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短期亚适宜温光对黄瓜氮吸收运转相关酶活性和基因表达的影响

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Effects of Suboptimum Temperature and Suboptimum PFD in a Short Time on Enzymes Activities and Genes Expression Related to Nitrogen Absorption of the Cucumber Plants

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摘要以‘中农106’黄瓜为试材, 对其进行不同温度和光照强度[正常温光25/15 °C, 光强(700 ± 30) μmol · m<sup>-2</sup> · s<sup>-1</sup>; 亚适宜温光18/12 °C, 光强(200 ± 20) μmol · m<sup>-2</sup> · s<sup>-1</sup>; 低温弱光12/8 °C, 光强75 - 100 μmol · m<sup>-2</sup> · s<sup>-1</sup>]处理, 研究亚适宜温光条件对结果期黄瓜生长、生理特性和氮(N)吸收的影响。结果表明, 与正常温光处理相比, 亚适宜温光和低温弱光处理下黄瓜株高、叶面积、果实大小与产量均明显下降, 根系活力、叶绿素含量、果实品质和谷氨酰胺合成酶(GS)、谷氨酸合成酶(GOGAT)、谷氨酸脱氢酶(GDH)活性也随处理温度和光照强度降低而降低。亚适宜温光条件下, 结果期黄瓜根系、叶片、果实中N含量均有所下降, 亚适宜温光和低温弱光处理降低了结果期黄瓜N运转蛋白基因的表达, 且温度和光照强度越低, 黄瓜根系、叶片和果实中N运转蛋白基因表达量越低。说明亚适宜温光可能通过降低N运转蛋白基因的表达, 抑制了N的吸收, 降低N含量, 进而抑制了黄瓜生长。

关键词: 黄瓜 亚适宜温光 结果期 氮 产量

Abstract: Cucumber of ‘Zhongnong 106’ in fruiting period was used as material, after 7, 14 and 21 days treatment of different temperature and light intensity[the normal temperature and light intensity is 25/15 °C, (700 ± 30) μmol · m<sup>-2</sup> · s<sup>-1</sup>; the suboptimum temperature and light intensity is 18/12 °C, (200 ± 20) μmol · m<sup>-2</sup> · s<sup>-1</sup>; the low temperature and weak light is 12/8 °C; 75 - 100 μmol · m<sup>-2</sup> · s<sup>-1</sup>], the growth, physiological characteristics and nitrogen absorption of the cucumber were detected. The results showed that, compared with the normal temperature and light intensity, under the suboptimum temperature and light intensity and the low temperature and weak light, the height, leaf area, fruit size and yield of cucumber were significantly decreased. The cucumber root activity, chlorophyll content, fruit quality and glutamine synthetase (GS), glutamate synthase (GOGAT), glutamate dehydrogenase (GDH) activity were decreased with the temperature and light intensity decreasing. Under the suboptimum temperature and light intensity condition, the N content of the cucumber during the fruiting period in the roots, leaves and fruits were declined. The suboptimum temperature and light intensity and the low temperature and weak light treatment reduced the expression of nitrogen transporters protein gene of the cucumber during the fruiting period, and the expression of nitrogen transporters protein gene were suppressed by lower temperature and light intensity. The results indicated that the suboptimum temperature and light intensity may decrease N content by suppressing nitrogen transporters protein gene expression, and then inhibit the growth of cucumber.

Keywords: cucumber, suboptimum temperature and suboptimum PFD, the fruiting period, nitrogen, yield

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