

### 西部黄土高原苜蓿终止时间对苜蓿-小麦轮作系统生产力及土壤水分的影响

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### Effects of Lucerne Removal Time on Soil Water and Productivity in a Lucerne- Wheat Rotation on the Western Loess Plateau

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摘要

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**摘要** 旱作春小麦 (*Triticum aestivum* L.) 是西部黄土高原最重要的禾谷类作物, 该区苜蓿 (*Medicago sativa* L.) 分布也非常广泛。持续的作物连作和多年苜蓿种植系统都存在很多问题。雨养农业系统发展的关键是最佳水分利用策略的应用。发展合理的苜蓿-小麦轮作系统对该区农业的发展有十分重要的意义。由于苜蓿终止时间严重影响土壤水分, 所以在适宜的时间终止苜蓿就显得十分重要。然而, 关于苜蓿-小麦轮作中老苜蓿在一年中适宜终止时间的研究鲜见报道。本研究利用黄土高原西部典型的半干旱雨养农业区30年老苜蓿布设田间试验, 旨在探索老苜蓿地土壤水分状况、苜蓿终止时间和少量氮肥施用对系统生产力及土壤水分的影响。结果表明, 长期种植苜蓿后0~3 m土壤水分很少, 即便遇到丰水年(2003年), 3年的时间都不足以恢复土壤水分。30年苜蓿在一年中春季还是秋季终止对土壤水分状况无显著影响。种植苜蓿30年后杂草竞争力增强, 苜蓿干物质和产量水平都相当低, 且对1 kg hm<sup>-2</sup>的氮肥使用无明显响应。由于土壤水分含量太低, 后茬春小麦对1 kg hm<sup>-2</sup>的氮肥使用和苜蓿终止时间也无明显响应。因此, 苜蓿持续种植时间太长会耗竭土壤水分, 使后茬春小麦对苜蓿在一年中的终止时间及少量的氮肥使用无响应, 需要3年以上时间才有可能恢复土壤含水量。

**关键词:** 30年苜蓿 苜蓿-春小麦轮作 土壤水分 生产力 WUE

**Abstract:** Rainfed spring wheat (*Triticum aestivum* L.) is the most important cereal crop on the Western Loess Plateau. Lucerne (*Medicago sativa* L.) has been very popular. There are problems associated with both continuous cropping and with perennial lucerne systems. The key challenge for rain-fed cropping systems is to adopt strategies that make optimal use of water. Developing lucerne-wheat rotation systems will have significant benefits for agriculture development on the Loess Plateau, nevertheless, it is very important to terminate lucerne at the right time as it affects soil moisture. However, very little research has been done on the timing for termination of old lucerne in the semiarid areas of the Western Loess Plateau. Based on field experiments conducted in a typical semiarid area on the Western Loess Plateau, this paper aimed to investigate the soil water and termination timing of 30a old lucerne on the productivity of lucerne-wheat rotation. The results showed that the soil profile after long-term lucerne was very dry down to 3 meters, the three year experiment period was not sufficient to allow soil water recharge, even after a high rainfall year. Time of 30a old lucerne removal (in spring or later in the year) had no significant effect on soil water regimes. As a result, weeds became more competitive, the old lucerne stand showed poor dry matter, yield, had no response to 1kg ha<sup>-1</sup> of N application, and was overdue for termination. Following spring wheat made no response to 1kg ha<sup>-1</sup> of N fertilizer due to dry soil profile after 30 years lucerne growing.

**Keywords:** 30 years lucerne Lucerne-spring wheat rotation Soil moisture Productivity WUE

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