**Bergamotene in *Manduca sexta* – ANSWER KEY** Dassow & Konrad

1. Read the Phys.org News article:

Bergamotene—alluring and lethal for Manduca sexta (2017, April 2019)

[phys.org/news bergamotene article](https://phys.org/news/2017-04-bergamotenealluring-lethal-manduca-sexta.html)

1. Complete the following questions and turn in electronically before our next class:
2. What is the benefit to *Nicotiana attenuata* of emitting (E)-α-bergamotene in its flowers? Why / how does this work?

(E)-alpha-bergamotene attracts moths to *Nicotiana* flowers at night to promote pollination, and the scented compound increases the time a moth keeps its proboscis in a flower. Pollination success is increased when flowers emit high amounts of the compound. (Students may also discuss moths’ sensory neurons here.)

1. What is the benefit to *Nicotiana attenuata* of emitting (E)-α-bergamotene in its leaves? Why / how does this work?

During the day, (E)-alpha-bergamotene produced by *Nicotiana* leaves attracts predatory insects to feed on *Manduca sexta* larvae and eggs. Although *Manduca* moths are key pollinators for the plant, they also lay their eggs on *Nicotiana* leaves. The hungry larvae can decimate the plant quickly, so luring diurnal predators of eggs and larvae helps protect the plant from damage. (E)-alpha-bergamotene is released from leaves when larvae start munching on the tobacco plants.

1. What is NaTPS38, and what might be the benefit to *Nicotiana attenuata* of using it to differentially regulate production of a single compound in different tissue types? Give at least three potential benefits.

NaTPS38 is a terpene synthase (a chemical needed to produce terpenes like (E)-α-bergamotene). This question encourages students to connect this reading with other concepts they’re studying in this and other biology/chemistry courses. We keep this discussion open-ended but expect to see evolutionary, physiological, and ecological ideas such as conservation of resources, efficiency in regulation of compound production, quick defensive responses to predation, and coevolution mechanisms.

1. Explain how (E)-α-bergamotene production in *Nicotiana attenuata* demonstrates ecological pleiotropy.

Ecological pleiotropy is indirectly defined in the article via example, so we want to ensure students have considered the term instead of glossing over it. They should demonstrate a basic understanding of the term gained either through context, or by looking it up. Something along the lines of: interactions between different ecological factors (e.g., pollination and herbivore defense mechanisms in *Nicotiana*) can affect plant evolution (e.g., the gene for NaTPS38 evolved to regulate terpene production in both leaves and flowers in response to different environmental cues).