
Study on the Relationship Between Soil Organic Matter Content and Soil Urease Activity

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Abstract: A long-term spatial displacement experiment was conducted to investigate the relationship between soil organic matter content, soil urease activity, and soil ammonium nitrogen content. The results showed that the changes in soil urease activity and soil ammonium nitrogen content during the maize growth period were as follows: filling period>large bell mouth period>harvest period; Among the five types of soil with organic matter content, soil urease activity, soil ammonium nitrogen content, and soil organic matter content are positively correlated, with Bei'an>Nenjiang>Helen>Dehui>pear trees. Figure 3, Table 1, Reference 9.

Keywords: soil urease activity; Organic matter; Soil NH-N content; soil temperature

Soil organic matter content is an important indicator reflecting soil quality or soil health, which directly affects soil fertility and crop yield. It plays an important role in improving soil quality and increasing crop productivity. Soil enzymes are an important biological indicator that characterizes the vigorous metabolism of substances and energy in soil, as well as the level of soil quality. With the intensification of human activities and changes in environmental conditions, the content of soil organic matter decreases, thereby affecting soil urease activity. Soil urease is closely related to the conversion of nitrogen in soil, and soil urease activity can reflect the level and capacity of soil nitrogen supply. Therefore, using spatial displacement long-term positioning experiments to study the relationship between organic matter content and soil urease activity in farmland black soil after changes in water and heat conditions, the aim is to further reveal the trend of biological property evolution of farmland black soil after changes in water and heat conditions, understand the soil biochemical environment for stable and high yield of farmland black soil under different water and heat conditions, and provide scientific basis for scientific management of farmland black soil.

1. Dynamic changes in soil temperature of black soil in farmland with different organic matter contents

The change in soil temperature will inevitably cause changes in soil microorganisms and enzyme activity. The dynamic changes of soil temperature in black soil of farmland with different organic matter contents during crop growth period are shown in Figure 1. From Figure 1, it can be seen that from the entire growth period of corn, the soil temperature of the five types of organic matter content soils is relatively high and close during the filling and big horn stage of corn, while the temperature is lower during the mature stage of corn, which is consistent with the temperature changes in the environment. Among the five types of soil with organic matter content, the change in soil temperature is: Bei'an>Nenjiang>Helen>Dehui>pear tree, which is consistent with the change in soil organic matter content. The surface temperature of soil increases with the increase of soil organic matter, with high soil organic matter content and high soil temperature, both of which work together to promote crop growth. Fertilization treatment showed higher soil urease activity in the five organic matter contents compared to the no fertilizer control treatment. Fertilization can enhance urease activity and promote soil nitrogen conversion. However, regardless of whether it is fertilization or no fertilizer control treatment, the trend of changes in

soil urease activity for the five organic matter contents is consistent, with the strongest trend occurring during the corn big horn stage, the lowest during the filling stage, and an increase at maturity and harvest. This indicates that soil urease activity is more active in summer, and heat has a greater impact on soil urease activity. Research by Liu Chunsheng and others has shown that soil temperature is an important factor affecting soil enzyme activity, as heat is the thermodynamic condition for enzyme catalyzed reactions. Within a certain range, temperature increases the affinity between enzymes and substrates, thereby increasing enzyme activity. At the maturity stage of corn, soil urease activity is stronger than during the filling stage, which may be due to the fluctuation of soil urease activity caused by the decomposition and shedding of dead roots in the later stage of corn growth. During the same period, there was a significant positive correlation ($r=0.9106$) between soil urease activity and soil organic matter content for five different organic matter contents. Bei'an had the highest soil organic matter content and urease activity, while pear trees had the lowest soil organic matter content and urease activity. This is consistent with the results of previous research, where the activity of urease is always high in soils rich in organic matter.

2. Dynamic changes of NH-N in black soil of farmland with 2 · 3 different organic matter contents

The trend of sexual dynamic changes is basically consistent, with a peak during the filling period of corn and then decreasing, but the fertilization treatment is higher than the non fertilization treatment. The order of soil NH-N content in the five organic matter contents during the entire growth period of corn is: grouting period>large bell mouth period>mature harvest period, indicating that nitrogen mineralization in the soil is greatly affected by temperature. The order of soil NH-N content in the five types of organic matter content soils is: Bei'an>Nenjiang>Helen>Dehui>pear tree, which is consistent with the change pattern of soil urease activity. This indicates that the soil has a high organic matter content and total nitrogen content. During the critical period of crop growth, there is relatively more mineralized nitrogen, and the soil NH-N content is correspondingly high.