

研究论文

# 小麦高效吸收和利用磷素的生理机制

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**摘要** 以典型的不同的磷效率品种为材料, 对磷高效小麦品种高效吸收和高效利用磷素的生理机制进行了研究。结果表明, 在缺磷条件下, 与低效型品种(L)相比, 吸收高效型品种(Ha)和利用高效型品种(Hu)较高的籽粒产量, 分别与各自较强的磷吸收能力和磷利用效率密切相关。在缺磷条件下, 单株次生根数以Ha最多, 次生根系粗度(根系半径)和单位土体根系干重均以Ha最大, Hu次之, L最小。在拔节期、抽穗期和灌浆中期的根系TTC还原力、可溶蛋白含量和根系分泌的酸性磷酸化酶(APase)活性均以Ha最高, Hu次之, L最低。随着生长进程, 叶片的APase活性不断增加, 在缺磷条件下, 各测定时期均以Hu最高。可见Ha在磷胁迫下对磷素吸收量的增加, 是根系形态和根体构型改变、土壤中难溶性磷活化效率增加的结果; Hu磷利用效率的提高, 一定程度上是其叶片较高APase活性相对改善植株磷的代谢周转和再利用能力所致。

**关键词** [小麦\(Triticum aestivum\)](#); [磷吸收高效](#); [磷利用高效](#); [生理机制](#)

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## Physiological Mechanisms of Absorption and use of Phosphorus with High Efficiency in Wheat Cultivars

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**Abstract** The objective of this study was to explore the physiological mechanisms of phosphorus absorption and utilization in the typical wheat cultivars with different phosphorus (P) efficiencies. The results indicated that the grain yields of the cultivars with high P absorption efficiency (Ha) and high P utilization efficiency (Hu) under the P-deficient condition were higher than that with low P efficiency (L) which was related to the more P accumulation and the higher P use efficiency, respectively (Fig.1). Under P-deficient condition, the secondary root number, the radius of secondary root and the root dry weight per unit soil were the highest in Ha, the middle in Hu, and the lowest in L (Fig.2). The root TTC reductive activity, the soluble protein content of root and the activity of secreted acid phosphatase (APase) from root at the jointing, spiking and mid-filling stages were also the highest in Ha, the middle in Hu, and the lowest in L (Fig.3 - 5). The APase activities in the spring fourth leaf and flag leaf were increased with the leaf grow under the sufficient or deficient conditions. Under the deficient condition, the APase activities measured in whole experiment were the highest in Hu (Fig.6). It was inferred that the increase of P absorption in Ha under deficient condition was due to the improvement in root architecture and the improvement of use efficiency of insoluble phosphate in the soil enhanced by secreting APase from roots. Meanwhile, the increase of P utilization efficiency in Hu under deficient condition was mainly caused by the higher APase activities in leaves by which the mobilized transfer and reuse of P in the plant were improved.

**Key words** [Wheat \(Triticum aestivum\)](#) [High P acquisition efficiency](#) [High P utilization efficiency](#) [P physiological mechanism](#)

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