2024年第15期 总428期

茶学研究专题

本期导读

学术文献

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相关专利

1. 突变型昆虫嗅觉受体蛋白
2. 昆虫G蛋白偶联受体基因及其应用

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学术文献

1. Identification and expression profiles of candidate chemoreceptor genes in the tea leafhopper, *Empoasca onukii* Matsuda (Hemiptera: Cicadellidae)
（茶小贯小绿叶蝉（半翅目：蝉科）候选化学受体基因的鉴定和表达谱）

简介：The olfactory system of insects regulates the processes of insect feeding, mating, and egg laying through the participation of various olfactory proteins, hence it plays a key role in insect survival and reproduction. The tea leafhopper, *Empoasca onukii* Matsuda, is one of the most devastating pests in Chinese tea plantations. Transcriptome sequencing experiments were conducted to detect chemoreceptor genes including odorant receptors/co-receptors (ORs/Orco), ionotropic receptors (IRs), N-methyl-D-aspartic acid receptors (NMDAs), gustatory receptors (GRs), and sensory neuron membrane proteins (SNMPs). Phylogenetic analysis of chemoreceptor genes and the expression levels of the identified genes in four different tissues of *E. onukii*, including antennae, heads, bodies, and legs were also analyzed. In total, 12 ORs, five IRs, three NMDAs, three GRs, and two SNMPs were annotated in the *E. onukii* transcriptome data. The number of chemoreceptor genes in *E. onukii* was considerably lower than that in other hemiptera insects. Phylogenetic analysis was conducted to compare ORs, IRs, NMDAs, GRs, and SNMPs among the hemiptera insects, and showed that chemoreceptor genes in *E.onukii* were clustered into ten clades with other hemiptera insects, respectively. The results of RT-qPCR showed that seven *EonuORs*, three *EonuIRs*, and one *EonuGRs* were highly expressed in the antennae of *E. onukii*. The function of chemoreceptor genes in *E. onukii* in sensing the volatile compounds remains to be elucidated.

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2. Targeting Insect Olfaction *in vivo* and *in vitro* Using Functional Imaging
（利用功能成像技术在体内和体外定位昆虫嗅觉）

简介：Insects decode volatile chemical signals from its surrounding environment with the help of its olfactory system, in a fast and reliable manner for its survival. In order to accomplish this task, odorant receptors (ORs) expressed in olfactory sensory neurons (OSNs) in the fly's antenna process such odor information. In order to study such a sophisticated process, we require access to the sensory neurons to perform functional imaging. In this article, we present different preparations to monitor odor information processing in *Drosophila melanogaster* OSNs using functional imaging of their Ca^{2+} dynamics. First, we established an *in vivo* preparation to image specific OSN population expressing the fluorescent Ca^{2+} reporter GCaMP3 during OR activation with airborne odors. Next, we developed a method to extract and to embed OSNs in a silica hydrogel with OR activation by dissolved odors. The odor response dynamics under these different conditions was qualitatively similar which indicates that the reduction of complexity did not affect the concentration dependence of odor responses at OSN level.

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3．Transcriptomic Characterization of Odorant Binding Proteins in *Cacia cretifera thibetana* and Their Association with Different Host Emitted Volatiles（西藏簇角缨象天牛气味结合蛋白的转录组学特征及其与不同寄主挥发性物质的关联）

简介：This study characterized the transcriptome of *Cacia cretifera thibetana* and explored odorant binding proteins (OBPs) and their interaction with host-specific compounds. A total of 36 samples from six different organs including antennae, head, thorax, abdomen, wings, and legs (12 groups with 3 replicates per group) from both male and female insects were collected for RNA extraction. Transcriptomic analysis revealed a total of 89,897 transcripts as unigenes, with an average length of 1036 bp. Between male and female groups, 31,095 transcripts were identified as differentially expressed genes (DEGs). The KEGG pathway analysis revealed 26 DEGs associated with cutin, suberine, and wax biosynthesis and 70, 48, and 62 were linked to glycerophospholipid metabolism, choline metabolism in cancer, and chemokine signaling pathways, respectively. A total of 31 OBP genes were identified. Among them, the relative expression of 11 OBP genes (OBP6, 10, 12, 14, 17, 20, 22, 26, 28, 30, and 31) was confirmed by quantitative RT-PCR in different tissues. Seven OBP genes including CcreOBP6 and CcreOBP10 revealed antennae-specific expression. Further, we selected two OBPs (CcreOBP6 and CcreOBP10) for functional analysis to evaluate their binding affinity with 20 host odorant compounds. The CcreOBP6 and CcreOBP10 exhibited strong binding affinities with terpineol and trans-2-hexenal revealing their potential as an attractant or repellent for controlling *C. cretifera thibetana*.

来源：Insects 期刊

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4．The role of SNMPs in insect olfaction（SNMPs在昆虫嗅觉中的作用）

简介：The sense of smell enables insects to recognize olfactory signals crucial for survival and reproduction. In insects, odorant detection highly depends on the interplay of distinct proteins expressed by specialized olfactory sensory neurons (OSNs) and associated support cells which are housed together in chemosensory units, named sensilla, mainly located on the antenna. Besides odorant-binding proteins (OBPs) and olfactory receptors, so-called sensory neuron membrane proteins (SNMPs) are indicated to play a critical role in the detection of certain odorants. SNMPs are insect-specific membrane proteins initially identified in pheromone-sensitive OSNs of Lepidoptera and are indispensable for a proper detection of pheromones. In the last decades, genome and transcriptome analyses have revealed a wide distribution of SNMP-encoding genes in holometabolous and hemimetabolous insects, with a given species expressing multiple subtypes in distinct cells of the olfactory system. Besides SNMPs having a neuronal expression in subpopulations of OSNs, certain SNMP types were found expressed in OSN-associated support cells suggesting different decisive roles of SNMPs in the peripheral olfactory system. In this review, we will report the state of knowledge of neuronal and non-neuronal members of the SNMP family and discuss their possible functions in insect olfaction.

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相关专利

1. MUTANT INSECT OLFACTORY RECEPTOR PROTEIN（突变型昆虫嗅觉受体蛋白）

简介：本发明在于提供一种提高嗅觉受体对化学物质应答活性的技术，其通过在昆虫嗅觉受体蛋白质的特定位点导入突变以满足特定条件来实现。
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2. Insect g protein-coupled receptor genes and uses thereof（昆虫G蛋白偶联受体基因及其应用）

简介：The present invention provides isolated nucleic acids encoding insect G protein-coupled receptor (GPCR) polypeptides, isolated insect GPCR polypeptides, and uses thereof. Further provided are recombinant proteins and methods for identifying inhibitors to these proteins. The disclosed insect GPCR nucleic acids and polypeptides can be used in screening assays to identify modulating compounds. Protein inhibitors active in the methods disclosed herein are useful as insecticidal, ectoparasiticidal, antiparasitic, anthenenthic and acaracidal agents.
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