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The Effect of Controlling the pH of Polluted Farmland Soil Treated by the Electrokinetic Method on Crop Growth

Tadayoshi Hitomi[1*], Mieno Toshihiko[2], Shiohama Keiji[3], Kubota Tomijiro[1], Hamada Koji[1], Shiratani Eisaku[1]

[1]National Institute for Rural Engineering, [2]Fuji Environ, [3]Asanuma Corporation

The electrokinetic method (EK method) is technical method for removal of pollutants at the original position by passing a direct current through the soil to generate an electrophoresis and an electroosmotic flow. This method has been applied mainly as a removal method for pollution in the urban regions-factory vacant lot, for example. On the other hand, EK method would be utilized as effective removal technology of pollutants in farmland soil to clean the low permeable soil in farmland and the lower layer soil where soil dressing is difficult for cleanup. However, for the effective application of the method to farm, it is necessary to clarify the installing process of the electrode to improve the efficiency of the method and the influence on agricultural productivity by applying the EK method. Therefore, we examined a cultivation experiment of Brassica campestris seedlings to reveal the agricultural productivity of the soil after the EK method applying and the influence of soil improvement by the pH controlling in the yield recovery.
At first, we examined the effect of cleanup of the EK method on the polluted farmland soil by the use of acrylic equipment in which the electrodes was arranged horizontally assuming an application of EK method to the paddy field. The equipment had a 30 cm of soil layer with anode placed in the surface and cathode in the underground. We submitted a test soil which was gathered from the surface of the polluted paddy field with heavy metals and was added zinc sulfate. The field from which the test soil had gathered located in the alluvion down the metal mine. We passed a current through the polluted soil for 24 days, and gathered a soil layer every 5 cm, and measured a soil pH and heavy metal contents. As the examination result, it was observed that the heave metal contents at the surface layer (the side of anode) had decreased and the heavy metal accumulation layer under the ground had been formed. Judging from the fact that pH of the surface layer at that the heavy metal contents had decreased was less than 4, it is thought that heavy metals of surface transferred to the under layer with the expansion of the acidity domain from the surface to the underground layer.
After the cleanup examination, we carried out a cultivation experiment of Brassica campestris seedlings using the soil of before and after the cleanup examination by EK method, and the soil which had been controlled pH. We carried out the examination in three series, and set the number of seeds twenty. The day cycle of light was 9 hours in blight condition and 15 hours in dark condition, and temperature was kept at 20 degrees. The soil pH was controlled by calcium carbonate. After the examination, we measured a leaf length and live weight above the ground. As a result of the examination, the growth of Brassica campestris grown in the soil which was gathered from the surface layer of 0-10 cm extremely deteriorated. On the other hand, the growth deterioration in the soil gathered from the deeper layer than 15 cm was not confirmed. In addition, the growth recovered to around 80 percent in the soil of surface layer by the enough application of pH controlling. Therefore, the pH controlling was the soil improvement method that was effective for recovery of the farm productivity. However, it is estimated to be around 20 percent deterioration in farm yield even if we apply pH controlling for the soil treated by the EK method. Therefore, examination considering the soil improvement from the point except the pH controlling

will be necessary.