

Study on the Use of Manganese-Containing Materials as a Micro Fertilizer Based on the Local Mineral Resources and Industrial Wastes in Hydroponic Systems

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Abstract : Hydroponic greenhouses systems (production of the artificial substrate without soil) are becoming popular in the world. Mostly the system is used to grow vegetables and berries. Different countries are taking action to participate in the development of hydroponic technology and solutions such as EU members, Turkey, Australia, New Zealand, Israel, Scandinavian countries, etc. Many vegetables and berries are grown by hydroponics in Europe. As a result of our research, we have obtained material containing manganese and nitrogen. It became possible to produce this fertilizer by means of one-stage thermal processing, using industrial waste containing manganese (ores and sludges) and mineral substance (ammonium nitrate) that exist in Georgia. The received material is usable as a micro-fertilizer with economic efficiency. It became possible to turn practically water-insoluble manganese dioxide substance into the soluble condition from industrial waste in an indirect way. The ability to use the material as a fertilizer is predetermined by its chemical and phase composition, as the amount of the active component of the material in relation to manganese is 30%. At the same time, the active component elements presented non-ballast sustained action compounds. The studies implemented in Poland and in Georgia by us have shown that the manganese-containing micro-fertilizer- $Mn(NO_3)_2$ can provide the plant with nitrate nitrogen, which is a form that can be used for plants, providing the economy and simplicity of the application of fertilizers. Given the fact that the application of the manganese-containing micro-fertilizers significantly increases the productivity and improves the quality of the big number of agricultural products, it is necessary to mention that it is recommended to introduce the manganese containing fertilizers into the following cultures: sugar beet, corn, potato, vegetables, vine grape, fruit, berries, and other cultures. Also, as a result of the study, it was established that the material obtained is the predominant fertilizer for vegetable cultures in the soil. Based on the positive results of the research, we consider it expedient to conduct research in hydroponic systems, which will enable us to provide plants the required amount of manganese; we also introduce nitrogen in solution and regulate the solution of pH, which is one of the main problems in hydroponic production. The findings of our research will be used in hydroponic greenhouse farms to increase the fertility of vegetable crops and, consequently, to get bountiful and high-quality harvests, which will promote the development of hydroponic greenhouses in Georgia as well as abroad.

Keywords : hydroponics, micro-fertilizers, manganese-containing materials, industrial wastes

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