Plant Communication: Pheromones Emit Chemical Distress Signals

Can plants communicate with each other?

This question has been a subject of debate for many scientists and the common belief was that plants do not have the ability to communicate due to lacking the structural components animals possess which allow audio communication. Throughout recent decades however it has become apparent to observers that there is clear indication of communication occurring between plants of the same species who reside in general proximity of each other.

It was first discovered that pheromones emitted from a plant can send out warning signals to other plants in the area of possible infestations by insects. Perhaps some of the most extensive research in this area of biological chemistry was initially discovered in populations of pine trees which are the preferred source of food for the Mountain Pine Beetle. These insects burrow into the bark of a pine tree and consume the inner bark layer of trees to attain nutrients and lay their eggs. Mountain Pine Beetles emit pheromones which tell others to come to the area leading to infestations in a relative short period of time. What baffled the researchers initially however was the observation that trees in the general area of an infestation were noticed to produce an over abundant amount of sap even if they were free of Mountain Pine Beetles. The sap production is believed to be the defensive mechanism of pine trees to drown and eradicate the insects feasting off their interior bark. These observations, like most in the early stages of scientific discovery only brought on more questions than answers to the researches involved in conservation efforts. Eventually it was discovered that the sap creation phenomenon was spurred on by the release of pheromones from the trees that were infested telling others in the

surrounding area to kick up their defenses like a multi-organism immune system. As it turns out the same method used by Mountain Pine Beetles to notify each other of a food source was being employed by the pine trees to start up their defensive mechanisms.

Can plants hear and talk?

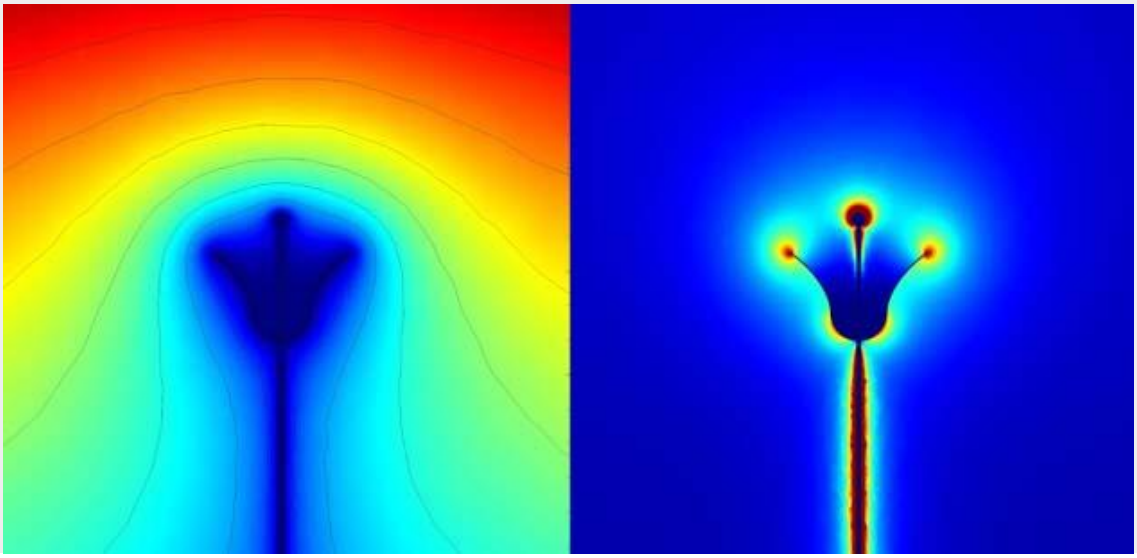
Most have heard the rumors that singing to a plant or playing classical music can help the plant grow quicker and remain healthy however in the past this could not be verified as a scientific fact. Audio communications were once thought to be exclusive to insects and animals however in 1960s it was discovered by scientists that listening to plants can give an insight into their health. Bubbles within plants can actually be detected to indicate the declining health of the organism. This occurs as a result of respiration during photosynthesis where leaf pores open up to receive carbon dioxide causing a loss of water within the plant. This water loss causes the root system to intake moisture sending it through xylems from the roots to the leaves, however during this process if the soil is too dry air bubbles can be sucked into plant membranes. The sound of these air bubbles are a detectable phenomenon which is also thought to be used by some insects when looking for food sources.

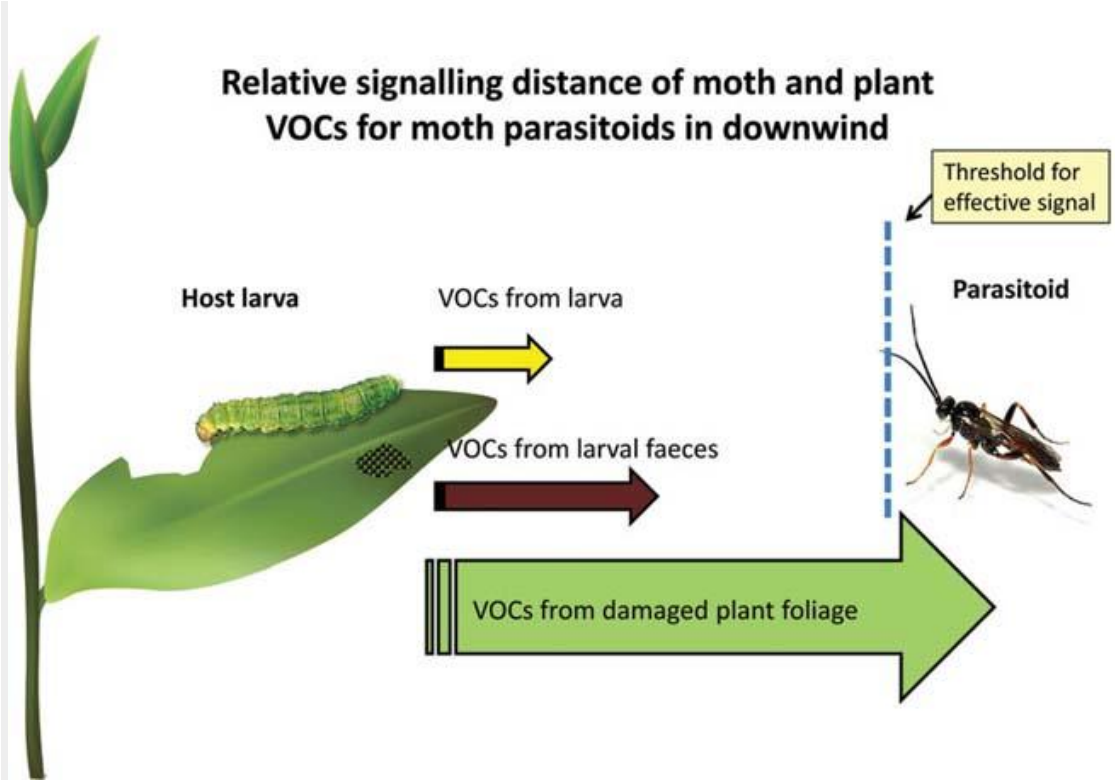
Many plants have been identified as having a response to certain sounds and it has even been discovered that some plants create their own sounds for the seeming purpose of communication. Chilli and fennel are another example of sound relationships between plants. Monica Gagliano from the University of Western Australia who specializes in plant physiology made a discovery that has changed the way scientists are thinking about communication. Fennel plants produce a natural chemical in the form of a pheromone which inhibits the growth of plants nearby. Chili seeds however are found to grow quicker when in the presence of fennel plants. This is believed to be a defensive mechanism for chili seedlings to ensure their survival in the presence of a possible threat. The discovery came as a shock however when chili plants and fennel plants were separated in chambers which blocked the transference of smell but allowed the transference of sound. The same effects resulted from this experiment leading researchers to believe that chili plants are able to detect sounds from the fennel plants causing their defensive mechanism to kick in.

How else do plants communicate?

Aside from using chemical signals in the form of pheromones, recent research from biologists have discovered that some flowers use electrical fields to communicate with insects. The shape of a flower, its color, scent and pattern attract insects such as bumble bees to pollinate the plant however recent studies also indicate that electricity is one of the many methods utilized by some species of flowers to communicate with other organisms.

The research indicates that bees possess a positive charge as they acquire friction from particles such as dust when they fly through the air. Electrons are lost from the bees as a result of this friction which is what gives them a positive electrical charge. Plants on the other hand have a negative electrical charge since they are grounded. When a bee lands on a flower it transfers its electrical charge to the plant creating an electrical field. Plants conduct electricity much slower than what we would see in metal so the charge remains in the plant for a short period of time. It appears as if bees can sense the electrical field generated by flowers and their behavior changes when in the presence of this by helping them identify colors quicker. Further research still needs to be conducted into the benefits of electrical charges in plants but it seems apparent that this does provide them with an evolutionary advantage which was previously unknown.




Relative signalling distance of moth and plant
VOCs for moth parasitoids in downwind
Threshold for effective signal
Host larva
VOCs from larva
Parasitoid
VOCs from larval faeces
VOCs from damaged plant foliage