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for sustainable resource management”

## Non-Additive Effects of Mixing Rice Straw and Groundnut Stover Alter Decomposition

WIMONSIRI PINGTHAISONG, PATMA VITYAKON

*Khon Kaen University, Dept. of Soil Science and Environment; Soil Organic Matter Management Research Group, Thailand*

### Abstract

Rice straw (RS) is a residue remained in high quantity in rice-based agricultural systems. However, RS incorporated singly into a sandy soil decomposes rapidly leading to C loss which is not conducive to soil organic C accumulation. The objective of this study was to compare decomposition rate of RS mixed with groundnut stover (GN), to RS and GN only. A microcosm experiment with three replicates was initiated and RS (low N, high cellulose; CL) was mixed GN (high N and moderate lignin; L), at a ratio of 1:1 w/w, and compared with RS and GN applied singly in a sandy soil. The litter bag technique was used and decomposition was investigated at 3, 7, 14, 28 and 56 days after incorporation. Groundnut and the mixture had higher mass losses than RS especially from day 14 onwards. Microbial biomass nitrogen (MBN) ( $\text{mg N kg}^{-1}$ ) peaked at 7 days in GN (23.16), while it was at 14 days in the mixture (24.18). During 14–28 days, MBN in the mixture significantly declined below that of GN, while RS had the lowest MBN. The mixture showed non-additive effects of synergistic type for mass loss throughout decomposition. Microbial biomass N showed antagonistic type of non-additive effects except for day 14. It appears that GN component in the mixture enhanced decomposition of the mixture relative to that of RS alone. The enhanced decomposition of the mixture corroborated the significantly lower C/N ratio of the mixture than that of the RS alone throughout the decomposition. Temporal changes in MBN and soil mineral N ( $\text{NH}_4^+ \text{-N} + \text{NO}_3 \text{-N}$ ) concentrations were examined to explain the non-additive effect of MBN. Temporal patterns of change of MBN and soil mineral N concentrations were similar in the mixture and GN alone treatments. However, both parameters were lower in the mixture than those of the GN alone except for MBN at day 14 which was comparable in both treatments. The results showed that mixing RS with GN altered decomposition as indicated by non-additive effect of MBN which was related to altered pattern of mineral N release.

**Keywords:** Decomposition in residue mixture, litter bag technique, microbial biomass nitrogen, Northeast Thailand, soil mineral nitrogen