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研究论文

CO_2浓度升高对棉铃虫生长发育和繁殖的直接影响

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摘要 利用CDCC-1型密闭式动态CO_2气室，在人工饲料下研究了不同CO_2浓度（750 μl/L vs. 370 μl/L）对棉铃虫生长发育和繁殖的直接影响，以及对棉铃虫幼虫体内营养物质和酶的含量。结果表明：(1) 高CO_2浓度大气中生长的棉铃虫种群发育延缓，单雌产卵量增加，虫体重量减轻，内禀增长率下降，而对人工饲料的消耗量和粪便排泄量增加。与对照相比，高CO_2浓度下饲养的棉铃虫幼虫的发育历期延缓了15.14% ($p<0.01$)，幼虫的取食量增加了8.03%（$p<0.01$），粪便量增加了14.54%（$p<0.05$）。(2) 高CO_2浓度可影响棉铃虫幼虫对人工饲料的利用效率。与对照相比，在750 μl/L CO_2饲养下棉铃虫幼虫的相对消耗率、生长效率，食物转化率和近似消化率均有所降低。（3）高CO_2浓度还改变了棉铃虫幼虫体内的营养物质的含量和酶的活性。与对照比较，750 μl/L CO_2饲养下棉铃虫幼虫体内蛋白质和总氨基酸含量分别下降了14.16%（$p< 0.01$）和28.40%（$p<0.01$）；超氧化物歧化酶、乙酰胆碱酯酶和淀粉酶的活性分别增加了26.43%、9.12%和40.17%，而谷胱甘肽过氧化物酶的活性则下降了20.25%（$p< 0.01$）。

关键词 CO_2；棉铃虫；直接影响；生长发育；繁殖

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Direct effects of elevated CO2 on growth, development and reproduction of cotton bollworm *Helicoverpa armigera* Hubner

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Abstract Direct impact of elevated CO_2 (750 μl/L) on growth, development and reproduction of cotton bollworm Helicoverpa armigera (Hübner) were examined in closed-dynamic CO2 chamber (CDCC-1)under artificial diet between CO_2 treatments. The results show that compared with ambient CO_2 (370 μl / L), as untreated control, the life-span of H. armigera was delayed under elevated CO2 (15.14%; $p<0.01$), and H. armigera larvae under elevated CO_2 fed more artificial diet (8.03%; $p< 0.01$) and produced more frass (14.54%; $p<0.05$) than those in the ambient CO_2. We also found that elevated CO_2 marginally influenced the artificial diet-utilization efficiency of H. armigera larvae that decreased in relative growth rate (RGR), relative consumption rate (RCR), conversation efficiency (ECD) and approximate digestibility (AD). Our data also indicate that elevated CO_2 influenced nutritional substance contents and activity of some enzymes in H. armigera larvae. For the larve under the 750 μl/L CO_2, their free fatty acid, SOD, TChE and AMS significantly increased, whereas their protein, total amino acid and GSH-PX significant decreased.

Key words CO_2; Helicoverpa armigera; direct effect; growth; development; reproduction

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