Whitefly menace and management

A news feature in *Nature* (2006, **443**, 898–900), titled 'The Christmas Invasion' about whitefly havoc is interesting and alarming not for only the Americans, but of global concern causing severe damage to a variety of crops annually in different niches. The morphological character and behaviour of the pest is so tuned genetically with its evolutionary stage that it easily protects its body from pesticide droplets. Whiteflies usually multiply and become active on the undersurface of leaf lamina of plants avoiding sunlight. Hence, plant growers notice its incidence only at a late stage. Once the pesticide odour during spraying is sensed by whitefly adults, they tilt their head–thorax downwards and cover their whole body with feathery wings simultaneously closing the openings of the spiracles. Thus, apart from pesticide-resistant Q-biotype, other common genotypes too are insecticide-resistant. Though other non-destructive life stages (egg and larva) could be exposed to promising potent pesticides, it is tedious to apply chemicals in the short life stage during their development at the right time.

Additionally, secondary metabolites are known to repel pests of crop plants. Surprisingly, whiteflies attack and transmit *Begomovirus* in menthol mint (*Mentha arvensis*). Both the upper and lower surfaces of the leaves of menthol-mint contain high amounts of menthol (65–75%) of essential oil (terpene) in trichomes. In my 31 years of research career in entomology, I have failed to manage this pest in menthol-mint crop by applying high dosage and repeated application of promising pesticides in the summer (March–June) of the northern Indian climate and shifted my interest of management towards screening whitefly-resistant genotypes of mint crop, where significant results were achieved. Among 26 *M. arvensis* entries of menthol-mint genotypes evaluated for resistant potential to whitefly, two genotypes were found significantly resistant to whitefly over other entries (Singh, D. *et al.*, *Indian J. Genet. Plant Breed.*, 2004, **64**, 253–254).

One and a half decades ago, menthol-mint was susceptible to larvae of *Syngamia abruptalis* feeding on paranchymus tissues of the upper surface of leaves. In the nineties, development and introduction of new strains containing high menthol of different genetic chemotypes were found that were attacked regularly by this devastating pest. We are not yet sure whether the whitefly attack in our region on menthol-mint is at par with the pesticide-resistant Q-biotype/or B-biotype. Usually menthol-mint crop is not exposed to pesticides in India because of unawareness and the need of eco-friendly organic product for export purposes. However, the crop may serve as an alternate host of whitefly, which may also move to other agricultural crops in the multi-cropping system.

Four strategies may be real solution internationally to whitefly menace: (a) survey of the pesticide-resistant Q-biotype/B-biotype; (b) evaluation of germplasms and cultivars for whitefly-resistant potential; (c) cultural management, namely intercropping allelopathic plant types, shift in date of sowing seeds/planting as local approach alone/along with nutrient management, and (d) attention to domestic and international quarantine apart from biotechnological approaches that need huge funds and long-term research. It is high time to gear up and share scientific contributions in international networking research programmes to fight whiteflies.

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'Genetic transformation'

The use of the term 'genetic transformation' seems inappropriate to describe the research work in the article by Shyamakumar *et al.*[1].

The uptake and expression of introduced genetic material, resulting in the alteration of the normal genome of an individual cell by the exogenous genetic material, is transformation, first demonstrated in 1944 in *Streptococcus pneumoniae* by Avery and co-workers. Impressive achievements of genetic transformation have now been demonstrated in several transgenic crops, sourcing genes from diverse organisms. Given this concept, introduction of even RNA molecules that do not produce heritable changes is not true transformation. *Agrobacterium tumefaciens* is just one of the more frequently used vector agents to introduce new genetic material, while particle bombardment (biolistics), electroporation and microinjection are some of the other means.

The article by Shyamakumar *et al.*[1] is interesting to the extent of demonstrating *Agrobacterium*-mediated cell proliferation in a tree species, but that in itself does not constitute genetic transformation. The presence of nopaline in the C-58-induced callus could be the function of the Ti-plasmid of *Agrobacterium* C-58, which does not essentially require integration of T-DNA with the host genome. However, incorporation of T-DNA into the host genome was assumed by the authors and not demonstrated by Southern blot. Tannin, which was demonstrated in the pericarp, normal callus and C-58-induced callus, was the characteristic of native *Terminalia chebula* and constitutes the expression of the host genes. Where is the evidence for genetic transformation in this work?

1. Shyamakumar, B., Anjaneyulu, C. and Giri, C. C., *Curr. Sci.*, 2007, **92**, 361–367.

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