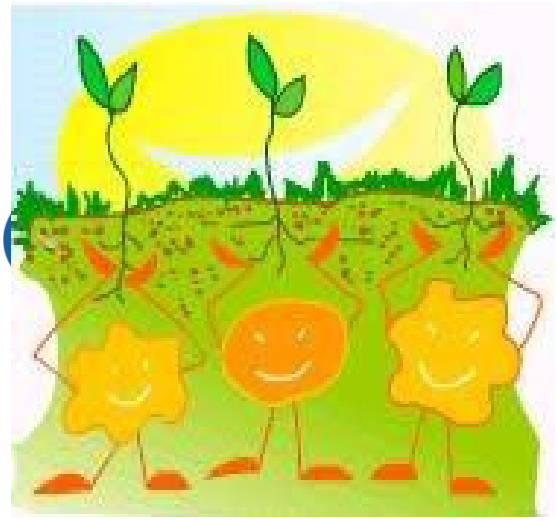
2.0 HUMUS

Humus (solid bio-fertilizer) resource plays an essential role in maintenance of ecological balance in soils. Humus is breeding ground for soil-generating microorganisms, which stimulate plant alimentation, their growing processes.

Humus base consists of phytogenous organic residuals: least decayed fractions, continuing to decay fractions, complex substances generated as a result of hydrolysis and oxidation and substances resulted from microorganisms vital activity.

Humic acids, fulvic acids and salts of these acids, also humins - stable compounds of humic, fulvic acids with gravel and sludge enter into the composition of humus. Humins have sizeable specific surface (600-1000m2/g), big adsorptive capacity. In comparison with other fertilizers, when applicating small ammount of humus to soil the composition and structure of microflora changes. This results in changing of microbiological conditions of soils, intensification of substances and energy transformation processes. As a result metabolic processes quicken, new development cycles of microflora begin, particularly the activity of nitrogen-fixing bacterias intensifies. This results in enrichment of nutrient medium.



Soils, which can be applicated by humus fertilizers are characterized by the following features:

- mobility of soil phosphorus rises;
- processes of nitro-formation in soil activate, that promotes also considerable growth of total and protein nitrogen, increase of carbonic acid liberation from soil;

- ingress of ammoniac forms of nitrogen, phosphorus in plants quickens;
- concentration of potassium, aluminium rises when amount of magnesium is reduced, notably humates exert considerable influence on content and dynamics of ground cations.

In all important processes of soil formation and formation of ground fertility humic substances take an active part. They are the result of organic matters decay. The main indicator of humic soil condition is the content of organic matter, because it considerably improves physical, chemical and biological properties of soil, promotes fertility. Organic matters also have low thermal conductivity and prevents quick heat elimination from soil to the atmosphere.

Table 4. Standards of recoverability of humus for different organic wastes (kg of humus in 1t of substrate) [24]

Substrate	Content of dry matter % in fresh substrate	Contents of humus, kg, in 1t in fresh substrate
Fermented Substrate (liquid)	**1–3**	**6–12**
Fermented Substrate (solid)	**25–35**	**36–54**
Compost	**40**	**50–60**
Filtration Sludge	**10–20**	**10–15**

Humus is 15–20 times more effective than any organic matter. Specific microflora and enzymes, which are contained in humus are able to revive «dead soil» that is to support all its functions and impart a property of high fertility. Humus keeps these valuable properties during 3–4 years.

Simultaneously with crop yearly is taken out a big amount of organic matter, amount of living microorganisms is reduced. As a result activity of humus–formation decreases. For maintenance of the necessary level of humus in soils in around the world more often organic fertilizers (mould, manure, peat) are applied but such organics are with low content of humic matters. That is why it is necessary to use more effective fertilizers to supply the minimum amount of humus.

When using humus it is reached the considerable growth of amount and quality of crop. For example, winter wheat gives increase at 15–20%, sugar beet up to 20%, maize – 20–30%, potato – up to 30%. Hereby, the positive influence of humus on ground fertility and crop capacity can be presented in a kind of complex of interconnected processes

- physical and mechanical properties of soil are increased;
- the processes of ground exchange are strengthened: adsorption of soil nutrients by fertilizers with improvement of plant growth nutritive regime and growth of biological activity. The result is increase of crop capacity.

Along with already specified features humus has also other properties such as big water-absorbing ability, humidity resistance, mechanical strength granules, absence of undesirable plant seeds, presence of big amount and wider spectrum of useful microorganisms, enzymes, antibiotics, growth hormone for plants. Humus has also more standard properties: flow ability regulate by humidity, manufacturability of usage, predictability of activity to crop capacity of agriculture, innocence for soil, good interaction with different mineral and chemical fertilizers. In combination with land reclamation and structuring properties of soil such organic fertilizer, made by natural technology in conditions of industrial production, exceeds the competitiveness of any other artificial mineral fertilizers.

Humus (solid bio-fertilezer) is 15-20 times more efficient than any other organic fertilizer. Specific microflora and ferments, which are in the humus, are capable to restore “dead soil”, thus provide all necessary functions and raise the fertility. These valuable properties humus holds for 3-4 years.