

Table 1 Lethal and sub-lethal values of lufenuron to the second instar larvae of *E.vittella* after 72 h exposure to treated okra fruit

Insecticide	N <sup>a</sup>	Concentration mg (a.i.) liter <sup>-1</sup> (95% CL) <sup>-1</sup>			Slope ± SE	χ <sup>2</sup>
		LC <sub>15</sub>	LC <sub>40</sub>	LC <sub>50</sub>		
Lufenuron	720	0.183 ( 0.129-0.242)	0.598 (0.483-0.720)	0.878 (0.730-1.039)	1.522 ± 0.121	1.724

a Number of *E.vittella* larvae used in toxicity test. CI: confidence interval.

**Table 2** Mean ( $\pm$  SE) of pupal period, pupation rate%, adults emergence% and pupal Weight of *E. vittella* in which 2nd instars larvae of F<sub>0</sub> generation were treated with higher sub-lethal and lower sub-lethal concentrations of lufenuron).

Parameters	F <sub>0</sub>			F <sub>1</sub>		
	Control	LC <sub>15</sub>	LC <sub>40</sub>	Control	LC <sub>15</sub>	LC <sub>40</sub>
Pupal period	9.62 $\pm$ 0.18 b	12.02 $\pm$ 0.46 a	11.76 $\pm$ 0.29 a	9.40 $\pm$ 0.07 c	10.5 $\pm$ 0.28 a	11.8 $\pm$ 0.06 b
Pupal wt (mg)	61.14 $\pm$ 2.14 a	49.56 $\pm$ 1.36 b	48.24 $\pm$ 1.64 b	58.13 $\pm$ 1.32 a	52.92 $\pm$ 3.02 ab	48.24 $\pm$ 1.64 b
Pupation rate	96.20 $\pm$ 3.12 a	73.58 $\pm$ 1.23 b	64.94 $\pm$ 1.48 c	97.40 $\pm$ 2.66 a	82.00 $\pm$ 4.64 b	72.20 $\pm$ 3.72 b
Adult emergence	97.12 $\pm$ 0.41 a	77.52 $\pm$ 1.14 b	67.86 $\pm$ 1.11 c	98.00 $\pm$ 2.0 a	82.20 $\pm$ 4.73 ab	69.00 $\pm$ 6.40 b

Means marked with different letters within the same row are significantly different ( $p > 0.05$ ; Tukey).

**Table 3** Mean ( $\pm$  SE) of fecundity (mean number of eggs laid by single female), eggs hatchability %, oviposition period of female and MPS% of *E. vittella* in which second instars larvae of F0 generation were treated with higher sub-lethal and lower sub-lethal concentrations of lufenuron

Parameters	F <sub>0</sub>			F <sub>1</sub>		
	Control	LC <sub>15</sub>	LC <sub>40</sub>	Control	LC <sub>15</sub>	LC <sub>40</sub>
Adult longevity						
Male	9.78 $\pm$ 1.34 a	7.91 $\pm$ 0.25 b	7.75 $\pm$ 0.24 b	9.96 $\pm$ 0.17 a	8.93 $\pm$ 0.25 b	8.58 $\pm$ 0.26 b
Female	13.62 $\pm$ 1.26 a	8.17 $\pm$ 0.18 b	7.08 $\pm$ 0.04 c	13.1 $\pm$ 1.27 a	9.42 $\pm$ 1.12 c	9.60 $\pm$ 0.52 b
MPS*	97.33 $\pm$ 2.67 a	82.87 $\pm$ 1.43 b	78.10 $\pm$ 1.24 b	100 $\pm$ 0.00 a	87.22 $\pm$ 5.04 ab	84.44 $\pm$ 3.57 b
Fecundity	326.56 $\pm$ 22.63 a	231.67 $\pm$ 14.03 b	226.78 $\pm$ 13.59 b	319.5 $\pm$ 24.88 a	244.3 $\pm$ 19.33 b	234.8 $\pm$ 16.32 c
Hatchability	95.99 $\pm$ 0.33 a	73.57 $\pm$ 1.77 b	67.43 $\pm$ 1.97 b	96.02 $\pm$ 0.21 a	77.67 $\pm$ 1.42 b	70.88 $\pm$ 2.24 c

\* Mating pair success

Means marked with different letters within the same row are significantly different ( $p > 0.05$ ; Tukey).

**Table 4** Mean ( $\pm$  SE) of pre-adults developmental period, APOP and TPOP of F<sub>1</sub> generation *E. vittella* (in which second instars larvae of F<sub>0</sub> generation were treated with higher sub-lethal and lower sub-lethal concentrations of lufenuron.)

Treatment	Control	Lufenuron	
		LC <sub>15</sub>	LC <sub>40</sub>
Eggs	3.00 $\pm$ 0.00 a	3.00 $\pm$ 0.00 a	3.00 $\pm$ 0.00 a
1 <sup>st</sup> instar	2.58 $\pm$ 0.02 a	2.14 $\pm$ 0.05 b	2.06 $\pm$ 0.04 b
2 <sup>nd</sup> instar	2.18 $\pm$ 0.02 a	2.18 $\pm$ 0.04 a	2.20 $\pm$ 0.05 a
3 <sup>rd</sup> instar	2.70 $\pm$ 0.05 a	2.68 $\pm$ 0.07 a	2.22 $\pm$ 0.06 b
4 <sup>th</sup> instar	2.66 $\pm$ 0.07 b	2.68 $\pm$ 0.07 a	2.80 $\pm$ 0.08 ab
5 <sup>th</sup> instar	2.16 $\pm$ 0.06 c	3.16 $\pm$ 0.16 a	2.58 $\pm$ 0.10 b
Larva	12.28 $\pm$ 0.7 b	13.14 $\pm$ 1.15 a	13.86 $\pm$ 1.22 a
Pupa	9.40 $\pm$ 0.52 c	11.8 $\pm$ 0.28 a	11.1 $\pm$ 0.06 b
OP of female <sup>a</sup>	9.10 $\pm$ 0.26 a	7.30 $\pm$ 0.21 c	7.70 $\pm$ 0.23 bc
APOP <sup>b</sup>	1.2 $\pm$ 0.132 a	1.00 $\pm$ 0.00 b	1.00 $\pm$ 0.00 b
TPOP <sup>c</sup>	26.0 $\pm$ 0.65 c	29.0 $\pm$ 1.19 a	27.3 $\pm$ 0.43 b

The standard error of the mean (SEM) values was estimated by using 100,000 bootstrap replications and Significant differences between the control and different lufenuron concentrations are given by letters.

<sup>a</sup>Oviposition period of female,

<sup>b</sup> Adult pre-oviposition period

<sup>c</sup> Total pre-oviposition period.

**Table 5** Mean ( $\pm$  SE) of Comparison of biological parameters of *E. vittella* in which second instars larvae of  $F_0$  generation were treated with low-lethal and sub-lethal concentrations of lufenuron

Parameters	CK	Lufenuron	
		LC <sub>15</sub>	LC <sub>40</sub>
Grass reproduction rate (GRR)	67.16 + 18.65a	57.55 + 16.89a	49.79 + 14.07a
Intrinsic rate of increase ( r )	0.139 + 1.06a	00.12 + 9.74a	0.108 + 8.88a
Finite rate of increase ( $\lambda$ )	1.149 + 1.21a	1.13 + 1.09a	1.11 + 9.76a
Net reproductive rate(Ro)	63.92 + 18.07a	48.86 + 13.92a	46.96 + 13.32a
Mean generation rate (T)	29.79 + 0.55a	32.38 + 1.55b	30.79 + 0.37a

The standard error of the mean (SEM) values was estimated by using 100,000 bootstrap replications and significant differences between the control and different lufenuron concentrations are given by letters.

**Table 6** P450 PNOD, Esterase- $\alpha$ NA and GST-DCNB (glutathione S-transferase) activity (Mean  $\pm$  SE) of *E. vittella*

Enzymes	CK	LC <sub>15</sub>	LC <sub>40</sub>
Cytochrome P450 mono-oxygenase (nmol/min/mg of protein)	0.58 $\pm$ 0.050a	1.28 $\pm$ 0.023b	1.53 $\pm$ 0.060c
Eterase, $\alpha$ -naphtyl (nmol/min/mg of protein)	92.15 $\pm$ 2.28a	115.73 $\pm$ 1.84a	123.83 $\pm$ 3.05c
GST(nmol/min/mg of protein)	40.52 $\pm$ 1.42b	44.19 $\pm$ 2.36 ab	48.93.60 $\pm$ 1.72a

All means  $\pm$  S.E. are based on three replicates within rows, means followed by the same letter did not differ significantly