

灰毛豆树皮中的杀虫成分及其杀虫活性 (英文)

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Isolation and identification of insecticidal compounds from *Tephrosia purpurea* (Fabaceae) bark and their insecticidal activity

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摘要 为确定灰毛豆 *Tephrosia purpurea* 树皮甲醇提取物中的杀虫成分, 以白纹伊蚊 *Aedes albopictus* 4龄幼虫为靶标昆虫, 在活性跟踪的基础上利用色谱技术分离其活性成分, 然后根据各化合物的核磁共振谱和质谱数据确定化合物的结构, 并利用玻片载蚜法和点滴法测定了各化合物对桃蚜 *Myzus persicae* 无翅蚜成虫和小菜蛾 *Plutella xylostella* 3龄幼虫的毒杀活性。结果表明: 从该植物树皮甲醇提取物中共分离、鉴定了10个对白纹伊蚊幼虫具有毒杀作用的化合物, 即12a-羟基鱼藤酮 (12a-hydroxyrotenone), 4'-hydroxyemoroidocarpin, 豆薯内酯 (pachyrrhizine), 鱼藤酮 (rotenone), 6-甲氧基香豆素 (6-methoxycoumarin), (-)-edunol, obovatin, pongachin, 12-acetyelliptinol 和2-hydroxyrotenone。这些化合物对该蚊虫幼虫处理24 h的LC₅₀值分别是12.5, 22.1, 25.0, 34.1, 43.4, 58.4, 121.9, 191.0, 219.8和250.0 mg/L。3个化合物 (4'-hydroxyemoroidocarpin, 鱼藤酮和12a-羟基鱼藤酮) 对桃蚜成虫和小菜蛾3龄幼虫表现出毒杀活性, 它们对桃蚜24 h的LC₅₀值分别是49.9, 1.9和0.9 mg/L, 对小菜蛾幼虫24 h的LD₅₀值分别是49.8, 197.1和40.9 μg/头。首次从该植物中分离得到6个已知的黄酮类化合物 [4'-hydroxyemoroidocarpin, 2-hydroxyrotenone, (-)-edunol, 12-acetyelliptinol, pongachin和obovatin] 和2个已知的香豆素类化合物 (6-甲氧基香豆素和豆薯内酯)。阐明这些杀虫化合物的结构不仅有利于理解植物和昆虫的关系, 而且有助于评价该植物及其活性化合物作为植物源农药开发利用的潜力。

关键词: 灰毛豆 杀虫化合物 杀虫活性 白纹伊蚊 小菜蛾 桃蚜

Abstract: In order to determine insecticidal compounds from the methanol extracts of *Tephrosia purpurea* bark, the active compounds were isolated by activity-guided fractionation with column chromatography and identified based on NMR (nuclear magnetic resonance) and MS (mass spectrometry) data. Slide-dip method was performed to determine the insecticidal activities of each compound against *Myzus persicae* adults, and topical application was conducted to determine contact toxicity of each compound against the 3rd instar larvae of *Plutella xylostella*. Ten known compounds were isolated and identified, i.e., 12a-hydroxyrotenone, 4'-hydroxyemoroidocarpin, pachyrrhizine, rotenone, 6-methoxycoumarin, (-)-edunol, obovatin, pongachin, 12-acetyelliptinol and 2-hydroxyrotenone. All these compounds exhibited insecticidal activity against the 4th instar larvae of *Aedes albopictus* with the LC₅₀ value being 12.5, 22.1, 25.0, 34.1, 43.4, 58.4, 121.9, 191.0, 219.8 and 250.0 mg/L, respectively at 24 h after treatment. Moreover, three compounds (4'-hydroxyemoroidocarpin, rotenone and 12a-hydroxyrotenone) exhibited insecticidal activity against *M. persicae* adults and the 3rd instar larvae of *P. xylostella* with their corresponding LC₅₀ values being 49.9, 1.9 and 0.9 mg/L against *M. persicae* adults, and with the LD₅₀ values being 49.8, 197.1 and 40.9 μg/individual against *P. xylostella* larvae, respectively. Eight known compounds, i.e., 4'-hydroxyemoroidocarpin, 2-hydroxyrotenone, 6-methoxycoumarin, pachyrrhizine, (-)-edunol, 12-acetyelliptinol, pongachin and obovatin, were isolated from *T. purpurea* bark for the first time. The elucidation of the structure of these phytochemicals and their insecticidal activity is important not only for understanding the insect-plant relationships, but also for assessing the potential of this plant as botanical insecticide to be explored and utilized.

Key words: *Tephrosia purpurea* insecticidal compounds insecticidal activities; *Aedes albopictus* *Plutella xylostella* *Myzus persicae*

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