

Method For Identifying Proteinase Inhibitors In Plants For Developing Pest Resistance In Crops

It is a common problem with the farmers for obtaining low yield of crops. The main reason is attack of the insect which also leads to significant economic losses. Conventional pesticides are not effective against insect pests as they develop resistance against them and these chemical pesticides cause environmental hazards.

Usually farmers use pesticides for the control of pests in their crops. These pesticides many a times cause harm to the plants and toxic to soil microorganisms and other beneficial insects. CSIR-NCL (NCL) developed a technology (method) to identify proteinase inhibitors that could be expressed in plants for developing pest resistant in variety of crops. Chickpea and tomato were chosen by NCL for trying out their new technology.

NCL used the method of natural defence mechanism, of plant, for protein crop and found this method to be environment friendly.

The plants in order to defend themselves against insect attack, synthesizes a wide range of molecules. Proteinase inhibitors (PIs) present on the plant plays a defensive role against pests and pathogens. The PIs are naturally found, containing defence-related proteins (properties). These proteins are often present in seeds and induced in certain plant tissues due to the insect chewing and dropping on them. The PIs synthesized by a plant might not be effective against all insects. To engineer defence against an insect, there is a need to identify the particular PIs that will inhibit growth of that particular insect.

Plants which do not naturally produce such PIs, can be protected against that specific / particular insect by transferring the genes responsible for PI production. This will produce a transgenic or genetically engineering plant variety that is pest-resistant, without use of pesticides.

For example, the Gram Pod Borer (*Helicoverpa armigera*) is a devastating pest of many commercially important crop plants including cotton, chickpea, pigeonpea, sunflower, tomato, okra etc. Dr. Vidya Gupta and Dr. Ashok Giri along with their team at NCL found that the Pod borer disarms the host plant's natural defence mechanism by inactivating PIs and, then feeds on them. As the PI found in the host plant is ineffective, Dr. Gupta's team screened several other

plants that were resistant to the Pod Borer and identified PIs from these plants. Their studies revealed that when PIs from winged bean, bitter melon, capsicum, potato and groundnut were fed to the Pod Borer, its growth and, egg-laying/hatching abilities were dramatically retarded. Dr. Gupta's team has focused on four PIs from the seeds of winged bean (known as 'chaudhari wal') that were found to be most effective against the Pod Borer. They then isolated the genes responsible for these PIs and successfully transferred these genes to bacteria and yeast. The PIs synthesized by these organisms show effective activity against the Pod Borer.

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7. Personal Discussion with Dr. Ashok Giri at CSIR-NCL.

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