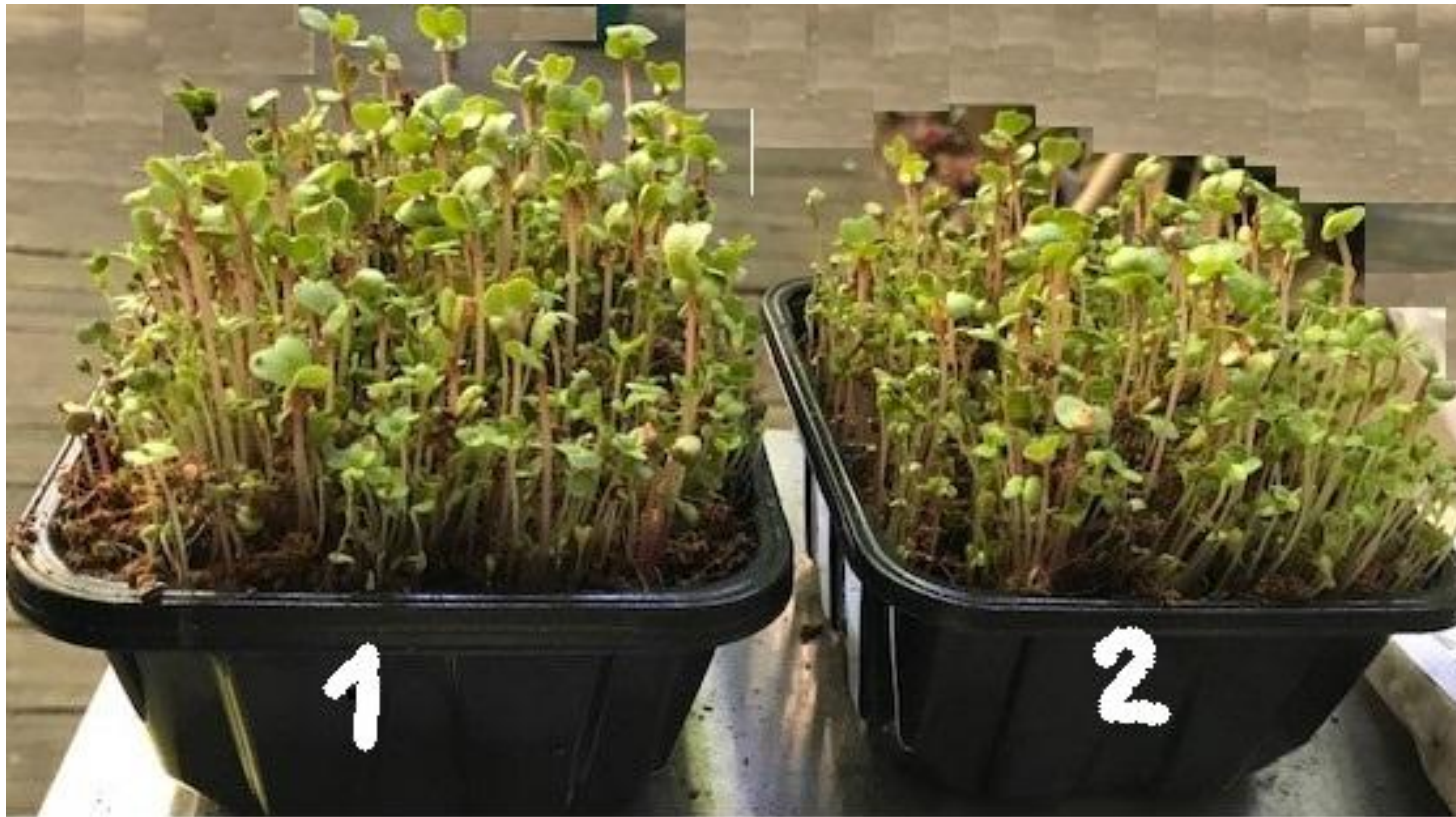
WHEAT

CUCUMBERS



MICROGREENS

**ACCELERATION OF SEED GERMINATION AND
SEED GROWTH 1 — EMF TEST 2 — UNTREATED
CONTROL**



CZECH BLUE POPPY

FLOWER



CAPSULES

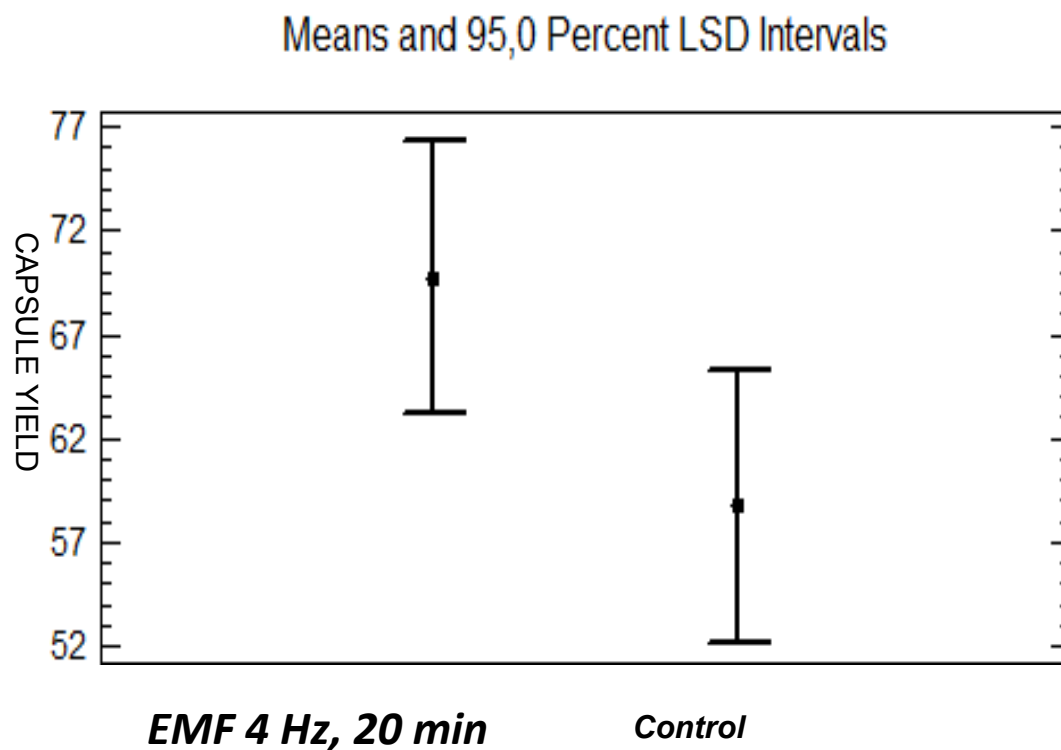


LEFT PHOTO — SEEDS UNTREATED WITH EMF

RIGHT PHOTO — TREATED SEEDS, EMF 20 MIN, 4 Hz



Three years of EMF tests using the ProEMgen generator on poppy seeds confirm a yield increase from 126 t/ha to 172 t/ha depending on conditions, providing additional income of approximately 10 000 CZK/ha [about \$440/ha]



SOYBEAN

seeds were treated with EMF using the ProEMgen generator before sowing in soil at 4 Hz for 25 minutes



- ▶ Grain yield in the treated variant was 274 kg/ha higher than in the untreated control variant.
- ▶ This is equivalent to additional income of USD 6 000 per hectare

COTTON

**SEEDS WERE TREATED WITH EMF AT 4 Hz
FOR 25 MINUTES BEFORE SOWING IN SOIL**



BENEFITS

Cotton varieties have different levels of sensitivity to electromagnetic seed treatment.

The yield increase for different varieties ranges from 10 % to 37 %.

The effect of EMF on vegetative plants in the field

► HOPS

- **ProEMgen GENERATOR POWERED BY A SOLAR PANEL**



► GRAPEVINE

- **THE EMF SIGNAL PROPAGATES THROUGH THE ANTENNA**



ECONOMIC EFFECT OF PLANT TREATMENT

WITH THE ProEMgen GENERATOR

▶ HOPS

- ▶ EMF APPLICATION ENABLED A HOP YIELD INCREASE FROM 5 % TO 8 %
- ▶ THE CONDITIONS OF THE YEAR AFFECTED EMF EFFECTIVENESS

▶ GRAPEVINE

- ▶ EMF APPLICATION ENABLED A GRAPE YIELD INCREASE FROM 10% TO 20 %

The effect of EMF on lettuce cultivation in hydroponic conditions

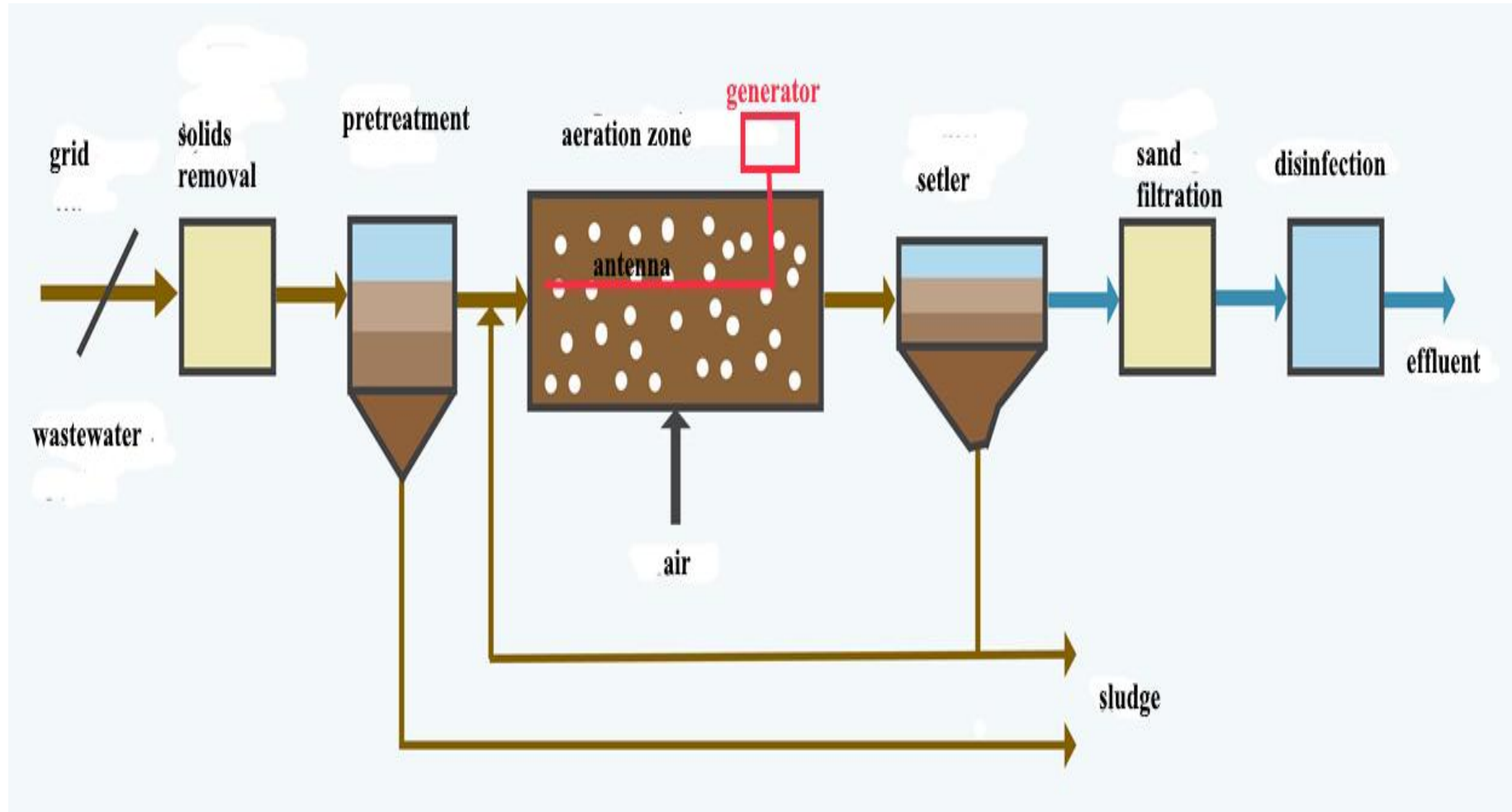
REDIN LETTUCE



A PhotosynQ fluorometer (USA) was used to measure photosynthesis.

- ▶ In EMF-treated plants, increased stomatal opening accelerated both photosynthesis and transpiration.
- ▶ EMF-treated plants also showed higher chlorophyll and carotenoid contents than untreated plants. However, this difference was not statistically significant.

WASTEWATER TREATMENT THROUGH EMF APPLICATION USING ProEMgen TECHNOLOGY



BENEFITS OF EMF APPLICATION IN WASTEWATER TREATMENT



- In addition to the environmental and social impact of wastewater treatment, an economic benefit can be achieved through energy savings in blower operation.
- Testing the ProEMgen generator at the wastewater treatment plant in Moravičany (1350 PE) recorded energy savings of approximately 6.5 % to 11%.
- With monthly energy consumption of approximately 11.4 MWh, 360 kWh was saved; at annual consumption of 136.8 MWh, savings were approximately 4.4 MWh.

ACCELERATION OF BACTERIAL ORE LEACHING USING THE ProEMgen EMF GENERATOR

- ▶ According to experts, more than 40 % of the world's underground gold reserves are in sulphide ores: pyrite (FeS_2), chalcopyrite (CuFeS_2), chalcocite (Cu_2S), etc. Gold in these deposits is also submicroscopic, finely dispersed and difficult to handle. Mining gold from these ores is profitable if copper, nickel, zinc, silver, etc. are extracted first, with gold extracted as an accompanying metal.
- ▶ Dumps at abandoned metal deposits and flotation waste contain, on average, about 0.1-0.2 % base metal and 0.3-0.6 g/t gold. At these concentrations of base metal and gold, processing the waste through bacterial leaching is economically beneficial.



KNOW-HOW in gold leaching by EMF using the ProEMgen generator

- The essence of our KNOW-HOW is that, during leaching, an antenna is placed on the heap or in the vat and transmits EMF (electromagnetic field) pulses. These pulses increase oxygen concentration in the leaching solution and bacterial activity. As a result, the leaching rate can increase by 20-30%.

SUMMARY

OF ProEMgen EMF GENERATOR APPLICATIONS IN VARIOUS SECTORS

STIMULATION OF SEED GERMINATION, INCREASED CROP YIELDS AND ACCELERATED BIOLOGICAL TREATMENT:

- ▶ WHEAT AND BARLEY — YIELD INCREASED FROM 10 % TO 25 %
- ▶ CZECH BLUE POPPY — YIELD INCREASE FROM 120 KG/HA TO 170 KG/HA
- ▶ SOYBEAN — YIELD INCREASE FROM 180 KG/HA TO 270 KG/HA
- ▶ HOPS — YIELD INCREASE FROM 4 % TO 11 %
- ▶ GRAPES — YIELD FROM 15 % TO 20 %
- ▶ ACCELERATION OF HYDROPONIC LETTUCE GROWTH BY 20 %
- ▶ ACCELERATION OF BIOLOGICAL WASTEWATER TREATMENT — SOCIOECONOMIC EFFECT (ENERGY SAVINGS)

Patent protection

- ▶ Industrial Property Office, Czech Republic, pursuant to Section 34(3) of Act No. 527/1990 Coll., on inventions and improvement proposals, as amended.
- ▶ **PATENT:**
- ▶ “Method of electromagnetic stimulation of vegetative plants”
- ▶ **PATENT:**
- ▶ “Method of electromagnetic activation of microbiological processes in a liquid medium”

THANK YOU FOR YOUR ATTENTION

