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Evaluation of wheat grain yield and soil organic carbon change under various agricultural management practices

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Abstract

Sustaining soil fertility and its productivity strongly depend on the type of agricultural management that potentially can augment and maintain soil organic carbon (SOC). The aim of this study was to investigate the effect of three agricultural strategies and four crop rotation systems on the wheat grain yield and SOC changes during four growing seasons from 2018 to 2020 in Ahvaz, Iran. The main factor of the field experiment was three agricultural strategies comprised conventional (CON: mineral fertiliser, removal of all crop residues, chemical weeding control), organic (ORG: organic fertiliser, 30 % return of crop residues to the soil, mechanical weeding), and integrated agricultural strategy (IAS: mineral/organic fertiliser, 15 % return of crop residues, chemical/mechanical weeding). The subfactor was crop rotation systems, which included: fallow-wheat (F-W), corn-wheat (C-W), sesame-wheat (S-W), and mung bean-wheat (B-W). Results illustrated that wheat grain yield from the first year to the second was significantly increased for all crop rotation systems with the exception of S-W under CON in which no significant increase was observed between the two experimental years. Among agricultural strategies and crop rotation systems CON and B-W showed the highest grain yield, respectively. No statistically significant difference was observed between S-W and B-W under IAS in the second experimental year. In addition, SOC showed a remarkable increase in ORG and IAS compared to CON. In contrast to F-W, all other crop rotation systems had an incrementing effect on the content of SOC over time. Rotation of legumes with wheat and also integrated management of organic and inorganic fertilisers highly improved both grain yield and SOC. This study calls for applying wheat-legume rotations under integrated agricultural strategies for sustainable wheat production in semi-arid Iran.

Keywords: Crop residues, crop rotation, integrated management, organic