愛知県農総試研報 51：135（2019）
Res.Bull.Aichi Agric.Res.Ctr.51:135 (2019)

水田における秋冬季の浅耕が稲わら分解と灌漑期のメタン排出量に及ぼす影響

田中雄一[1)]・菅野淳夫[2)]・尾賀俊哉[3)]・鈴木玉与[4)]・井手康人[5)]・林 元樹[1)]

日本土壌肥料学雑誌　第 90 巻 第 5 号 p. 372–380（2019）

摘要：収穫後に土壌表面に残された稲わらの好気的分解を促すための秋冬季の浅耕（耕深 8 cm）について，耕深 15 cm の慣行区を対照として，メタン排出量を 3 年間調査した。耕起後の稲わらの深度別存在率と埋設法による残存率の経時変化から，作土中の稲わら由来の炭素量を試算し，メタン排出量に影響する要因を解析した。
1）灌漑期における浅耕区のメタン排出量は，平均 600 kg C ha^{-1} で，慣行区の 1.0～1.3 倍となった。 2）秋耕起後の浅耕区では、稲わらは地表に多く存在し、深さ 10 cm までに分布が限定されていた。一方、慣行区では、地表の存在率が低く、15 cm までのすき込み深に広く分布していた。 3）埋設深度別の稲わら残存率は、5 cm 深と 10 cm 深では差がみられなかった。一方、地表に設置した稲わらは、土壌との接触が少なく、低温にさらされるため、非灌漑期の残存率が高かった。埋設並びに地表に設置した稲わらは春耕起を模して 4 月に埋設深 8 cm に移設した。地表から 8 cm 深に移設された稲わらは、春耕起・湛水後に急激に分解し、灌漑期間終了時には当初から埋設された稲わらと同等の残存率となった。 4）灌漑期間中における浅耕区の稲わら由来の炭素減少量は、慣行区の 1.18 倍となった．このことが灌漑期間中のメタン排出量の増加につながったと推察された。

キーワード：メタン、水田、稲わら、浅耕

Effects of Shallow and Conventional Tillage in Paddy Fields during Fall and Winter on Rice Straw Decomposition and Methane Emissions during the Irrigation Season

TANAKA Yuuichi[1)], SUGANO Atsuo[2)], OGA Toshiya[3)], SUZUKI Tamayo[4)], IDE Yasuto[5)] and HAYASHI Motoki[1)]

Jpn. J. Soil Sci. Plant Nutr., 90, 372–380, (2019)

Abstract：We evaluated the effects of shallow tillage (ST) and conventional tillage (CT) conducted during fall and winter on the decomposition of residual rice straw and levels of methane emission in a paddy field during the irrigation season over a period of 3 years. The ST and CT plots were prepared by plowing to depths of 8 cm and 15 cm, respectively. Methane emissions from the ST plot during the irrigation season were equivalent to or 1.3-fold higher than those from the CT plot. In the ST plot, residual rice straw on the soil surface was abundant after fall plowing and was exclusively distributed down to a depth of 10 cm. There was less residual rice straw on the soil surface in the CT plot, and it was distributed down to a plowing depth of 15 cm. Using a mesh-bag burying method, no significant difference was observed in the evaluation of rice straw decomposition between the 5 and 10 cm depths. In contrast, the rice straw on the soil surface had minimal contact with the soil and was exposed to low temperatures, resulting in significantly lower decomposition quantities during the non-irrigation season. The mesh-bag that had been buried or placed on the soil surface was relocated to a depth of 8 cm in April, simulating spring plowing. After transfer, the rice straw on the soil surface decomposed rapidly, and its residual carbon content was equivalent to that of the initially buried rice straw. In the ST plot, the rice straw-derived carbon content was 1.47 Mg ha^{-1} after spring plowing and 0.96 Mg ha^{-1} before surface drainage. The decrease in carbon content during the irrigation season in the ST plot was 0.51 Mg ha^{-1}, which was 1.18-fold greater than that in the CT plot. This was likely the cause of increased methane emissions observed during the irrigation season.

Keyword: methane, paddy field, rice straw, shallow tillage

[1)]企画普及部　[2)]農業水産局　[3)]作物研究部　[4)]環境基盤研究部　[5)]西三河農林水産事務所