

Turf Gel – multipurpose growth catalyst and soil recultivator.

High-performance appropriate technology of manufacture of inexpensive bio active matter on the basis of humic acid nitrites - Turf Gel - had been developed. Turf Gel recovery technology is based on production of strong colloidal solutions from turf matter. On the basis of these colloidal solutions the plant growth stimulants and soil recultivators as well as feed additives of high nutritive value are produced.

The basic elements of turf gel production line are cavitation ultrasonic dispergators. When feed pulp passes through hydropulse apparatus there is formation of colloidal solution from turf matter. Herewith, the synchronous processes of extraction, solution, cellular structure disintegration and cellulose destruction with further molecular level recombination take place. The process takes place against the background of fast-growing temperature being the processing accelerator.

Application of turf gel in livestock farming

Application of turf gel as a bio additive in poultry industry and livestock farming is also perspective. The use of turf gel for animals and poultry diet stimulates immunity strengthening and strongly increases liveweight gain. Moreover, the use of turf gel considerably increases animals and poultry digestion. As a result of production test of turf gel, which had been hold at one of agricultural enterprises of Novosibirsk region, it was shown that average daily weight growth of livestock has 10-11% increased in comparison with control animal group. Turf gel was added taking into account that the tested animals got daily 10-15 mg per 1 kg of live weight. Herewith, the feedstuff economy was found to be 30-33% that was 200—215 kgs per year of one livestock unit.

As a result of production experiment at one of big pig farms the daily gain of piglet pilot group was **10,8%** higher in comparison with control group. The most effective turf gel dosage was found to be 1% of dry feed.

The nutrition value of Turf gel is more than the value of silo and haylage, etc. The protein percentage in turf gel may be up to 20%.

In full, all property spectrum of turf gel as concentrated colloidal solution shows itself in the process of further synchronous processing with little-used or non-traditional stuff. For example, as it was shown above, the synchronous processing of turf gel and scalplings provides, together with high calorificity, high feed assimilability at pigs fattening.

During processing of raw products the deactivation of pathogenic flora and fauna and their metabolic by-product takes place. It is possible to process green herbal mass adding turf gel into dry granules of long-term storage saving all necessary nutrients. In that case, grass cutting is possible under any weather conditions. At a certain dehydration level turf gel shows good preservative and moisture regulation features.

Application of Turf Gel in agriculture

Turf Gel is used in agriculture as a natural, ecological soil fertility recovery (recultivator). Turf Gel is easily assimilated by plants, intensifies metabolic processes in plant cells increasing the quantity of chlorophyll, vitamins and other valuable matters (for example – gluten in wheat). At the same time it 2 times and more decreases nitrate content in a product, stimulates the development of powerful root system. The complex of factors described enables **20-40%** yield growth and cutting down ageing period for less than **10-12 days**. The drought-resistance and frost hardiness of the plants is rising.

Applying of turf gel is consistent with applicable agro-technologies and does not demand separate operations as well as additional expenses for fuel, purchasing of new equipment, etc. Applying of turf gel is used in seeds treatment, application into solid together with mineral fertilizers, leaf watering at herbicide and pesticide treatment.

Turf gel effects on general plant metabolism progresses and their growth processes. Under their influence nitrogen, phosphoric, potassium and carbohydrate metabolisms in plants increase. Taking into account strong plant root system permeability the problem of effective mineral fertilizers assimilation in plant cultivation is successfully solved. **The assimilation of instant water-soluble potassium and nitrogen fertilizers by a plant under turf gel influence few times increases.**

That enables to reduce the dosage of nitrogen and potassium mineral fertilizers up to **30%**. The same takes place with phosphoric fertilizers under the conditions that Turf gel was applied.

The purchasing of turf gel does not demand additional expenses, but, on the contrary, save money on buying of mineral fertilizers (**up to 30%**) and enables to fertilize wider cultivation area.

Turf gel is able to enhance protective function of a plant. Its protective activity strongly shows itself in extreme climate conditions (high or low temperature, drought or overwetting, insufficient light and oxygen quantity in soil, pesticide accumulation). There are facts of potatoes and **maize (corn)** survival at a temperature up to minus 12°C.

Turf gel reduces or absolutely neutralizes toxic and mutagenic activity of pesticides.

Soils, which regularly accept humic fertilizers are more resistant to chemical pollutants such as radionuclides, hard metals (plumbum, mercury, chromium, cadmium, etc.), pesticides than small-humus soils. In time of urbanization epoch and cultivation of agriculture at arable lands, which are close to big industrial regions this fact is more than topical. Turf gel fixes those detrimental compounds generating insoluble complexes in soil solution. Detrimental compounds cannot penetrate into plants, soil-underground waters and air. In technogeneous zones the watering of soil by turf gel solution (at concentration from 0,1 up to 0,01%) strongly enhances biological activity of soil and favours the plant resistance to detrimental emission of industrial factories.

Due to turf gel application soil degradation is prevented, gradual accumulation and regeneration of humus in soil is provided, fertility of malnourished lands is recovered. Turf gel beneficial has favourable effect onto soil structure increasing gas permeability and water-holding factor decreasing soil man-induced. Addition of humic fertilizers enhances physical and physicochemical properties, its water and heating rate. Turf gel, together with mineral and organic mineral soil particles forms soil absorbing complex conditioning its absorbing capacity. By means of obduce and glue of mineral soil particles between each other, application of turf gel enables humus matters to create valuable water-stable cloddy - granular structure enhancing water permeable and water-holding capacity of soils, its air permeability.

Turf gel enables soil microflora growth and, first of all, ray fungi (microorganisms, which combine features of fungi and bacteria) that destroy wooden remains (cellulose, hemicellulose, protein and lignin) and, hereby, accelerating the process of natural humus accumulation. Turf gel enables significant activation of those groups of microorganisms, which takes part in mineralization of organic matters. As a result, soil is enhanced by accessible nutritious elements. At decomposition of organic matter many organic acids and carbonic acids are generated. Under their effect a hard-to-reach phosphorus, calcium, potassium and magnesium compounds pass into disposable plants forms. Thereby, it is necessary to remember, that addition of humic fertilizers provides "overbalance" of accumulation of organic matter in soil over its decomposition. However, humus content in soil is usually less that 10% from soil mass. It is because of humus matters variegated microbial population is sustained in soil.

Providing perceptible enhancement of ecological status of cultivated areas and territories, the use of humus matters allows substantially raising of weather and climate resistance and yield of plants and green planting. At the same time the level of assimilation of mineral fertilizers by plants rises; that enables to decrease fertilizers consumption for **20-40%**.

Molecules of humus matters penetrate into soil structure that leads to sharp raise of soil exchange capacity. Adsorbed forms of nutritional matters do not compound with soil. They are not washed out by water and are located in a status disposable for plants. Further, plants use those absorbed matters from soil more intensive than from soil solution. It was noted, that humus matters are able to prevent clay potassium mineral fixation being a result of forming the compounds of chelate type. All useful microelements, being the metals, forms chelate complexes together with humus matters in soil, thereby, providing their nutrition. As for iron and manganese, they are assimilated as humic complexes only.

Turf gel prevent irreversible sorption of phosphates compounding iron and aluminum ions into complexes especially on those soils, which are over-excessed by them. Turf gel applied into soil enables to fix nutrient elements in soil and to use them more rational. Turf gel raises **20-25%** the level of

phosphorus use from soil, and **23-25%** level of potassium. Up to other data, application of similar humic fertilizers at mould humus soils **1,5-2 times** increased the content of movable phosphorus and **2-2,5 times** increased the content of ammonia nitrogen. Turf gel enables to enhance the nutrition of plants by nutrient elements preventing wash out of soluble salines of potassium and nitrogen increasing the accessibility of calcium, magnesium, aluminum and iron phosphate salines for plants.

There was determined that 0,1% of humus matters concentration releases phosphorus from soil with a rate of 100 mg of phosphorus per week per 100 g of soil. After addition of turf gel firm tendency of increase of content of movable phosphorus, metabolic potassium, assimilated nitrogen in topsoil is observed.

Even at high dosage of mineral fertilizers used for planned grain, vegetable and other cultures yields, the plants take only 1/3 of necessary nutrition matters to form their biomass and 2/3 of nutrition elements they get from soil. It is one more solid argument for the benefit of purposeful applying of turf gel into soil.

Applying of humus fertilizers into soil reduces and, after, completely removes detrimental effect onto plants being the causes leading to soil exhaustion. And that is much faster than traditional method of crop rotation. At crop rotation the ability of soil to natural purification caused by its microfauna is used. To accelerate soil purification its biological activity is increased by means of addition of humic fertilizers (including manure, mineral fertilizers and green manure). Than, the sunflower (*Helianthus annuus*) or sugar beet come back to previous field in 5-6 years but not in third of fourth year. Applying of turf gel is particularly important for soils with low humus content, where long-term monoculture is grown.

Being the basic active matter of humic fertilizers, humic acids are capable of gelatinization. Due to this feature, after soil treatment by humic fertilizers its water-holding ability rises. Taking into account that more than 3/4 of agricultural lands in a country are located in aridity regions, this feature of humic fertilizers is especially important. From another side, that is because of addition of humates, the same soils keeps satisfactory features longer at intensive irrigation, including watering with the use of high dosage of mineral fertilizers.

Modern plant cultivation is not possible without the use of various pesticides necessary for weed control, pests and plant diseases. However, the use of these agents leads to wide range of negative effects because of their accumulation in soil: soil microflora is destroyed, plants physiological functions are damaged. Pesticides are accumulated into agricultural products being negative for human health. Applying of turf gel into soil stimulates the activity of microorganisms and enables fast decomposition of pesticides in soil. At the same time, plant resistance to effects of these chemical agents increases, the rate of decomposition of pesticides in plant cells rises.

Under the influence of turf gel the plants are more tolerant to fertilizers over dosage, especially to nitrogen and pesticide ones.

Turf gel is able to enhance the protective functions of plant organism. Its protective activity strongly shows itself in extreme climate conditions (high or low temperature, drought or overwetting, insufficient light and oxygen quantity in soil, pesticide accumulation). There are facts of potatoes and corn survival at a temperature up to -12°C.

Turf gel reduces or absolutely neutralizes toxic and mutagenic activity of pesticides. Under the influence of turf gel the plant are more tolerant to fertilizers over dosage.