

## Evaluating the effects of fungicides on the biocontrol potential of *Neoseiulus longispinosus* (Acari: Phytoseiidae) against *Tetranychus urticae* (Acari: Tetranychidae)

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### INTRODUCTION & AIM

- Tomato (*Solanum lycopersicum* L.) is an important crop valued for health benefits and economic significance, but it is vulnerable to pests and diseases, requiring the use of insecticides and fungicides.
- The two-spotted spider mite, *Tetranychus urticae* Koch, is a major pest of tomato, known for its resistance to many acaricides, making biological control an effective alternative.
- Neoseiulus longispinosus* (Evans), a phytoseiid predator, is used for controlling *T. urticae*; however, fungicides applied for disease control may negatively affect the predator's performance through lethal and sub-lethal effects in an IPM programme.

### METHOD

- The wettable powder (WP) formulations of four fungicides were used to evaluate their toxicity to adult females of *N. longispinosus*. Untreated leaves were used for the control.
- Tomato leaf discs (3cm × 3cm) were treated with fungicides using the modified leaf dip method.
- The per cent mortality of *N. longispinosus* was recorded after a 48-h period and the fungicides were classified according to the International Organization for Biological Control (IOBC) standards (Sterk et al. 1999).
- The progenies of survivor females were further taken to study the residual toxicity of fungicides on the life-table parameters of the predatory mite. These were reared on the leaf discs taken from tomato plants that were sprayed in the polyhouse on the day of start of the toxicity experiment.
- The demographic parameters evaluated were gross reproductive rate (*GRR*), net reproductive rate (*R<sub>0</sub>*), Intrinsic rate (*r*), finite rate (*λ*), mean generation time (*T*), mean fecundity (*F*), and survival rate (*l<sub>x</sub>*).

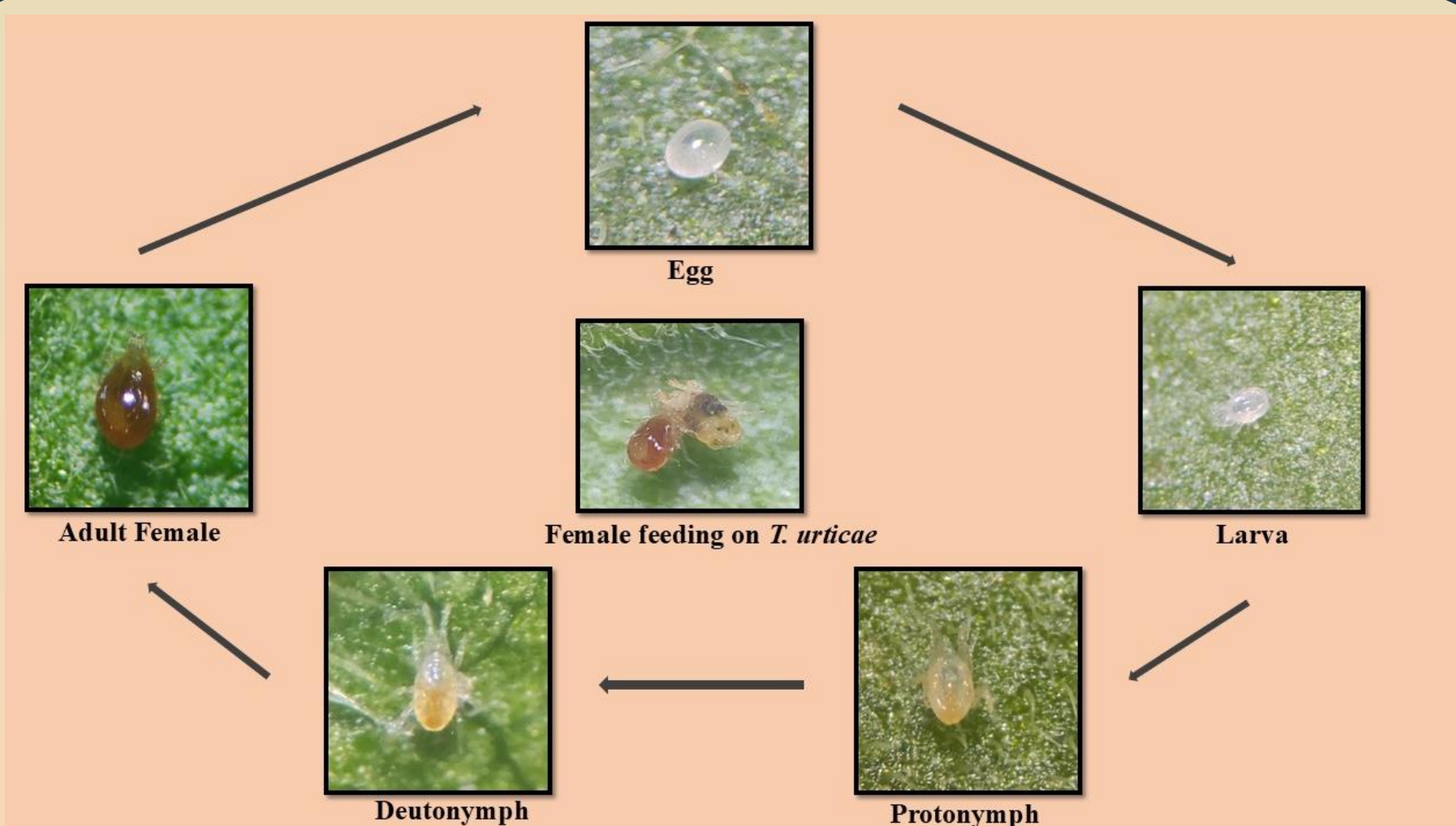


Figure 1. Different stages of *Neoseiulus longispinosus*

### RESULTS & DISCUSSION

Table 1. Toxicity of fungicides to *N. longispinosus* after 48-hour period

Fungicide	Concentration (ppm)	Per cent mortality	IOBC toxicity category
Mancozeb 75% WP	2500	52.50 ± 6.48 (46.71 ± 3.91)	Slightly harmful
Copper Oxychloride 50% WP	3000	35.00 ± 5.00 (35.91 ± 3.07)	Slightly harmful
Metalaxyl 4% + Mancozeb 64% WP	2500	60.00 ± 5.35 (51.03 ± 3.24)	Slightly harmful
Thiophanate Methyl 70% WP	1000	17.50 ± 5.90 (19.76 ± 6.08)	Harmless
C.D. ( <i>p</i> < 0.05)		(12.36)	

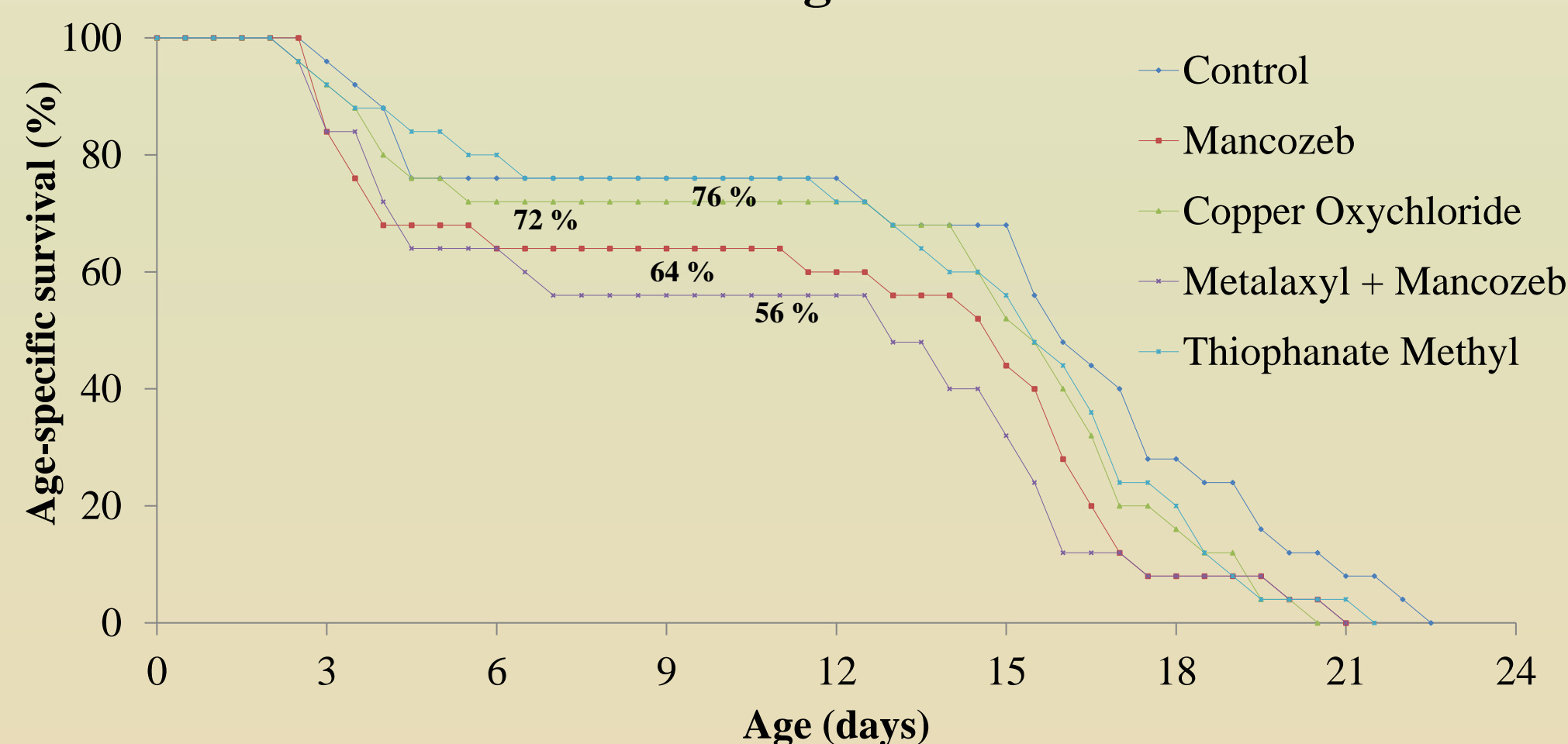
\*IOBC: International Organization for Biological Control

Table 2. Demographic parameters of *N. longispinosus* preyed upon *T. urticae* across different treatments of fungicides

Parameter	Control	Mancozeb	Copper Oxychloride	Metalaxyl + Mancozeb	Thiophanate Methyl
<i>GRR</i>	12.65 ± 2.17 <sup>a</sup>	7.44 ± 1.81 <sup>b</sup>	9.40 ± 1.73 <sup>ab</sup>	5.96 ± 1.44 <sup>b</sup>	9.92 ± 2.08 <sup>ab</sup>
<i>R<sub>0</sub></i>	8.16 ± 1.90 <sup>a</sup>	3.92 ± 1.13 <sup>bc</sup>	6.00 ± 1.46 <sup>ab</sup>	3.04 ± 0.93 <sup>c</sup>	6.24 ± 1.61 <sup>abc</sup>
<i>r</i>	0.18 ± 0.02 <sup>a</sup>	0.11 ± 0.03 <sup>bc</sup>	0.15 ± 0.02 <sup>ab</sup>	0.09 ± 0.03 <sup>c</sup>	0.15 ± 0.02 <sup>ab</sup>
<i>λ</i>	1.20 ± 0.03 <sup>a</sup>	1.12 ± 0.03 <sup>bc</sup>	1.16 ± 0.03 <sup>ab</sup>	1.10 ± 0.03 <sup>c</sup>	1.17 ± 0.03 <sup>ab</sup>
<i>T</i>	11.53 ± 0.30 <sup>a</sup>	11.98 ± 0.47 <sup>a</sup>	11.89 ± 0.21 <sup>a</sup>	11.82 ± 0.75 <sup>a</sup>	11.93 ± 0.26 <sup>a</sup>
<i>F</i>	18.55 ± 1.09 <sup>a</sup>	10.89 ± 1.24 <sup>cd</sup>	13.64 ± 1.29 <sup>bc</sup>	9.5 ± 0.97 <sup>d</sup>	15.6 ± 1.33 <sup>ab</sup>

\*Means in the row with same alphabetical superscript are statistically similar (*p* < 0.05)

Figure 2. Per cent age-specific survival (*l<sub>x</sub>*) of *N. longispinosus* across different treatments of fungicides



\* The per cent values below the curve represent survival when all individuals reached the adult stage.

### CONCLUSION

The fungicides thiophanate methyl and copper oxychloride appear to be more compatible with *N. longispinosus* compared to mancozeb and metalaxyl + mancozeb. The overall effect of copper oxychloride and thiophanate methyl toxicity was moderate to negligible for *N. longispinosus* and its progeny.

### REFERENCES

- Sterk, G.; Hassan, S.A.; Bailod, M. Results of the seventh joint pesticide testing programme of the IOBC/WPRS working group “Pesticides and Beneficial Organisms”. *BioControl*, **1999**, *44*, 99–117.  
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