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## Diversity of insects associated with grain amaranth, *Amaranthus* spp (F: Amaranthaceae)

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**Abstract**

The study on diversity of insects associated with grain amaranth, *Amaranthus* spp was conducted from August to November 2019 at College of Agriculture, Vijayapura. A total of thirty one insects belonging to twenty one families and eight orders; comprising of twenty six insect pests, four predators and one parasitoid were recorded. Each genus recorded during the study was represented by a single species totaling thirty one genus and species. Order Hemiptera was the most diverse with a relative abundance of 29.03 per cent followed by Coleoptera (22.58 per cent), Lepidoptera and Thysanoptera (12.90 per cent), Homoptera, Orthoptera and Hymenoptera (6.45 per cent) while Neuroptera was the least (3.23 per cent) abundant.

**Keywords:** Grain amaranth, insect diversity

**1. Introduction**

Amaranthus is an ancient (8000 years in cultivation) crop whose virtue as a nutraceutical has been discovered recently. Amaranth, as an alternative cereal is attracting researchers' attention mainly because of the high nutritional value of its seeds (Posopisil *et al.*, 2006)<sup>[1]</sup>. It is a viable alternative source of nutrition for people in developing countries. Tender leaves and stems contain carbohydrates, protein, fat, phosphorus, iron, calcium, vitamin A and C (Rai and Yadav, 2005)<sup>[2]</sup>. Grain amaranth has higher protein content than most cereals and grains. The amino acid composition of amaranth grain protein compares well with the FAO/WHO protein standard. It is also a good source of dietary fibre. The amaranth grain provides an ideal amino acid composition for human nutrition. Amaranth has a relatively high portion of lysine compared to other foods, leading to its effective utilization as protein source (Sseguya, 2007)<sup>[3]</sup>.

Amaranthus is a fast growing crop and because of its low production cost it is one of the cheapest dark green vegetable in the tropical market. Unlike other green vegetables, it is cultivated during summer when no other green vegetables are available in the market (Singh and Whitehead, 1996)<sup>[4]</sup>. Current interest in amaranth is due to the fact that, it is extremely adaptable to adverse growing conditions, resists heat and drought and is among the easiest of plants to grow in marginal lands.

Grain amaranth like most other vegetables is not free from the attack of insects. Various species of insects damage the grain and cause economic yield losses. Amaranths are susceptible to damage by foliar insect pests such as leaf worms (*Spodoptera* sp), aphids (*Aphis* sp), leaf miners (*Liriomyza* sp.), leaf roller (*Sylepta derogate* F.), spider mites (*Tetranychus* sp), bugs (*Aspavia armigera* F.) and stem boring weevils (*H. haereus*) (Okunlola *et al.*, 2008; Wilson, 1989)<sup>[5, 6]</sup>.

Several pest surveys have been conducted in other parts of the world, for example, Mexico and Brazil (Torres *et al.*, 2011 and Garcia *et al.*, 2011)<sup>[7, 8]</sup>. However, information on the diversity insects on cultivated grain amaranth in India is still very limited.

**2. Materials and methods****Study site**

The experiment was conducted during *khariif*, 2018 at College of Agriculture, Vijayapura. Observation was recorded from seedling to harvesting stage. The plants were examined visually to collect insect pests and natural enemies from amaranth crop. Slow moving and sedentary insects were collected by hand using poison bottle.

Soft bodied and immature insects were collected with paint brush and preserved in vials containing 70 per cent alcohol. Flying insects were collected using aerial nets. Beating sheets were used to collect the thrips. Grain pests were collected by tapping the panicle on the polythene cover. Natural enemies were also collected and preserved for identification.

### Identification of insect pests and natural enemies

Collected samples were labeled with the following information: Collection date, number of each species and the part of the plant of which the insects were found. The insect specimens were got identified by the experts from NBAIR and GKVK, Bengaluru.

### 3. Results and discussion

During study conducted in the month of August to November, 2018 a total of thirty one insects from twenty one families and eight orders; comprising of twenty six insect pests, four predators and one parasitoid were recorded (Table 1; Plate 1). Each genus recorded during the study was represented by a single species totaling thirty one genus and species. Among thirty one species recorded Hemiptera was the most diverse group (nine species) followed by Coleoptera (seven species), Homoptera, Lepidoptera and Thysanoptera (four species), Orthoptera and Hymenoptera (two species) and alone Neuroptera represented by common predator, Green lace wing (*Chrysoperla zastrowi sillemi* Esben-Petersen). Twenty six insect pests, five predators and one parasitoid were recorded during study period.

Hemipteran insects recorded during study included seed bug (*Nysius* sp and *Eurystylus* sp.), Green bug (*Nezera viridula* Linnaeus.), stink bug (*Plautia crossata* Dallas.), predatory bug (*Eucanthecona furcellata* Wolff.), squash bug (*Cletus punctiger* Dallas.), bean bug (*Riptortus pedestris* Fabricius.), eurybrachid bug (*Eurybrachys* sp.), and cow bug (*Otinotus* sp.).

Among Homoptera leaf hopper (*Empoasca* sp.) and cowpea aphid (*Aphis craccivora* Koch.) were recorded.

Coleopteran insects were represented by stem weevil (*Hypolixus truncatulus* Fabricius.), blister beetle (*Mylabris pustulata* Thunberg.), myllocerous weevil (*Myllocerous* sp.), flower beetle (*Oxycetonia versicolor* Fabricius.) and lady bird beetles (*Coccinella transversalis* Fabricius, *Ileiscincta* Fabricius and *Scymnus nubilus* Mulsant).

Lepidopteran pests included leaf webber (*Spoladea recurvalis* Fabricius.), Earhead caterpillar (*Helicoverpa armigera* Hubnar.), leaf eating caterpillar (*Spodopteralitura* Fabricius.) and hairy caterpillar (*Euproctis* sp.).

*Attractomorpha crenulata* Fabricius and *Cyrtacanthacris tatarica* Linnaeus represented the Orthoptera. Among the hymenoptera paper wasp (*Ropalidia marginata* Lepeletier) and braconid wasp (*Bracon* sp.) were recorded.

The order Thysanoptera was represented by *Frankliniella schultzei* Try bom, *Haplothrips gowdeyi* Frank, *Thrips flavus* Schrank and *Scirtothrips dorsalis* Hood.

Paper wasp *Ropalidia marginata* Lepeletier, is a predator on various insects and economic importance of which could not be ascertained during study, probably it could be feeding on the larvae.

Order Hemiptera was the most diverse with a relative abundance of 29.03 per cent followed by Coleoptera (22.58 per cent), Lepidoptera and Thysanoptera (12.90 per cent), Homoptera, Orthoptera and Hymenoptera (6.45 per cent) where Neuroptera was the least (3.23 per cent) abundant (Fig.1). Diversity of insect pests was most abundant (twenty five species) than predators (five species) and parasitoid (one species) (Fig 2).

The results of present investigation are in accordance with the previous research who reported that, the order Heteroptera was most diverse with greatest number of species *i. e.*, 13 species followed by Coleoptera with 11 species (Kagali *et al.*, 2013) [9]. Aderolu *et al.*, 2013 [10] reported sixty insect species belonging 29 families and 12 orders, comprising 31 defoliators, 12 predators, one pupal parasitoid (*Apanteles hymeneae*) and 16 non-economic species on *Amaranthus* sp. The species abundance in both seasons was Beet worm moth >*Hypolixustruncatulus*.

### 4. Summary and conclusions

A total of thirty one insects belonging to twenty one families and eight orders were recorded on grain amaranth. Among which Hemiptera was the most diverse group (nine species) followed by Coleoptera (seven species), Homoptera, Lepidoptera and Thysanoptera (four species), Orthoptera and Hymenoptera (two species) and alone Neuroptera represented by common predator, Green lace wing (*Chrysoperla zastrowi sillemi* Esben-Petersen). Twenty six insect pests, five predators and one parasitoid were recorded during study period. Each genus recorded during the study was represented by a single species totaling thirty one genus and species.

- Order Hemiptera was the most diverse with a relative abundance of 29.03 per cent followed by Coleoptera with 22.58 per cent, Lepidoptera and Thysanoptera with 12.90 per cent, Homoptera, Orthoptera and Hymenoptera with 6.45 per cent where Neuroptera was the least (3.23 per cent) abundant.
- Diversity of insect pests was most abundant with twenty five species followed by predators (five species) and parasitoid (one species).
- There are diverse insect pests attacking amaranth causing considerable damage to yield of both leaves and grain hence requiring control measures. The natural enemies can be conserved and used for biological control.

**Table 1:** Diversity of insects recorded on grain amaranth at College of Agriculture, Vijayapura

Sl. No.	Common Name	Scientific Name	Family	Order
1	Seed bug	<i>Nysius</i> sp.	Lygaeidae	Hemiptera
2	Stink bug	<i>Plautiacrossota</i> (Dallas)	Pentatomidae	Hemiptera
3	Green bug	<i>Nezaraviridula</i> (Linnaeus)	Pentatomidae	Hemiptera
4	Amaranth bug	<i>Cletus punctiger</i> (Dallas)	Coreidae	Hemiptera
5	Bean bug	<i>Riptortus pedestris</i> (Fabricius)	Alydidae	Hemiptera
6	Seed bug	<i>Eurystylus</i> sp.	Miridae	Hemiptera
7	Cow bug	<i>Otinotus</i> sp.	Membracidae	Hemiptera
8	Predatory bug	<i>Eucantheconafurcellata</i> (Wolff)	Pentatomidae	Hemiptera
9	Eurybrachid bug	<i>Eurybrachys</i> sp.	Euribrachidae	Hemiptera
10	Stem weevil	<i>Hypolixus truncatulus</i> (Fabricius)	Curculionidae	Coleoptera

11	Blister beetle	<i>Mylabrispustulata</i> (Thunberg)	Meloidae	Coleoptera
12	Myllocerous weevil	<i>Myllocerous</i> Sp.	Curculionidae	Coleoptera
13	Flower beetle	<i>Oxycetoniaversicolor</i> (Fabricius)	Scarabidae	Coleoptera
14	Transverse Lady beetle	<i>Coccinella transversalis</i> (Fabricius)	Coccinellidae	Coleoptera
15	Lady bird beetle	<i>Ileiscincta</i> (Fabricius)	Coccinellidae	Coleoptera
16	Lady bird beetle	<i>Scymnus (Scymnus) nubilus</i> (Mulsant)	Coccinellidae	Coleoptera
17	Leaf webber	<i>Spoladearecurvalis</i> (Fabricius)	Crambidae	Lepidoptera
18	Tobacco cut worm	<i>Spodoptera litura</i> (Fabricius)	Noctuidae	Lepidoptera
19	Ear head caterpillar	<i>Helicoverpa armigera</i> (Hubnar)	Noctuidae	Lepidoptera
20	Hairy caterpillar	<i>Euproctis</i> sp.	Lymantriidae	Lepidoptera
21	Blossom thrips	<i>Frankliniella schultzei</i> (Trybom)	Thripidae	Thysanoptera
22	Thrips	<i>Haplothripsgowdeyi</i> (Franklin)	Thripidae	Thysanoptera
23	Thrips	<i>Thripsflavus</i> (Schrank)	Thripidae	Thysanoptera
24	Chillithrips	<i>Scirtothripsdorsalis</i> (Hood)	Thripidae	Thysanoptera
25	Leaf hopper	<i>Empoasca</i> sp.	Cicadellidae	Homoptera
26	Cowpea aphid	<i>Aphis craccivora</i> (Koch.)	Aphididae	Homoptera
27	Grass hopper	<i>Cyrtacanthacristatarica</i> (L.)	Acrididae	Orthoptera
28	Tobacco grass hopper	<i>Atractomorphaacrenulata</i> (Fabricius)	Acrididae	Orthoptera
29	Paper wasp	<i>Ropalidiamarginata</i> (Lepelletier)	Vespidae	Hymenoptera
30	Braconid wasp	<i>Bracon</i> sp.	Braconidae	Hymenoptera
31	Green lace wing	<i>Chrysoperlazastrowisillemi</i> (Esben-Petersen).	Chrysopidae	Neuroptera

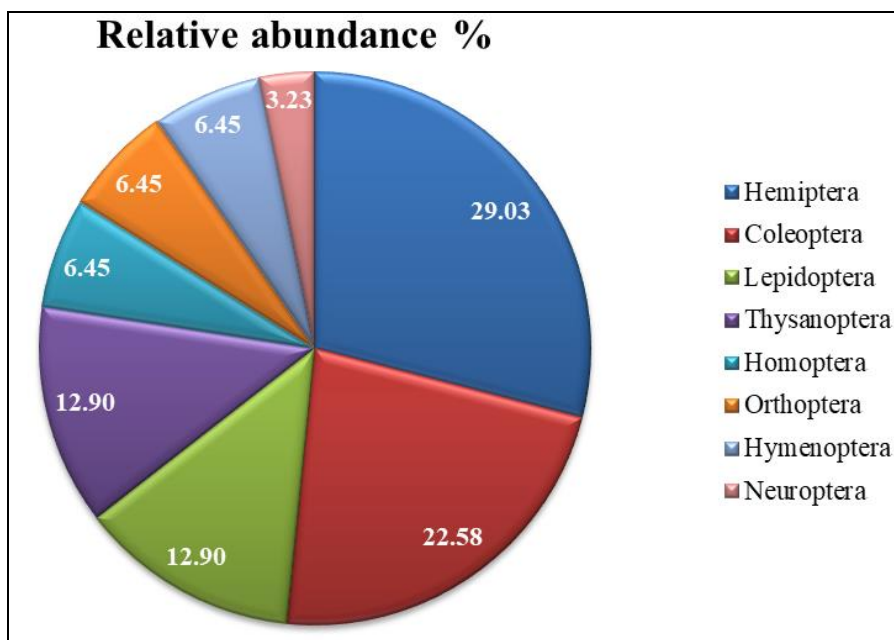


Fig 2: Relative abundance of insects belonging to different orders recorded on grain amaranth

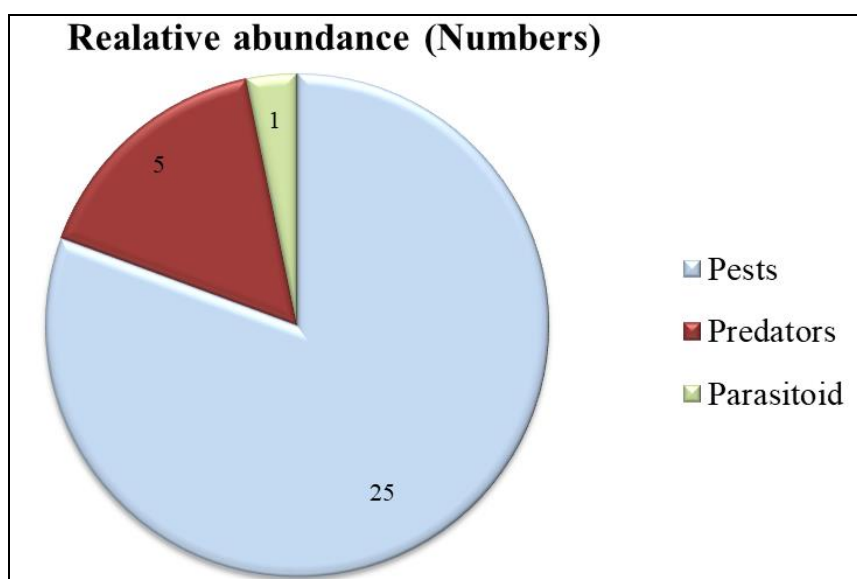


Fig 3: Relative diversity of insects based on economic importance



*Mylabrius pustulata* Thunberg



*Nysius* sp.



*Riptortus pedestris* Fabricius



*Cletus punctiger* Dallas



*Attractomorpha crenulata* Fabricius



*Hypolixus truncatulus* Fabricius

**Plate 1:** Insect pests recorded on grain amaranth



*Euproctis* sp.



*Spoladea recurvalis* Fabricius



*Helicoverpa armigera* Hubnar



*Spodoptera litura* Fabricius



*Nezera viridula* Linnaeus



*Aphis craccivora* Koch.

**Plate 1: Contd...**



**Thrips**



*Oxycetonia versicolor* Fabricius



*Empoasca* sp.



*Cyrtacanthacirs tatarica* Linnaeus

**Plate 1:** Contd...



Lady bird beetles



*Ropalidia marginata* Lepeletier



*Chrysoperla zastrowii sillemi* Esben-Petersen

*Eucantacona furcellata* Wolff

Braconid wasp

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