Biological performance, response and population dynamics of *Tetranychus evansi* (Acari: Tetranychidae), as influenced by different African nightshade (Solanales: Solanaceae) species

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ABSTRACT

Despite the vast research on trichome-based resistance as well as plant chemical factors in plant-herbivore interactions in Solanaceous plants, little or no information is available on the association between *Tetranychus evansi* Baker and Pritchard and these mechanisms in African nightshades. The current study which was carried out from December, 2006 to March, 2009 focused on five African nightshade species viz. *Solanum sarrachoides* Sendter, *S. villosum* Mill, *S. tarderemotum* Bitter, *S. americanum* Mill and *S. scabrum* Mill that were evaluated for their resistance to *T. evansi*. The objective was to investigate several host plant characteristics of the five *Solanum* spp and their influence on developmental duration, oviposition, survival, intrinsic population growth rate and other life history characteristics of *T. evansi*. To achieve this objective, the study concentrated on four major areas (i) Effect of five *Solanum* spp on biology and life table parameters of T. evansi (ii) Evaluating the effects of morphological and chemical factors in five *Solanum* spp to mite fecundity, repellency and olfactory responses (iii) Population dynamics of *T. evansi* on five *Solanum* spp under greenhouse and field conditions and (iv) Effect of *T. evansi* feeding on growth and yield of five *Solanum* spp grown under field conditions. The results indicated that *S. villosum, S. scabrum, S. tarderemotum* and *S. americanum* are the most susceptible to *T. evansi* due to the shorter adult developmental period, longer adult longevity, higher reproduction and intrinsic rate of natural increase ranging between 0.180 - 0.196 females/female/day compared with *S. sarrachoides* which cannot support *T. evansi* populations as the rm was negative on this host. Differences in developmental time and life table parameters among the other host plants were also not significant. Five different trichome types were identified among the *Solanum* spp with the glandular types predominant in *S. sarrachoides*. There was a significant negative correlation between fecundity ($R = -0.649$; $P = 0.0019$) and distance travelled by mites after every 15 min interval with the density of glandular trichomes. Significantly fewer eggs that decreased with the age of the plant were laid on *S. sarrachoides* in comparison to other *Solanum* spp. Distance travelled by mites was also significantly low in this species indicating that higher densities of glandular trichomes decreased distances walked by mites. In olfactometer bioassays, significantly more females responded to volatiles from intact plants of *S. villosum* than those from other *Solanum* spp. Based on mite fecundity and behavioural response studies, intact plants of two species, *S. sarrachoides* and *S. villosum* were selected for volatile chemical analysis. GC-MS analysis and comparison with authentic standards identified volatile compounds as belonging to the classes of terpenoids, esters, aldehydes, ketones and green leaf alcohols. Quantification of these compounds revealed that except for the ketones, other compounds were significantly higher in *S. sarrachoides* than in *S. villosum.* Population densities of *T. evansi* in screenhouse studies revealed that *S. scabrum* was highly infested by *T. evansi* but the percentage leaf area damaged was very low in comparison to other *Solanum* spp. The highest level of resistance was observed in *S. sarrachoides* where *T. evansi* populations significantly remained low. Field studies revealed

significant differences in number of motile individuals of *T. evansi* among the acaricide free and acaricide protected plots. Significant differences were also found on growth and yield among nightshade species in acaricide free and acaricide protected plots over time and space. Significant seasonal variation in yields of respective nightshade species was detected. Yields in both seasons were negatively correlated to leaf area damaged by *T. evansi* in acaricide free plots. Based on population dynamics findings, *S. sarrachoides* did not support any mite populations over time. However, *S. scabrum* supported high mite populations but no significant reduction in growth and yield was detected. In conclusion, *Solanum americanum, S. villosum, S. tarderemotum* are suitable host plants for *T. evansi* and severe mite outbreaks are likely to occur under favorable conditions in the field. Since *S. sarrachoides* and *S. scabrum* seem to possess resistance and tolerance attributes respectively to *T. evansi*, these attributes can be investigated further and utilized in programs such as breeding and IPM in order to develop resistant genotypes and reduce *T. evansi* populations in African nightshades.