

INSECTICIDE RESISTANCE IN COTTON MEALYBUG, *PHENACOCCLUS SOLENOPSIS* TINSLEY POPULATION COLLECTED FROM FARMER'S FIELD OF BHARUCH DISTRICT OF GUJARAT

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Abstract: Investigations on cotton mealybug, *Phenacoccus solenopsis* Tinsley” was carried out at Laboratory of Main Cotton Research Station, Navsari Agricultural University, Surat during October 2020 to January 2021 through the IRAC leaf dip bio-assay technique. Mealybug population from the farmers fields’ of five locations viz., Amod, Bharuch, Jambusar, Netrang and Valia taluka of Bharuch district and as well as Research farm, MCRS, Surat were collected and reared at Main Cotton Research Station, NAU, Surat under field cage cover. Leaf dip bio-assays were carried out for the seven insecticides viz., imidacloprid 70 WG, acetamiprid 20 SP, thiamethoxam 25 WG, buprofezin 25 SC, lamda cyhalothrin 5 EC, spinosad 45 SC and profenophos 50 EC with eight concentrations including control with three repetitions. The LC₅₀ values for imidacloprid 70 WG, acetamiprid 20 SP, thiamethoxam 25 WG, profenophos 50 EC, buprofezin 25 SC, Lamda cyhalothrin 5 EC and spinosad 45 SC ranged from 0.0027 to 0.0032, 0.0015 to 0.0017, 0.005 to 0.007, 0.025 to 0.049, 0.017 to 0.029, 0.004 to 0.011 and 0.009 to 0.022 per cent, respectively. The slope values across locations for specific insecticide were estimated as >1 indicated more near homogeneous population across locations. The LC₉₀ values for imidacloprid 70 WG, acetamiprid 20 SP, thiamethoxam 25 WG, profenophos 50 EC, buprofezin 25 SC, lamda cyhalothrin 5 EC and spinosad 45 SC ranged from 0.023 to 0.033, 0.008 to 0.010, 0.048 to 0.058, 0.127 to 0.213, 0.072 to 0.126, 0.050 to 0.099 and 0.078 to 0.204 per cent, respectively. The relative resistance ratio considering lowest LC₅₀ value as susceptible population varied from 1.00 to 1.19, 1.00 to 1.13, 1.00 to 1.40, 1.00 to 1.96, 1.00 to 1.71, 1.00 to 2.75 and 1.00 to 2.44 fold for imidacloprid 70 WG, acetamiprid 20 SP, thiamethoxam 25 WG, profenophos 50 EC, buprofezin 25 SC, lamda cyhalothrin 5 EC and spinosad 45 SC, respectively. The comparison between LC₉₀ values obtained with the field recommended rate showed the lowest ratio for profenophos (1.27 to 2.13 fold), buprofezin (1.44 to 2.52 fold), acetamiprid (2.00 to 2.50 fold), spinosad (3.94 to 10.30 fold), imidacloprid (4.69 to 6.73 fold) and thiamethoxam (4.80 to 5.80 fold), whereas higher ratio for lamda cyhalothrin (10.00 to 19.80 fold). There was much variation between the LC₉₀ and recommended rate in case of lamda cyhalothrin 5 EC at Valia (19.80 fold) followed by Amod (16.80 fold) than other locations (10.0 to 14.0 fold). Similarly, variation in case of spinosad 45 SC showed high at Netrang (10.30 fold) followed by Bharuch (8.33 fold) than other locations (3.94 to 7.93 fold).

Keywords: Cotton, Farmers, Insecticide, Investigation, Population

REFERENCES

- Abbott, W. S. (1925). A method of computing the effectiveness of an insecticide. *J. Econ. Ent.*, **18**: 265-267. [[Google Scholar](#)]
- Afzal, M. B. S. and Shad, S. A. (2016). Characterization of *Phenacoccus solenopsis* (Tinsley) (Homoptera: Pseudococcidae) Resistance to Emamectin Benzoate: Cross-Resistance Patterns and Fitness Cost Analysis. *Neotropical Entomology*, **45**(3): 310–319. [[Google Scholar](#)]
- Afzal, M. B. S. and Shad, S. A. (2017). Spinosad resistance in an invasive cotton mealybug, *Phenacoccus solenopsis*: Cross-resistance, stability and relative fitness. *Journal of Asia-Pacific Entomology*, **20** (2):457-462. [[Google Scholar](#)]
- Afzal, M. B. S., Shad, S. A., Ejaz, M. and Serrao, J. E. (2019). Laboratory selection, cross-resistance, and estimations of realized heritability of indoxacarb resistance in *Phenacoccus solenopsis* (Homoptera: Pseudococcidae). *Pest Management Science*, **76**(1): 161-168. [[Google Scholar](#)]
- Banazeer, A., Afzal, M. B. S., Ijaz, M. and Shad, S. A. (2019). Spinosad resistance selected in the laboratory strain of *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae): studies on risk assessment and cross-resistance patterns. *Phytoparasitica*, **47**(4): 531-542. [[Google Scholar](#)]
- Bhanderi, G. R., Patel, R. D., Desai, H. R. and Patel, R. K. (2020). Assessment of yield losses due to mealybug (*Phenacoccus solenopsis* Tinsley) infestation in the cotton farmers’ field of south Gujarat. *Journal of Entomology and Zoology Studies*, **8**(2): 73-79. [[Google Scholar](#)]
- Dhawan, A. K., Sidhu, A. S. and Simwat, G. S. (1988). Assessment of avoidable loss in cotton (*Gossypium hirsutum* and *G. arboreum*) due to sucking pests and bollworms. *Indian Journal of Agricultural Science*, **58**: 290-292. [[Google Scholar](#)]
- Finney, D. J. (1971). “*Probit analysis*”, Cambridge University Press, London, United Kingdom, p. 318.
- Hargreaves, H. (1948). *List of Recorded Cotton*

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Insects of the World, Common Wealth Institute of Entomology, London, 50 p.

[[Google Scholar](#)]

Ismail, M., Ejaz, M., Abbas, N., Shad, S. A. and Afzal, M. B. S. (2017). Resistance risk assessment to chlorpyrifos and cross-resistance to other insecticides in a field strain of *Phenacoccus solenopsis* Tinsley. *Crop Protection*, **94**: 38-43.

[[Google Scholar](#)]

Nagrare, V. S., Fand, B. B., Naik, V. C. B., Naikwadi, B., Deshmukh, V. and Sinh, D. (2020). Resistance development in Cotton mealybug, *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae) to insecticides from Organophosphate, Thiadiazines and Thiourea derivatives. *International Journal of Tropical Insect Science*, **40**: 181-188.

[[Google Scholar](#)]

Nagrare, V. S., Kranthi, S., Biradar, V. K., Zade, N. N., Sangode, V., Kakde, G. and Kranthi, K. R. (2009). Widespread infestation of the exotic mealybug species, *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae), on cotton in India. *Bulletin of entomological Research*, **99**(5): 537.

[[Google Scholar](#)]

Rakesh, R. C. and Kathane, T. V. (1989). Cotton marketing federation and export of cotton in India (1980-81 to 1987-88). *Cott. Dev.*, **18**(3-4): 1-18.

[[Google Scholar](#)]

Venkatesan, T., Jalali, S. K., Ramya, S. L. and Prathibha, M. (2016). Insecticide resistance and its management in mealybugs. In: *Mealybugs and their Management in Agricultural and Horticultural crops* (Pp. 223-229). Springer, New Delhi.

[[Google Scholar](#)]