

# Manual

including in particular the scope and manner of use, and the conditions for storage of product **HUMAC® Agro**

Instructions for use:

## **1. Arable land, land for growing fruits, vegetables and other plants:**

The humic acids contained in HUMAC® Agro need a certain amount of time to create humic complexes ensuring effective plant nutrition, thus the product's application is most suitable from autumn to early spring. During spring application a 2 - 4 day delay of plant germination and sprouting may occur. The basic dosage of the product is set on a scale from 200 - 500 kg/ha and is based on the quality of soil. Repeated usage is recommended after 3 to 4 years.

**Arable land:** 200-500 kg/ha in autumn, with or without artificial fertilizers

**Cereals, canola, corn:** 200-500 kg/ha

**Fruit orchards and vineyards:** 10-40 kg/100 pc in autumn

**Fruit crops** (raspberries, strawberries, currants): 350-500 kg/ha = 0,35-0,5 kg/10m<sup>2</sup>

**Vegetables** (Leafy - cabbage, kale, lettuce, spinach; Brassica - cauliflower, broccoli; Fruiting - cucumbers, tomatoes, peppers, pumpkins, melons), **legumes:** 350-500 kg/ha = 0,35-0,5 kg/10m<sup>2</sup>

**Root vegetables and intensive crops** (beets, carrots, parsley, potatoes): 300-400 kg/ha =  
= 0,3-0,4 kg/10m<sup>2</sup>

**Herbs:** 250-300 kg/ha = 0,25-0,30 kg/10m<sup>2</sup>

**Ornamental plants and shrubs:** 2-3 kg /100m<sup>2</sup>

## **2. Land without topsoil and reactive land:**

A basic dosage of **1 - 3 t/ha** repeatedly applied throughout 2 - 3 years in combination with artificial fertilizers and grass seeds is required for land recovery.

## **3. Preparation of compost:**

3 - 5% of the formula is gradually added to the compost mass.

## **4. Usage when fertilizing with digestate:**

The recommended amount of HUMAC® Agro (first application to soil) is applied directly to arable land and following the application of digestate (fugue) is worked into the upper layers of the soil.

## **5. Adjustment of organic and organic-mineral fertilizer properties:**

Based on fertilizer analysis (digestate, separates, fugue, etc.) and the determination of carbon /C/, nitrogen /N/ and dry matter levels, we convert the dosage of HUMAC® Agro in accordance with the desired effect and desired final ratio of C/N.

The appropriate amount (ratio) is applied either directly into the tank before it is filled with the substrate, or gradually into storage tanks based on the daily amount of supplemented substrate (not at once after filling the tank prior to export to the land).

Input data for calculation of HUMAC® Agro:

85,5% dry matter, 57,9% carbon /C/, 1,03% nitrogen /N/

Formula for calculating a dosage of HUMAC<sup>®</sup> Agro for adjustment of C/N ratio:

Fertilizer

$$\begin{array}{l} \text{substrate} \quad \frac{M1 \times C1 \times \text{dry matter}}{C/N} = \frac{X1}{Y1} \quad \text{HUMAC}^{\text{®}} \text{ Agro} \quad \frac{M2 \times C2 \times \text{dry matter}}{C/N} = \frac{X2}{Y2} \end{array}$$

$$\text{Final ratio C/N} \quad \frac{X1+X2}{Y1+Y2}$$

Legend: M1 weight of substrate input in kg  
C1 carbon substrate input in % in dry matter  
M2 weight of added HUMAC<sup>®</sup> Agro in kg  
C2 carbon of added HUMAC<sup>®</sup> Agro in % in dry matter  
N1 nitrogen substrate input in % in dry matter  
N2 nitrogen of added HUMAC<sup>®</sup> Agro in % in dry matter

There are humic acids contained in HUMAC<sup>®</sup> Agro - as active compounds of hummus they in general have multiple uses, and their significance and importance lies mainly in:

1. Improving soil structure.
2. Increasing rentability and yields of agricultural outputs.
3. Adjusting soil pH to an optimal level in terms of receiving nutrients and biological processes in soil (buffer).
4. Containing chelate bound biogenic elements.
5. Improving conditions for development of soil organisms and microorganisms.
6. Withholding water in soil (creating tubes) - a significant impact on water management. By improving soil structure they prevent its supersaturation with water in upper layers, and thus reduce the period of soil flooded with water and lowers the risk of time-limited application of organic, organic-mineral and mineral fertilizers (with digestate and fuge).
7. Belonging among ion exchangers of reductive nature.
8. Lowering the need for mineral fertilizers.
9. Reducing nitrogen emissions and natural smell of organic and organic-mineral fertilizers in the air.
10. Adjusting the C/N ratio in organic and organic-mineral fertilizers and other processed substrates in the soil.
11. Adjusting the C/N ratio in soil.
12. Increasing the activity of important microflora and microfauna, especially in growing monocultures.
13. Improving the sorptive capacity of soil and thus increasing nutrient accessibility for plants (humic substances - humic acids have the best sorptive capacity).
14. Optimizing use of soil nutrients by plants and significantly limiting leaching of nutrients into lower levels of the soil complex and into groundwaters.
15. Increasing the availability of nitrogen for plants and avoiding its loss in the atmosphere in form of ammonia.
16. Their composition and structure hamper nitrification processes in the soil, thus preventing loss and leaching of nitrogen by inhibiting nitrification.
17. Acts as an inhibitor of nitrification.

18. By substantially impacting the C/N ratio, they positively affect the processes of mineralization and of biological immobilization of nitrogen.
19. Reducing the leaching of nitrates from soil to groundwaters and significantly reducing accumulation of nitrates in plants and in other agricultural crops.
20. Preventing soil erosion.
21. Binding heavy metals, pesticides and other toxins into complexes inaccessible for plants. Remediating contaminated soil.
22. By adjusting the C/N ratio, they are changing organic and organic-mineral fertilizers with quick nitrogen release to fertilizers with slow nitrogen release.
23. Increasing agricultural production yields, thus impacting production economy and nitrogen fertilizer dosage calculations.
24. By adjusting soil structure and preventing erosion they allow a more efficient fertilization even on terrain slopes.
25. By systematic addition to stocks (landfills) of organic and organic-mineral fertilizers we prevent the passing of toxic substances from soil to plants and into groundwaters by binding these toxic elements into inaccessible complexes.
26. Affecting the decomposition speed of organic compounds, substrates and substances found in soil.
27. Affecting the assessment of fertilization limit by transiting fertilizers with quick nitrogen release (60% of the total nitrogen supply) to fertilizers with slow nitrogen release (40% of the total nitrogen supply).
28. By adjusting the amount unused nitrogen limit (to 40% instead of 60%), it allows the application of higher doses of mineral fertilizers (where N = 100%) in order to achieve higher yields without exceeding the standards of the Nitrates Directive.
29. Reducing the risk of exceeding the limits of nitrogen fertilization by achieving higher yields, which equivalently tolerate the increase of N dosage by the amount of increase of agricultural crop yields.
30. By lowering the risk of soil erosion (soil less threatened by erosion) it enables greater use of slopes for cultivation of wide-drops (corn, potatoes, beets, bobs, soybeans, sunflowers).
31. The classification of fertilizers following the application of HUMAC<sup>®</sup> Agro on fertilizers with slow nitrogen release enables the application of organic and organic-mineral fertilizers on lands where it is prohibited or where application of fertilizers with quick nitrogen release is limited (slopes over 7%, protected zones, etc.)

Based on the reasons listed above, the application of humic acids throughout the world is increasing year by year.

**Humic acids are substances with an exceptional biological effectiveness, thus their dosage needs to be determined based on individual criteria such as:**

- soil character and quality
- cultures used in the following 3 - 4 years
- amount of soil fertilization with artificial and organic fertilizers (when using our product, the doses of used technical fertilisers can be reduced in order to ensure the harvest planned for the following 3 - 4 years)
- composition and structure of adjusted substrates (organic and organic-mineral fertilizers)
- soil, ecological and environmental aspects

- valid legislative standards concerning fertilization directives and various restrictions on the application of each soil nutrient component
- economical aspect (the desired amount of production).

Dosing guidance is provided in the leaflet attached, containing the etiquette, instructions for use, the declared product composition and the product safety data sheet.

**Conditions for product storage:**

Storing the product requires a dry storage with a temperature limit from -10°C to +40°C.

**Application to soil:**

With ordinary applicators such as for fertilizers.

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