

ZombieAnts: A Case of Perfect Puppetry

Anubha Das



(Image credit: Muhammad Mahdi Karim — GFDL 1.2; Wikimedia commons)

Carpenter Ant cleaning antennae



(Image credit: Wikimedia commons)

Ant Killed by Fungus — Cockscomb Wildlife Sanctuary, Belize

NATURE is full of astounding, jaw-dropping stories and one such comprises zombie ants with their pathogenic fungus partner, zombie-ant-fungus presenting one of the most fascinating relationships between animals and microbes.

Carpenter Ants (Genus: *Camponotus*) are large-sized ants found globally in forested regions and prefer to forage at night. Like other ant species, they are also very industrious, social and live in colonies. They have earned the name “carpenter ants” as they construct their nest by excavating damp wood, making tunnels/galleries through it and hollowing it from inside, a trait that turns them into wonderful forest engineers.

They don’t mind hunting down small insects or feasting on dead ones and love honeydew from aphids or nectar from flowers, as dessert.

It is night and everything looks normal to one such group of carpenter ants residing in a tropical forest’s canopy nest as they step out, to forage. The unwary foragers march together peacefully, descending the canopy nest, reaching the ground and searching and collecting food items to bring back home, being completely unaware of the living landmines scattered all around. A few unfortunate members of the group step on those landmines but there isn’t any explosion. The group returns home, carrying food and a few unfortunate members with those living landmines as well, glued to their bodies.

Next day, its business as usual for the ant colony, barring those unfortunate members, however, the living landmine initially glued to the ant’s body has penetrated the exoskeleton and has been busy eating away the internal tissue and spreading to various parts of the host’s body. So, meet the devil, *Cordyceps* (Zombie-ant fungus) which has got access to the ant’s internal body parts, thanks to the fungal spore the poor ant stepped on the previous night and became an integral part of the fungus life cycle. Her fate is inevitable, as the devil’s kiss is fatal. There is no escape from death, approaching quietly.

For the next couple of days, the apparently normal victim stays with the colony members before it finally starts behaving strange. By now the devil has almost completely invaded the

victim's body, except the brain. Her muscles, throughout the body, are penetrated by fungal cells but her brain is still intact, suggesting that the devil takes control over her brain *via* the secreted metabolites that alter her behaviour. The ant is actually a walking fungus, in disguise as the devil eats up all the internal parts turning her body simply into a capsule, carrying the devil.

It's time now for the devil to showcase its exquisite puppetry. He has got complete control over her body muscles, like a skilled puppeteer pulling the strings and making her dance like a puppet to his tunes. The ant leaves the nest now and starts wandering aimlessly, with convulsing body and unsteady steps. After several hours of erratic crawling movements, the possessed victim is far away from her canopy nest. The devil is guiding her silently to his favourite spot, a place with high humidity that's ideal for its own survival. At last, the



(Image credit: Sripathiharsha – (CC BY-SA 3.0:) Wikimedia commons)

Carpenter ants carrying a dead bee



(Image credit: David Hughes/flickr.com/photos/pennstatelive/5706653345(CC BY-NC 2.0))

A dead carpenter ant attached to the leaf in the understory of a Thai forest

seemingly intoxicated ant finds the spot, gets hold of a young leaf, thrusts her powerful mandibles (jaws) into it and stays like this for another few hours before she dies, away from her home and relatives.

The story does not end here as post her death the devil sends out a sprouting structure piercing through the dead ant's body and after three weeks it releases mature spores, to start another gruesome tale. The devil has the power to wipe off the entire colony of ants but interestingly at any given point in time, only a few ants get infected. As the infection is fatal the ultimate goal of the devil is not to take over the entire colony but to ensure its own propagation, underscoring the intricate nature of host-parasite interaction. We are yet to fully understand this

bizarre yet interesting relationship that fascinates both scientists and everyone else equally.

////////////////////////////////////
 Dr Anubha Das is Associate Professor, Department of
 Zoology, Zakir Husain Delhi College (M), University of Delhi.
 Address: H.No. 36, 3rd Floor, Pocket-5, Sector-24, Rohini, New
 Delhi-110085.
 Email: yanubha@gmail.com