



F₁代法检测棉铃虫种群对Bt棉的抗性等位基因频率变化

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Analysis of Frequency of Resistance Allele to Transgenic Bt Cotton in Field Populations of *Helicoverpa armigera* (Noctuidae) with F₁ Screening Method

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摘要

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摘要 在具有室内高抗Bt棉棉铃虫品系的前提下, F₁代法是检测棉铃虫对Bt棉抗性等位基因频率的最简捷、快速的生物测定方法。2010—2012年采用F₁代法检测了河北省邱县棉铃虫田间种群对Bt棉的抗性等位基因频率变化。结果表明, 2010—2012年采集的122、141及141头棉铃虫中, 分别有32、22及43头携带抗性基因, 抗性等位基因频率分别为0.131(95%置信限CI:0.101~0.162)、0.078(95% CI:0.034~0.122)及0.199(95% CI:0.124~0.274)。2012年采用带毒饲料法测定河北邱县等4个地区Bt棉田间棉铃虫对Cry1Ac的抗性。与室内抗性品系相比, 河北邱县棉铃虫种群的抗性最高(抗性倍数RR为19.2倍), 明显高于湖北荆州、湖北枣阳和安徽萧县种群的抗性(RR为4.9~9.3倍)。长期大面积种植转基因Bt棉导致田间棉铃虫抗性进化, 需要尽快采取有效的抗性治理措施。

关键词: 转Bt棉 棉铃虫 F₁代法 抗性基因频率 抗性检测

Abstract: F₁ screening method is the best bioassay measure to detect the resistance allele frequency of *Helicoverpa armigera* (Hübner) to transgenic Bt cotton if there is a high Bt-resistant strain. From 2010 to 2012, the frequency of resistance allele conferring resistance to Bt cotton in Qiuxian County, Hebei Province, was estimated by using the F₁ screening method. The results showed that from 2010 to 2012, 32 out of 122, 22 out of 141 and 22 out of 141 field-collected moths were detected to carry resistance alleles and the resistance allele frequency was estimated as 0.131 (95% confidence interval (CI): 0.101-0.162), 0.078 (95% CI: 0.034-0.122) and 0.199 (95% CI: 0.124-0.274), respectively. Bioassay of *Helicoverpa armigera* populations on Bt diet was adopted to detect resistance to Cry1Ac in 2012. The results showed that the resistance of field population from Qiuxian County was the highest, the resistance ratio reached 19.2 fold, compared with susceptible strain, and the resistance ratio of other three populations which ranged between 4.9 and 9.3 fold. Long-term adoption of planting uni-toxin-producing Bt cotton, and lack of conventional cotton refuge system may accelerate the resistance evolution in this region, and it is necessary to establish and implement effective resistance management strategy as soon as possible.

Keywords: *Helicoverpa armigera* transgenic Bt cotton F₁ screening method resistance allele frequency resistance monitoring

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