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T. Y. Duan
Lanzhou University, China

Zhibiao Nan
Lanzhou University, China

L. Y. Xie
Lanzhou University, China

Y. Y. Shen
Lanzhou University, China

C. J. Li
Lanzhou University, China

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Impact of tillage system on root-invading fungi of winter wheat in the Loess Plateau

T.Y. Duan, Z.B. Nan, L.Y. Xie, Y.Y. Shen and C.J. Li

College of Pastoral Agriculture Science and Technology, Lanzhou University, China, E-mail zhibiao@lzu.edu.cn

Key words : root invading fungi, rotation, Loess plateau

Introduction Soil erosion is a serious problem in the Loess Plateau of China. Previous work indicated that no tillage system reduced soil erosion effectively (Xie et al., 2006). Tillage can change the composition, distribution, and activities of soil microbial significantly (Alvarez and Alvarez, 2000). The objective of this study was to identify root invading fungi of winter wheat (*Triticum aestivum*) in the Loess Plateau, China, with various tillage systems.

Materials and methods The experiment was conducted at the Loess Plateau Experimental Station of Lanzhou University, located in the central area of the Loess Plateau, China (35°39'N, 107°51'E). The annual rainfall was 480-660mm with the average of about 550 mm. There were four treatments in the experiment: (1) Conventional tillage (T): Tilled in July after harvesting and again in September before sowing, (2) Conventional tillage with stubble retention (TS): Tilled as T treatment but with previous crop stubble returned, (3) No tillage (NT): Soil was disturbed only at the sowing, and (4) No tillage with stubble retention (NTS): As NT and with previous crop stubble returned after harvesting. The experiment was conducted as randomized completed block design with four replicates for each treatment, the area of each plots was 4m × 14m = 56 m². 12 of winter wheat roots from each plot were sampled on April 5th, 2004. Roots were washed, sterilized, and isolated as the normal process.

Results and discussion Twenty four fungal species were isolated and identified in total. Similar fungal species were isolated from various treatments. They were, in order of decreasing frequency of isolation, *Phoma medicaginis* (28.34%), *Ascochyta* spp (21.67%), *Acremonium* spp (19.99%), *Fusarium* spp (19.16%) and *Rhizoctonia* sp (16.68%). However, differences in percent of isolation were found among the tillage treatments. NTS had the lowest percent frequency of fungal isolation whereas the roots from T treatment plots yielded the highest isolation rates; significant differences existed for species of *Acremonium* and *Phoma medicaginis* (Table 1). Majority of fungi isolated were so called minor pathogens and induced damage only when the hosts were under stress. The NT and NTS treatments provided better soil structure and richer soil organic matter than other treatments, which in turn aids the crop's growth and resulted in less fungal invasion.

Table 1 Percent frequency of main fungi isolated from winter wheat root.

Fungi	Treatment			
	T	TS	NT	NTS
<i>Acremonium</i> spp .	5.00b	8.33a	5.83ab	0.83c
<i>Ascochyta</i> spp .	8.33a	4.17b	5.00b	4.17b
<i>Fusarium</i> spp .	5.83	5.00	5.00	3.33
<i>Phoma medicaginis</i> .	12.50a	5.00b	5.84b	5.00b
<i>Rhizoctonia</i> sp .	1.67b	4.17a	6.67a	4.17a
Total isolation	43.33	40.83	38.34	35.83

* Means within each line followed by the different letters were differed at $P < 0.05$ in an analysis of variance (LSD test)

Conclusion No till system reduced the potential damage of disease caused by fungi at an early stage and could reduce soil erosion as well. Further study is needed to confirm the above findings.

Reference

Alvarez C R, Alvarez R (2000) Short-term effects of tillage systems on active soil microbial biomass. *Biol Fertil Soils* 31: 157-161.