

视觉和嗅觉信号对果蝇食物搜寻行为的协同作用

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Synergistic effect of visual and olfactory cues in the food searching behavior of *Drosophila melanogaster*

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摘要 为了探索视觉和嗅觉信号在昆虫食物搜寻过程中的作用, 本研究利用杨梅和橘子为引诱物, 在实验室条件下测定了嗅觉和视觉信号诱集到的黑腹果蝇 *Drosophila melanogaster* 数量, 分析了嗅觉经历对果蝇嗅觉和视觉食物搜寻的影响。发现同源性嗅觉和视觉信号存在的杨梅诱集到的果蝇数量显著大于单一的视觉信号和嗅觉信号, 但异源性嗅觉和视觉信号组合诱集到的果蝇数量和单独的嗅觉信号相似。嗅觉信号预处理不仅能够显著增加嗅觉信号诱集到的果蝇数量, 其中杨梅嗅觉信号对杨梅预处理果蝇的吸引能力与视觉和嗅觉信号存在的杨梅相似, 而且异源性嗅觉和视觉信号组合诱集到的预处理果蝇数量也不低于视觉和嗅觉信号存在的杨梅。另外杨梅嗅觉信号预处理也能够显著增强杨梅视觉信号诱集到的果蝇数量。但嗅觉预处理并不会改变同源性视觉和嗅觉信号组合诱集到的果蝇数量。本研究表明, 果蝇同时利用视觉和嗅觉信号进行食物搜寻, 因此同源性视觉和嗅觉信号在果蝇诱集过程中具有协同作用。另外果蝇具有较强的记忆和学习能力, 能够将记忆中的嗅觉信号应用于食物搜寻。本研究结果不仅有利于我们了解果蝇在自然状态下的食物搜寻机制, 而且有利于开发更有效的果蝇新型诱捕器。

关键词: 黑腹果蝇 视觉 嗅觉 协同作用 食物搜寻

Abstract: To study the roles of olfaction and vision in the food searching behavior of insects, we investigated the number of trapped adults of *Drosophila melanogaster* with bayberry and orange as attractants, and the effect of pretreatment with olfactory fruits (bayberry or orange) during the behavioral scenario. The results showed that traps with visual and olfactory cues from the same fruit sources attracted more flies than the bayberry picture or olfactory odor from the bayberry. However, the flies attracted by the combination of visual and olfactory cues from different kind of fruits were not significantly more than those attracted by olfactory cues. Experience by olfactory pretreatments with fruit bayberry or orange not only increased the number of flies attracted by olfactory or visual cues, in which the number of flies attracted by olfactory bayberry was the same as that attracted by bayberry with visual and olfactory cues, but also increased the number of flies attracted by traps with visual and olfactory cues from different kind of fruits. However, olfactory pretreatments did not influence the number of flies attracted by traps with visual and olfactory cues from the same fruits. So, olfactory and visual cues were used by flies in food searching behavior and there was synergistic effect of visual and olfactory cues from the same fruits on the attraction of flies. The fly *D. melanogaster* has strong memory, and can use remembered olfactory cues to facilitate food searching. Our results will not only improve our understanding about the food searching behavior of flies in nature, but also help us to design more efficient fly traps.

Key words: *Drosophila melanogaster* vision olfaction synergism food searching

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