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Plant Protection Research Institute Guangdong Academy Of Agricultural Sciences

植保所在化学杀虫剂胁迫下荔枝蒂蛀虫毒理响应机制研究方面取得新进展

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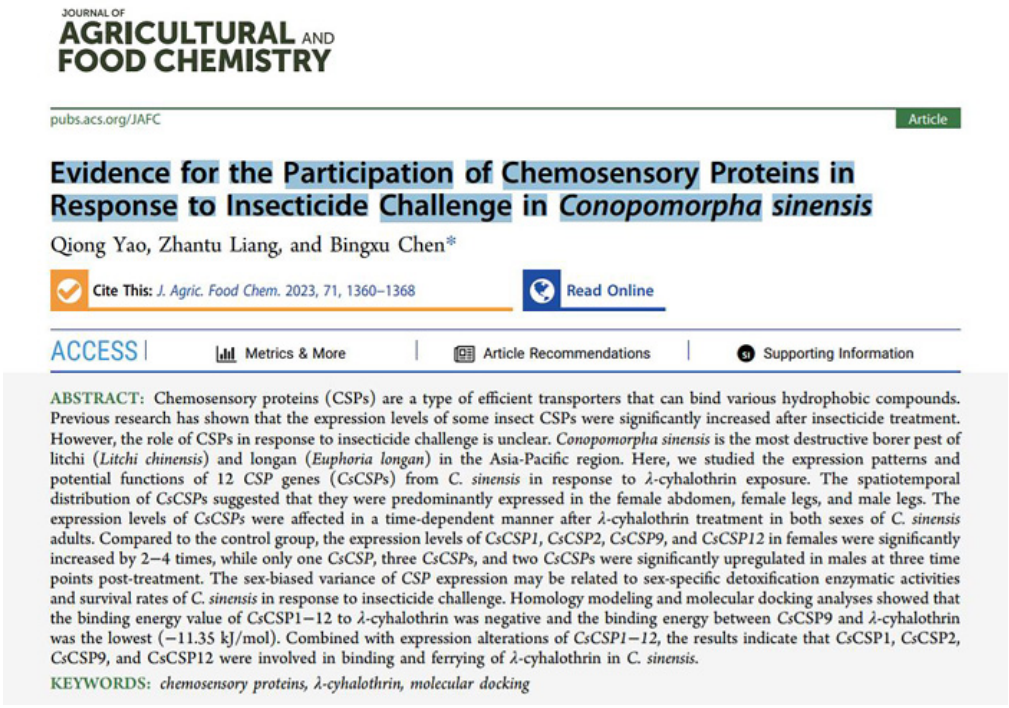
近日，植保所果树害虫防控团队在农林科学领域Top期刊《Journal of Agricultural and Food Chemistry》（JCR一区，IF=5.279）发表了题为“Evidence for the Participation of Chemosensory Proteins in Response to Insecticide Challenge in Conopomorpha sinensis”的研究论文。植保所姚琼副研究员为论文第一作者，陈炳旭研究员为通讯作者。



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Evidence for the Participation of Chemosensory Proteins in Response to Insecticide Challenge in *Conopomorpha sinensis*

Qiong Yao, Zhantu Liang, and Bingxu Chen*

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ABSTRACT: Chemosensory proteins (CSPs) are a type of efficient transporters that can bind various hydrophobic compounds. Previous research has shown that the expression levels of some insect CSPs were significantly increased after insecticide treatment. However, the role of CSPs in response to insecticide challenge is unclear. *Conopomorpha sinensis* is the most destructive borer pest of litchi (*Litchi chinensis*) and longan (*Euphoria longan*) in the Asia-Pacific region. Here, we studied the expression patterns and potential functions of 12 *CSP* genes (*CsCSPs*) from *C. sinensis* in response to λ-cyhalothrin exposure. The spatiotemporal distribution of *CsCSPs* suggested that they were predominantly expressed in the female abdomen, female legs, and male legs. The expression levels of *CsCSPs* were affected in a time-dependent manner after λ-cyhalothrin treatment in both sexes of *C. sinensis* adults. Compared to the control group, the expression levels of *CsCSP1*, *CsCSP2*, *CsCSP9*, and *CsCSP12* in females were significantly increased by 2−4 times, while only one *CsCSP*, three *CsCSPs*, and two *CsCSPs* were significantly upregulated in males at three time points post-treatment. The sex-biased variance of *CSP* expression may be related to sex-specific detoxification enzymatic activities and survival rates of *C. sinensis* in response to insecticide challenge. Homology modeling and molecular docking analyses showed that the binding energy value of CsCSP1−12 to λ-cyhalothrin was negative and the binding energy between CsCSP9 and λ-cyhalothrin was the lowest (−11.35 kJ/mol). Combined with expression alterations of *CsCSP1−12*, the results indicate that CsCSP1, CsCSP2, CsCSP9, and CsCSP12 were involved in binding and ferrying of λ-cyhalothrin in *C. sinensis*.

KEYWORDS: *chemosensory proteins, λ-cyhalothrin, molecular docking*

荔枝蒂蛀虫Conopomorpha sinensis Bradley 属鳞翅目细蛾科害虫，以幼虫钻蛀为害荔枝、龙眼的果实、花穗、嫩梢和嫩叶，是荔枝龙眼产业首要害虫。近年来，该虫对菊酯类杀虫剂抗性风险问题日益突出。植保所果树害虫防控团队开展化学杀虫剂胁迫下荔枝蒂蛀虫毒理响应机制研究，并取得新进展。

本研究旨在探明化学感受蛋白基因（chemosensory protein, CSP）在荔枝蒂蛀虫对高效氯氟氰菊酯胁迫响应中作用。研究发现，经高效氯氟氰菊酯处理后，荔枝蒂蛀虫雌雄成虫存活率下降，且二者生存曲线存在显著差异。通过酶活检测发现，蒂蛀虫雌性成虫的解毒酶活性较雄虫响应速度更快，推测是造成两性虫体存活率差异的主要原因。通过对荔枝蒂蛀虫CsCSP1-12的时空分布模式分析及药剂处理后基因表达变化检测，初步找到CSP参与虫体对杀虫剂胁迫响应的分子证据。借助三维结构预测及分子虚拟对接技术，进一步明确CsCSPs作为运载蛋白分子对高效氯氟氰菊酯的识别结合能力。本研究为荔枝蒂蛀虫对化学杀虫剂适应机制及其抗性预防策略制定提供了新思路。

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电话：020-87597431 传真：020-87561757 地址：广州市天河区金颖路7号 邮编：510640