Breeding tomato for resistance to South American tomato moth, *Tuta absoluta*

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South American tomato moth, *Tuta absoluta* (Meyrick) (Gelechiidae: Lepidoptera), a serious pest of tomato (*Solanum lycopersicum*) in tropics and subtropics, is rapidly spreading world over. In India, it was first reported in 2014 and since then it has reached all major tomato growing areas in the country causing significant damage ranging from 50 to 100% both under open and polyhouse conditions (Sridhar *et al*., 2014, Sridhar *et al*., 2020).

T. absoluta larvae can destroy the tomato canopy by excavating the leaves, stems and buds; and burrows into fruits causing the quality decline of fresh tomato and yield loss. Multiple generations of the pest coupled with its mining nature of damaging all the parts of the plant at all stages of the crop make it a difficult pest to control. As of now, chemical control methods are being followed. But the feeding habit of the larvae, the increasing number of resistant strains of this pest, together with the negative impact of the insecticides in the environment, makes the chemical control method not sustainable. In addition, mating disruption methods (like sex pheromones) have been used to control *T. absoluta*, but this technique is a lot more expensive than pesticide applications. The biological control methods are still under development for the management of this pest effectively. Due to the various reasons, stated above, exploring wild accession of tomato for new sources of resistance is needed (Bitew, 2018).

Keeping in view the importance of host plant resistance as an important component in the IPM against this pest, twenty one wild/cultivated/advanced breeding lines of tomato were screened for resistance to *T. absoluta* under greenhouse conditions (choice bioassay) at ICAR-Indian Institute of Horticultural Research, Bengaluru during 2017-18. From these screening trials, promising genotypes were evaluated further for their antibiosis activity through no choice bioassay under *in-vitro* conditions. For the *T. absoluta* screening, under field conditions, damage scoring proposed by Maluf *et al*., (1997) was followed. From 21 genotypes screened, six wild accessions *viz.*, *S. pennellii* (LA 1940); *S. chilense* (LA 1963); *S. arcanum* (LA 2157); *S. lycopersicum* (LA1257) and *S. corneliomulleri* (LA 1292, LA1274) were found relatively

resistant to *T. absoluta* based on mean per cent damage. Among these six genotypes, *S. pennellii* (LA-1940) showed resistance both under choice and no choice bioassays with a higher number of type IV trichomes, highest total flavonoids and phenols (Sridhar *et al*., 2019). In addition, *S. pennellii* had the highest total phenols (2200 mg/100 g dry weight). In general, glandular trichomes (GTs) (type I, IV, VII) showed negative correlation in different genotypes of tomato with reference to larval number/plant, percent damage and adult activity, whereas type V (non-GTs) showed a negative correlation with number of larvae/plant (Sridhar *et al*., 2019). Trichomes, besides acting as chemical barriers, can also act as physical barriers, limiting pest insect access to the plant surface, due to trichome density and length.

An interspecific hybrid (F_1) between, cultivated line *S. lycopersicum* (TLBER-38-7) and wild genotype identified as resistant to *T. absoluta viz., S. pennellii* (LA 1940) was successfully developed to introgress genes resistant to *T. absoluta*. The evaluation of F_1 progeny revealed clear difference in terms of resistance to the target pest. F_1 progeny has recorded a total phenols of 1637 mg/100 g dry weight and total flavonoids of 1160 mg/100 g dry weight. On F_1, *T. absoluta* took additional time for completing the larval and pupal stages coupled with higher larval mortality, which may be attributed to the antibiosis of the host against *T. absoluta*. On F_1, developmental time for larvae and pupae was recorded as 12.33 days and 7.33 days, respectively, as against 9.33 days and 5.33 days, respectively on check cv. Shivam. When *T. absoluta* was reared on F_1 progeny, only 18 per cent of the pest could reach the adult stage. BC_1F_1 and F_2 progenies of SH-3 are being further advanced to study the resistance/tolerance of the lines against *T. absoluta*.

The present attempt to introgress *Tuta* resistance genes to the cultivated tomato lines is very challenging, as the resistance to *T. absoluta* is observed only in wild genotypes and needs different breeding approaches to successfully introduce the resistant genes into the cultivated lines.

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