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Controlling of beet armyworm (*Spodoptera exigua* Hubner) in shallot by non-chemical methods

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Shallot (*Allium cepa var ascalonicum*)

- An essential commodity, especially in Asia, including Indonesia
- Consumed in both fresh and processed forms. The use of shallot has been widely known as a flavoring in food or used as an ingredient in herbal medicines because of its abundant in beneficial health substances
- Affect the national rate in Indonesia
- Demands for shallots in Indonesia and the international markets continue to increase from year to year

Beet armyworm (*Spodoptera exigua* Hubner)

- Major insect pest in shallot
- 32-54% yield loss of shallot in Indonesia
- Short life cycle
- Polypahous
- Massive damage by *S. exigua* is reported in many production centers in Indonesia

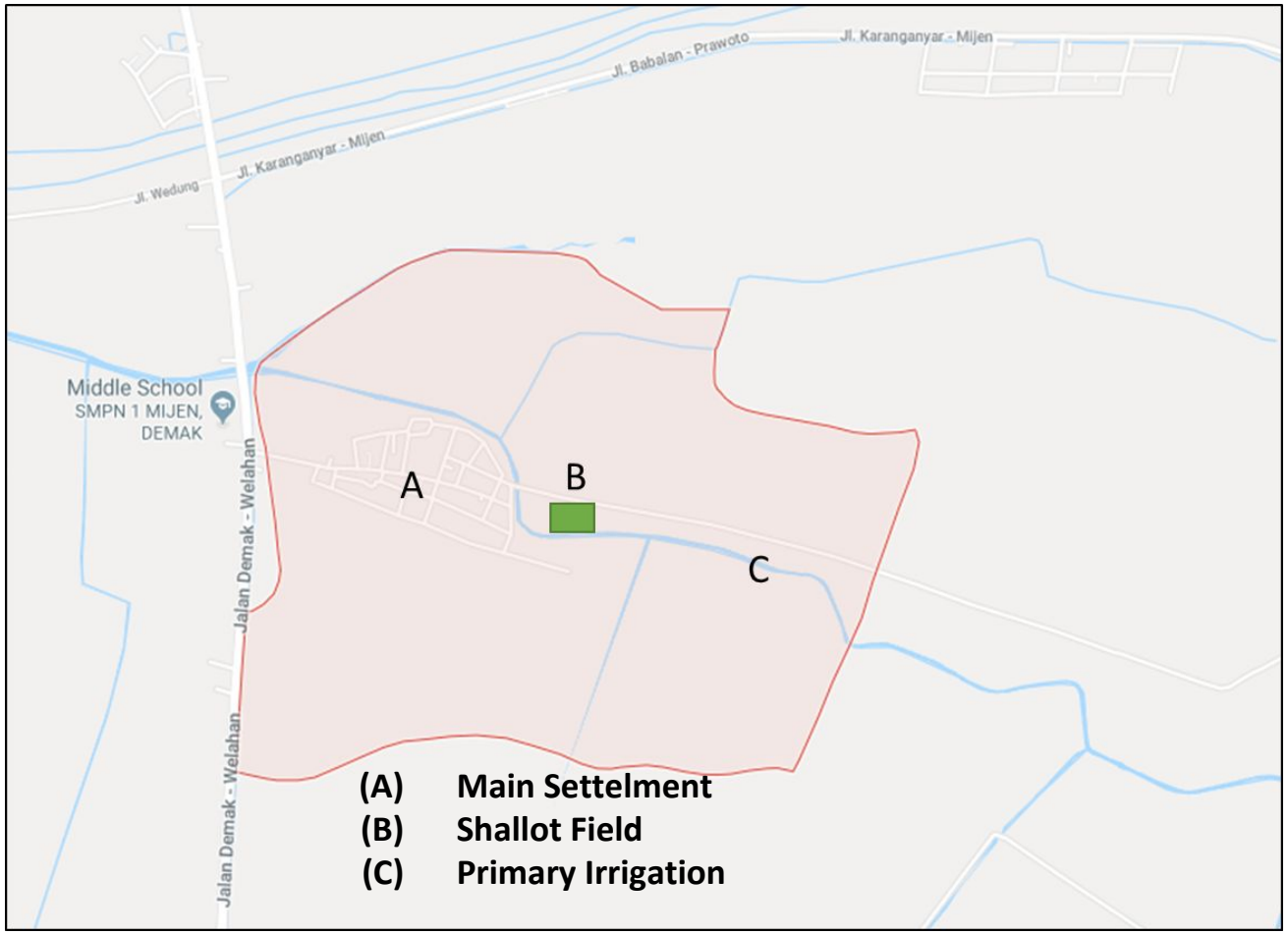
Control of *S. exigua*

- Most available varieties are susceptible
- Rely on chemical (pesticides)
- Not too effective; *S. exigua* are hiding in the leaf hollow make it difficult to reach by contact pesticides
- High frequency and dosage (up to 30 times in two months)
- High cost: **9-26%**
- Environmental and health issue

Objectives

- to evaluate the effectiveness of non-chemical methods for controlling the *S. exigua* in shallot cultivation in the field.
- We assessed the use of a light trap in combination with *Spodoptera exigua* Nuclear Polyhedrosis Virus (SeNPV), egg hand-picking, and insecticide, neem, and *Bacillus thuringiensis* (Bt) technically and economically.

Materials and methods



Location: Demak, Central Java
Farmer Group: Sido Makmur
Dry Season (2): March-May 2019
Dry Season (3): July-August 2019

Experiment

- Variety: Bima Brebes

S. exigua control methods

a) Standard insecticide application by farmers

b) The use of light traps in combination with SeNPV treatment (LT-SeNPV),

c) Light trap in combination with SeNPV treatment and egg collection (LT-SeNVP-collecting),

d) Light trap in combination with chemical insecticide one time in a week (LT-insecticide),

e) Insect net with chemical insecticide one time in a week (net-insecticide),

f) Neem two times in a week (neem),

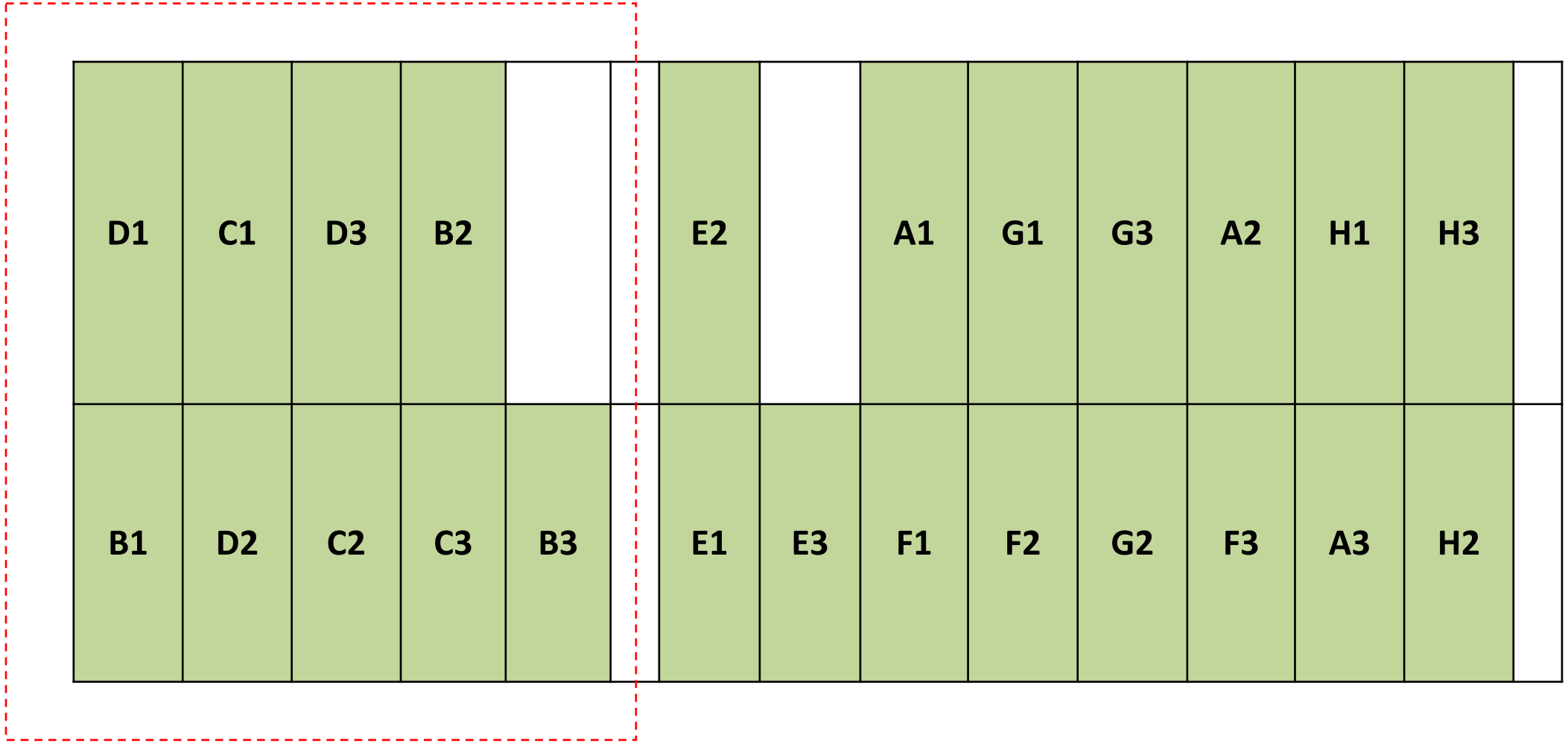
g) *B. thuringiensis* two times in a week (*Bt*), and

h) Chemical pesticide application three times in a week (insecticide 3x)


(a)
Jangan Biarkan Bak Air Kosong
Selalu Isi Air & Deterjen


(b)

Layout


D1
C1
D3
B2
E2
A1
G1
G3
A2
H1
H3
B1
D2
C2
C3
B3
E1
E3
F1
F2
G2
F3
A3
H2
Light trap treatment

Observations

- Number of eggs
- Number of L1-L2 larvae
- Number of L3-L4 larvae
- Number of adults
- Damage score (from 0 to 3)
- Yield
- Total cost production, R/C ratio, and profit

Spodoptera exigua observed in this study. (a) eggs (indicated by arrow), (b) L1-L2 larvae, (c) L3-L4 larvae, (d) adult

Results & Discussions

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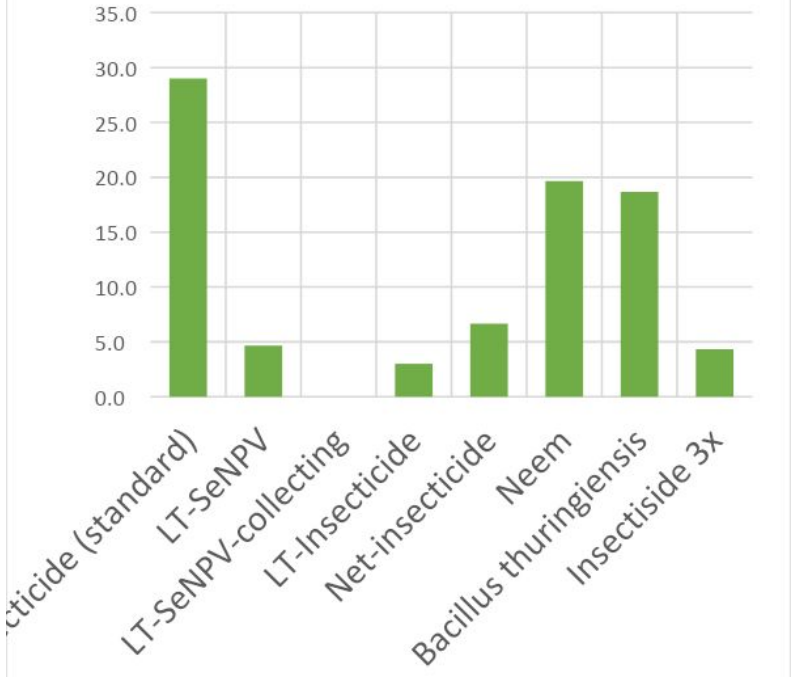
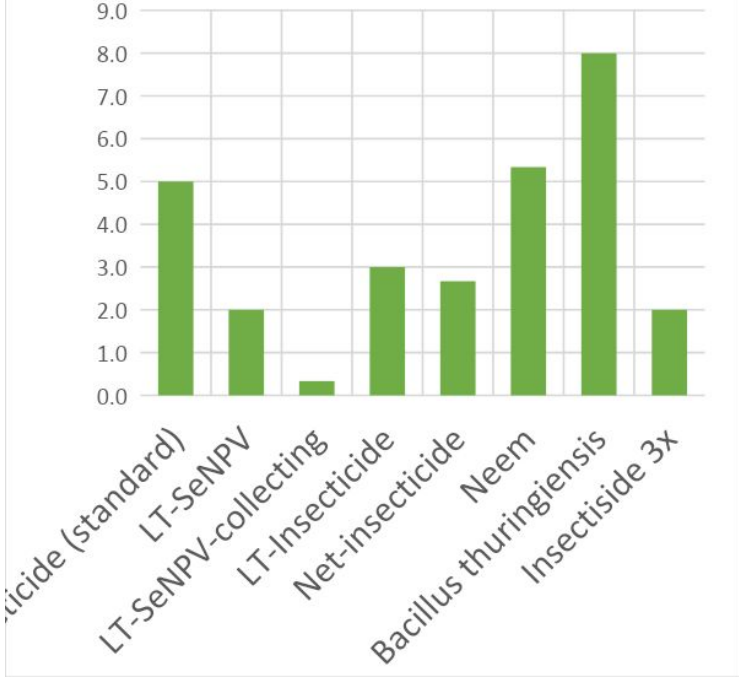
Non-chemical methods are more effective than insecticide applications

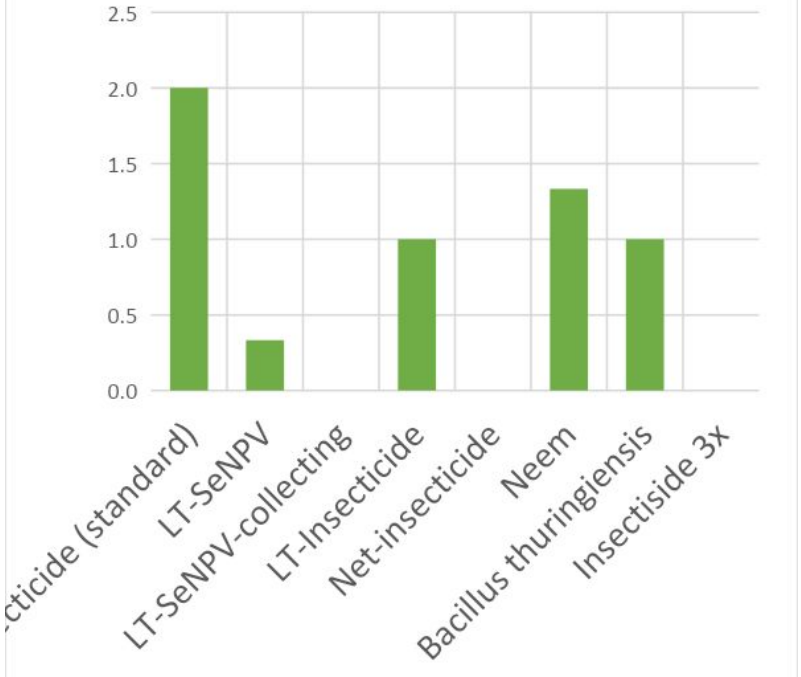
egg larvae



L1-L2 larvae



L3-L4 larvae



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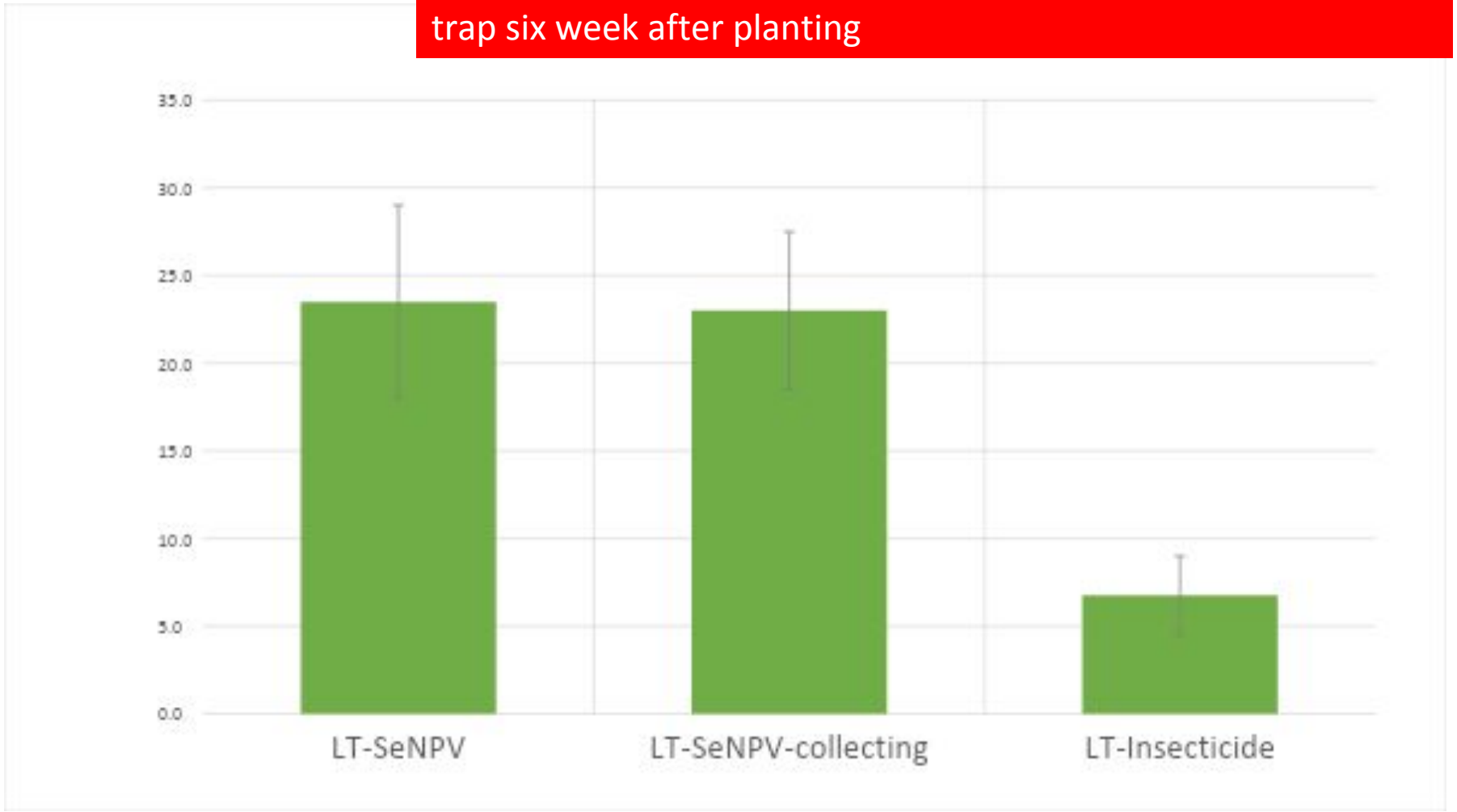
the number of *Spodoptera exigua* imago trapped in the light trap six week after planting



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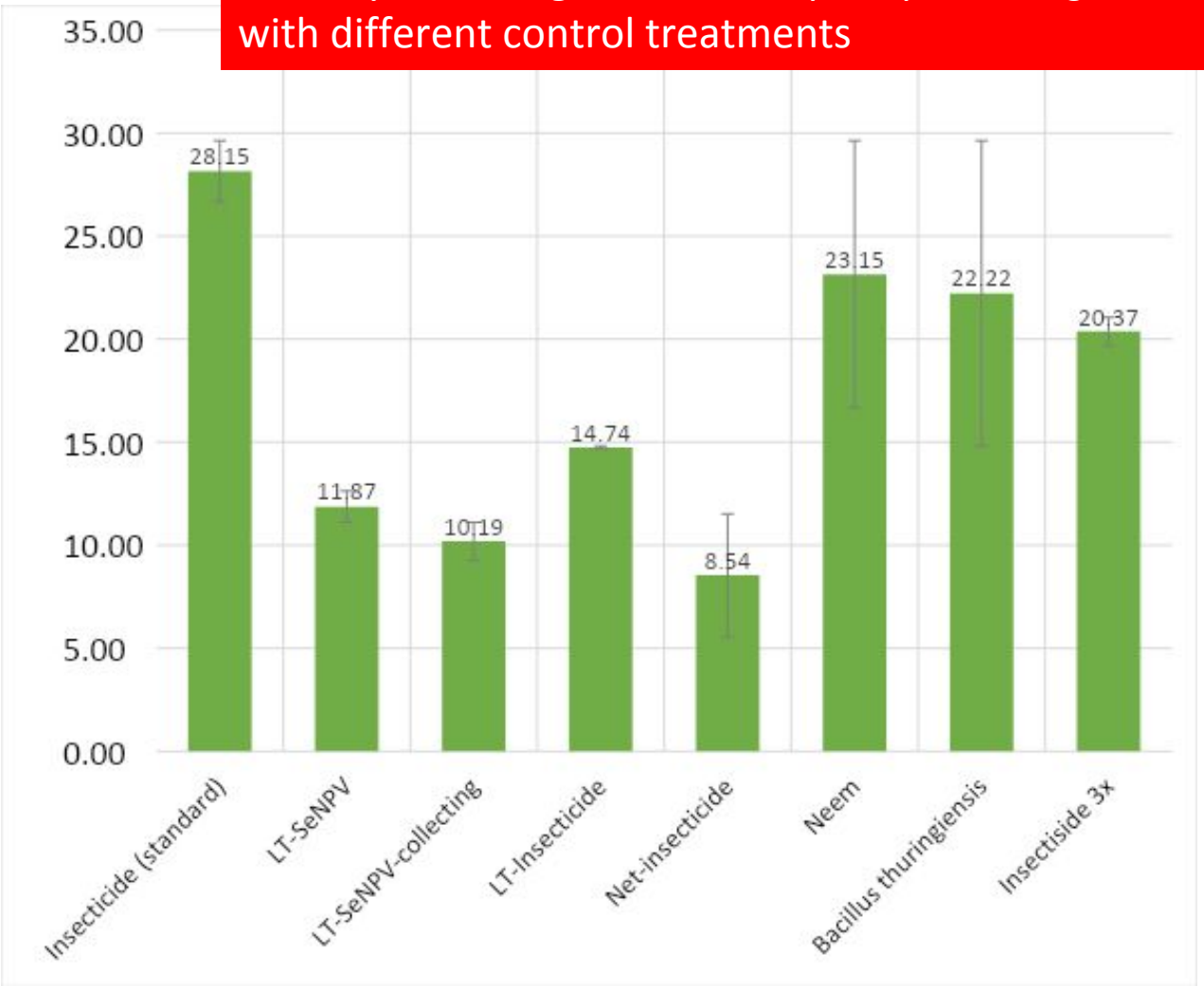
Severity of damage caused of *Spodoptera exigua* on shallot with different control treatments



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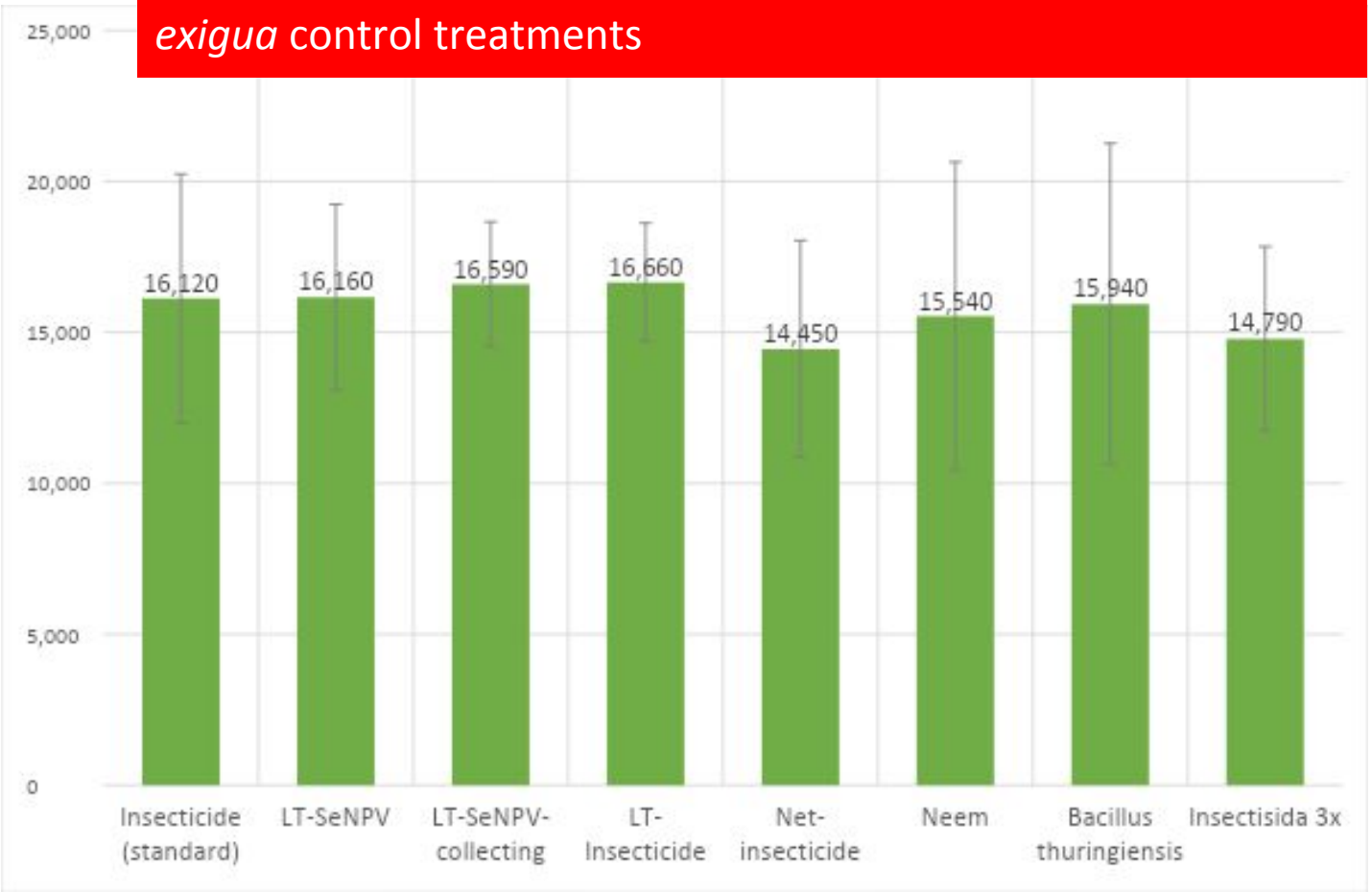
Fresh tuber yield (Kg) of shallot using different *Spodoptera exigua* control treatments



Correlation analysis of all parameter observed in this study

	Total cost (IDR)	RC Ratio	Profit (IDR)	egg population	population of 1-2 larvae	population of instar 3-4 larvae	damage index	yield
Total cost (IDR)	1.00							
RC Ratio	-0.90	1.00						
Profit (IDR)	-0.80	0.97	1.00					
egg population	0.34	-0.19	-0.11	1.00				
population of 1-2 larvae	0.17	-0.16	-0.08	0.79	1.00			
population of instar 3-4 larvae	0.23	0.02	0.17	0.87	0.69	1.00		
damage index	0.57	-0.40	-0.26	0.85	0.70	0.80	1.00	
yield	-0.36	0.69	0.83	-0.01	-0.01	0.36	0.04	1.00

Total cost, R/C Ratio and profit of shallot yield per ha using *different S.exigua* control methods

	Total cost (IDR)	RC Ratio	Profit (IDR)
Insecticide (standard)	158,399,970	1.65	95,400,030
LT-SeNPV	118,336,667	2.05	124,063,333
LT-SeNPV-collecting	125,536,667	1.98	123,463,333
LT-Insecticide	137,211,667	1.82	112,688,333
Net-insecticide	137,186,667	1.63	79,713,333
Neem	126,685,000	1.84	106,415,000
Bacillus thuringiensis	138,194,867	1.73	100,905,133
Insecticide 3X	162,636,667	1.36	59,063,333

Conclusions

- Non-chemical methods are more effective than insecticide applications
- The light trap can potentially be used in shallot cultivation resulting in higher profit and cleaner environment
  - Compared to neem and Bt, the use of light trap plus SeNPV seems to be preferable. The total cost of control using neem and Bt are higher than using a light trap plus SeNPV.
  - Another reason is that the constraint of using neem and Bt for its effectiveness toward S. exigua that prefers to stay in the leaf hollow
  - The challenge of using a light trap before is the availability of electrical sources. However, this should not be a big concern now since there are many options for a portable light trap using battery or even using solar panels as we did in this present study

Thank You