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Recognition of insect pests of chickpea (*Cicer arietinum* L.) at Tandojam, Pakistan

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Abstract

For present studies insect pests were collected from Chickpea crop planted at Pulse department (Oil Seed Section), Agriculture Research Institute, Tandojam. The study revealed that 08 various species under 3 insect orders; Lepidoptera, Orthoptera, and Hemiptera were identified. The 3 species of Lepidoptera *Helicoverpa armigera* under family Noctuidae, *Danaus chrysippus* under Family Nymphalidae and *Catopsilia pomona* under family Pieridae were recorded from Chickpea crop. However, the Orthoptera discovered with three species *Gryllus bimaculatus* under family Gryllidae, *Gryllotalpa Africana* under family Gryllotalpidae and *Chrotogonus trachypterus* under family Pyrgomorphidae. Furthermore, 2 species of order Hemiptera were observed i.e. *Spilostethus hospes* under family Lygaeidae and *Acyrtosiphon pisum* under family Aphididae.

Keywords: Insect pests, species, *Cicer arietinum* L., lepidoptera, tandojam

1. Introduction

Chickpea, *Cicer arietinum* L. is a grain legume crop of Pakistan; it is cultivated under pulses In India, Nepal, Bangladesh and Pakistan, which covers about 90% of the world [16]. The annual production of Pakistan was 673 Thousand tons with 2nd largest chickpea producing country [7]. The Chickpea are known with different names in different in countries such as gram or Bengal gram, garbanzo or garbanzo bean and Egyptian pea [3]. The chick pea crop is attacked various insect pests from seedling stages to maturity, the major insect pest species associated with the chickpea crop are belonging to the insect orders Lepidoptera, Hemiptera, Diptera and Thysanoptera [8].

About 60 insect species are known to feed on chickpea crop from which cutworm, leaf caterpillar, and pod borer are the important and area specific pests. The incidence of semilooper and acridid and arctiid moths as pests of minor importance on chickpea in India and Pakistan are reported [10, 13, 14, 12, 6]. However, Army worm, *H. armigera* is destructive pest of pulses which damaged 90% exposed chickpea crops in Northern Pakistan [1], Leaf miner was also recorded from south Asia [9, 15]. Whereas, different species of bruchids were observed damaging pulses crop [4] and genus *Callosobruchus* spp. were found attacking pre and post stages overall world [7].

Chickpea is grown on a large scale in Sindh Province, has never been studied for diagnosis of species attacking on crop. Accurate identification of insect species can give a strong background to understand the status of species in order to plan control measures of pests or utilize beneficial ones. Proper identification of species permits for comparison or expansion of more ancient research works Cohen 1990 [5]. Due to above mentioned wide range of insect pest problems invading Chickpea crop and causing losses in production, it was felt necessary to observe the current insect pest status on Chickpea crop in Tandojam, the available knowledge will be helpful for the Chickpea growers to diagnose insect pests and find its solution to increase their crop yields.

2. Materials and Methods

Place of work: For present studies insect pests were collected from Chickpea crop at Pulse department (Oil Seed Section), ARI, Tandojam. Further examination and identification were carried out at insect systematic laboratory, department of Entomology, Sindh Agriculture University Tandojam.

Method of collection: Collection was made through sweep net, from various localities of Oilseed section at the evening time.

Methods of killing and preserving: The specimens were collected from field and put into a killing jar which containing potassium cyanide. The species were mounted through entomological pins.

Labeling: Specimens were labeled with following information.

(1) Name of locality. (2) Date of collection. (3) Name of the collector. (4) Name of host plant.

Method of imaging: For the imaging of adult stage high mega pixel camera was used. For imaging of genitalia; 350 k pixel, USB camera fitted on microscopes a) Labomed CSM2 (20X and 40X), b) Kyowa Medilux 20X were used.

Methods of identification: To identify the specimen up to the species level, keys for the region were collected from various publications.

Method of preparing checklist: Checklist was prepared from previous literature and further was updated with collection.

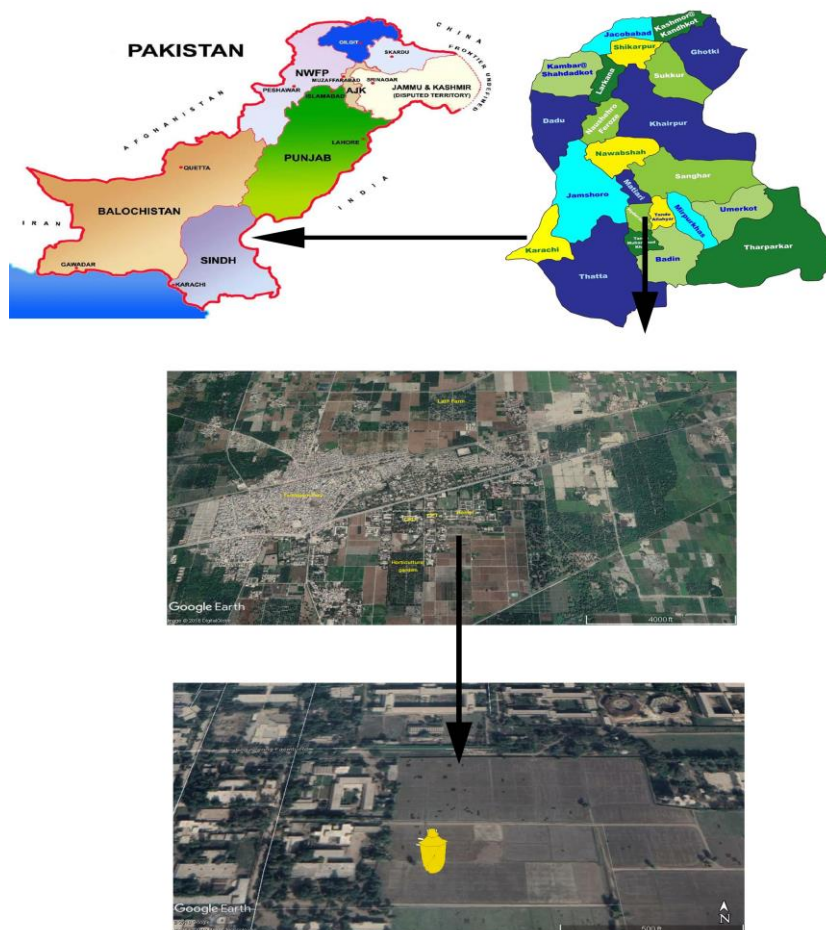


Fig 1: Map of study area

3. Results

In present study total 90 specimens of class insecta were collected from chickpea crop. The study revealed the occurrence of various 08 species under 3 insect orders; Lepidoptera, Linnaeus, 1758, Orthoptera, Latreille, 1793 and Hemiptera Linnaeus, 1758. Lepidoptera revealed 3 records of species including; *Helicoverpa armigera* (Hübner, 1808) under family Noctuidae, Latreille, 1809 and subfamily Heliethinae, Boisduval, 1828; *Danaus chrysippus* (Linnaeus, 1758) under family Nymphalidae, Rafinesque, 1815 and subfamily Danainae, Boisduval 1833; *Catopsilia pomona* Fabricius 1775 under family Gryllidae Laicharting, 1781 and subfamily Gryllinae Laicharting, 1781. Orthoptera discovered

with three species record including; *Gryllus bimaculatus* De Geer, 1773 under family Gryllidae Laicharting, 1781 and subfamily Gryllinae Laicharting, 1781; *Gryllotalpa africana* (Palisot de Beauvois, 1805) under family Gryllotalpidae Saussure, 1870; *Chrotogonus trachypterus trachypterus* (Blanchard, 1836) under family Pyrgomorphidae Brunner von Wattenwyl, 1874 and subfamily Pyrgomorphinae Brunner von Wattenwyl, 1874. Hemiptera *Spilostethus hospes* (Fabricius, 1794) under family Lygaeidae Schilling, 1829 and subfamily Lygaeinae Schilling, 1829; *Acyrtosiphon pisum* (Harris, 1776) under family Aphididae Latreille, 1802 and subfamily Aphidinae Latreille, 1802

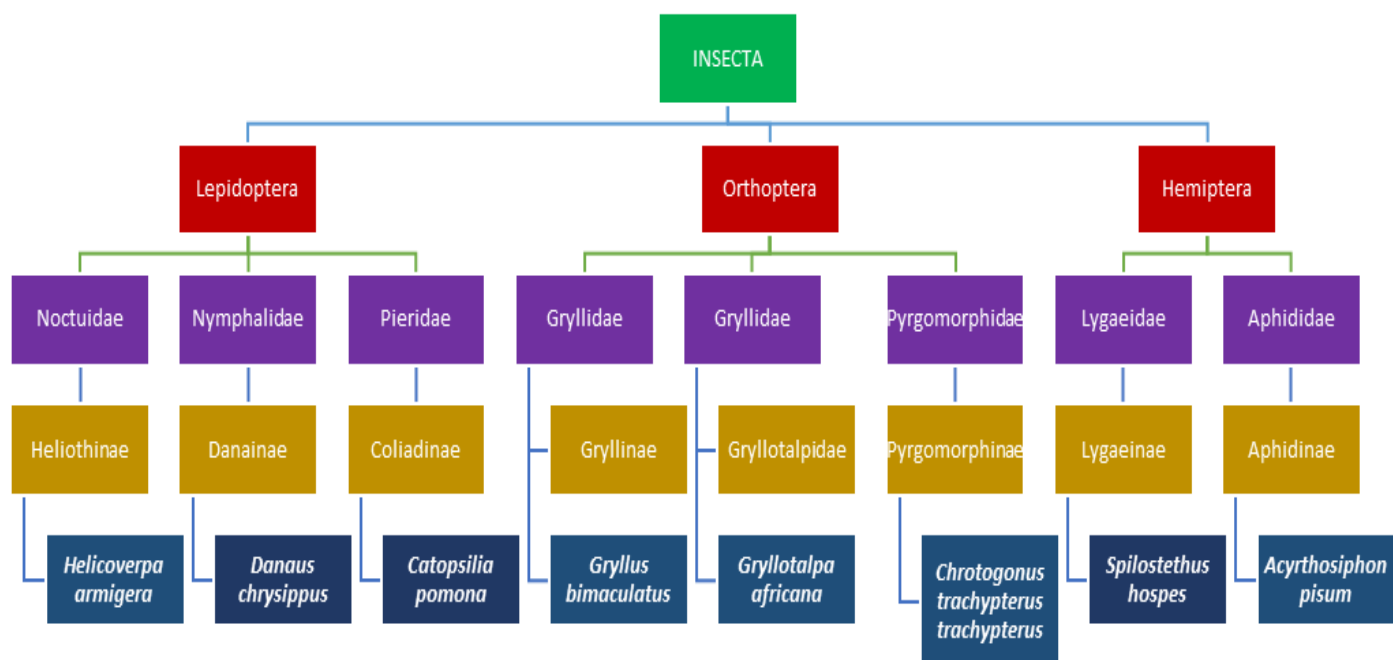


Fig 2: Hierarchical representation of species

Order: Lepidoptera, Linnaeus, 1758
 Suborder: Glossata Fabricius, 1775
 Infraorder: Heteroneura Tillyard, 1918
 Superfamily: Noctuoidea, Latreille, 1809
 Family: Noctuidae, Latreille, 1809
 Subfamily: Heliothinae, Boisduval, 1828

a. *Helicoverpa armigera* (Hübner, 1808) (Plate 1, a)

Description: Forewings with scales, body colour brown and body shape sub cylindrical. Head colour brown. Head markings absent. The head punctuation is absent. Head setae are present and thick. Eye colour brown. The size of antenna was medium. The eye size small, the colour of pronotum is brown. Pronotum setae present and course. The colour of forewing are colour brown. Forewing markings present. Forewing bands absent.

Material examined: Pakistan: 7♂, 6♀, Sindh Prov., Tandojam, Sindh Agriculture University, Oil seed section, 02.ii.2019, G.Q. Junejo, Chickpea.

Superfamily: Papilionoidea, Latreille, 1802
 Family: Nymphalidae, Rafinesque, 1815
 Subfamily: Danainae, Boisduval 1833
 Tribe: Danaini, Boisduval, 1833

b. *Danaus chrysippus* (Linnaeus, 1758) (Plate 1, b)

Description: This butterfly is mostly found on akk plant, it is also known as akk butterfly, they are generally brown in colour with white markings at apical part of forewing, both wings have fringe brown colour with little irregular spots, three spots on the mid wings. Males have scent gland on hind wing, which is used to attract females.

Material examined: Pakistan: 4♂, 2♀, Sindh Prov., Tandojam, Sindh Agriculture University, Oil seed section, 27.i.2019, G.Q. Junejo, Chickpea.

Family: Pieridae, Duponchel, 1832
 Subfamily: Coliadinae, Swainson 1827
 Tribe: Coliadini, Swainson 1827

c. *Catopsilia pomona*: Fabricius 1775 Common Emigrant or Lemon Emigrant (Plate 1, c)

Description: The upper side of the male is chalky-white and basal sulphur-yellow area on fore and hind wings.

Material examined: Pakistan: 2♂, Sindh Prov., Tandojam, Sindh Agriculture University, Oil seed section, 12.ii.2019, G.Q. Junejo, Chickpea.

Order: Orthoptera, Latreille, 1793
 Suborder: Ensifera Lesson, 1843
 Superfamily: Grylloidea Laicharding, 1781
 Family: Gryllidae Laicharting, 1781
 Subfamily: Gryllinae Laicharting, 1781
 Tribe: Gryllini Laicharting, 1781

d. *Gryllus bimaculatus* De Geer, 1773 (Plate 1, d)

Description: Body colour light brown, head small, pronotum elongated almost to the size of forewings, hindlegs adapted for jumping, mostly to feed on plants at night, eyes medium sized, antennae long and thread like, forewing light brown colour reaching crossing the abdomen, ovipositor spade shaped.

Material examined: Pakistan: 3♂, 7♀, Sindh Prov., Tandojam, Sindh Agriculture University, Oil seed section, 16.ii.2019, G.Q. Junejo, Chickpea.

Superfamily: Gryllotalpoidea
 Family: Gryllotalpidae Saussure, 1870

e. *Gryllotalpa africana* (Palisot de Beauvois, 1805) (Plate 1,e)

Description: Body colour light brown, head small, pronotum elongated almost to the size of forewings, forelegs extended forward and are fossorial type for digging purpose mostly to feed on roots of plants, eyes very small, antennae small and moniliform, forewing light brown colour reaching at half of the abdomen, broader, veins conspicuous straight at margin, posterior half of the abdomen bare and open dark brown in colour, a pair of cerci at the end of abdomen.

Material examined: Pakistan: Pakistan: 4♂, 9♀, Sindh Prov., Tandojam, Sindh Agriculture University, Oil seed section, 17.iii.2019, G.Q. Junejo, Chickpea.

Suborder: Caelifera, Ander, 1939
 Superfamily: Pyrgomorphae Brunner von Wattenwyl, 1874
 Family: Pyrgomorphidae Brunner von Wattenwyl, 1874
 Subfamily: Pyrgomorphinae Brunner von Wattenwyl, 1874
 Tribe: Chrotogonini Bolívar, 1904

f. *Chrotogonus trachypterus* (Blanchard, 1836) (Plate 1,f)

Description: Body colour brown, eyes dark brown medium sized extruding for prominent vision, antennae short, head colour dark brown, pronotum broader, forewings starting widely and narrowing posteriorly crossing abdomen, small dark brown marking on forewings, almost camouflaged when rest at soil to escape from predators.

Material examined: Pakistan: 4♂, 8♀, Sindh Prov., Tandojam, Sindh Agriculture University, Oil seed section, 11.i.2019, G.Q. Junejo, Chickpea.

Order: Hemiptera Linnaeus, 1758
 Suborder: Heteroptera Latreille, 1810
 Infraorder: Pentatomorpha Leston, Pendergrast & Southwood, 1954
 Superfamily: Lygaeoidea Schilling, 1829
 Family: Lygaeidae Schilling, 1829
 Subfamily: Lygaeinae Schilling, 1829

g. *Spilostethus hospes* (Fabricius, 1794) (Plate 1, g)

Description: Body colour reddish brown, antennae long, eye size small. Eye colour brown and body shape elongate. Pronotum markings present. Pronotum punctuation is absent and scutellum size small. Scutellum colour black. Scutellum punctures absent. Forewing markings present. Forewing membranous its part black, pronotum bands blackish brown or present and longitudinal. Head markings present and round.

Material examined: Pakistan: 3♂, 8♀, Sindh Prov., Tandojam, Sindh Agriculture University, Oil seed section, 17.ii.2019, G.Q. Junejo, Chickpea.

Suborder: Sternorrhyncha,
 Infraorder: Aphidomorpha
 Superfamily: Aphidoidea Latreille, 1802
 Family: Aphididae Latreille, 1802
 Subfamily: Aphidinae Latreille, 1802

Tribe: Macrosiphini Wilson, 1910

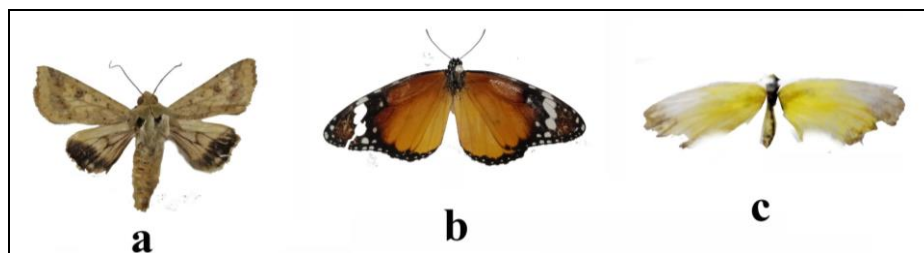
h. *Acyrtosiphon pisum* (Harris, 1776) (Plate 1,h)

Description: Body colour brown, antennae long, eyes size small, eye colour brown. Body shape oval, Pronotum small. Abdomen with cornicles for extruding of sugary material, that causes sooty mold on crops. Fore, mid and hind legs slender for walking, may insects are attracted to aphids due to their sugary juice on which especially ants feed, abdomen broader.

Material examined: Pakistan: 19♂, 4♀, Sindh Prov., Tandojam, Sindh Agriculture University, Oil seed section, 12.i.2019, G.Q. Junejo, Chickpea.

4. Discussion

Chickpea is one of the major pulse crops of Pakistan, whenever, extensive cultivation of crops is attempted, the pest problems also increases, from Sindh province this is the first attempt to undertake the diagnosis of insect diversity in Chickpea crop. Accurate identification of insect species can give a strong background to understand the status of species in order to plan control measures of pests or utilize beneficial ones. Proper identification of species permits for comparison or expansion of more ancient research works [5]. The similar type of diagnosis for the insect pests of Chickpea crop was observed [12, 6]. They mentioned the records of sixty insect pests invading chickpea crop. The similar results as on chickpea recorded *Danaus chrysippus* as a pollinator, among soil surface feeders three species were recorded including; *Gryllus bimaculatus* (De Geer, 1773), *Gryllotalpa africana* (Palisot de Beauvois, 1805) and *Chrotogonus trachypterus* (Blanchard, 1836); field cricket, mole cricket and surface grasshopper respectively [11]. Commonly known as *Spilostethus hospes* with generally reddish brown colour with white small spots forewings, it was found on plant. The aphid species in the early months of the year was also recorded including; *Acyrtosiphon pisum* (Harris, 1776). During observation several pollinators and pollen feeders were recorded including; akk butterfly and some members of Pieridae, some were xylem and phloem feeders. Some restricted them to the soil, while other played their role as predators, some studies suggests the availability of arctiid moths, but during our regular observation, no arctiid moth was recorded. The adult of *H. armigera* was obtained from the larva, which was later reared in post graduate systematic laboratory to have final adult stages. Further, these studies help us to record common fauna of chickpea crop, how climatic conditions affect on the faunal diversity.



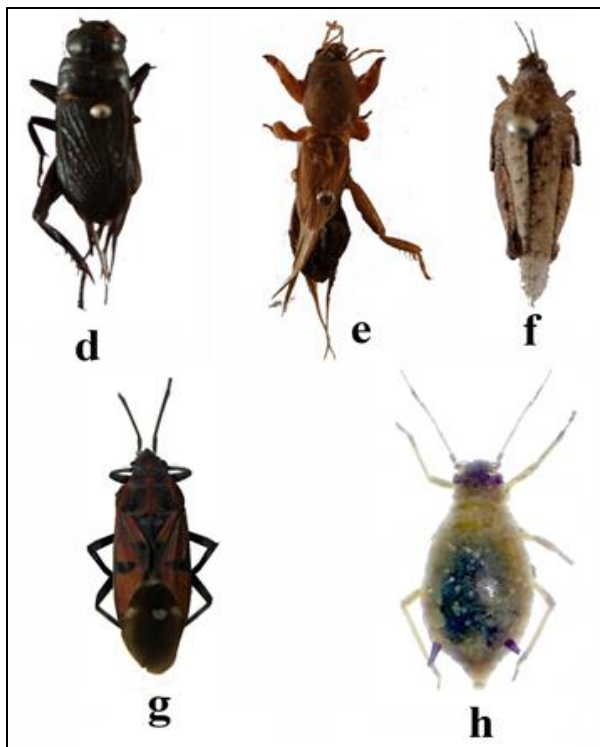


Plate 1: a) *Helicoverpa armigera* b) *Danaus chrysippus* c) *Catopsilia pomona* d) *Gryllus bimaculatus* e) *Gryllotalpa africana* f) *Chrotogonus trachypterus trachypterus* g) *Spilostethus hospes* h) *Acyrthosiphon pisum*

5. Conclusions

The purpose of this research was to identify different insect pests associated with Chickpea crop in environmental condition of Tandojam Sindh, Pakistan. From the result revealed that chickpea crop was attacked by 8 different species. From which 3 species from Lepidoptera, 3 species from orthoptera and 2 species were observed from hemiptera.

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