

Physiological and Ecological Studies on the Desert Locust

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Desert locust, *Schistocerca gregaria*, is one of the most destructive pests in the world. Sometimes desert locust populations grow explosively, forming swarms and causing locust plagues. A plague can affect up to 20% of the earth's surface across Africa, the Middle East, and Southwest Asia. Desert locusts can potentially damage the livelihoods of a tenth of the world's population. In West Africa alone, economic damage is estimated at more than USD400 million.

The locust changes behavioural, morphological, and physiological characteristics in response to its population density. This phenomenon is known as phase polyphenism. Locusts in a solitarious phase exhibit low population density growth, whereas those in a gregarious phase show high population density growth. Gregarization is very much linked with locust outbreaks. Therefore, understanding the mechanism of phase polyphenism and the process of gregarization in desert locust has been thought to be the most important key to solving locust problems. Solitarious locusts are known to produce smaller but more eggs than gregarious ones. We demonstrated that adults were highly sensitive to a shift in rearing density and quickly modified the quality and quantity of their progenies depending on the density encountered [1]. By varying the time and length of exposure, we have identified a critically sensitive stage during the reproductive cycle. Furthermore, we found that the tactile stimuli of conspecific chemical compounds perceived by the antennae of their mother caused phase change [2].

We will continue studying this locust and aim to develop efficient and sustainable control measures with due consideration to environmental well-being. Understanding behavioral patterns, for example, the tendency for gregarious locusts to form dense groups at certain plant-associated sites [3], will enable us to control them efficiently using only small amounts of pesticides. Furthermore, knowing the process of gregarization would make prediction of locust outbreaks easy and fast. Based on the results of these ecological studies, we will try to establish an effective preventative control system for this locust.

[1] Maeno K, Tanaka S (2008) Maternal effects on progeny size, number and body color in the desert locust, *Schistocerca gregaria*: Density- and reproductive cycle-dependent variation. *J Insect Physiol* 54(6):1072–1080.

[2] Maeno K, Tanaka S (2010) Epigenetic transmission of phase in the desert locust, *Schistocerca gregaria*: determining the stage sensitive to crowding for the maternal determination of progeny characteristics. *J Insect Physiol* 56(12):1883–1888.

[3] Maeno KO, et al. (2013) Plant size-dependent escaping behavior of gregarious nymphs of the Desert locust, *Schistocerca gregaria*. *J Insect Behav* 26(5):623–633.