Introduction

Proper incorporation of crop residues can return to the soil on average (depending on yields) per hectare: 9-10 kg of nitrogen, 4-5 kg of phosphorus, 10-15 kg of potassium. The intensity of decomposition and mineralisation of plant residues depends directly on the properties of the soil and the activity of specific microorganisms. It is considered that microorganisms are not needed for straw mineralisation and plants, everything can be solved with fertilizers. However, nitrogen fertilizers weakly promote mineralisation and at the same time activate the anaerobic microflora in the soil, which are the most disease-causing microorganisms. After sowing crops, the soil in that case first damages the seeds and seedlings, and later infects the plants during the growing stages and affects the productivity of the plants.

Figure 1.

Elements	Parts of Plants			In Total
	In Grains	In Straw	In Roots	
Macronutrients kg/t in dry matter (Major elements)				
Nitrogen (N)	22.4	6.70	3.15	32.25
Phosphorus (P_2O_5)	7.70	2.50	0.60	10.80
Potassium (K_2O)	9.80	10.00	2.00	21.80
Magnesium (MgO)	2.20	1.80	0.90	4.90
Sulfur (S)	1.50	1.40	0.60	3.50
Micronutrients kg/t in dry matter (Trace elements)				
Boron (B)	2.50	16.00	7.50	26.00
Copper (Cu)	6.00	3.14	0.05	10.20
Zinc (Zn)	30.00	12.30	8.00	50.30
Manganese (Mn)	42.00	26.10	9.90	78.00
Iron (Fe)	90.00	210.00	4.00	324.00

Challenges

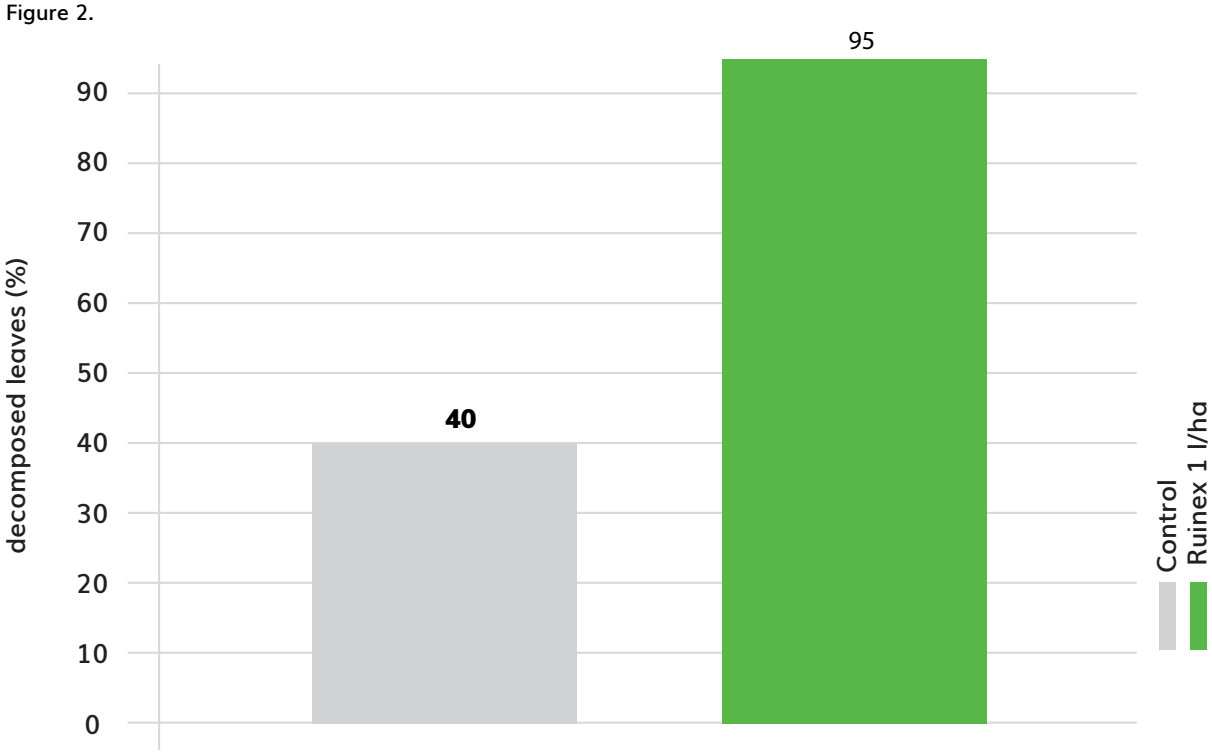
If the soil is poor in microorganisms responsible for the breakdown and decomposition of straw and other plant residues, the processes in the soil cannot be called decomposition or mineralisation, but a process of "silage". Soil respiration slows down, carbon dioxide is displaced by methane, and the roots of future crops suffer. Such a "silage" changes the soil moisture, temperature regime, clogs pores, closes the natural cycles of soil. This is particularly detrimental to plant growth and development. The importance of microorganisms for straw mineralisation is undisputed.

Solution

Ruinex – microbial biostimulant for decomposition and mineralisation of vegetal residues. Methods that protect and maintain existing Soil Organic Matter (SOM) levels (and potentially enhance SOM) includes also incorporation of crop residues.

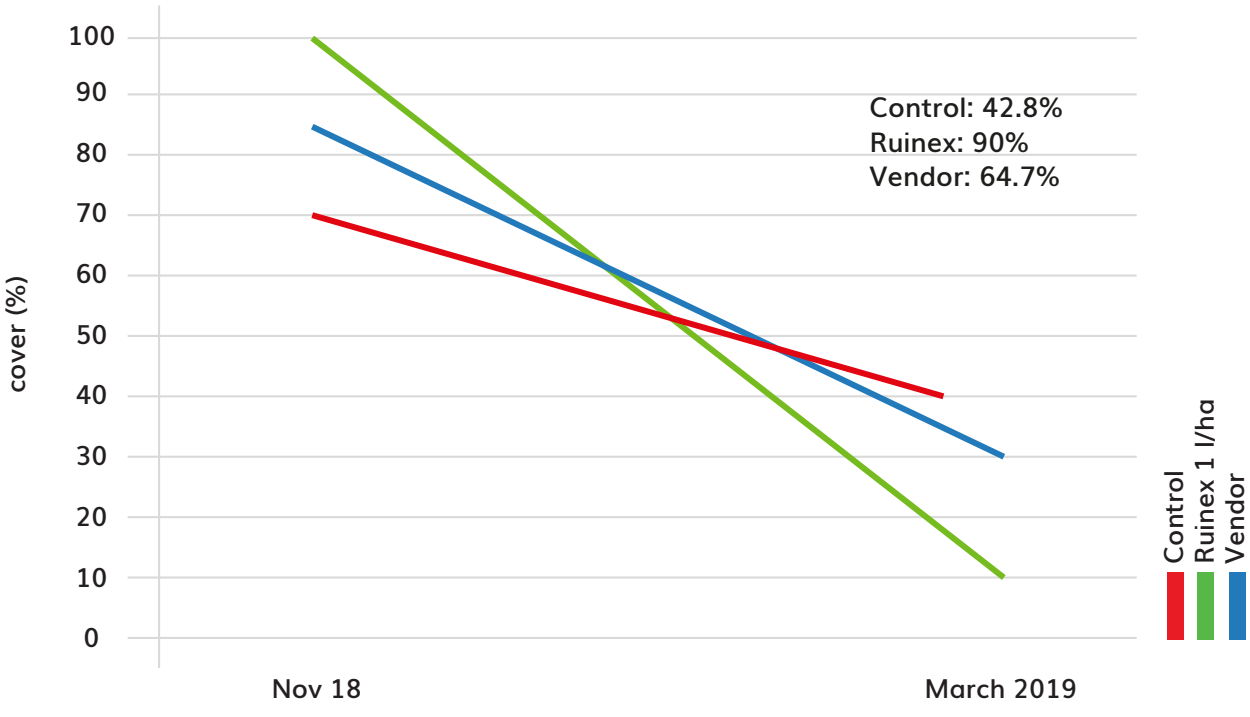
Registration information and certificates
Suitable for: cereals, rapeseed, corn, sunflower, sugarbeet, vegetables, fruit trees, fruit bushes, berries.

Figure 2.



Soil cover with rapeseed residues 2019

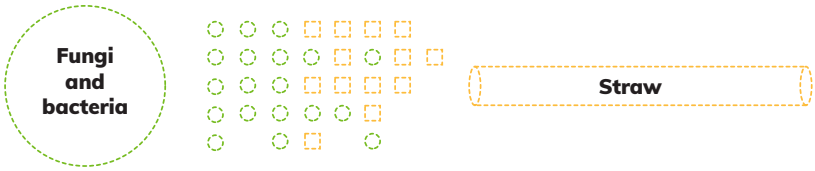
Figure 3.



Soil cover with apple leaves 2019

Mode of action

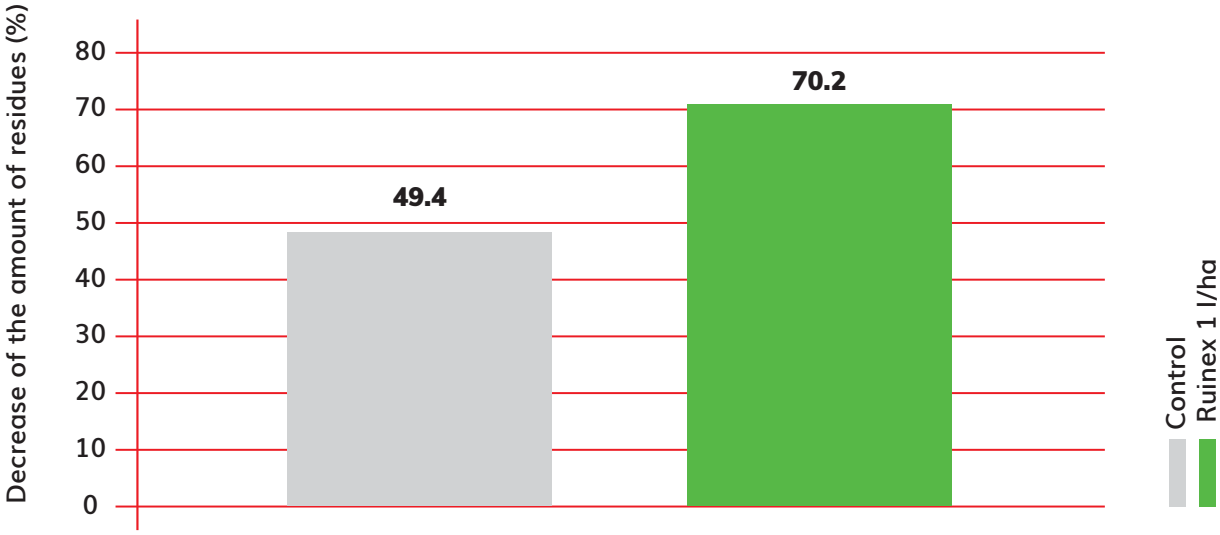
The microorganisms in the biological preparation act as agents for breakdown of lignin and cellulose by secreting specific enzymes. Also, the microorganisms release antibiotics that increase plant resistance to pathogens.



Benefits and Results

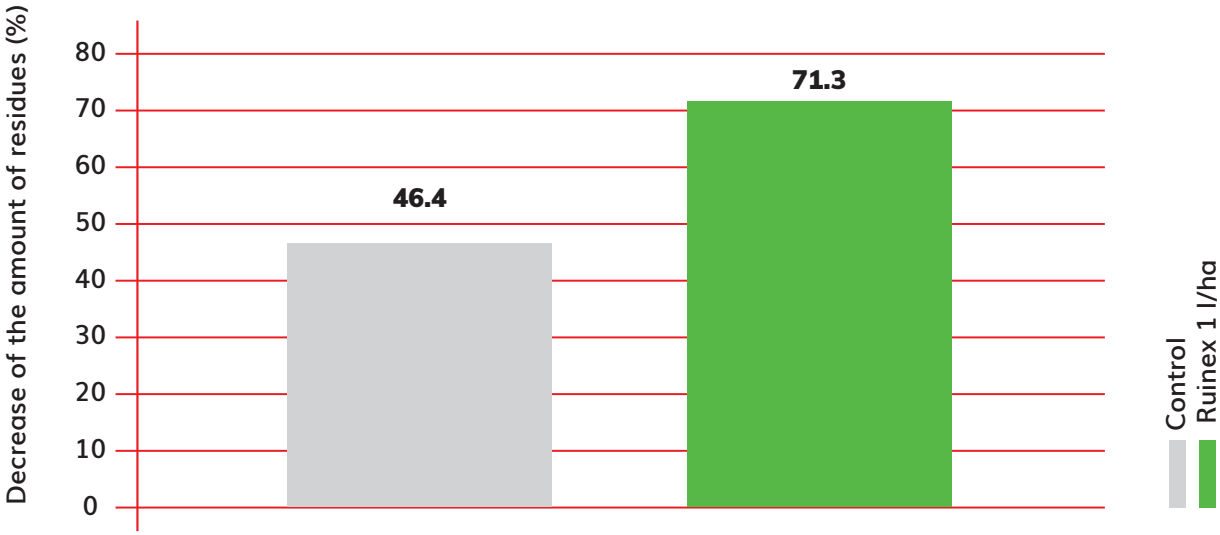
- Increases mineralisation of crop residues;
- Enhances decomposition of lignin, cellulose and other organic polymers;
- Enhances change of vegetal residues into humus;
- Re-establishes soil balance and creates unfavourable soil environment for the spread of pathogens;
- Promotes biological activity of soils.

Figure 4.



ASU Experiment Centre, W. Wheat 2020

Figure 5.



ASU Experiment Center. W. Wheat, 2019

Application rate, technology

Application rate: cereals: 1-3 l/ha – on the soil post harvesting; rapeseed: 1-3 l/ha – on the soil post harvesting; corn: 1-5 l/ha – on the soil post harvesting; sugar beet: 1-3 l/ha – on the soil post harvesting; vegetables: 1-5 l/ha – on the soil post harvesting; fruit trees, fruit bushes: 1-4 l/ha – on the soil post harvesting; berries: 1-3 l/ha – on the soil post harvesting.

Application requirements: the sprayer pressure must be 1-10 bar or 15-145 psi; nozzle size is at least 50 µm.

Safety and storage: product can be mixed with all kinds of fertilizers and pesticides unless the manufacturer of fertilizer or pesticide states otherwise. May contain natural sediments. Storage at high temperature above 30 °C must be avoided. Use Ruinex as soon as possible after opening or store in the refrigerator (4 °C) once it is opened and use it within 72 h. Contamination of the product may occur at any time after opening and the manufacturer takes no responsibility for opened products not used immediately.

Product is non-toxic and has no irritating compounds. There is no risk to humans, animals and the environment. After contact with the skin or eyes, wash with running water. Microorganisms may have the potential to provoke sensitising reactions.

Specifications

Composition: *Bacillus mojavensis* MVY-007; *Bacillus amyloliquefaciens* MVY-008; *Bacillus megaterium* MVY-001; *Trichoderma harzianum* MVY-021, (in total, 1.2×10^{12} CFU/l).
Na-3208 mg/l; K-1398 mg/l; S-1247 mg/l; P-274 mg/l; Ca-218 mg/l; Mg-95 mg/l.

Packaging: 20 l; 10 l; 5 l; 1 l.

- **Biological activity:** decomposition and mineralisation of plant residues; free-living microorganisms;
- **Physical state:** liquid biological product;
- **Viability, shelf life:** 12 months. The manufacturer does not recommend storing the product above 30 °C.
- **Working conditions:** 5-42 °C soil temperature; 3.5 to 9.5 pH;
- **Chemical parameters:** dry matter, 1.7%; pH, 6.2; organic matter, 66.1%.
- **Physical parameters:** colour from dark brown to black; dynamic viscosity 0.7 mPas; density 1.01 g/cm^3.

Manufacturer: "Bioenergy LT", Staniunu str. 83/1, LT 36151 Panevezys, Lithuania.

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