Blackcurrant nutrition with fertilizers containing the biostimulating substances

Maciej Sroczyński, Ph.D
Roullier Group in Numbers

- Commercial and industrial branch units in 46 countries
- 6,200 personnel
- 6 research and scientific centres all over the world
- 74 production plants all over the world
- EUR 3.7 billion of turnover in 2013
Timac Agro, 55 years know-how

- Supplies for agriculture are the first and historical operation of the Group, launched in 1959 in Saint-Malo, France.

- The unique Timac Agro business model is based on direct relationships with clients and consultations.

> Supplies for the agricultural sector make 78% of the Group sales in 2013.
Unique approach to agriculture in Poland

- Our goal is to raise the efficiency and quality of production.
- We develop our relations with clients through advice and partnership.
- We analyse soil and nutritional needs of plants (fluorometry) to be able to recommend innovative solutions which are customised to the client needs.

- 100 technical and sales consultants
- 500 visits to farms paid every day
Based on algae...

We use algae to produce our fertilizers
Extreme environmental conditions

Cyclical differences in aqueous and thermal conditions.
Algae - abundance of nature
Algae yield potential

The yield potential is 10 times bigger as compared to the field crops.
Algae – the first experience
Mr Daniel Roullier, who was aware of it, decided to find out what is so special about algae...
Research and Development
Fertilisers enriched with biostimulating substances
Liquid fertilisers with biostimulating substances
Liquid fertiliser containing biostimulating substances with foliar and subsurface action
FERTIACTYL – innovative start-up fertiliser

1. Humic and fulvic acids
   - They facilitate accessibility and assimilability of nutrients

2. Glycine Betaine
   - Anti-stress action
   - Photosynthesis intensification

3. Zeatin
   - Radicular system growth
   - Chlorophyll aging delay

4. Nutrients
   - 13% nitrogen
   - 5% phosphorus
   - 8% potassium
   - Growth - vigour
   - Ripenning - Quality
Humic and fulvic acids

- Soil structure improvement
- Better uptake of mineral ingredients
- Stimulation of soil life
- Increase of water retention
- Better development of roots
Glycine and Betaine

- Present in all plants
- Produced in stress conditions as defensive reaction
- Reduces unfavourable influence of stress factors
- Increases photosynthesis efficiency
Zeatin

• Stimulates cell division (creating adventitious roots and root hair)

• Increases the uptake of nutrients

• Extends chlorophyll lifetime

• Improves vitality of plants

• Significant amounts of it are present in corn from which the substance derives its name.
Growth optimisation in the initial period

1. Increase of natural immunity
   - Increase of resistance against external stress factors e.g. temperature, water

2. Effective uptake
   - Increased uptake of nutrients, including phosphorus
   - Increased availability of the nutrients in soil

3. Strengthening physiological processes in the plant
   - Greater photosynthesis efficiency
   - Stimulation of growth of new plant organs
Unique formula!

FERTIACTYL STARTER
1. IPA
   Fast transport of mineral ingredients and assimilative substances

2. Glycine Betaine
   Anti-stress action
   Photosynthesis

3. Amino acids
   - Growth of the vegetative and radicular system
   - Production of proteins and sugars
   - Immediately available micro-nutrients

Strength of nature
Glycine and Betaine

- Present in all plants
- Produced in stress conditions as defensive reaction
- Reduces unfavourable influence of stress factors
- Increases photosynthesis efficiency
IPA is a cytokinin which stimulates uptake and transport of nutrients.
Amino acids - carriers without defects

- The fastest possible penetration into the plant
- Amino acid is a component of proteins
- The substance is entirely neutral to the environment
- "Perpetum mobile" - nothing is wasted.
Stomatal Openings
Historically, the entryway into foliage for liquid fertilizers and solubles.

Transcuticular Pore Spaces
These are ALWAYS OPEN, more numerous, but SMALLER.
Aparaty szparkowe a przestrzenie kutikularne

- Transcuticular Pores
  - 10,000,000 per square centimeter
# Amino acids – carriers of micro-nutrients

Uptaking doses of various preparations of iron in the form of foliar fertilisers after 8 hours.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Fe z Amino acid</th>
<th>Fe- EDTA *</th>
<th>FeSO4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves</td>
<td>43.09 %</td>
<td>26.23 %</td>
<td>29.24 %</td>
</tr>
<tr>
<td>Stems</td>
<td>0.49 %</td>
<td>0.14 %</td>
<td>0.32 %</td>
</tr>
<tr>
<td>Entire plant</td>
<td>43.58 %</td>
<td>26.37 %</td>
<td>29.56 %</td>
</tr>
</tbody>
</table>
Purpose of applying liquid fertilisers

1. Stimulating physiological performance
   Better uptake of nutrients

2. Improvement of transport system
   More effective uptake of nutrients

3. Greater resistance to stress
   Plants are more resistant to stress conditions.
Micro-nutrients vs Soil Reaction

- The soil pH is adjusted for the uptake of macro-nutrients.
- The availability of micro-nutrients in such soil is low.
FERTILEADER LEOS

- This ensures greater resistance in the initial phase of growing, minimizing the effects of stress (weather conditions).
- Have a better uptake and transport of nutrients and increases energy production.
- Provides fully digestible micronutrients: boron (production and pollen viability, cell division), zinc (synthesis of enzymes, creating auxin).
- Dose: 4 l/ha.

Boron 1,7%
Zinc 2,6%
FERTILEADER GOLD BMo

- Increase of flowering and pollination
- Production and transport of sugars
- Uptake and transformation of nitrogen
- Production of proteins
- Dose: 5 l/ha or 2x3 l/ha

Boron 5.7%
Molybdenum 0.35%
FERTILEADER AXIS

- Energy support for fruit buds
- Intensification of cell division
- Improvement of plant condition
- Dose: 3 l/ha

Nitrogen 3 %
Phosphorus 18%
Manganese 2.5%
Zinc 5.7%
FERTILEADER VITAL 954

- It stimulates the growth of the vegetative and radicular system.
- It intensifies the production of proteins and sugars.
- Micro-nutrients are immediately available.
- Terms of application: heads setting
- Dose: 5l/ha

Nitrogen 9%
Phosphorus 5%
Potassium 4%
Boron 0.05%
Copper 0.02%
Manganese 0.1%
Molybdenum 0.01%
Zinc 0.05%
FERTILEADER ELITE

- It has anti-stress performance.
- It influences the growth and the dry matter content.
- It strengthens the epidermis (skin) and improves the resistance of fruits.
- It ensures maximum quality parameters.
- Terms of application: growth and ripening.
- Dose: 2x3 l/ha

Seactiv

Nitrogen 9%
Potassium 6%
Calcium 12%
Boron 0.2%
The added value which we offer along with our liquid products are:

– Individual consultancy (100 consultants all over Poland)

– Fluorimetric surveys
Plant Nutritional Status

2.34% measurements prove that plants have been correctly nourished.

97.66% measurements show insufficiencies in the nutrition of plants.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>48.38%</td>
</tr>
<tr>
<td>B</td>
<td>4.16%</td>
</tr>
<tr>
<td>Mg</td>
<td>31.34%</td>
</tr>
<tr>
<td>Mn</td>
<td>7.06%</td>
</tr>
<tr>
<td>S</td>
<td>0.36%</td>
</tr>
<tr>
<td>K</td>
<td>1.98%</td>
</tr>
<tr>
<td>Fe</td>
<td>5.06%</td>
</tr>
<tr>
<td>Ca</td>
<td>1.62%</td>
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</table>
Granulated fertilisers with biostimulation – the only product of this type available on the market!
MAERL

IMAGE FROM MICROSCOPE

Bringing up the MAERL
MEZOCALC – highly reactive calcium carbonate

The application of MEZOCALC means:

- Fast and long-lasting action
- Soil structure improvement
- Stimulus for soil micro-organisms
- More effective uptake of nutrients
- Supply of Ca as a plant nutrition component
Fertile soil with good structure

Micro pH optimisation

Increased ability to store nutrients on soil sorption complex
More effective uptake of nutrients in alkaline pH

Diagram showing nutrient uptake at different pH levels:
- Azot (Nitrogen)
- Fosfor (Phosphorus)
- Potas i siarka (Potassium and Sulfur)
- Wapń (Calcium)
- Magnez (Magnesium)

The diagram indicates that uptake is more effective at higher pH levels, particularly around pH 8.0.
Aminopurine is a natural substance which is present in every plant. By getting connected with the cellular receptors, it works as a signal for the plant to intensify the uptake of calcium. While increasing the uptake of Ca, it intensified cellular divisions, improves the growth and development of the main root and the root hair, germination, flowering and ripening.

Source: Villais, université de Rennes
Joint action of MEZOCALC – PHYSIO+

Współdziałanie MEZOCALC – PHYSIO+

PHYSIO+ MEZOCALC

Plant

Growing root system

Higher resistant for water and temperature stresses

Quicker and more uniform germination

Soil

Micro pH in root zone

Better ingredients uptake

Higher microbiological activity

Improves soil structure

Efficient storage on SC

Growing root system

Higher resistant for water and temperature stresses

Quicker and more uniform germination

Better ingredients uptake

Higher microbiological activity
PHYSIOMAX – fertiliser content

PHYSIOMAX 975:

• Improves the reaction and structure of soil
• Ensures better growth of the radicular system of plants
• Increases the efficiency of the organic and mineral fertilisation
• Increases the plant resistance to thermal and aqueous stress
• Intensifies calcium nutrition
• The fertiliser is approved for use in the organic agriculture
• dose: 300-600 kg/ha
The N PRO complex is a set of selected indole derivatives which determine the assimilation and transformation of nitrogen.
Process of nitrogen uptake by the plant

How to produce more?
Enzyme nitrate reductase

$\text{NO}_3^-$ $\text{NH}_4^+$ $\text{AK}$ $\text{Protein}$

$\text{NO}_3^-$ $\text{NH}_4^+$
The N PRO complex not only increases the output of crops but also improves their quality, reducing the amounts of harmful nitrates!
Influence on the plant - 16 days after application

10 mM of nitrate
Optimum form of potassium for plants sensitive to chlorine. Ammonium form of nitrogen, content of calcium, magnesium and sulphur as well as the N PRO complex - all these factors increase the efficiency of the plant nitrogen nutrition.

The additive of micro-nutrients ensures high output of crops and their better quality.

Dose: 300-800 kg/ha
The complex fertiliser with a high content of nitrogen and sulphur, containing magnesium and calcium. Nitrogen is present in two forms: the fast acting ammonium one and the slow acting amide one.

The fertiliser contains the active N PRO complex which present in the fertiliser accelerates the uptake and processing of nitrogen.

Dose: 200-300 kg/ha
FORMUŁA
EKSTRA JAKOŚCI

Kompleksowy program odżywiania roślin jagodowych

Timac AGRO

Poland

Timac AGRO
After applying fertilizers of Timac Agro on blackcurrant plantation, in 2014 were observed as follows:

- increased flowering shrubs (among longer with more flowers)

- a greater percentage of knotted berries among
Ground frost damages

The use of fertilizers containing complex Seactiv (glycine betaine, IPA, amino acids) increases the ability of the plant to overcome stress (set with the occurrence of low temperatures)?
Despite the adverse weather conditions in the spring of 2014 the formation of the fruit on the bushes fed with fertilizers containing complex fertiaxyl and seactiv is greater than the bushes control (standard fertilization) - as at 18.05
WYNIKI BADAŃ Z TECHNOLOGIĄ TIMAC AGRO

PORZECZKA

PORÓWNANIE PLONOWANIA Z LAT 2012-2013

<table>
<thead>
<tr>
<th></th>
<th>kontrola (standardowe nawożenie) [t/ha]</th>
<th>TIMAC [t/ha]</th>
<th>przyrost [%]</th>
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<tbody>
<tr>
<td>2012</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odmiana 1</td>
<td>8.3</td>
<td>9.2</td>
<td>10.8</td>
</tr>
<tr>
<td>Odmiana 2</td>
<td>6.5</td>
<td>7.3</td>
<td>12.3</td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odmiana 1</td>
<td>9.2</td>
<td>10.5</td>
<td>14.1</td>
</tr>
<tr>
<td>Odmiana 2</td>
<td>7.3</td>
<td>8.5</td>
<td>16.4</td>
</tr>
</tbody>
</table>
Conclusions

- comprehensive nutrition program blackcurrant bushes fertilizer company Timac Agro improves plant growth (increased vigor), which contributes to the "construction of the production potential" for next year

- improves flowering and fruit set

- increases the resistance of plants to stress

- increases the yield
I have been using liquid and granulated fertilisers from Timac Agro for 3 years. These include the EUROFERTIL 33 N PRO chloride-free fertiliser and PHYSIOMAX 975. The liquid fertilisers are LEOS, GOLD, AXIS, ELITE and others. The most important advantage which I have found after applying the Timac AGRO fertilisers is a better appearance of leaves throughout the entire vegetative period. They are healthier and less infested. The uniform ripening of fruits made the harvests easier. The above actions have significantly improved the quality and increased the yield. The Timac products are widely applicable to my cultivations: most of all the currant, the production of aronia berry (grown for the production of cosmetics and other purposes), in the orchard and in the horticultural farm - tree and decorative bush nurseries. Here, thanks to the Timac fertilisers, we see better rooting of plants, better health and correct development.
In my farm, I use Timac Agro granulated and liquid fertilisers. The important factor is that they have biostimulating properties. I use the Timac products in the cultivation of currant, cherry and blackcurrant nurseries. I especially recommend FERTILEADER LEOS to protect the plantation during the flowering and fruit setting periods.