

山药块茎发育中物质积累及相关代谢酶变化

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Changes of Matter Accumulation and Relative Enzymatic Activity during Yam Tuber Development

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摘要

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摘要 以桂淮5号和桂淮16两个不同山药品种为材料, 根据块茎生长发育特性, 在山药发育进程中测定块茎的有关生理生化指标。结果表明, 随着块茎发育进程的推进, 块茎长度及干物质积累持续增加, 淀粉酶(AMY)活性降低; 多数碳水化合物、功能性物质及过氧化物酶(POD)、酸性转化酶(AI)和蔗糖磷酸合酶(SPS)活性先持续增加, 达到峰值后下降, 但峰期不同; 2个品种的还原糖、ADPG焦磷酸化酶(AGPase)变化不一致。*t*检验表明, 在块茎发育全过程中, 品种间的干物质($P=0.011$)、淀粉($P=0.031$)、皂苷($P=0.019$)差异显著。可溶性糖($r_5=0.97^{**}$, $r_{16}=1.00^{**}$)、AGPase ($r_5=-0.85^*$)、还原糖($r_{16}=0.87^*$)与蔗糖显著相关; 多糖($r_5=0.95^{**}$)、Vc($r_5=0.83^*$)、皂苷($r_{16}=0.88^{**}$)与淀粉显著相关; 干物质($r_5=0.97^{**}$, $r_{16}=0.87^*$)、AMY($r_{16}=-0.95^{**}$)、AGPase ($r_{16}=-0.90^{**}$)、蛋白质($r_{16}=0.83^*$)与块茎伸长膨大显著相关。由此表明, 蔗糖积累、SPS和AI活性在山药块茎发育中起关键调控作用, 主要功能性物质彼此间密切相关。

关键词: 山药 块茎发育 物质积累 酶

Abstract: Tuber development is a complex physiological process, involving in changes of various components and enzymes activities, so learning about changes of the matter accumulation and enzymes metabolism will help to instruct yam production. In the paper, two different cultivars Guihuai 5 and Guihuai 16 were used to investigate some physiological and biochemical indicators during yam tuber development in 2009—2010. The results showed that tuber length and dry matter content were kept increasing, but AMY enzyme activity decreasing during the tuber development. The main carbohydrates contents, functional substances, and the activities of POD, AI, and SPS presented similar trend: continually increased firstly, and reached various peaks, then decreased. The changes of reducing sugar content and AGPase activity were different between two cultivars. The *t*-test results indicated that there was a significant difference between two cultivars in dry matter ($P=0.011$), starch ($P=0.031$), and saponin ($P=0.019$). Sucrose content was significantly correlated with soluble sugars content ($r_5=0.97^{**}$, $r_{16}=1.00^{**}$), AGPase activity ($r_5=-0.85^*$) and reducing sugars content ($r_{16}=0.87^*$), and starch content was significantly correlated with polysaccharides ($r_5=0.95^{**}$), Vc ($r_5=0.83^*$) and saponin ($r_{16}=0.88^{**}$) contents as well as tuber length was significantly correlated with dry matter content ($r_5=0.97^{**}$, $r_{16}=0.87^*$), AMY activity ($r_{16}=-0.95^{**}$), AGPase activity ($r_{16}=-0.90^{**}$) and protein content ($r_{16}=0.83^*$). To sum up, the sucrose accumulation, SPS and AI activity play a key regulatory effect in yam tuber development, the main functional substances are close correlated between each other.

Keywords: Yam Tuber development Matter accumulation Enzyme

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