

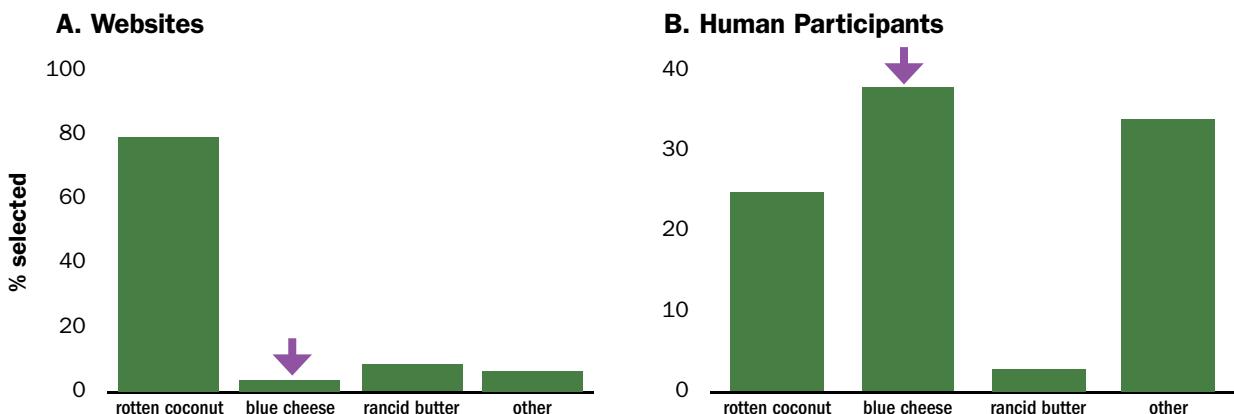


# The True Odor of the Odorous House Ant

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**M**ore than 13,000 ant species have been formally described, yet the general public recognizes only two main categories: red ants and black ants. This system has some limitations, so there has been increased effort to provide additional sensory information for ant identification, including the sense of smell. Nowhere has this been more strongly applied than to the “odorous house ant” (*Tapinoma sessile* Say), a common household pest in North America that releases a curious odor when crushed (Smith 1928).

At first, using scent to identify ants seems obvious and practical, because ants themselves communicate through smell. However, the sense of smell in humans is far less developed, and there has been recent controversy over what, exactly, the odorous house ant smells like. This species belongs to a large group of ants whose members are thought to smell like blue cheese (Forney and Markovetz 1971), yet numerous online sources report their odor as “rancid butter,” “cleaning solution,” or, most commonly, “rotten coconuts.” Some



**Fig. 1.** While 80% of websites reported the scent of the odorous house ant as “rotten coconut” (a), most participants in the smell test chose “blue cheese” (b). Results are based on data collected from 53 Web sites and 143 participants from North Carolina’s BugFest.

sources have even gone so far as to rename the odorous house ant the “coconut ant.” In order to shed light on this controversy and provide more accurate fragrance notes for ant identification, we investigated the volatile compounds released by the odorous house ant and the foodstuffs most commonly associated with their scent.

### Methods

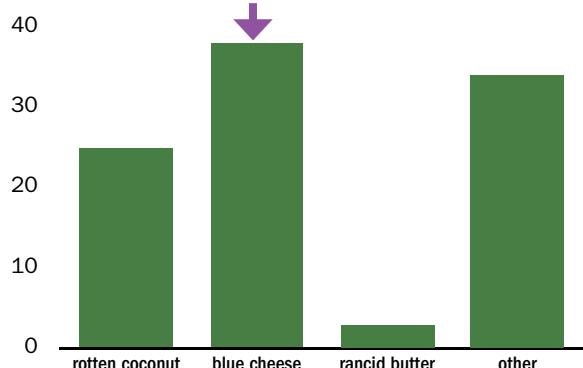
To begin, we conducted an online literature review of the most common odors attributed to the odorous house ant. Based on this review, we asked attendees of North Carolina’s BugFest (2013) to take the smell test. Participants were asked to crush an odorous house ant between their fingers and identify the scent from among four choices: rotten coconut, blue cheese, rancid butter, or “other,” which allowed a write-in candidate.

To determine the exact chemical composition of the odorous house ant scent, we used gas chromatography-mass spectrometry (GC-MS). We analyzed the volatile compounds produced by live ant workers, blue cheese, and coconut (fresh or rotten). Coconut was purchased fresh, and a portion was buried for three days until it was covered with a blue mold and emitted a strong odor. We then collected headspace samples from each substance using solid-phase microextraction (SPME) and identified compounds based on the GC-MS output.

### Results and Discussion

The vast majority of online sources identified the odor of the odorous house ant as “coconut-like” (Fig. 1a), with one Web site describing it as “sickening sweet...like a coconut piña colada that has been sitting out for a day.” This ran counter to the results from our smell test, in which participants most often identified the odor as “blue cheese” followed by “other” as a close second (Fig. 1b). The most common write-in candidate was “cleaning spray,” while one little girl told us the ants smelled exactly like her doctor.

### B. Human Participants



Based on our chemical analysis, the major component of the odorous house ant scent was 6-methyl-5-hepten-2-one (Fig. 2), a methyl ketone that has been identified in other ant species. The most prominent compounds associated with blue cheese were also methyl ketones, but no methyl ketones were found in fresh coconut. Once coconut turned rotten, however, it developed a distinct odorous house ant scent and released the same methyl ketones found in blue cheese. Interestingly, the microbes that turn coconut oil rancid—*Penicillium* mold—are the very same microbes used to make blue cheese (Stokoe 1928). While natural and artificial coconut flavorings are derived from lactones (Lin and Wilkins 1970), we found no evidence that lactones were a major component of the odor of the odorous house ant.

So what does the odorous house ant smell like? Our results point to blue cheese, with a cautious nod to rotten coconut. We say cautious, because it is not the “coconut” in rotten coconut that smells like the odorous house ant, but the “rotten.” Sources that provide information for ant identification to the general public should take note: odorous house ants do not smell like coconuts. They smell like blue cheese. Or you could say that they smell like coconuts colonized by a *Penicillium* mold that metabolizes coconut oil to produce an odor similar to blue cheese, but by then, you could have said 6-methyl-5-hepten-2-one three times fast.

### References Cited

- Smith, M.R. 1928. The biology of *Tapinoma sessile* Say, an important house-infesting ant. Annals of the Entomological Society of America 21(2): 307-330.
- Forney, F., and A. Markovetz. 1971. The biology of methyl ketones. Journal of Lipid Research 12(4): 383-395.
- Stokoe, W.N. 1928. The rancidity of coconut oil produced by mould action. Biochemical Journal 22(1): 80.
- Lin, F.M., and W.F. Wilkins. 1970. Volatile flavor components of coconut meat. Journal of Food Science 35(5): 538-539.

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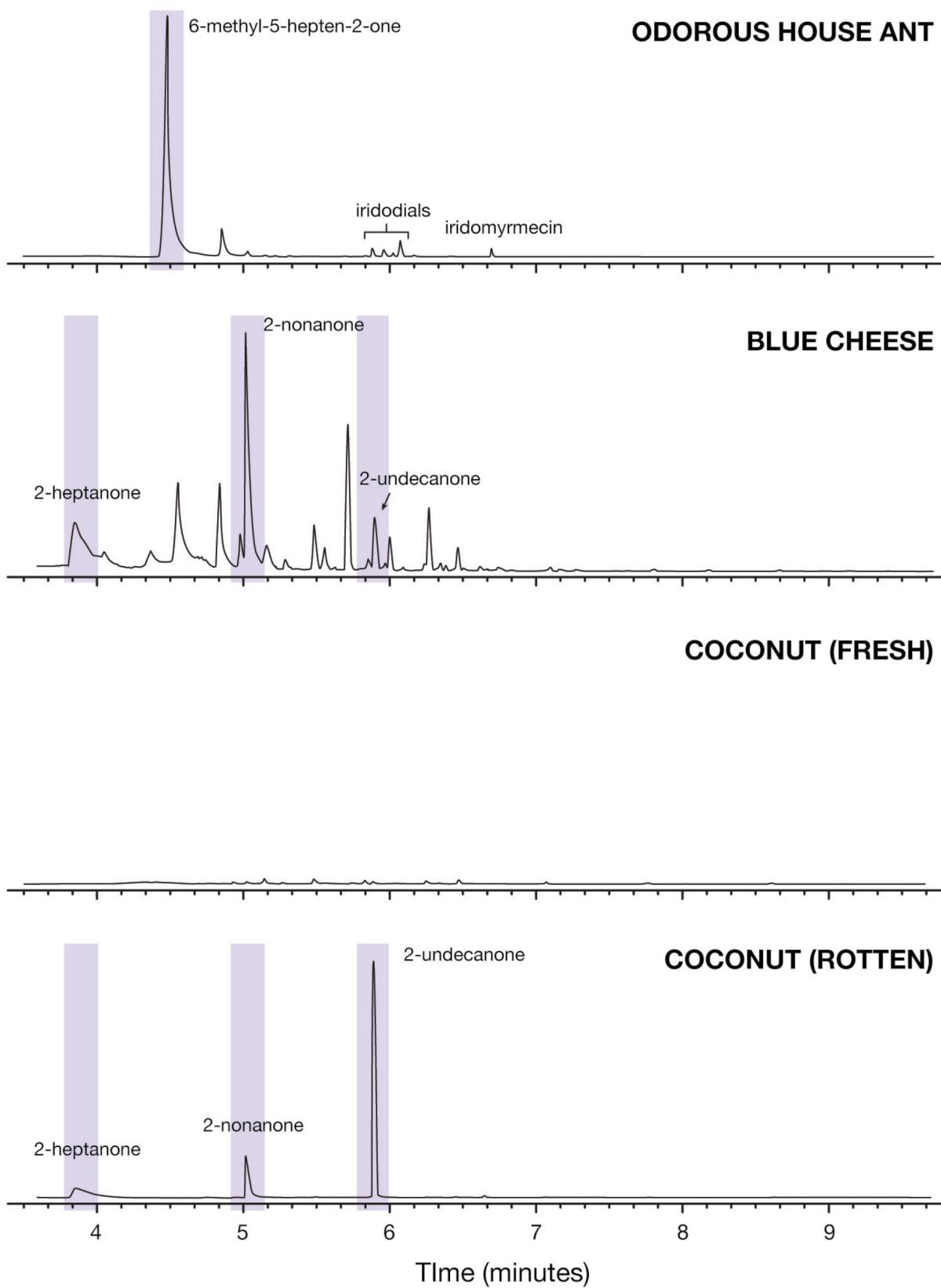


Fig. 2. Each peak from the gas chromatographs above corresponds with a specific chemical compound, and the size of the peak represents the relative abundance of that compound. Methyl ketones (shaded) were present in the odorous house ant, blue cheese, and rotten coconut, but fresh coconut had no prominent compounds.