

SUMMARY of all official EXPERIMENTS with MINERAL in 2018

BIOTECHNICAL FACULTY OF LJUBLJANA

potatoes, corn, wheat, grass, tomatoes, cabbage, onions

FINDINGS:

A higher average weight of the bulb of onions was found by using MINERAL BLUE and also a higher average weight of the cabbage head. The same results were obtained in experiments from manufacturers.

Despite the high number of repetitions, the trend is reflected in various experiments and also in our field experience that the impact of both MINERAL FORTE is limited and not sufficiently effective at strong pressure of disease such as *Phytophthora infestans* and pests such as Colorado beetle on small plots of 100-200 m². That is why, in fact, our focus is on these preparations for gardening areas, where the maximum is under one type of plant of 10 m², and therefore the application itself is more manageable and the presence of harmful organisms is lower.

In experiments, tomatoes were at 40 m², potatoes at 1000 m², onions at 90 m², cabbage at 70 m², wheat at 200 m².



Phytophthora infestans in testing field after spraying with MINERAL YELLOW FORTE



Colorado beetle in testing field after spraying with MINERAL RED FORTE

HYDROPONICS: is about using MINERAL GREEN and MINERAL BLUE

- hydroponics: tomato, paprika

- floatingsystem: radic, asian salads, herbs

FINDINGS:

In cultivation chicory on a floating system, it was again confirmed that the strength and resistance of the plants came from the root system. Plants in the MINERAL solution were significantly less infected with Radici powdery mildew (*Erysiphe cichoracearum*).

The MINERAL solution essentially influenced the increased content of total chlorophyll in radic, a significantly increased content of α and β -carotene, xanthophils (lutein), pigments (violaxanthin, anteraxanthin, zeaxanthin).



Floating system



Radici powdery mildew (*Erysiphe cichoracearum*)

With tomatoes and peppers, there is more fruit, which is the consequence of MINERAL's already known function to increase the rate of fertilization in fruit plants.

The analysis of the fruits of the pepper re-confirmed the better quality, the content of sugars (glucose, fructose, sucrose), organic acids = taste (citric and malic acid), antioxidants and secondary metabolites (flavonoids, apigenin) was significantly increased.



Quality of tomato fruit:

-Fertility does not increase significantly with the use of MINERAL, but only partially in some varieties.

-The content of bioactive substances:

For all varieties, the content of chlorophyll a significantly increased in the fruit compared with the standard solution, while there was no difference between the chlorophyll b content.

The increased lycopene content showed only one species (Gardel F1).

There was also no difference in β -carotene content, while all varieties had an increased vitamin E content.

In any case, **MINERAL can not replace the basic fertilization**, which is in this case the standard solution, but in particular at the hydroponics is **a useful addition to improve the quality of the fruit, especially the taste.**

In the framework of the experiment, a sensory analysis of the fruits at the Department of Food Technology was carried out. The evaluators received a better estimate of the color and taste of the fruits of all varieties where MINERAL was used. No differences were detected in the scent assessment.



2. AGRICULTURAL INSTITUTE OF SLOVENIA

strawberries, raspberries

FINDINGS:

In the crop, no significant differences were found in comparison with control.

A better effect on visual differences was achieved only by watering.

Even a higher number of fruits per plant and a higher average weight of the fruit was achieved only by watering: GREEN 1 x, BLUE 3 x /7 days.

As regards the state of the plant health, leaves were significantly more green (dark) by using MINERAL. Otherwise, there were no differences in the state of health during the control and use of MINERAL.

No influence was found on raspberry drought (*Didymella applanata* and *Leptosphaeria coniothyrium*) in a perennial plantation.

Chemical analyzes of fruits were not performed.



3. THE INSTITUTE FOR HOP AGRICULTURE AND BREWING OF SLOVENIA

herbs (melis, purple coneflower), hops, hemp

FINDINGS:

MELIS (*Melissa officinalis*):

The use of the MINERAL preparations has proven to have a positive effect on the height of the plants.

In the number of shoots per plant at the time of harvest, there was no demonstrable difference.

In the yield of fresh and dry matter per plant during the treatment, there was no demonstrable difference, but it was slightly higher in the treatment with Mineral.

The content of essential oil was demonstrably lower in the treatment with Mineral than in control.



MINERAL left, classical production right

PURPLE CONEFLOWER (*Echinacea purpurea*):

The yeald is much more equal in terms of plots in dealing with MINERAL.

There was no demonstrable difference in the yield of fresh straw weight at the first harvest during treatments with and without MINERAL.

The harvest of the dry matter of the first harvest is greater with the use of MINERAL.



With MINERAL



Without MINERAL

HOPS:

The difference in plant height during treatment was not noticeable.

There was no perception of a greater presence of the disease or pests in any of the treatments.

The difference in the yield of cones during the treatment was not demonstrable.

A slightly higher nitrate content was found in the cone treatments with MINERAL.

HEMP: variety USO 31, two locations – at the farmer and at the institute

The yield was very small at both locations, as was typical for cannabis in 2018 due to weather conditions.

During the treatment, the difference in yield was not demonstrably, a slightly higher yield was indicated in treatment with MINERAL and with standard basic fertilization.

In the moisture content of the crop during the examinations, there was no demonstrable difference.

Between treatments with and without MINERAL they are not demonstrably difference in the fat content of the seed.



At the farmer



At the institute

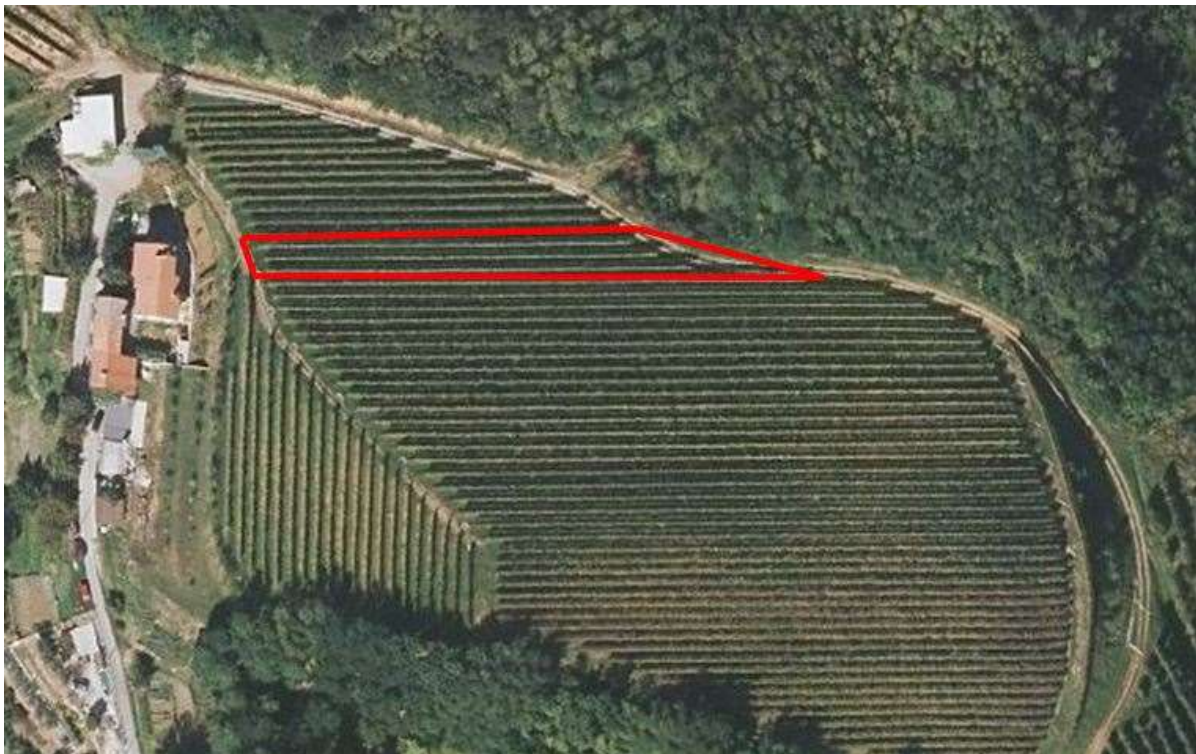
4. AGRICULTURAL FORESTRY INSTITUTION NOVA GORICA

vine

FINDINGS:

The effectiveness of the MINERAL watering program was 64% for the first and 49% for the second assessment, which is acceptable in principle for organic production.

The effectiveness of the MINERAL spraying program without prior watering with the MINERAL GREEN and MINERAL BLUE preparations and the half-dose combination of the Cu preparation was 8% for the first and 3% for the second assessment, which is also undereffective in the organic production method.



5. KGZS - INSTITUTE CELJE = end users

cabbage (early, late), salad

- integrated production

- organic production

FINDINGS:

The results of the annual testing of MINERAL show that using the MINERAL GREEN and MINERAL BLUE for watering seedlings can influence the vigor and development of young plants.

Using MINERAL can influence the quality and quantity of early cabbage production.

The cabbage produced without the use of MINERAL has formed less compact heads, which resulted in a lower yield.

The highest harvest of cabbage was achieved in the case of watering and spraying with MINERAL, and slightly lower yields in case of watering or only spraying with MINERAL.

On average, the cabbage head with MINERAL was heavier by 20-30 dkg. The calculated harvest of cabbage per ha in comparison with the control is 4 t higher. Heads stay fresh for longer, thus prolonging sales and reducing feces.

Even with twice-repeated use of MINERAL RED FORTE (3-4 days apart) on the larger production area of capsic fleas (*Phyllotreta undulata*), we were not able to satisfactorily manage the problem (the occurrence of economic damage), therefore insecticides must be used to deal with economic damage.



Left without, right with MINERAL



COMMON FINDINGS or confirmations:

The significantly higher efficiency of MINERAL is in watering than in spraying:

- higher yield with standard basic fertilization + MINERAL BLUE
- better crop quality = coloring, taste, transport and storage capacity

The most effective is watering seedlings from sowing = vegetable cultivation

- with respect to plant resistance = optimum development of the root system (GREEN)
- regarding the quantity and quality of the crop = the consequence of the optimal functioning of the roots

Transplanting of seedlings: watering plates before planting on arable land

1 x watering with MINERAL GREEN after sowing and planting seedlings is enough.

It is perfectly sufficient 2 - 3 x watering with MINERAL BLUE during the intensive growth of plants at basic fertilization.

The effectiveness of all MINERAL preparations is lost on the arable land, and their use is not reasonable, especially if we start using it only on the field:

- there are no substantially better crop results that would justify the cost of using MINERAL
- no expected efficacy in terms of disease, pests = economic damage caused
- the use of MINERAL preparations requires significantly more work, time, costs compared to standard measures (fertilization, spraying)
- destroying soil structure due to frequent surface runs

When watering and use both MINERAL FORTE + half the amount permitted chemical plant protection products (copper, sulfur) results meet standards for organic production, but not for integrated, which is codified standard production in agriculture.

On surfaces larger than 10 m² under one type of plant is insufficient efficiency of use only MINERAL YELLOW FORTE when attacking aggressive fungi like *Phytophthora infestans*.

FOLLOW-UP = use YELLOW FORTE when less aggressive fungi occur, like *Erysiphe spp.* or *Botrytis spp.* + a combination of half the dose of the relevant fungicides.

On surfaces larger than 10 m² under one type of plant is insufficient efficiency of use only MINERAL RED FORTE when attacking biting pests, which usually occur in large numbers like caterpillars, colorado beetles.

FOLLOW-UP = use RED FORTE in case of more sensitive sucking pests like aphids + a combination of half the dose of the relevant insecticides.

