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SAPROPEL IN AGRICULTURE

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SUMMARY

An organic fertilizer refers to a soil amendment derived from natural sources that guarantees at least, the minimum percentages of sulfur, nitrogen, phosphorus, potassium, low content of heavy metals and other contaminations, low biomass weeds etc. It contributes to an increase in crop yields. Examples include plant and animal by-products, rock powders, seaweed, inoculants, and conditioners.

Sapropel characterizes bottom sediments occurring in freshwater basins. It locates near the peat. It is formed during long-term different kinds of chemical, biochemical, biological and physical processes such as degradation of aquatic vegetation, decomposition of life forms reminders and/or organic and inorganic soil pieces drifted by water, conversions of processes and mechanism of organic compounds.

KEYWORDS: sapropel organic product, broad utilization

INTRODUCTION

Sapropel includes three main components: water (from 60 to 97%), ash (sand, loam, carbonates, phosphates, silica, calcium, magnesium and iron compounds, less than 30% etc.) and organic compound (at least 15%) of well-known and unknown structure (Belkevitch, 1962; Inicki, 2002; Kurzo, 2010). Sapropel contains inorganic compounds (less than 30% in dry mass: Silica, calcium, iron, magnesium, potassium, aluminum, sulphur, phosphorous, Co, Mn, Cu, B, Zn, I, Br, Mo, Cr, Be, Ni, Ag, Sn, Pb, Sr, Ti) Kireicheva and Khokhlova (2000). In addition, there are in sapropel organic chemicals of well known structure (biologically active substances: amino acids, nucleotides, nucleosides, peptides, carbohydrates, bitumes, fatty acids, fenols and fenolic acids, nucleic acids, flavones, derivatives of purine and pyrimidine bases, carotenoids, enzymes as catalase, peroxidase, reductase urease, xanthine oxidase, protease), alkaloids (derivatives of different structures), amines, vitamins (B complex vitamins including B₁, B₁₂, B₃, B₆), E, C, D, K etc.), and unknown structures (humic and fulvic acids).

Sapropel contains also phytohormes: gibberelic acid, cytokinin, ethylene, abscisic acid, brassinosteroids and derivatives of indole-3-acetic acid. Phytohormones effect on plant growth and differentiation and coordinate plant growth and development. However the quality and quantity of these compounds in sapropels are significantly different and up of the formation conditions (ionic strength, pH, content of oxygen, redox potential, temperature)

and by lakes' flora and fauna (Sokolov and Bambalov, 2000; Szajdak and Maryganova, 2007).



Fig. 1. Stratigraphic layers of sapropel - Biebrza, Poland

RESULTS

The rich content of inorganic and organic chemicals leads to the different ways of utilization of sapropel:

- i) organic fertilizer,
- ii) ii) supplement for animals and poultry,
- iii) in mud therapy,
- iv) as adsorbent of organic and mineral compounds.
- v) in veterinary
- vi) in organic pelletized stock production,
- vii) for yeast assimilation,

Sapropel modifies and improves soil structure, physical properties, soil aeration, viscosity, and capillary rise. It positively impacts on the hydrophilic - hydrophobic properties in fertilized soils, thus activates the water movement and air mode in soils. Sapropel reveals water consuming and water retaining ability, gives humus increasing in soil on 2nd-3d year, activates soil processes. In consequence of slow solvability of product's acting compounds provides plants balanced nutrition with all fertilizer elements.

Sapropel increases humus content and participates in the cycle of nitrogen, phosphorus, sulfur and microelements in soils. Sapropel is also used in the preparation of composts.



Fig. 2. Sapropel - Biebrza, Poland.

Sapropel as non-hazardous fertilizer activates many biochemical and chemical processes and pathways in plants, leading to an increase of self-purification. It stimulates seed sprouting and root growth of cultivated plants.

Sapropel as fertilizer increase:

- grain-crops' yields, vegetables, fruits and root crops,
- protein, carotene, sugar, starch quantity in plants cultivation products,
- the highest efficiency was observed at light sandy and stony soils, at soils supersaturated with mineral fertilizers.

However, during mutual application of mineral fertilizers simultaneously with sapropel heavy metals harmfulness threshold is decreased, tubers remain clean and do not accumulate heavy metals. Sapropel is added to the rations given agricultural animals as a mineral supplement; daily sapropel supplements reach 2 kg for hogs, 3 kg for cows, and 10-15 g for hens.

CONCLUSION

Expert Group for Technical Advice on Organic Production EGTOP (2011) of European Commission Directorate-General for Agriculture and Rural Development in final report on Fertilizers and soil conditioners (EGTOP/2/2011) during 3rd plenary meeting on 29 and 30 June 2011, concluded that according to the dossier, sapropel may be added to soil for increasing soil organic matter content. It is also a fertilizer (P and micro-nutrients; sometimes

also N). In addition, sapropel, as well as similar organic sediments from fresh water bodies, are in line with the objectives, criteria and principles of organic farming and should be included in Annex I, with the following restrictions:

- Only organic sediments that are by-products of water body management, and which are extracted in ways that cause minimal negative impact on the aquatic ecosystem, should be used
- Same limits for heavy metals, as given in Annex I for household waste, should be applied.
- Sediments rich in contaminants such as petrol-like substances should not be used.

Sapropel is also used in the preparation of composts. Sapropels, which are rich in salts of calcium, iron, and phosphorus, contain no sand and are poor in clay. They are added to the rations given agricultural animals as a mineral supplement; daily sapropel supplements reach 2 kg for hogs, 3 kg for cows, and 10–15 g for hens.

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