核农学报 2012, 26(7) 1053-1057 DOI: ISSN: 1000-8551 CN: 11-2265/S

同位素示踪·资源环境·动植物生理

夜温升高对早籼稻产量和品质的影响

吴自明, 时红, 石秀兰, 石庆华, 潘晓华

作物生理生态与遗传育种教育部重点实验室, 江西省作物生理生态与遗传育种重点实验室, 江西农业大学, 江西 南昌 330045

摘要： 利用2间玻璃室内夜间不同的温度条件,研究了生长期间夜温升高对早籼稻产量和品质的影响。结果表明,夜温升高促进早籼稻的生长发育,缩短早籼稻生育期;前期夜温升高能提高早籼稻的分蘖能力,增加有效穗;中后期夜温升高不利于早稻颖花分化和籽粒灌浆,导致结实率的下降;另外,夜温升高显著降低早籼稻稻米的碾磨和外观品质。但夜温升高对早籼稻产量的影响与生育期内的白天温度有关,白天温度较低时,夜温适度升高,有利于产量增加。

关键词： 早籼稻 夜温升高 颖花分化与退化 产量 品质

EFFECTS OF NIGHT TEMPERATURE INCREASE ON YIELD AND QUALITY OF EARLY INDICA RICE

WU Zi-ming, SHI Hong, SHI Xiu-lan, SHI Qing-hua, PAN Xiao-hua

Key Laboratory of Crop Physiology, Ecology and Genetic Breeding, Ministry of Education, Key Laboratory of Crop Physiology, Ecology and Genetic Breeding of Jiangxi Province, Jiangxi Agricultural University, Nanchang, Jiangxi 330045

Abstract: Two-glass-houses experiment with different night temperatures was conducted to investigate effect of night temperature increase on the grain yield and quality of early indica rice. Results showed that inereasing of the night temperature improved plant development and shortened rice growth period. Higher night temperature facilitated the tillering of early rice, increased the effective panicles at early stage, but the spikelets differentiation of early rice were inhibited and seed-setting rate decreased at middle stage. In addition, rice milling and appearance quality were decreased by higher night temperature. But the effects of night-temperature increase on the grain yield was related with daytime temperature, the grain-yield of rice grown under lower daytime-temperature will increase when a moderate increase of night-temperature..

Keywords: early indica rice night temperature increase spikelets differentiation and abortion grain yield quality

收稿日期 2012-05-25 修回日期 2012-07-25 网络版发布日期

DOI:

基金项目:

国家自然科学基金项目资助(30860138)和国家"十二五"科技支撑计划(2011BAD16B04和2011BAD16B14)

通讯作者: 潘晓华(1963-),男,江西分宜人,博士,教授,博士生导师,主要从事作物高产理论与技术研究。Tel:0791-83813490;E-mail:xhuapan@163.com

作者简介:

作者Email: xhuapan@163.com

参考文献：

[1] Peng S B, Huang J L, Sheehy J E, Laza R C, Visperas R M, Zhong XH, Centeno G S, Khush G S and Cassman K G. Rice yields decline with higher night temperature from global warming[J]. Proceedings of the National Academy of Sciences of the United States of America, 2004,101: 9971-9975

[2] 赵 平,孙谷畴,蔡锡安,饶兴权,曾小平.夜间变暖提高荫香叶片的光合能力[J].生态学报,2005,25(10):2703-2708
[3] Rosenzweig C, Tubiello F N. Effects of changes in minimum and maximum temperature on wheat yields in the central USA simulation study[J]. Agricultural and Forest Meteorology, 1996,80: 215-230
[4] Tao F, Yokozawa M, Xu Y. Climate changes and trends in phenology and yields of field crops in China, 1981-2000[J].Agricultural and Forest Meteorology, 2006,138:82-92
[5] Lobell D B, Burke M B, Tebaldi C, Mastrandrea M D, Falcon W P, Naylor R L. Prioritizing climate change adaptation needs for food security in 2030[J].Science, 2008,319: 607-610
[6] Chen C Q, Qian C R, Deng A X, Zhang W J. Progressive and active adaptations of cropping system to climate change in Northeast China[J]. European Journal of Agronomy, 2012,38:94-103
[7] 黄英金, 张宏玉, 郭进耀, 漆映雪,彭耀东,李长生,刘宜柏,徐正进.水稻耐高温逼熟的生理机制及育种应用研究初报[J]. 种子技术与工程,2004(8):1671-1815
[8] Cheng W G, Sakai H, Yagi K,Hasegawa T. Interactions of elevated [CO2] and night temperature on rice growth and yield[J]. Agricultural and forest meteorology, 2009, 149:51-58
[9] 国家质量技术监督局, 中华人民共和国国家标准——优质稻谷. GB/T17891-1999
[10] 中华人民共和国农业部部颁标准, 米质测定方法, NY147-88.北京:中国标准出版社,1988, 4-6
[11] Kanno K, Mae T and Makino A. High night temperature stimulates photosynthesis, biomass production and growth during the vegetative stage of rice plants[J]. Soil Science and Plant Nutrition, 2009,55:124-131
[12] 魏金连,潘晓华,邓强辉. 夜间温度升高对双季早晚稻产量的影响[J].生态学报, 2010, 30(10): 2793-2798
[13] 魏金连,潘晓华,邓强辉.不同生育阶段夜温升高对双季水稻产量的影响[J].应用生态学报,2010,21(2): 331-337
[14] 梁光商.水稻生态学[M].北京: 中国农业出版社,1983,177
[15] 戴云云,丁艳锋,刘正辉,王强盛,李刚华,王绍华. 花后水稻穗部夜间远红外增温处理对稻米品质的影响[J]. 中国水稻科学, 2009,23(4):414-420
[16] 李 林, 沙国栋, 陆景淮. 水稻灌浆期温光因子对稻米品质的影响[J]. 中国农业气象, 1989, 10(3): 33-38
[17] 沈 波, 陈 能, 李太贵, 罗玉坤. 温度对早籼稻米垩白发生与胚乳物质形成的影响[J]. 中国水稻科学, 1997, 11(3): 183-186
[18] 蔺万煌,萧浪涛,黄见良,洪亚辉,李合松.早籼稻米垩白形成与稻株源-库特性关系的研究[J]. 核农学报,2003,17(6):462-465
[19] Dong W J, Chen J, Zhang B, Tian Y L, Zhang W J. Responses of biomass growth and grain yield of midseason rice to the anticipated warming with FATI facility in East China. Field Crops Research[J]. 2011,123:259-265

本刊中的类似文章

1. 刘春泉, 刘春菊, 宋江峰, 李大婧, 冯敏, 朱佳廷.辐照杀菌对核桃粉品质的影响[J]. 核农学报, 2009,23(5): 825-828
2. 鲍正发,段智英,赵海军,夏英武,吴殿星.空间诱变引起水稻9311的品质变异[J]. 核农学报, 2004,18(04): 272-275
3. 劳华均,傅俊杰.辐照灭菌对鱿鱼品质的影响[J]. 核农学报, 2004,18(03): 225-227
4. 刘宏跃,林音,李香玲.γ射线辐照对豆类发芽和谷物类食用品质的影响[J]. 核农学报, 2004,18(02): 128-130
5. 马建中,马东艳,伊虎英,鱼红斌,郝玉怀.~(60)Co γ射线与稀土元素复合处理甜菜种子对其含糖量和产量的影响[J]. 核农学报, 2004,18(01): 11-13
6. 张利华,王林友,王建军.籼型杂交稻稻米碾磨品质与外观品质的配合力及遗传力研究[J]. 核农学报, 2003,17(06): 417-422
7. 蔺万煌,萧浪涛,黄见良,洪亚辉,李合松.早籼稻米垩白形成与稻株源-库特性关系的研究[J]. 核农学报, 2003,17(06): 462-465+457
8. 潘家荣,邹国元,魏丽,王保忠.群体密度和追氮方法对不同熟相冬小麦产量效应的差异及对化肥氮去向的影响[J]. 核农学报, 2003,17(06): 466-471
9. 黄建昌,肖艳.~(60)Coγ射线与GA_3复合处理对番木瓜的遗传诱变效应研究[J]. 核农学报, 2003,17(05): 332-335
10. 高国强,苏学合,吕铁信,孙永堂,朱斗北.陆地型长绒棉主要经济性状遗传模式分析[J]. 核农学报, 2003,17(04): 259-263
11. 倪竹如,陈俊伟,阮美颖.氮肥不同施用技术对直播水稻氮素吸收及其产量形成的影响[J]. 核农学报, 2003,17(02): 123-126
12. 王法宏,王旭清,任德昌,于振文,余松烈.土壤深松对小麦根系活性的垂直分布及旗叶衰老的影响[J]. 核农学报, 2003,17(01): 56-61
13. 吴关庭,刘庆龙,王贤裕,吴国泉.早籼突变体稻米品质变化的研究[J]. 核农学报, 2002,16(06): 342-346
14. 鲍根良,严文潮,张小明,左晓旭,叶胜海,崛内久满,富田桂.粳稻优质米突变体E203的诱变选育研究[J]. 核农学报, 2002,16(05): 268-271
15. 石岩,位东斌,于振文,余松烈.深耘断根对旱地高产小麦氮素分配利用及产量的影响[J]. 核农学报, 2002,16(04): 224-227