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Soil nitrogen fractions under long-term crop rotations in the loess plateau of China

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Long-term crop rotation may influence soil N storage, mineralization, and availability. We studied the 30 years effect of crop rotations on soil N fractions at 0-15 and 15-30 cm depths in the Loess Plateau of China. Crop rotations were continuous winter wheat (Triticum aestivum L.) (W), corn (Zea mays L.)-winter wheat-winter wheat-millet (Eleusine coracana L.) (CWWM), pea (Pisum sativum L.)-winter wheat-winter wheat-millet (PWWM), and sainfoin (Onobrychis viciifolia Scop.)-winter wheat-winter wheat-sainfoin (SWWS); pea-winter wheat-winter wheat-corn (PWWC); alfalfa (Medicago sativa L.) (4 years)-potato (solanum tuberosum L.) (1 year)-winter wheat (3 years) (A4PoW3), and fallow (F). Nitrogen fractions were soil total N (STN), particulate organic N (PON), microbial biomass N (MBN), potential N mineralization (PNM), NH4–N, and NO3–N. The STN and PON at 0-15 cm were greater in CWWM and at 15-30 cm were greater in A4PoW3 than F and W. The PNM at both depths was greater in A4PoW3 than other crop rotations, except SWWS and CWWM. The MBN was greater in CWWM, PWWM, SWWS, and A4PoW3 than other crop rotations. The NH4-N content was greater in F than other crop rotations, except PWWC. The NO3-N content at 0-15 cm was greater in CWWM and at 15-30 cm was greater in PWWM than F. Most soil N fractions were correlated with each other and also with the length of the crop rotation. Diversified crop rotations with increased root biomass N returned to the soil and longer year rotations enhanced soil N storage, mineralization, and availability compared with monocropping and fallow.

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