

Cleaning up toxic red sludge with DUDARIT

October 22, 2010

Improving the soil with eco friendly substances – experimenting with dudarit

Hungary's economy is currently under restructuring, where one reason is to increase the performance and export of the country's small and medium enterprises. The restructuring requires the reallocation of subventions, the strengthening of business partnerships and the support of innovation. One remarkable example of an efficient business partnership is Ecopolis Cluster whose members pledged environmental cooperation through competitive and innovative developments. The cluster had already proven through a variety of its projects that a successful cooperation among the economy, municipalities and higher education institutions can bring significant results not only for the participants but also for the entire society, economy and the state itself.

The members of the cluster have adopted environmentally sensitive business practices and launched various R&D&I projects which directly contribute to environmental protection. One of the distinguished areas of environmental protection is soil protection, which receives special attention in the karstic region of Transdanubia in Hungary. Duszen Kft., Agro-Hum Kft. and the Research Institute for Viticulture and Enology at the Center of Agricultural Sciences of the University of Pannonia have launched a project in this research field to develop a slow dissolving, pelleted and eco friendly green manure with high humus content.

Duszen Kft. is a small business with limited financial and professional resources, which is why the fertilizer project must be financed by the Baross Gabor program's KD_INTEG_07-DudarNPK project named "Development of slow dissolving, pelleted and eco friendly fertilizer with high humus content from waste material." The project's final product will be a long lasting, environment- and plant-friendly fertilizer with high humus and mineral nutrient content (e.g.: N, P, K, secondary- and micronutrients) that can meet the agricultural needs of the 21st century on a national and international scale. The project includes all the laboratory experiments of production; the pilot production; the culture dish and outdoor soil plant researches for the purpose of determining the effectiveness of the various fertilizers, as well as full administration of acquiring the distribution license from FVM (Ministry of Rural Development).

Originally, Duszen Kft. was established as a mining company for the energetic utilization of lignite found in the Dudar area of Hungary's Transdanubian region. The humic acid content of these lignite deposits is over 60% which is one of a kind even on a global scale. This unique property of lignite can be exploited in the field of soil fertility enrichment in the agricultural industry. Duszen Kft. produces grained and graded products of lignite from Dudar since 1998 within Hungary and also for export to Italy, Slovakia and Australia.

The importance of humus and humic acid as soil components is widely described in text books and scientific reports. Soil is referred to as infertile with no humus content, whereas with a 3-4% humus content it can be labeled as fertile. Only soil with decomposing humus content can continuously provide plants with nitrogen. As soil is cultivated, it gradually loses its humus content and with it, its nitrogen supply and cation absorption ability. Humus is generated in soil through humification (composting) of organic matter. For centuries, missing humus content of soil has been provided by organic fertilizers. The industrial use of lignite with high humic acid content and other organic minerals as soil and fertility enhancers looks back to only a few decades. Due to continuous R&D, the variety of products had increased, and today, they include veterinarian products and human as well as animal dietary supplements with humic acid content. In Hungary, this product line is represented and distributed by Organit Kft.

The high humic acid of Dudarit is currently produced from lignite by digestion with potassium hydroxide which is a strong base. The result is water solubehumates. However, this is an expensive process due to the high market price of potassium hydroxide and does not bring return on investment. The real knowhow is to substitute potassium hydroxide with another substance. This special substance is being generated in Hungary in growing quantities from the past four years. Added to lignite at a 15-30% ratio, this substance can reach the same desired result, that is, the humus content of lignite becomes soluble and as such, may be supplemented by green nutrients in a complex form. The total nitrogen-phosphorus-potassium content of the product can reach 20-25%, which is about 2-3 times higher than that of the currently marketed products. It also contains microelements at a sufficient level.

The new invention is a natural, long lasting, plant- and eco-friendly product. To sum it up, dudarit is a lignite granule with high humic acid content that is unique to the whole continent. It can only be activated by bases. Many research institutes have experimented with this substance in the past to figure out what would happen when mixed with red sludge. The results have been very positive everywhere. When the red sludge reservoir burst in 2010, the use of dudarit was considered instantly as a possibility to neutralize the spill. Laboratory and later, field experiments have shown that under moist conditions dudarit can neutralize pH from 13 to 7.5 – 8 in a short period of time. (Solutions with pH 14 are strong alkalis, whereas pH 7 is neutral. Solutions with pH 1 are strong acids.) As previous measurements by the University of Pannonia indicate, the first and foremost hazard of red sludge is its strong acidic value of pH 13. Therefore, dudarit is guaranteed to be an effective substance in neutralizing the alkaline red sludge and mitigating the damages.

Remediation could be done by withdrawing the red sludge spill then spreading dudarit on the contaminated area. Within a couple of days, dudarit will neutralize the alkaline property of red sludge, thus no further action is needed to remove affected soil. It must be determined though, whether the buffering capacity of soil is still adequate to support the redeposition of biological soil crusts. Members of the Ecopolis Cluster continue to work out a solution with innovative processes in order to mitigate damages and reestablish ecological balance in the affected area.