IISER scientists identify natural compound which reduces pesticide use in eggplant farming

ByGayatri Vajpeyee
Jun 05, 2023 11:43 PM IST

Farmers growing eggplants can use geraniol-emitting devices that will protect the produce from the shoot and fruit borer

Using metabolomics, scientists from the Indian Institute of Science Education and Research (IISER) Pune have identified a natural compound known as ‘geraniol’ in a Himalayan eggplant variety which is capable of reducing the load of synthetic pesticides. Metabolomics is defined as the scientific study of the set of metabolites present in an organism, cell or tissue.

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The research – first published in the ‘New Phytologist Journal for Plant Science’ in March 2023 – found that moths flew away from plants laced with geraniol such as the Himalayan eggplant variety, RC-RL-22 (RL22). Most other eggplant (Solanum Melongena) varieties suffer severe losses due to a multi-insecticide resistant lepidopteran pest called the shoot and fruit borer (SFB). Whereas the researchers found that gravid (carrying egg/s) SFB females do not oviposit (lay egg/s) on RL22 due to the presence of geraniol. In any case, eggplant varieties other than RL22 have to be sprayed with combinations of heavy pesticides for SFB control which in turn renders the eggplant risky for human consumption. The researchers concluded that geraniol-emitting devices may reduce pest infestations if installed in eggplant farms. The IISER Pune research team included Dr Sagar Pandit, Rituparna Ghosh,

Dennis Metze, Surhud Sant, Maroof Shaikh, Ashish Deshpande and Dnyaneshwar M Firake.

Dr Pandit, associate professor at IISER Pune, said, “Eggplant or brinjal is the third most consumed solanaceous vegetable in India after potato and tomato. Brinjal is one of the highest pesticide-applied plants in India. Shoot and fruit borer moth (Leucinodes Orbonalis) attacks can cause 45 to 100% loss in crop yield. Moreover, the heavy use of synthetic pesticides causes serious damage to human health with cancer being one of the hazards. This discovery will not only help farmers in protecting their eggplant crop but will also eliminate the harm to human health as this is a completely edible component.”

Moving ahead with this research, farmers growing eggplants can use geraniol-emitting devices on their farms that will protect the produce from the SFB. Another option is to breed this specific plant variety that can emit geraniol, Dr Pandit said.

Farmers all over the world have been carrying out intercropping which involves growing crops among plants of different kinds, usually in the space between the rows. It means that if you are growing eggplants, you can grow something else in the middle of the eggplant field. Whenever the farmers grow marigolds, coriander or geranium in combination with eggplant, the incidence of eggplant borers is reportedly less. Reason being marigolds, coriander and geranium all emit geraniol which keeps the SFB away. Dr Pandit said that our ancestors may have known about this but it wasn’t traced scientifically till now.

How the research was conducted

The Eastern Himalayan variety (RL22) and six popular (Indian) eggplant varieties including Ankur Kavach (KV), Ankur Vijay (VJ), JK 6829 (JK), Riccia Hirvi Kateri (HK), KGN’s Pinstripe (KP) and Omaxe CVKMK124 (CVK) were used in the research.

All seven varieties were planted in a field of the IISER Pune as an experiment. The plants were arranged inside a nylon mesh (160 µm) tent with a distance of 30 cm between the plants. One SFB female, which had mated 18 to 24 hours before the assay, was released in this tent and allowed to oviposit for 10 hours. A cotton wick dipped in a sucrose solution was provided to the SFB female for feeding during the assay. The assay was repeated 20 times with a different randomised host plant arrangement every time to negate any host plant positional effects and using 20 different female SFBs.

“At the end of each assay, the eggs on each plant were counted. The moths did not land on the RL22 filter paper but laid eggs on the other six eggplant varieties. Gas chromatography and mass spectrometry helped pinpoint geraniol as the deterrent. The moths laid less than 10 eggs per plant after geraniol application where they were earlier laying 100 eggs,” the scientists said.