Vol. 14, No. 4 (2025): 1476 - 1488 http://dx.doi.org/10.23960/jtep-l.v14i4.1476-1488

JURNAL TEKNIK PERTANIAN LAMPUNG

ISSN 2302-559X (print) / 2549-0818 (online)
Journal homepage : https://jurnal.fp.unila.ac.id/index.php/JTP

Insect Diversity Study on Shallot Plants with Ecological Engineering in Nganjuk District

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Article History:

Received : 26 March 2025
Revised : 27 June 2025
Accepted : 17 July 2025

Keywords:

Ecological engineering,
Insect diversity,
Shallot cultivation,
Sustainable agriculture.

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ABSTRACT

This study examines the cultivation of shallots (Allium ascalonicum L.) using an ecological engineering approach in Nganjuk Regency, Indonesia, to enhance insect diversity and natural pest control. The applied methods include compost application, refugia planting, and the use of biological agents to reduce synthetic pesticide dependence. The study compares two management systems: ecological engineering farmland (A) and conventional farmland (B), with insect data collected using various trapping methods. The results show that ecological engineering farmland had a higher insect population (23,428 individuals) compared to conventional farmland (14,880 individuals). A total of 181 morphospecies from 10 orders, 85 families, and 170 genera were identified, with Coleoptera being the dominant order and predatory insects prevailing in both farmlands. The diversity index was higher in ecological engineering farmland (3.079) than in conventional farmland (2.725). The evenness index was also higher in ecological engineering farmland (0.608–0.624) than in conventional farmland (0.561–0.603), indicating a more stable ecosystem. The dominance index was low in both farmlands (0.003–0.188), showing no single species significantly dominated. The community similarity index was relatively high at 0.666 (vegetative), 0.651 (generative), and 0.712 (one growing season). Although the t-test showed no significant differences, ecological engineering farmland tends supports more sustainable shallot farming by enhancing biodiversity and ecosystem stability. Further research is needed to evaluate long-term impacts and the implementation of polyculture systems to strengthen agricultural ecosystems.

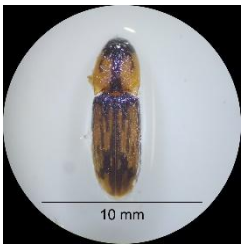
1. PHOTOGRAPHIC DOCUMENTATION OF INSECTS

This section presents visual documentation of various insect species observed in shallot cultivation areas.

HERBIVOROUS INSECTS

Longitarsus. linnaei *Phyllotreta* sp. *Psyliodes* sp. *Altica* sp. *Baris* sp.

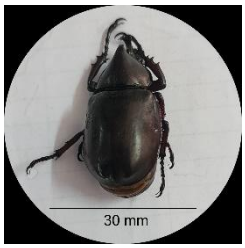
Sitophilus oryzae



Conoderus sp01

Conoderus sp02

Holotrichia sp.



Oryctes rhinoceros

Xylosandrus sp.

Palorus subdepressus

Tribolium sp.

Liriomyza chinensis

Ophiomyia sp.

Orseolia sp.

Drosophila sp.

Hydrellia sp.

Atherigona sp.

Bradysia ocellaris

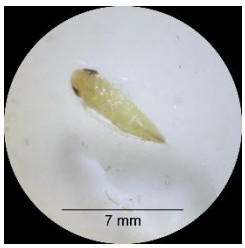
Leptocorisa acuta

Aphis gossypii

Balclutha sp.

Cicadella viridis

Cicadulina bipunctata



Cofana spectra

Dalbulus sp.

Deltochepalus sp.

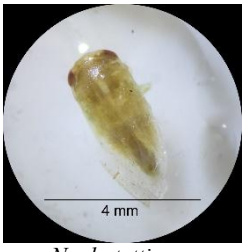
Empoasca sp.

Idiocerus niveosparsus

Idioscopus sp.

Macrosteles sp.

Maiestas dorsalis



Nephotettix sp.

Gonocerus sp.

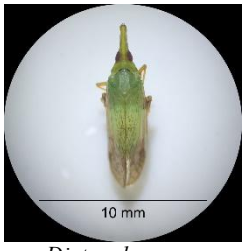
Geotomus sp.

Nilaparvata lugens

Peregrinus maidis

Sogatella furcifera

Tagosodes sp.



Dictyophara sp.

Nysius raphanus

Scotinophara sp.

Horridipamera nietneri

Dipara petiolata

Spodoptera exigua

Oxya chinensis

Gryllotalpa sp.

Thrips tabaci

PREDATORY INSECTS

Anthicus sp.

Acupalpus sp.

Bradycellus sp.

Clivina sp.

Harpalus sp.

Ophionea sp.

Perigona nigriceps

Pheropsophus occipitalis

Stenolophus quinquepustulatus

Stenolophus sp01

Stenolophus sp02

Tachys sp01

Tachys sp01

Tachyura sp.

Myriochila specularis

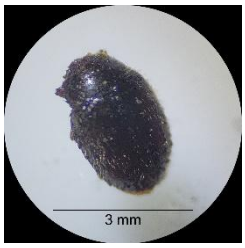
Coccinella transversalis

Harmonia octomaculata

Menochilus sexmaculatus

Micraspis discolor

Scymnus sp.



Stethorus sp.

Verania lineata

Agabus sp.

Hydroglyphus geminus

Hydroglyphus sp01

Hydroporus sp.

Hydrovatus subtilis

Laccophilus sp.

Neobidessus sp.

Berosus sp01

Berosus sp02

Enochrus sp.

Helobata sp.

Paracymus sp.

Attalus sp.

Astenus sp.

Atheta sp.

Lathrobium sp.

Oligota sp.

Paederus fuscipes

Xantholinus sp.

Euborellia sp.

Forficula sp.

Aphidoletes aphidimyza

Amblypsilopus sp.

Dolichopus sp.

Tetanocerini sp.

Orius laevigatus

Hesperocorixa sp.

Systelloderes sp.

Geocoris sp.

Mesovelia sp.

Micronecta sp.

Cyrtorhinus lividipennis

Microvelia sp.

Camponotus sp.

Crematogaster sp.

Dorylus sp.

Formica sp.

Monomorium pharaonis

Monomorium sp01

Nylanderia sp.

Odontoponera sp.

Paratrechina longicornis

Pheidole megacephala

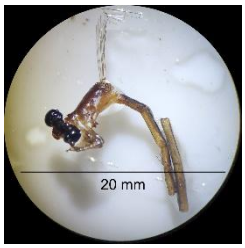
Plagiolepis alluaudi

Solenopsis geminata

Solenopsis sp01

Solenopsis sp02

Tapinoma sp.



Agriocnemis pygmaea

Gryllus sp.

Gryllodes sp.

Xya sp.

PARASITOID INSECTS

Tomosvarryella sp.

Sarcophaga carnaria

Sepedon, sp.

Argyrophylax sp.

Besseria sp.

Cephalonomia sp.

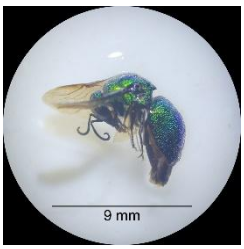
Apanteles sp.

Cotesia sp.

Fopius arinus

Macrosentrus sp.

Opius sp.



Stilbum cyanurum

Entomacis platypes

Ophelimus sp.

Helorus sp.

Ophion sp.

Xanthocryptus sp.

Anaphes sp.

Gonatocerus sp.

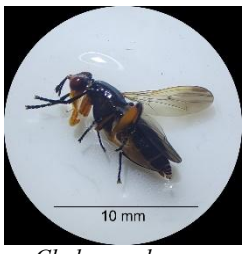
Anisopteromalus calandrae

Scelio sp.

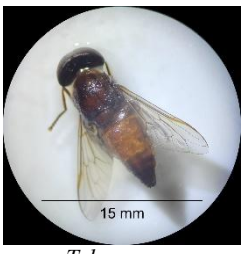
Telenomus sp.

Tiphia sp.

POLLINATORS

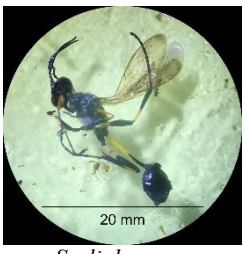


Chalcosyrphus sp.



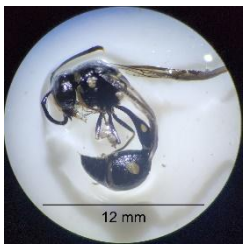
Tabanus sp.

Lasioglossum sp.



Sceliphron sp.

Allorhynchium. argentatum



Eumenes sp.

Amata huebneri

DECOMPOSER INSECTS

Xyleborus sp.

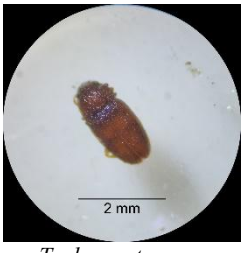
Indalmus hirsutus

Heterocerus sp.

Laccobius bipunctatus

Agathidium sp.

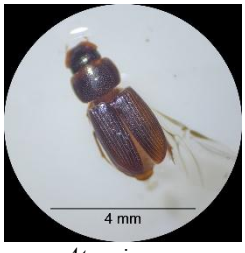
Pseudotriphyllus colchilus



Typhaea stecorea

Neohydrocoptus subvittulus

Stilbus sp.



Ataenius sp.

Onthopagus sp.

Phloeonomus sp.

Calliphora sp.

Lucilia sericata

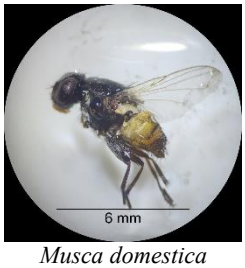
Chironomus sp.

Critocopus sp.

Scatella sp.

Elaphropeza sp.

Fannia sp.



Musca domestica

Muscina sp.

Dorniphora sp.

Megaselia sp.

Fam : Piophilidae (unknown genus)

Psectrosciara sp.

Oligotoma sp.

NEUTRAL INSECTS

Culicoides sp.

Culex sp.