

阿拉善平颜蚜蝇对肉苁蓉不同器官挥发物的选择行为

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摘要:【目的】阿拉善平颜蚜蝇 *Eumerus alxaensis* Huo & Liu 是一种主要危害肉苁蓉 *Cistanche deserticoia* (Y.C.Ma)的钻蛀性害虫, 鉴于其寄主为药理植物, 探究适宜的生物防治手段显得尤为重要。本研究筛选了对不同生理状态阿拉善平颜蚜蝇 *Eumerus alxaensis* Huo & Liu 有引诱作用的花序和肉质茎挥发性物质并选出最适浓度, 旨在为阿拉善平颜蚜蝇引诱剂研发提供理论基础。【方法】以 Y 形嗅觉仪分别测定阿拉善平颜蚜蝇雌雄成虫交配前以及雌虫产卵前期, 对肉苁蓉花序和肉质茎相对含量较高的 8 种挥发物, 在 3 个浓度(原液、10%溶液和 1%溶液)条件下的选择行为反应, 并在此基础上于梭梭 *Haloxylon ammodendron* (C. A. Mey.) Bunge 林结合黄板的缓释瓶进行最适挥发物浓度单体的田间引诱试验。【结果】室内试验结果显示, 阿拉善平颜蚜蝇成虫对 8 种花序、肉质茎挥发物具有较强的正趋性。雌成虫对 1%苯甲醛原液和石竹烯原液的反应率较强, 分别为 50.00%和 48.30%, 对花序挥发物中十六烷原液反应率较强, 为 38.30%, 不同挥发物和浓度间交互差异显著; 雄成虫对石竹烯原液和丁香酚原液的反应率较强, 分别为 60.00%和 51.7%, 对花序挥发物中 1-氯十二烷原液反应率较强为 43.30%, 不同挥发物和浓度间交互差异显著; 产卵前雌虫对石竹烯和苯甲醛原液的反应率较强分别为 48.40%和 46.70%, 对花序挥发物中柠檬烯原液和十六烷原液反应率较强, 分别为 38.30%和 36.70%, 不同挥发物和浓度间无显著性交互差异。田间试验表明, 肉质茎挥发物中石竹烯和丁香酚对成虫有较好的诱集效果, 3 d 平均诱捕量分别为 13.50/张和 13.60/张, 花序挥发物中柠檬烯诱捕效果较好, 3 d 平均诱捕量为 9.30/张, 上述 3 种挥发物诱捕量均显著高于 CK; 其中石竹烯对雌虫诱集效果较强显著高于雄虫($P=0.03$), 3 d 平均诱捕数量 7.3 头/张, 丁香酚和柠檬烯对雄虫的诱集作用较强且在两性间有显著差异, 3 d 平均诱捕数量分别为 9.12 头/张和 6.08 头/张。【结论】试验结果证明, 丁香酚和石竹烯可作为阿拉善平颜蚜蝇引诱剂的首选化合物来使用。

Selective Betermination of Secondary Metabolites of *Cistanche deserticoia* Organs by *Eumerus alxaensis* Huo & Liu

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Abstract :【Objective】*Eumerus alxaensis* Huo & Liu is a borescent pest that mainly harms *Cistanche deserticoia* Y. C. Ma. Considering that its host is a pharmacological plant, it is important to explore appropriate biological control measures. In this study, volatile substances in inflorescences and fleshy stems that have attractants to *E. alxaensis* in different physiological states were screened and the optimal concentrations were selected, aiming to provide theoretical basis for the research and development of attractants of *E. alxaensis*.【Methods】The relatively

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high content of 8 volatile compounds in *C. deserticoia* Y. C. Ma inflorescence and fleshy stem were measured by Y-shaped olfactometry before mating of male and female adults and in early oviposition stage of female. On the basis of the selective behavior reaction under three concentrations (stock solution, 10% solution and 1% solution), field lure tests of the monomer with optimum volatile concentration were conducted in *Haloxylon ammodendron* (C. A. Mey.) Bunge combined with yellow plate. 【Results】 The results of laboratory experiments showed that the adults of *E. alxaensis* had strong positive taxis to the volatiles of 8 inflorescence and fleshy stems. The reaction rate of female adults to 1% benzaldehyde and caryophyllene was 50.00% and 48.30%, respectively, and the reaction rate to cetane in inflorescence volatiles was 38.30%, and the interaction between different volatiles and concentrations was significant. The reaction rate of male adult worms to caryophyllene and eugenol was 60.00% and 51.7% respectively, and the reaction rate to 1-chlorododecyl in inflorescence volatiles was 43.30%, and the interaction between different volatiles and concentrations was significant. Before laying eggs, the reaction rates of female to caryophyllene and benzaldehyde were 48.40% and 46.70%, respectively, and the reaction rates of limonene and cetane in inflorescence volatiles were 38.30% and 36.70%, respectively, and there was no significant interaction difference among different volatiles and concentrations. Field experiments showed that caryophyllene and eugenol in the succulent stem volatiles had better trapping effect on *E. alxaensis*. The average trapping quantity of caryophyllene and eugenol in the succulent stem volatiles was 13.50/ piece and 13.60/ piece, respectively, respectively. The trapping effect of limonene in the inflorescence volatiles was better. The average trapping amount of 3 days was 9.30/ piece. The trapping amount of the above three volatile substances was significantly higher than that of CK. Among them, caryophyllene had a stronger trapping effect on female than male ($P=0.03$), and the average trapping number of male was 7.3/ piece. Eugenol and limonene had a stronger trapping effect on male, and the average trapping number of male was 9.12/ piece and 6.08/ piece, respectively. 【Conclusion】 The results show that eugenol and caryophyllene can be used as the first choice compounds for the attractant of *E. alxaensis*.