

Insecticidal activity of leaf proteins isolated from tuberous *Ipomoea mauritiana* against sweetpotato weevil

B. G. Sangeetha^{1,*}, Athira J. K. Jayan¹, T. Makesh Kumar¹, T. Santhosh Kumar², G. Ajesh¹, E. R. Harish¹ and L. S. Rajeshwari¹

¹Division of Crop Protection, ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram 695 017, India

²Department of Entomology, College of Agriculture, Thiruvananthapuram 695 522, India

Sweetpotato is one of the most important food crops in the world and serves as a rich source of carbohydrates, betacarotene, vitamins and minerals. Sweetpotato weevil is one of the harmful pests infesting the crop and remains a challenge for crop cultivation. From screening of different *Ipomoea* spp., wild tuberous *Ipomoea mauritiana* was identified as resistant to sweetpotato weevil infestation. Hence, several extraction methods for the isolation of proteins from the leaves of different wild *I. mauritiana*, *Ipomoea palmata*, *Ipomoea triloba* and *Ipomoea obscura* were standardised. Further, the crude protein extract from *I. mauritiana* was tested against adult sweetpotato weevils using the leaf dip method. The mortality of the weevils were observed for crude extract isolated after 48 h at a concentration of protein ranges from 4 to 5 mg/ml. Further, to study the effects of crude protein of *I. mauritiana*, the protein content and various enzymes from sweetpotato weevil were estimated after treatment. A significant reduction in the amount of protein was observed after treatment with crude leaf protein, which shows the presence of protease inhibitor activity. Significant difference was observed in the different enzyme activity, viz. superoxide dismutase, lipid peroxidase, glutathione peroxidase, glutathione reductase, glutathione s-transferase of sweetpotato weevil, which also reveals the insecticidal activity of crude protein extract. In conclusion, this is one of the first studies regarding the evaluation of insecticidal activity of leaf protein extract from the wild *I. mauritiana* against sweetpotato weevils, and our studies revealed the presence of insecticidal proteins as well as protease inhibitors from the leaves of *I. mauritiana*. Further studies will be done to identify and purify novel proteins from *I. mauritiana* using a proteomics approach to evaluate insecticidal activity against sweetpotato weevil.

Keywords: Extraction, *Ipomoea* sp., protease inhibitory assay, protein, sweetpotato, TCA-acetone.

cultivated for tubers in the tropical and subtropical regions of the world in various countries. The crop serves as an important source of calories, proteins, vitamins and minerals for humans¹. The soluble protein in sweetpotato is Ipomoein, a 25 kDa protein strand formerly known as sporamin². They have an immense potential to play a major role in human nutrition, food security and poverty alleviation in developing countries³. Despite the economic importance of the crop, the sweetpotato weevil infestation still remains a hurdle for sweetpotato cultivation. The weevils are widespread in the tropical regions of the world and lead to severe economic loss⁴. In this context, identification of resistance genes from crop wild relative (CWR) for developing host-plant resistance mechanism in *I. batatas* is one of the alternate pest management strategic. In plants, the CWR always retain a high level of genetic diversity in their gene pool compared to domesticated crops, and serves as a source of resistance genes against biotic stress. The genus *Ipomoea* also comprises about 600–700 species all over the world and is the largest genus of family Convolvulaceae¹. In other crops like rice, the resistant genes in CWR of rice have already been identified and used as an alternate source for resistance to brown planthopper attacks and various bacterial diseases⁵. Similarly, earlier studies also reported the transfer of various traits, such as resistance to insects, viruses, fungi, bacteria and nematodes to cultivated tomatoes (*Solanum lycopersicum*) from wild relatives⁶. The wild species of tomato, such as *Solanum habrochaites*, *Solanum peruvianum* and *Solanum pennellii*, were mainly reported as resistant to arthropod pests⁷. In previous studies for screening different wild *Ipomoea* spp. for sweetpotato weevil resistance, tuberous wild *Ipomoea mauritiana* was identified as resistant to sweetpotato weevil infestation⁸. In plants, protease inhibitor proteins are a group of proteins that are developmentally regulated due to their antinutritional interaction against phytopathogens and insects⁹. Eight clas-