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## 论文

### 缺磷胁迫增强了马铃薯植株的耐旱能力

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#### 摘要:

大多数研究表明, 充足的磷营养能促进光合作用和根系生长, 增加束缚水含量和膜稳定性, 提高植株的耐旱能力。我们在对马铃薯24个品种(系)的盆栽沙培试验中发现缺磷胁迫反而增强了植株的耐旱能力。为进一步研究磷营养对马铃薯植株耐旱能力的影响, 以两个远缘杂交后代分离群体的60个株系(30 d苗龄)为材料, 在正常磷和缺磷的1/2 MS矿质营养液中培养16 d后, 用8% PEG8000模拟干旱胁迫3 h, 干旱胁迫前后取样测定生理指标。结果表明, 缺磷处理的植株矮小且气孔密度下降, 长出更多新根; 叶片和根系的可溶性糖、脯氨酸(Pro)含量以及叶片过氧化物酶(POD)活性与正常磷处理相比升高了一倍左右。干旱胁迫后缺磷处理叶片超氧化物歧化酶(SOD)活性极显著升高, 叶片未萎蔫; 而正常磷处理叶片Pro、丙二醛(MDA)含量均显著升高, 叶片明显萎蔫, 并且缺磷处理可溶性糖、根系Pro含量以及POD、SOD活性都显著或极显著高于正常磷处理。说明: 马铃薯在适应缺磷胁迫中发生的形态和生理代谢改变有助于提高其耐旱能力。

关键词: 马铃薯 缺磷胁迫 形态变化 生理变化 耐旱能力

## Drought Tolerance Enhanced by phosphorus Deficiency in Potato Plants

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#### Abstract:

Many morphological and physiological adaptations responding to drought or phosphorus (P) deficiency have been reported. But the researches on the relationship between P nutrition and drought tolerance are less, and the results are not consistent. The majority findings indicate that sufficient P nutrition can promote photosynthesis and growth of roots, increase bound water proportion and cell membrane stability and so on, thus enhance the adult plant drought tolerance. But it is found in our preliminary studies that potato grown in low-P environment showed a strong resistance to drought. This experiment aimed to verify and explain this phenomenon in physiological level. A total of 60 lines with 30-day-old Seedlings chosen from two segregating populations of distant-hybridization progenies were cultured in 1/2 MS mineral nutrient solution with two treatments of normal P and without P for 16 d respectively. Then, 8% PEG8000 was used to simulate drought stress for 3 h. Before and after drought stress, the concentrations of proline (Pro), soluble sugar, malonaldehyde (MDA) and the activities of peroxidase (POD) and superoxide dismutase (SOD) were measured, respectively. P deficient treatment increased the number of new roots, but reduced the leaf area and stomatal density. Before drought stress, the Pro and soluble sugar concentrations, POD activity of P deficient plants were increased and reached about 2 times higher compared to P sufficient plants. After 3 h drought stress, plants in P deficient treatment did not wilted, and the soluble sugar, root Pro concentrations, POD and SOD activities were significantly or very significantly higher, but plants in P sufficient treatment showed severely wilting and the MDA, leaf Pro concentrations evidently increased. Therefore, we can conclude that the morphological and physiological changes adapting to P deficiency enhance the drought tolerance of potatoes.

Keywords: Potato Phosphorus deficiency stress Morphological changes Physiological changes Drought tolerance

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