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Integrating a mini catchment with mulching for soil water management in a sloping jujube orchard on the semiarid Loess Plateau of China

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Conserving more soil water is of great importance to the success of arid and semiarid orchards. On the hilly areas of the Loess Plateau of China, mini catchments, named fish-scale pits, are widely used in orchards for collecting surface runoff to infiltrate more soil water. However, the flat surface inside fish-scale pits would increase soil evaporation during non-rainfall periods. Here we integrated fish-scale pits with mulching, a popular meanings to reduce soil evaporation, to test whether this integration could improve soil water conservation. To this end, we observed soil water in the 0-180 cm in a typical rain fed jujube orchard in the hilly region of the Loess Plateau. Four different treatments with three replicates of each were established including fish-scale pit with branch mulching (FB), fish-scale pit with straw mulching (FS), fish-scale pit without mulching (F) and no fish-scale pit and no mulching (CK). The results showed that the treatments FB, FS, and F increased soil water storages (SWS) in the 0-180 cm by 14.23%, 9.35% and 4.82%, respectively, compared to the CK during the growing season. It is noteworthy that the increases of SWS were mainly in the 0-100cm indicating relatively low levels of water was supplied by rainfall infiltration beneath. During the dry season (June), an apparent soil water deficit was observed for all treatments. Throughout the wet season (July and August) soil water was greatly compensated. However, soil water deficit occurred again in the dry month of September. An index was used to represent the soil water supply from rainfall infiltration denoted WS. During the growing season the FB and FS treatments showed positive WS in the whole profile while the F treatment showed positive values only in the 0-100 cm. However, positive WS values were only found in the 0-40 cm for the CK treatment. In conclusion, integrating fish-scale pits with branch/straw mulching could conserve significantly more soil water by increasing infiltration and decreasing evaporation compared to fish-scale pits alone. Since the mulching branches were trimmed jujube branches, the integration of fish-scale pit with branch mulching is recommended in jujube orchards in order to both preserve more soil water and reduce the cost of mulching materials.