

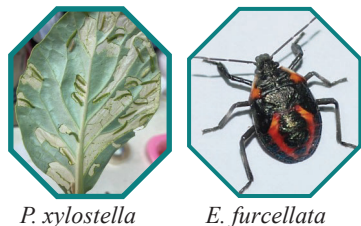
JUREEPORN SUKHATIPHUM^[1], PANIDA KRUAISAWAT^[1], NUTCHAREE SIRI^[1], PRAKAIJAN NIMKINGRAT^[2] AND UBON TANGKAWANIT^{[2]*}^[1] National Biological Control Research Center (NBCRC), Upper North eastern Regional Center, Khon Kaen University, Thailand.^[2] Department of Entomology and Plant Pathology, Faculty of Agriculture, Khon Kaen University, Thailand.

ABSTRACT

Predatory bug *Eocanthecona furcellata* was investigated for the potential of biological control agent to *Plutella xylostella* in the laboratory and greenhouse condition. Predation rate of 3rd to 4th instar nymphs *E. furcellata* on 2nd, 3rd and 4th instar larvae *P. xylostella* were studied in the laboratory. The results showed that predation rate of 4th and 5th nymphal instars of *E. furcellata* were higher than 3rd instar. Feeding rate were greater when they feed on 2nd and 3rd instar larvae than feed on 4th instar larvae of *P. xylostella*. The efficiency of *E. furcellata* in controlling *P. xylostella* under greenhouse conditions was conducted. When *P. xylostella* population reached to economic threshold (ET), 20 of *E. furcellata* were released to chinese kale greenhouse (18 m³). Results showed that pest population was reduced 10.32% after 5 days of release when compared to control. Additionally, percentage of plant damage from released predatory bug greenhouse was lower than non-released greenhouse. Therefore, it is possible to release the predatory bug *E. furcellata* in vegetable production as a biological control agent.

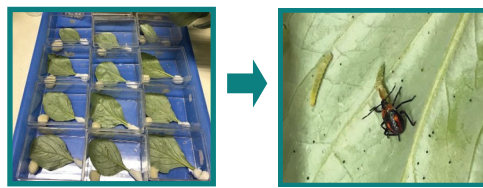
METHODOLOGY

Insect rearing

*P. xylostella**E. furcellata*

Predation rate

3th-5th nymphal stages *E. furcellata* were tested on 2nd-4th stage of *P. xylostella* (CRD, 10 replications)



Greenhouse

20 of 3rd *E. furcellata* were released, percent reduction of *P. xylostella* were calculated, insect population and damage level were recorded.

$$\% \text{ reduction} = 100 \times (1 - (T_a \times C_b) / (T_b \times C_a))$$

Where:

T_a = population of insect counts after treatment
 C_b = population of untreated insect count before treatment
 T_b = population of insect counts before treatment
 C_a = population of untreated insect count after treatment



RESULTS AND DISCUSSION

The third nymphal instar of *E. furcellata* fed on 3rd and 4th instar larvae more than 2nd instar larvae, whereas, 4th and 5th nymphal instar of *E. furcellata* fed on younger more than the older prey (Table 1). Predation rate of *E. furcellata* may involve with a prey species. predation rate of prey consumed slightly increased with increasing prey stage in some prey species. However, for some species predation rate of prey consume decreased with increasing prey size (Tiwari et al., 2017). Kumar et al. (2001) revealed that visualization of the predator and movement of prey increases the predation rate. In this case, the active movement of 2nd and 3rd instar larvae of *P. xylostella* may be a factor of high predation rate of 4th and 5th nymphal stage of predator. Contrast to 4th and 5th nymphal stage, 3rd nymphal stage may difficult to handle the active prey movement.

The results of *E. furcellata* as a biological control in chinese kale greenhouse revealed that population of *P. xylostella* was reduced at 3 days after *E. furcellata* released (high value of percent reduction). During 1-2 days after predator released the population in treatment was not reduced. At that period, most of *P. xylostella* was 2nd instar which was not suitable for the predator stage. Two day later, most of pest population was 3rd instar, and predator was changing nymphal stage from 3rd to 4th nymph. Then the population was reduced (high percent reduction)(Table 2). Level of chinese kale leaf damage in treatment greenhouse was lower than in control greenhouse.

However, applying in open field condition may have some factors such as temperature, various pests, other natural enemies and chemical insecticide which involving the efficiency of predator.

CONCLUSION

E. furcellata is an effective predator of *P. xylostella*, the third nymphal stage consumed 3rd and 4th larval instar than 2nd instar. In contrast, 4th and 5th nymphal stage consumed 2nd and 3rd instar more than 4th instar. *E. furcellata* is an alternative biological control agent in chinese kale green house. It can reduce pest population and level of leaf damage.

Table 1 Prey consumption of different stages of *Eocanthecona furcellata* fed on larvae of *Plutella xylostella*

Treatment	<i>P. xylostella</i> ^{1/}		
	2 nd instar	3 rd instar	4 th instar
3 rd nymph	28±0.50 B	65±4.50 A	50±1.91 A
4 th nymph	71±5.91 A	79±4.72 A	24±0.82 B
5 th nymph	71±2.65 A	60±5.35 AB	38±2.08 B
F-test	**	**	*
CV (%)	24.33	30.28	26.08

^{1/}Within each column, mean±SD followed by the same capital letter indicate no significantly different (P>0.05)

Table 2 Number of *Plutella xylostella* in chinese kale greenhouse and level of leave damage with released and non-released *Eocanthecona furcellata* as a biological control agent, and percentage reduction

Plant age (day)	non-released		released		Reduction (%)
	Insect/plant	Level of leave damage	Insect/plant	Level of leave damage	
36 ^{2/}	2.32±1.15a	1	1.44±0.15a	1	na
37	2.21±1.12a	1	1.42±0.14a	1	-3.52
38	2.17±1.09a	1	1.40±0.15a	1	-3.94
39	2.12±1.04a	2	1.18±0.18a	1	10.32
40	2.06±1.00a	2	1.00±0.26a	1	21.79
41	1.75±1.00a	3	0.89±0.24a	2	18.06

^{1/}Within each row, mean±SD followed by the same small letter indicate no significantly different (P>0.05).
^{2/} *Eocanthecona furcellata* was released into the greenhouse.

