

Study on Carbon Transfer Accompanied with Composting Rice Straws

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Abstract

Carbon-14, released from a spent nuclear fuel reprocessing plant into the atmosphere, is transferred into farm products such as rice crops, vegetables and others, through photosynthesis. Though rice plant is the most important food stuff for the Japanese, large amounts of rice straws are left behind as inedible parts after harvest. In Aomori prefecture, it is recommended by the local government that rice straws, composed of leaf and stem, be reused as recycled biomass for the feed or compost. The behavior of ^{14}C , accompanied with utilization of the biomass, is of large concern from the view point of its probable long-term accumulation in farm fields. In this study, the decomposition of organic matter in composting rice straws was examined to understand the transfer of ^{14}C from the farm soil to the atmosphere.

The compost was produced by mixing ^{13}C -enriched rice straws and cow dung with the equal amount in dry weight base, and being incubated at temperature of 37°C .

The total amount of carbon in the compost decreased to about 50 % of the initial amount at 30 days after the beginning of fermentation, and then to 40% at 60 days. Accompanied with fermentation proceeding, the ratio of carbon contained in rice straw to that in cow dung changed from 1 by 1.19 to 1 by 2. It suggests that the organic matter in rice straw was decomposed easier than that in cow dung. The decomposable organic matter, amount of which counted initially around 30% of total organic matter, was fully decomposed during around 2 weeks. The fraction of recalcitrant organic matter, such as lignin, cellulose and hemi-cellulose, exceeding 70% of the initial amount of organic matter, reached up to almost 100 % after 60 days fermentation. Among them, only hemi-cellulose was decomposed very slowly.

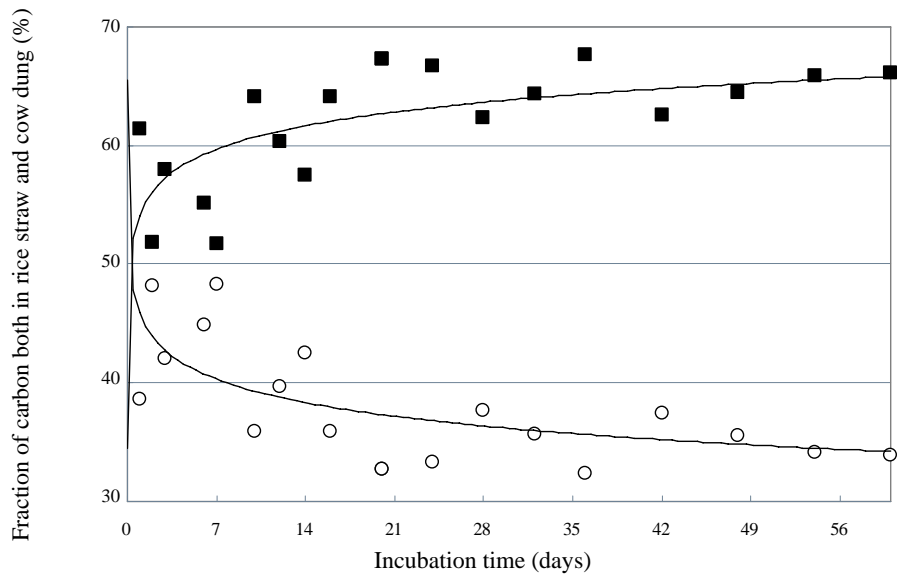


Fig. 1 Changes in fractions of carbon contained in the rice straw and in the cow dung to the total carbon in the compost.
 ■ and ○ indicate the ratio of carbon in the cow dung and the rice straw, respectively.

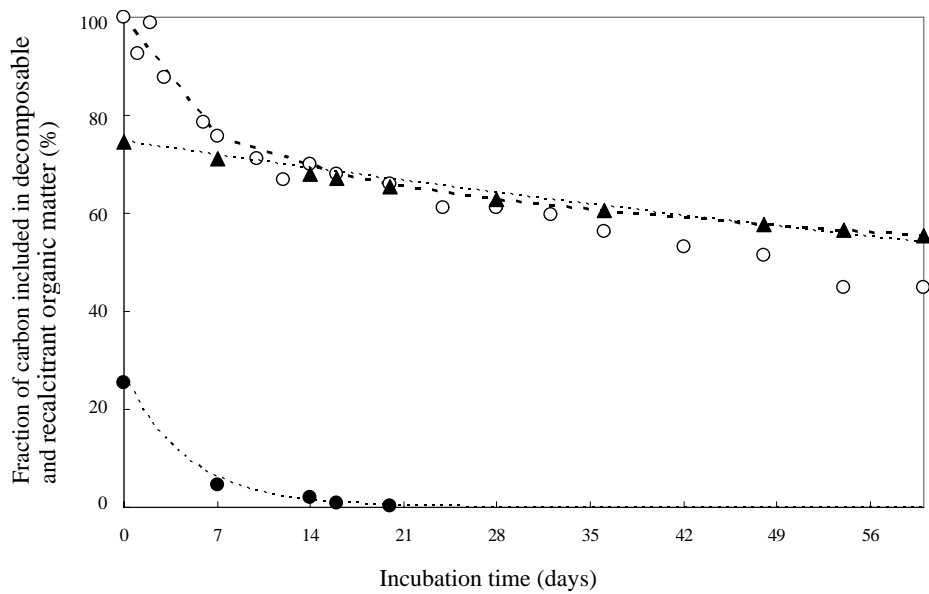


Fig. 2 Changes in fractions of decomposable (●) and recalcitrant (▲) organic carbon in compost.
 ○ :the total carbon contained in compost.