Greenhouse experiments show plant's long-term memory

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"The little plants remembered one event of one day, one month later which was just amazing!"—Dr Gagliano. Credit: Jkadavoor

Scientists have demonstrated that Mimosa pudica plants not only learn from experience—they also remember what they have learnt over extended periods of time.

The groundbreaking study used the same experimental methods usually reserved for testing learned behavioural responses in animals.

Mimosa pudica, native to South and Central America, is known as the 'sensitive plant' due to its defensive leaf-folding reflex in response to physical stimuli.

Lead researcher Dr Monica Gagliano from UWA's Centre for Evolutionary Biology School of Animal Biology, was curious to explore Mimosa's capacity to develop learned behavioural responses through habituation.

"Habituation is where you actively learn to adapt to and filter out stimuli which have proven over time to be harmless, enabling you to remain responsive to your surrounding environment," she says.

The researchers devised an apparatus which dropped each potted Mimosa 15cm down a vertical rail onto a foam base, generating a physical shock that elicited the leaf-folding behaviour.

The plants were divided into a low-light (LL) and high-light (HL) environment, hypothesising the LL plants would be faster learners and retain their memory longer given their greater need for open leaves (for photosynthesis).

A single drop was administered to 16 control plants (eight per light condition) and again eight hours later; they swiftly closed their leaves both times.

The researchers then 'trained' 56 plants (28 per light condition) by administering 60 consecutive drops, five to 10 seconds apart, seven times within a day.

After the first four to six drops the plants habituated swiftly, keeping their leaves open after learning the drops presented no real threat.

As predicted, plants in LL re-opened their leaves more widely.

"They learn the same way we do … they acquire a new understanding of their environment and change their behaviour accordingly," Dr Gagliano says.

"They also change their behaviour depending on what the environment is demanding, so when the light was not at an optimum level, it became very important to work this out and adapt quickly."

Plants display long-term behaviour changes

Mimosa's long-term memory when exposed to new environments was tested, where plants from LL were switched to HL and vice versa, and re-tested 28 days later using the full-day training regime.

They continued to exhibit the learned behaviour in the new light condition, indicating long-term habituation in the face of changed environments.

"The plants' learnt behaviour is important in the present but also important in the future, so they don't waste energy repeating the same process of acquiring knowledge again," Dr Gagliano says.

"The little plants remembered one event of one day, one month later which was just amazing!"

She is interested in seeing what happens when more complex conditions and scenarios of learning are introduced to the plants.

More information: "Experience teaches plants to learn faster and forget slower in environments where it matters." Monica Gagliano, Michael Renton, Martial Depczynski, Stefano Mancuso. *Oecologia*. January 2014. link.springer.com/article/10.1007%2Fs00442-013-2873-7

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