

Abstract:

In recent years, intensive production techniques have increasingly led to serious symptoms in agroecosystems. Conservation agriculture is one of the human approaches to cope with the limitation of production initial inputs and increase their productivity. The basis of conservation agriculture is based on three principles of minimum tillage, retention of a part of the crop residue (at least 30%) and crop rotation. In order to study the effects of tillage methods, rates of residue retention and water stress on yield, yield components and some of the crop characteristics of forage corn and wheat and also some chemical and physical properties of the soil, an experiment was carried out as split split plots based on a randomized complete block design with three replications in water stress conditions during two years of 2015 and 2016 at Agricultural Research Station of Jolgeh-rokh district in Torbate-Heidarieh. Experimental treatments include tillage methods (no tillage, minimum tillage and conventional tillage as main plot), residues retention rates (without residues retention and residues retention of 30 and 60 percent as sub plot) and water stress (irrigation based on 50, 75 and 100 percent of water requirement as sub-sub plot). Corn was planted in the first year and wheat in the second year. Based on the results, tillage and residues retention treatments did not had a statistically significant effects on bulk density of soil, penetration resistance of soil, soil moisture content and organic carbon, nitrogen, phosphorus and potassium content of soil, but the effect of tillage treatment was significant on soil infiltration rate at sampling times. In the first year, corn forage yield was significantly affected by tillage method ($p \leq 0.05$) and water stress ($p \leq 0.01$) treatments, and water use efficiency was only significantly affected by water stress ($p \leq 0.01$). The highest forage yield was observed in minimum tillage with 37690 kg/ha. According to the results of the second year, tillage method had a significant effect on plant height, spike length and number of seeds per spike of wheat ($p \leq 0.05$) and in all three cases, minimum tillage was superior. Residues retention had a significant effect on plant height ($p \leq 0.01$) and normalized difference vegetation index ($p \leq 0.05$). Water stress treatment had a significant effect on 1000-seed weight ($p \leq 0.01$). The resultant of this effects was in such a way that grain yield was significantly affected by tillage methods and water stress treatments at levels of 5% and 1% respectively. Among the tillage methods, minimum tillage had the highest grain yield (6551 kg/ha) and among water stress levels, water stress with 50% water requirement, had the lowest grain yield (4633 kg ha⁻¹). Water use efficiency was significantly affected by tillage and water stress treatments ($p \leq 0.05$). The maximum water use efficiency was related to minimum tillage with 1.71kg/m³. Considering that replacement of conventional tillage method with minimum tillage, showed a 6 and 35 percent increase in forage yield of corn and grain yield of wheat respectively, a minimum tillage method is recommended.

Keywords: Residues retention, Soil characteristics, Tillage, Yield



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Title

**Effect of conventional and conservation agricultural systems on
water use productivity and some agronomical traits of maize and
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