

非对称性增温对冬小麦强势粒和弱势粒淀粉合成关键酶活性的影响

田云录¹, 陈金¹, 董文军¹, 邓艾兴², 张卫建^{1,2,*}

1南京农业大学应用生态研究所, 江苏南京 210095; 2中国农业科学院作物科学研究所 / 农业部作物生理生态与栽培重点开放实验室, 北京 100081

Effects of Asymmetric Warming on Key Enzyme Activities of Starch Synthesis in Superior and Inferior Grains of Winter Wheat under FATI Facility

TIAN Yun-Lu¹, CHEN Jin¹, DONG Wen-Jun¹, DENG Ai-Xing², ZHANG Wei-Jian^{1,2,*}

1 Institute of Applied Ecology, Nanjing Agricultural University, Nanjing 210095, China; 2 Institute of Crop Sciences, Chinese Academy of Agricultural Sciences/ Key Laboratory of Crop Physiology, Ecology & Production, Ministry of Agriculture, Beijing 100081, China

摘要

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摘要 以扬麦11为材料, 采用全生育期间开放式增温系统进行增温处理, 研究了不同增温处理对小麦强和弱势粒淀粉合成关键酶活性的影响差异。结果表明, 冬小麦强势粒中蔗糖合酶(SS)、腺苷二磷酸葡萄糖焦磷酸化酶(AGPase)和淀粉分支酶(SBE)的活性较弱势粒高, 而且三者白天的活性均比夜间高。不增温条件下, 整个灌浆期强势粒中SS、AGPase和SBE的活性平均分别比弱势粒高72.9%、111.4%和7.8%。全天、白天和夜间增温条件下, 强势粒SS白天的活性比常温对照的高8.4%~31.2%, 夜间的活性比对照高11.1%~20.3%; 弱势粒SS白天的活性比对照高9.7%~20.3%之间, 夜间的活性比对照高6.1%~32.0%。弱势粒中AGPase活性在不同增温处理下也显著提高, 其白天的活性比对照高54.2%~124.4%, 夜间的活性比对照高20.7%~99.3%。增温对SBE活性的影响较小, 强势粒和弱势粒在增温条件下其白天的活性均比对照高3.9%~12.1%, 夜间的活性均比对照高1.0%~7.6%。相关分析表明, AGPase和SBE的活性与千粒重之间存在极显著正相关, 增温条件下AGPase和SBE的活性显著提高, 尤其是弱势粒中AGPase和SBE活性的显著提高是千粒重提高的一个重要原因。

关键词: 非对称性增温 冬小麦 强势粒 弱势粒 淀粉合成关键酶 千粒重

Abstract: Using Yangmai 11 as the material, we investigated the impacts of asymmetric warming on the key enzyme activities in starch synthesis in winter-wheat superior and inferior grains based on field study with FATI (Free Air Temperature Increased) facility. The results showed that the activities of sucrose synthase (SS), ADP-glucose pyrophosphorylase (AGPase), and starch branching enzyme(SBE) were higher in superior grains than in inferior grains, and also higher in the daytime than at night. In the control during the grain filling stage, the average activities of SS, AGPase, and SBE were 72.9%, 111.4%, and 7.8% higher in superior grains than in inferior grains. In superior grains, the SS activities in all-day warming, daytime warming and nighttime warming treatments were 8.4 - 31.2% higher than those in the ambient control in the daytime, and 11.1 - 20.3% higher than those in the control at night. In inferior grains, the increased percentages were 9.7 - 20.3% in the daytime and 6.1 - 32.0% at night. In inferior grains, the AGPase activities were elevated significantly compared to the control with 54.2 - 124.4% in the daytime and 20.7 - 99.3% at night. The SBE activities were also higher in the warming treatments than in the control with the increase of 3.9 - 12.1% in the daytime and 1.0 - 7.6% at night. Besides, the correlations existed between the activities of AGPase and SBE and the 1000-grain weight were positive and significant. This result indicated that elevation of AGPase and SBE activities plays an important role in the enhancement of 1000-grain weight.

Keywords:

Asymmetric warming) " href="#">font-size: 9pt" lang="EN-US">Asymmetric warming Winter wheat Superior grain Inferior grain Key enzymes for starch synthesis 1000-grain weight

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Corresponding Authors: 张卫建, E-mail: zhangweij@caas.net.cn, Tel: 010-62156856

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