MONITORING SOYBEAN ROOT DEVELOPMENT UNDER TILL-SYSTEM MANAGEMENT (TSM) AT DRY-FARMING CONDITIONS

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ABSTRACT

Root system development is very importance for highest soybean (*Glycine max* L.) grain yield, especially under arid and semiarid conditions. In order to tillage system management (TSM) for achieved to the optimum yield of soybean in dry-farming conditions, this experiment was carried out using by a factorial design with four replications. The factors were till-systems including no-tillage (NT), minimum tillage (MT), full tillage (FT) and conventional tillage (CT) and were studied the effects of tillage system on root growth and grain yield in soybean. The root development features were root length and root diameter at 5 soybean growth stages. The root length was increased under no-tillage than under conventional tillage and the root diameter wasn't significantly affected by the tillage systems. The best of root system development in soybean was achieved during the stem elongation stage under no-tillage system. Therefore, monitoring soybean root development showed that tillage system management is very important in dry-farming, because in arid and semi arid weather the water resources are limited, so no-tillage system is a good system for farming in these conditions.

Keywords: Monitoring root development, till-system management, Soybean.

INTRODUCTION

Good root system development is essential for optimum wheat (*Triticum aestivum* L.) grain yield, especially under water-limiting conditions. Published information about the influence of tillage system on root dynamic and their effect on grain yield in Mediterranean rainfed Vertisols is scarce. A three-year field study was conducted on a typical Mediterranean rainfed Vertisol to determine, using a minirhizotron system, the effects of tillage system on root growth and grain yield in wheat. Tillage treatments were no-tillage (NT) and conventional tillage (CT). The parameters measured were root length

(RL) and root diameter (RD) for 6 depths. Minirhizotron measurements were performed at 5 wheat growth stages. The RL was greater under NT than under CT for most growth stages and depths, this being the key to its greater grain yield (3.2 vs 3.0Mgha−1, respectively). The RD was not significantly affected by the tillage treatments, but was lower from stem elongation onward and during the dry years. The key to the development of a good wheat root system is the rainfall received during the tillering stage, regardless of soil water content at planting and rainfall before or after this growth stage. Under the rainfed Mediterranean Vertisol studied, wheat productivity is greater under NT due to better root system development (Munoz-Romero et al., 2010). A mesorhizotron and scanning system was modified to study the development of Russian thistle root systems during the 1996 and 1997 growing seasons at Lind, WA. The imaging equipment combined the full profile images afforded by conventional rhizotrons with the portability of cylinderbased minirhizotron systems at a fraction of the cost of either system. Root development of Russian thistle in early spring was rapid and extensive compared with shoot growth. In 1996, 30 d after planting (DAP) Russian thistle roots were at least five times as long as the corresponding plant's shoots. During the next 20 d, shoots grew a maximum of 20 cm, whereas roots grew a maximum of 120-cm deep. Maximum root elongation rate reached 2 to 3 mm/cm2/d at the 70- to 120-cm depths 30 to 50 DAP in 1996 and 55 to 70 DAP in 1997. More than one (multiaxial grouping) Russian thistle root was often observed growing through the same soil channels. After the rapid early season growth, roots began to shrink or die back until shoots were clipped to simulate wheat harvest. Within 7 d after harvest, roots regenerated in old root channels. The mesorhizotron system is a promising inexpensive tool for monitoring root morphological development of Russian thistle under field conditions (Willaim et al., 2001).

MATERIALS AND METHODS

In order to tillage system management (TSM) for achieved to the optimum yield of soybean in dry-farming conditions, this experiment was carried out using by a factorial design with four replications. The factors were till-systems including no-tillage (NT), minimum tillage (MT), full tillage (FT) and conventional tillage (CT) and were studied the effects of tillage system on root growth and grain yield in soybean. The root development features were root length and root diameter at 5 soybean growth stages.

RESULTS AND DISCUSSION

The root length was increased under no-tillage than under conventional tillage and the root diameter wasn't significantly affected by the tillage systems. The best of root system development in soybean was achieved during the stem elongation stage under no-tillage system. Therefore, monitoring soybean root development showed that tillage system management is very important in dry-farming, because in arid and semi arid weather the water resources are limited, so no-tillage system is a good system for farming in these conditions.

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