

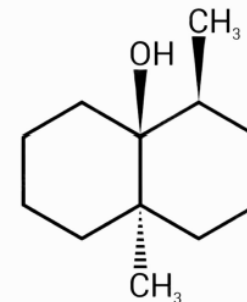
Geosmin as a Safe, Environmentally-Friendly Means of **Mosquito Control**

What is Geosmin?

- Terpene
- Nontoxic to humans
- Responsible for petrichor – the earthy scent associated with fresh rainfall on dry soil
- Secreted by various organisms, from bacteria to beets
 - First synthesized by *Streptomyces coelicolor*; ability spread to others via horizontal conjugation



GEOSMIN | C₁₂H₂₂O



Human Sensitivity to Geosmin

- Humans have a remarkable sensitivity to geosmin, capable of detecting it at very low concentrations, typically around 5 to 10 parts per trillion.

- This is equal to about **half a teaspoon in 200-400 Olympic-sized swimming pools.**

- The reason for this sensitivity has not yet been proven, but there are theories.

- Early humans could have used geosmin to detect water sources.

- Korean study that demonstrated a linkage between geosmin and increased levels of serotonin.



Geosmin and Insect Behavior

- At low concentrations, geosmin strongly suppressed defensive/stinging behavior in honeybees.
- Fire ant queens preferentially establish new nests in actinobacteria-rich soil, which enhances their survival rate.
 - Geosmin acts as the attractant.
- In fruit flies, geosmin activates a single glomerulus, indicating a specific role in odor detection.
 - Repels gravid flies, most likely signaling the presence of microbes that may harm their larvae.



Mechanism of Attraction in Mosquitoes

- Activates the same glomerulus in the yellow fever mosquito (*Aedes aegypti*) as in fruit flies: L2.
- However, in *Ae. Aegypti*, geosmin acts as an **attractant**.
 - Influences where gravid females lay their eggs.
 - Believed to be due to the association with cyanobacteria, which can synthesize geosmin and serve as a food source for larvae.



Practical Applications for Mosquito Control



- Use of geosmin to bait mosquito traps can increase the success of this control method.
- Researchers have observed higher capture rates of gravid mosquitoes compared to traps without geosmin, as it mimics natural cues that signal suitable breeding habitats.
- However, just like in honeybees, there is a “goldilocks” concentration in which geosmin is most effective.

The Beet Peel Method

- Geosmin can be very expensive and hard to come by.
- There is also the aforementioned issue with achieving the “perfect” concentration for the desired effect.
- Mother Nature has done this already with **beets**.
 - A study found that an effective concentration of naturally-occurring geosmin was found in the peel from beets.
 - Researchers observed markedly higher success rates of beet peel-baited traps versus control traps.



Relevance to Mosquito Control Issues

- Insecticide Resistance:
 - Pyrethroid Resistance: Studies show resistance levels as high as 90% in certain populations globally.
 - Field Studies: In some urban areas, *Aedes aegypti* populations have shown reduced mortality rates of up to 75% when exposed to standard insecticide concentrations.
- Recent Hurricanes:
 - Increased flooding and standing water, which means increased breeding sites for mosquitoes.
- Urbanization:
 - Can also yield more stagnant water sources and increased breeding sites.

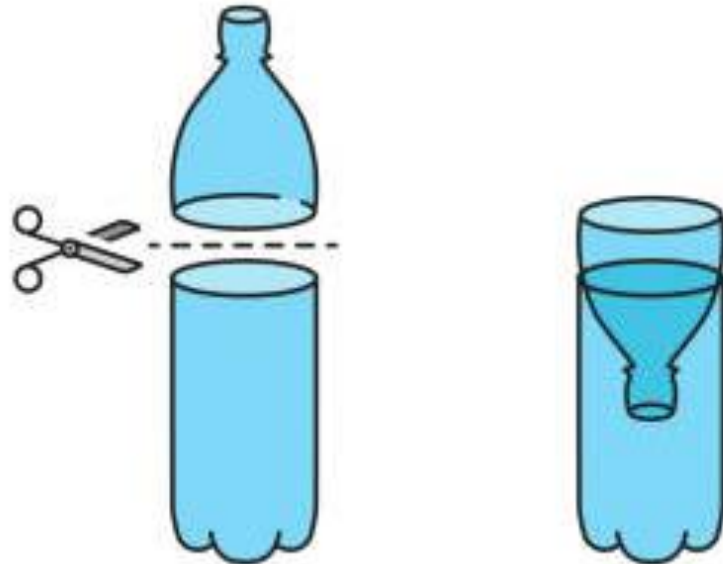
Cost-Effectiveness and Sustainability

- Supports local agriculture.
- Can be implemented easily in low-income areas.
- Promotes waste reduction by utilizing beet parts that would typically be discarded.
- Reduces reliance on synthetic chemicals, minimizing any potential ecological impact or public concerns.



Community Involvement

- A plastic bottle trap can be easily constructed by cutting the bottle, inverting the top, and filling the bottom with water and beet peel.
- This simple design allows mosquitoes to enter but makes it difficult for them to escape.



Challenges and Considerations

An official website of the United States government [Here's how you know](#)

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geosmin + mosquito

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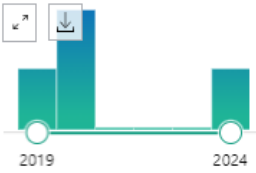
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3 results

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RESULTS BY YEAR



TEXT AVAILABILITY

- Abstract
- Free full text
- Full text

ARTICLE ATTRIBUTE

- Associated data

ARTICLE TYPE

- Books and Documents
- Clinical Trial
- Meta-Analysis
- Randomized Controlled Trial
- Review

1 **Geosmin Attracts *Aedes aegypti* Mosquitoes to Oviposition Sites.**
1 Melo N, Wolff GH, Costa-da-Silva AL, Arribas R, Triana MF, Gugger M, Riffell JA, DeGennaro M, Stensmyr MC.
Cite Curr Biol. 2020 Jan 6;30(1):127-134.e5. doi: 10.1016/j.cub.2019.11.002. Epub 2019 Dec 12.
Share PMID: 31839454 [Free PMC article.](#)
We have here investigated the effect of **geosmin** on the behavior of the yellow fever **mosquito** *Aedes aegypti*. In contrast to flies, **geosmin** is not aversive but mediates egg-laying site selection. Female **mosquitoes** likely associate **geosmin** with mic ...

2 **Chemosensation: Hate *Mosquitoes*? Peel Beetroots!**
2 Galizia G.
Cite Curr Biol. 2020 Jan 6;30(1):R12-R14. doi: 10.1016/j.cub.2019.11.057.
Share PMID: 31910367 [Free article.](#)
The typical smell of rain and humid soil, **geosmin**, now turns out to be a strong attractant for the yellow fever **mosquito** *Aedes aegypti*....

3 **EVALUATION OF THE EFFICIENCY OF BEETROOT PEEL (*BETA VULGARIS*) IN OVITRAPS AS AN ATTRACTANT FOR SURVEILLANCE OF ARBOVIRUS VECTORS IN THE MUNICIPALITY OF AGRESTINA, STATE OF PERNAMBUCO, BRAZIL.**
3 De Vasconcelos CAA, Silva SOF, Gomes B, Alencar J.
Cite J Am Mosq Control Assoc. 2024 Sep 1;40(3):145-148. doi: 10.2987/24-7183.
Share PMID: 39089686 [Free article.](#)
Beetroot peel extract is a cheap and accessible source of **geosmin**, which holds significant potential as an attractant for **mosquitoes** due to its resemblance to microbial volatiles found in water bodies rich in organic material. ...

- There are currently only **three** studies available (all free).
- When beets spoil, their effectiveness is reduced; the peels will need to be replaced for best results.
- Current studies have only shown effectiveness with *Aedes aegypti*.
- Results may also vary based on life cycle.

Questions?

Contact Info:

Bri Young

Brianna.Young2@dph.ga.gov