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施钾对夏玉米子粒发育过程中糖代谢相关酶活性的影响

崔丽娜， 许 珍， 董树亭*

山东农业大学农学院，作物生物学国家重点实验室，山东泰安 271018

Effects of potassium fertilization on enzyme activities associated with sucrose metabolism in the grain development of maize

CUI Li-na,XU Zhen,DONG Shu-ting**

Agronomy Collrge of Shangdong Agricultural University, State Key Lab. of Crop Biology, Taian 271018, China

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摘要 选用高淀粉玉米品种费玉3号及低淀粉玉米品种豫玉22为材料，研究了钾肥不同用量对玉米开花后子粒淀粉积累、淀粉合成关键酶活性的影响；分析不同处理对直、支链淀粉含量的影响以及淀粉合成关键酶活性与直、支链淀粉积累的关系。结果表明，施K2O 225kg/hm2的处理显著比不施钾肥处理提高了两品种子粒中腺苷二磷酸葡萄糖焦磷酸化酶（ADPG-PPase）的活性与尿苷二磷酸葡萄糖焦磷酸化酶 （UDPG-PPase），显著提高了费玉3号子粒中可溶性淀粉合成酶（SSS） 的活性；施钾降低了豫玉22子粒SSS、束缚态淀粉合成酶（GBSS）的活性。施K2O 225kg/hm2提高了两品种穗位叶蔗糖含量和蔗糖合成能力，促进了子粒淀粉的合成；显著提高子粒直链、支链及总淀粉含量及积累速率，收获时总淀粉含量分别提高13.6%和8.2%，施钾更容易提高费玉3号子粒淀粉含量。中、高量钾提高了高淀粉玉米费玉3号子粒可溶性糖含量，有利于淀粉的合成；而对低淀粉玉米豫玉22子粒可溶性糖含量没有显著影响。除可溶性糖含量外，品种与施钾的交互作用对以上各指标的影响均达到显著性水平。

关键词： 玉米 淀粉 蔗糖 酶 钾

Abstract： Field experiments were carried out to compare the dynamic variations of starch accumulation and enzyme activities in the developing grains of high-starch maize (Zea mays L.) Feiyu 3 and low-starch maize (Zea mays L.) Yuyu22 with different levels of basic potassium fertilization. The effects of the fertilization on contents of amylose content and amyloectin were studied, and as well as the relationship between key enzymes activities and the amylase, amyloectin accumulation. The results indicate that the activities of ADPG-PPase and UDPG-PPase in grains of the two maize cultivars are significantly improved under the potassium fertilization when 225 kg/ha potassium fertilizer is applied before the sowing, and the activity of SSS in grains of Feiyu 3 is also improved significantly, while the activities of SSS and GBSS of Yuyu22 are reduced. The treatment of potassium applied before sowing with 225 kg/ha improve the content of sucrose, the ability of sucrose and starch synthesis of ear leaves. The contents of amylopectin and amylose, total starch accumulation rate are significantly increased under the 225 kg/ha application. The total starch contents are increased by 13.6% and 8.2% for Feiyu 3 and Yuyu22 respectively, and the increased total starch content of Feiyu is higher than that of Yuyu22. It is favorable to compose starch by middle and high potassium, which increased the content of soluble sugar in high-starch maize Feiyu 3. But the infection was not significant to low-starch maize (Zea mays L.) Yuyu22. Interactive effects of potassium fertilization application and maize varieties on every target in the study are significant, except soluble sugar.

Keywords： maize (Zea mays L.) starch sucrose enzyme potassium

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Corresponding Authors: 崔丽娜 Email: cuilina01@163.com

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