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Survey studies on insect-pests associated with important medicinal plants in Shivamogga, Karnataka

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Abstract

The survey on insect pests of selected medicinal plants viz., Ashwagandha, Shatavari, Sarpagandha, Solanum and Amruthaballi at different locations in and around Shivamogga district like Ayurvedic college, Machenhalli, Shivamogga dairy, Shivamogga Milk Union Limited (SHIMUL) and Organic Farming Research Centre (OFRC), UAHS, Shivamogga was carried out during 2014-15. The results revealed that the occurrence of five insect species on ashwagandha (*Leptocentrus* sp., *Acrosternum gramineum* Fab., *Tetranychus urticae* Koch, *Helicoverpa armigera* Hub., *Deilephila nerii* Linn.), three species on Solanum (*Leptocentrus* sp., *Nezara viridula* Fab., *Aphis gossypii* Glov.) and one species on shatavari (*Lema* sp.) at Machenhalli. At Shivamogga dairy, four species on sarpagandha (*Indomia cretaceous* Fst., *Deilephila nerii* Linn., *Trilophida annulata* Thumb., *Riptortus pedestris* Fab.) and two species on Amruthaballi (*Neorthacris acuticeps* Bol., *Kolla ceylonica* Melichar.) were recorded and similarly four species were found on Ashwagandha (*Henosepilachna vigintioctopunctata* Fab., *Elasmolomus pallens* Dallas., *Spilostethus hospes* Fab., *Dolicoris indicus* Stal) at OFRC Shivamogga.

Keywords: Medicinal pests, Ashwagandha, *Solanum*, Sarpagandha, Amruthaballi

1. Introduction

Karnataka is one of the few states in India which has rich flora representing evergreen, semi evergreen, deciduous and shrub forests. Some of the crops like Periwinkle, *Dioscorea*, *Duboisia*, Senna, Gloriosa, *Datura* and *Solanum* are under commercial cultivation in the state (Parinitha *et al.*, 2005) [1]. Out of 17,500 flowering plants known to occur in India, about 3000 are recognized for the medicinal uses (Sharma and Mudgal, 1997) [2]. According to the World Health Organization, 80 per cent of the population of developing countries relies on traditional plant-based systems of medicine to provide them with primary health care needs (Agarwal and Upadhyaya, 2006) [3].

Before exploring the potential of these plants in the farmer's field or for the commercial exploitation of these plants, it is mandatory to know about different aspects related to their cultivation like agronomical practices, diseases and insect-pests. The large scale cultivation of these plants in the state may face the problem of sudden appearance of large populations of variety of insect pests in a single crop. Like other plants, medicinal plants too have to bear the devastating effects of injurious insect-pests, which are not only harmful for the plant but also, deteriorate the quality of the produce, thus hampering its medicinal value. The Information regarding the occurrence of insect-pests on medicinal and aromatic plants of the state is scanty. Hence the present study was undertaken to record the insect-pests associated with important medicinal plants in the state.

2. Materials and Methods

Survey was undertaken to know insect pests incidence on selected medicinal plants like Ashwagandha, Shatavaria, Amruthaballi, Sarpagandha, *Solanum* and the pest incidence was recorded during cropping season in and around Shivamogga district during August 2014 to March 2015. The selected area in and around Shivamogga district for survey of major pests of different medicinal plants are,

1. Ayurvedic College, Machenahalli
2. Shivamogga dairy, Shivamogga Milk Union Limited (SHIMUL)
3. Organic Farming Research Centre (OFRC), UAHS, Shivamogga

Fixed plot survey was followed to record the insect pests of important medicinal plants during cropping season 2014-15 on randomly selected plants. The nature of damage by each insect was observed. The immature stages of the insects recorded on the plants were collected and reared to adult stage in the laboratory of Department of Entomology, UAHS, Shivamogga. The species were later on got identified based on key characters of the species (Rammana, 2009)^[4]. The unidentified specimens were identified by Dr. C. A. Viraktamath (UAS, Bangalore) and Dr. Yashwanth (UAS, Bangalore).

2.1 Statistical analysis

Survey was conducted twice in a month then average was done, data were recorded up to different months then it was pooled as standard mean for comparing the different pests population in different medicinal crop.

3. Results and Discussion

Observations were made during the survey revealed that the occurrence of 23 species of phytophagous pests belonging to different orders viz., Hemiptera (14 species), Coleoptera (two species), Lepidoptera (two species), Orthoptera (three species) and Acarina (two species). These pests have been categorized as defoliators (five species), sucking pests (16 species) and flower and fruit feeders (two species) based on their feeding habit. Among the different orders Hemiptera recorded maximum number of species (14 species) followed by Orthoptera (three species), Lepidoptera (two species), Coleoptera (two species) and Acarina (one species).

The incidence of different insect pests on different medicinal plants during survey studied and they were recorded in low to medium numbers causing moderate damage. These are being discussed area-wise as under.

3.1 Location 1:- Studies on pest complex of medicinal plants at Ayurvedic College, Machenahalli, Shivamogga:-

3.1.1 Ashwagandha

Five insect species observed in ashwagandha. Tree hoppers were recorded at the population of 0.77 hoppers per plant. Both nymph and adults of the tree hopper caused damage to the ashwagandha by sucking the sap from the leaves and shoots which resulted in yellowing and devitalisation. These hoppers are small, had a backwardly directed spine like process with two lateral processes on pronotum. These results are similar to the findings of Suman and Swaminathan (2007)^[5] who reported *Leptocentrus substitutes* were sucking the sap from the tender parts of ashwagandha plants. (Plate 1a.)

Green plant bug, *Acrosternum gramineum* (Fab.) (Hemiptera: Pentatomidae) were recorded at the population of 0.71 bugs per plant. Both nymphs and adults were observed to suck the sap from leaves, buds and young shoots of ashwagandha from causing withering of berries. There were no findings found pertaining to this pest in medicinal crops. (Plate 1b)

A mite, *Tetranychus urticae* (Koch.) belong to the family Tetranychidae caused damage to the leaves of ashwagandha with a mean population of 4.48 mites per leaf. Severe infestation leads to yellowing and stunting of the plant. These finding are lined with Indranil *et al.*, (2008)^[6] recorded phytophagous mite *T. urticae* on ashwagandha from West Bengal (Plate 1c)

Fruit borer, *Helicoverpa armigera* (Hub.) (Lepidoptera: Noctuidae) were recorded at the population of 0.60 larvae per plant. It enters the fruit and feed while remaining concealed

inside the fruit. They bore into the developing fruits causing severe damage and thereby reducing the marketable yield. The incidence of *H. armigera* on Ashwagandha is in conformity with the findings of Udayagiri (1987)^[7], Hanumanthaswamy (1992)^[8] and Kumar (2007)^[9] who reported incidence of *H. armigera* was observed (Plate 1d).

Sphingid, *Deilephila nerii* (Linn.) (Lepidoptera: Sphingidae) were found defoliating the leaves of ashwagandha with population of 0.58 larvae per plant. The present results are in confirmation with the findings of Hanumanthaswamy (1992)^[8] and Kumar (2007)^[9], they reported this pest on ashwagandha from Bangalore and Raichur. (Plate 1e).

From above discussion of ashwagandha crop *Tetranychus urticae* found highest mean population (4.48 mites per leaf) followed by *Leptocentrus* sp.(0.77 hoppers per plant) and least mean population was found in *Deilephila nerii* (0.58 larvae per plant) (Fig.1).

3.1.2 Solanum viarum

Three sap sucking pests were observed in solanum plants viz., green stink bug, tree hopper and aphids (Fig.2). Nymphs and adults of *Aphis gossypii* (Hemiptera: Aphididae) were found to suck the sap from lower surface of the leaves of *S. viarum*. Adult aphid is black colored with two cornicles at the tip of the abdomen. The infested leaves showed downward curling with the population of 4.13 aphids per leaf (Plate 2a). These results are lined with Hanumanthaswamy (1992)^[8] who found that the nymphs and adults of *A. gossypii* suck sap from leaves, flowers and flower buds of *Solanum indicum* from GKVK, Bangalore.

Tree hopper, *Leptocentrus* sp. (Hemiptera: Membracidae) nymphs and adults were observed to suck the sap from green stem and tender parts of *Solanum nigrum* at all the stages of plant causing corky tissue and excrete honey dew which attracts ants with the population of 1.23 nymphs/adults per plant. (Plate 2b). The results obtained are similar to the findings of Suman and Swaminathan (2007)^[5] who reported *Leptocentrus substitutes* were sucking the sap from the tender parts of ashwagandha plants.

Green stink bug, *Nezara viridula* (Fab.) (Hemiptera: Pentatomidae) nymphs and adults were observed to suck the sap from leaves, buds and young shoots of *S. viarum* with the population of 1.17 nymphs per plant. (Plate 2c). However, similar findings are reported by Kumar (2007)^[9] in which, *N. viridula* feeding on *Coleus* from Raichur.

From above discussion in *Solanum viarum* crop *Aphis gossypii* found highest mean population (4.13 aphids per leaf) followed by *Leptocentrus* sp.(1.23 nymphs/adults per plant.) and least mean population was found in *Nezara viridula* (1.17 nymphs per plant) (Fig.2).

3.1.3 Shatavari, *Asparagus roseus* (Linn.)

The Shatavari is affected mainly by a chrysomelid beetle, *Lema* sp. Chrysomelid beetle, *Lema* sp. (Coleoptera: Chrysomelidae) is a light brown coloured beetle along with the black spots on the body. Grubs are yellow in colour with black head. Both adults and grubs feeds on shoots and caused drying of shoot tip with the mean population of 4.13 insects per leaf (Plate 3a and 3b).The incidence of *Lema* sp. on Shatavari is in conformity with the findings of Rammana (2009)^[4].

From above discussion only one major pest has been reported in shatavari which cause damage with a mean population of 4.13 insects per leaf (Fig. 3).

3.2 Location 2:- Studies on pest complex of medicinal plants at Shivamogga dairy, SHIMUL

Observations were made during the survey at Shivamogga dairy, SHIMUL (Shivamogga Milk Union Limited) revealed that the occurrence of six species of phytophagous pests belonging to different orders *viz.*, Hemiptera (one species), Coleoptera (one species), Lepidoptera (one species), Homoptera (one species) and Orthoptera (two species). These have been categorized as defoliators (four species), sucking pests (two species) based on their feeding habit.

3.2.1 Sarpagandha, *Rauvolfia serpentina* (Benth.)

The lablab bug, grasshopper, curculionid weevil and sphingid larvae attacking the leaves and berries of Sarpagandha and causes economic damage.

Lab lab bug, *Riptortus pedestris* (Fabricus) (Hemiptera: Alydidae) is a dark brown bug, hind femur provided with row of spines. Adults were observed sucking the juice from the berries of *R. serpentina*. The berries showed withering and drying up symptoms due to the bug attack with mean population of 1.1 bugs per plant (Plate 4a). The observation on the incidence of *R. pedestris* on *Rauvolfia serpentina* is in conformity with the findings of Singh (1964)^[10].

The nymphs and adults of grasshopper *T. annulata* (Orthoptera: Acrididae) were found defoliating the leaves of sarpagandha with mean population of 0.84 grass hopper per plant. It is brown to dark grey with black spots, tegmina with two to three darker bands (Plate 4b). This was earlier recorded by Reddy *et al.*, (1981)^[11] who found damage was more severe during vegetative stage at Dharward.

Weevil, *Indomia cretaceous* (Fst.) (Coleoptera: Curculionidae) grub and adult were found defoliating the leaves and also feeding on immature berries of Sarpagandha by making holes in them with the population of 1.09 adult per plant (Plate 4c). Similar finding was matched with Srivastava and Saxena (1976)^[12].

The larvae of Sphingid, *Deilephila nerii* (Linn.) (Lepidoptera: Sphingidae) were greenish in colour which was found defoliating the leaves of Sarpagandha with population of 0.60 larvae per plant. The present results are in conformation with the findings of Singh (1964)^[10] from Coimbatore who reported the incidence of *D. nerii*.

From above discussion of sarpagandha crop *Riptortus pedestris* found highest mean population (1.1 bugs per plant) followed by *Indomia cretaceous* (1.09 adult per plant) and least mean population was found in *Deilephila nerii* (0.60 larvae per plant)(Fig.4).

3.2.2 Amruthaballi (Guduchi), *Tinospora cordifolia* (Linn.)

The Amruthaballi is mainly feed by Grass hopper, *Neorthacris acuticeps* (Bol.) (Orthoptera: Pyrgomorphidae) is green with a black band running from the eyes to middle of the abdominal segments laterally, pronotum with red lateral stripe and scattered white tubercles. Both nymphs and adults were feeding on leaves with population of 0.61 hoppers per plant (Plate 5a). The present results are lined with similar findings of Hanumanthaswamy (1992)^[8] who reported the incidence throughout the year.

Adults and nymphs of Leaf hopper *Kolla ceylonica* (Melichar.) (Homoptera: Cicadellidae) were occasionally found sucking the sap from ventral surface of *T. cordifolia* leaves. White spots on the leaves are the first symptoms of attacked plants which eventually die from loss of chlorophyll with the population of 0.89 hoppers per plant (Plate 5b). However, similar findings were reported by Rammana (2009)

[4].

From above discussion of amruthaballi crop Leaf hopper *Kolla ceylonica* found highest mean population (0.89 hoppers per plant) followed by *Neorthacris acuticeps* (0.61 hoppers per plant) (Fig.5).

3.3 Location 3:- Studies on insect pest complex of medicinal plant at organic farming research center (OFRC), Shivamogga:-

Observations made during different months of cropping period in OFRC, College of Agriculture, Shivamogga revealed that the occurrence of eight species of phytophagous pests belonging to different orders *viz.*, Hemiptera (five species), Lepidoptera (one species), Coleoptera (one species) and Acarina (one species)(Table 12). These could be categorized as defoliators (two species) and sucking pests (four species) and flower and fruit feeder (one species) based on their feeding habit. Among the different orders Hemiptera recorded maximum number (five species) followed by Lepidoptera (one species), Coleoptera (one species) and Acarina (one species).

3.3.1 Aswagandha

The aswagandha is affected by various pests *viz.*, lygaid bug, red spider mite, tree hopper, sphingid moth, green plant bug, peanut trash bug, hadda beetle and black shield bug. These pests are affecting mainly leaves.

Lygaid bug, *Spilostethus hospes* (Fabricus) (Hemiptera: Lygaeidae) is elongated reddish bug, two black patches on the coastal region of the wings and apex blackish. Antennae and legs are black in colour. These colour pattern are warning to their predators. Adults and nymphs suck the juice from the tender leaves and flower buds of aswagandha which withered and dried up. The mean population of 1.60 bugs per plant was recorded. (Plate 6.1 a). These results are lined with Hanumanthaswamy (1992)^[8] who reported the *Lygaeus hospes* (Fab.) were sucking the sap from flower buds of *Gloriosa superb* which withered and dried up.

Red spider mite, *Tetranychus urticae* (Fab.) (Acarina: Tetranychidae) causes damage to the leaves of aswagandha with the mean population of 6.4 mites per leaf (Plate 6.1 b). These finding are lined with Indranil *et al.*, (2008)^[6] recorded phytophagous mite *T. urticae* on ashwagandha from West Bengal.

A polyphagous tree hopper, *Leptocentrus* sp. (Hemiptera: Membracidae) had a backwardly directed spine like process with two lateral processes on pronotum. Both nymphs and adults were observed to suck the sap from tender parts of Ashwagandha. The tree hopper was noticed in association with ants, mean population of 2.37 hoppers per plant was recorded (Plate 6.1 c). The results obtained are similar to the findings of Suman and Swaminathan (2007)^[5] who reported *Leptocentrus substitutes* were sucking the sap from the tender parts of ashwagandha plants.

The larvae of *Deilephila nerii* (Linn.) (Lepidoptera: Sphingidae) were found defoliating the leaves of aswagandha with mean population of 0.42 larvae per plant (Plate 6.1 d). The present results are in confirmation with the findings of Hanumanthaswamy (1992)^[8] and Kumar (2007)^[9], they reported this pest on ashwagandha from Bangalore and Raichur.

Green plant bug, *Acrosternum gramineum* (Fab.) (Hemiptera: Pentatomidae) is polyphagous pest, where nymphs and adults were observed to suck the sap from leaves, buds of ashwagandha with population of 1.41 bugs per plant (Plate

6.1 e). There were no findings found pertaining to this pest in medicinal crops.

Pea nut Trash bug, *Elasmolomus pallens* (Dallas) (Hemiptera: Rhyparochromidae) are dark brown in colour. They move towards seeds, buds, fruits for hiding places. Both nymphs and adults were observed to suck the sap from leaves, buds of ashwagandha by hiding inside (Plate 6.1 f). The mean population of 1.02 bugs per plant was recorded. There were no findings found pertaining to this pest in medicinal crops.

Hadda beetle, *Henosepilachna vigintioctopunctata* (Fabricius) (Coleoptera: Coccinellidae) was observed to feed on the undersurface of the leaves of ashwagandha. Both adults and grubs scraped the green matter, leaving a skeletonized pattern. The incidence of hadda beetle resulted in complete skeletonized leaf during heavy infestation at later stage of the crop growth. Finally the plants dried and wither up. Adult beetle had reddish brown elytra and 28 dark, roundish spots on the dorsal surface. The yellowish grub was cylindrical,

with thoracic and abdominal segments had long sharp spines. The mean population of 0.84 adults per plants was recorded. These results are in lined with the findings of Smith (1974)^[13] and Rammana (2009)^[4] reported the incidence of hadda beetle.

Black shield bug, *Dolycoris indicus* (Stal) (Hemiptera: Pentatomidae) is a brown coloured bug with three spots on the scutellum. It sucks the sap from the tender flesh of ashwagandha and flowers showed drying up symptoms (Plate 6.2 a). The mean population of 0.45 bugs per plant was observed. Similar finding are closely related with Hanumanthaswamy (1992)^[8] reported *Dolycoris indicus* (Stal.) suck the sap from the tender flesh of *Duboisia myoporoides* and *Solanum indicum*.

From above discussion of ashwagandha crop *Tetranychus urticae* found highest mean population (6.4 mites per leaf) and least mean population was found in *Deilephila nerii* (0.42 larvae per plant) (Fig..6).

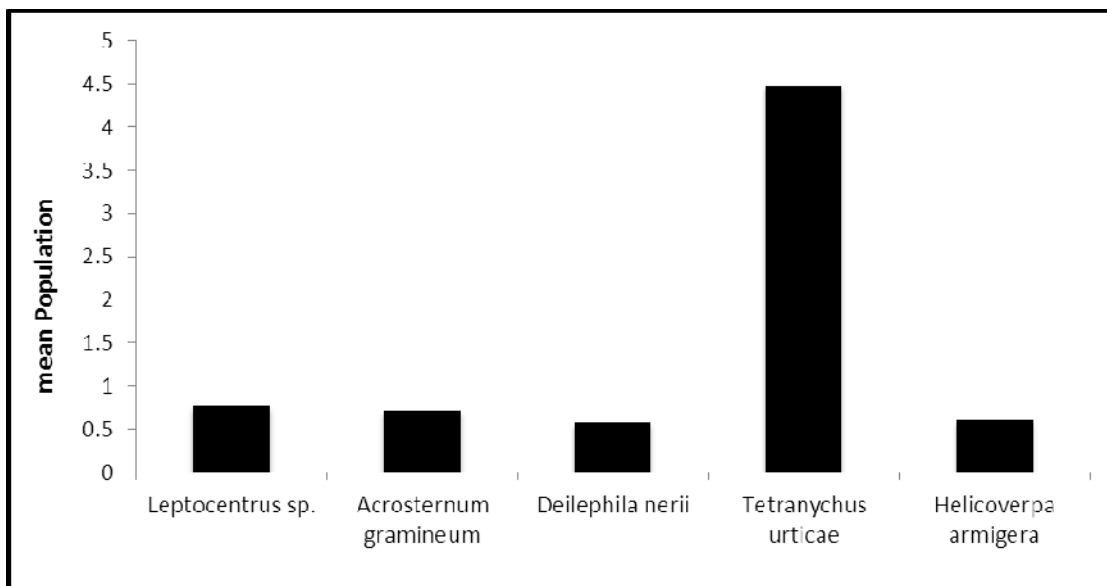


Fig 1: Relative abundance of insect pests on Ashwagandha at Ayurvedic College, Machenahalli

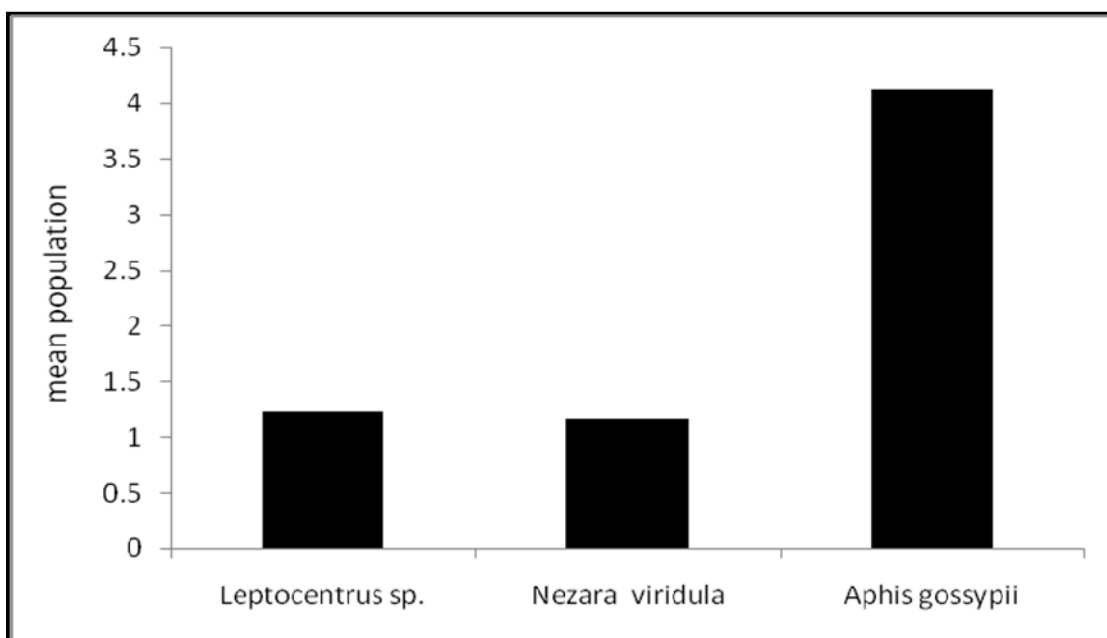


Fig 2: Relative abundance of insect pests on Solanum viarum at Ayurvedic College, Machenahalli

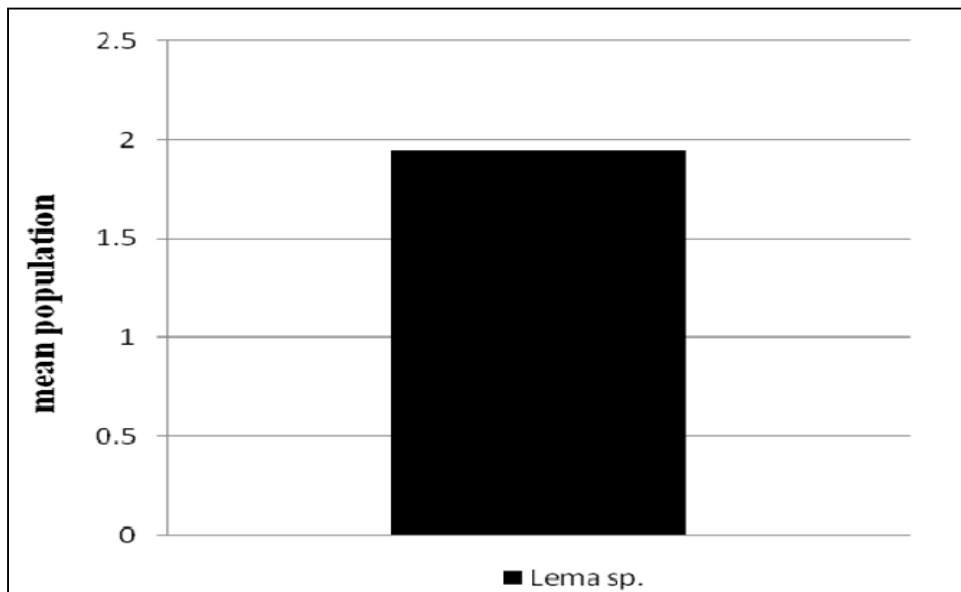


Fig 3: Relative abundance of insect pest on Shatavari at Ayurvedic College, Machenahalli

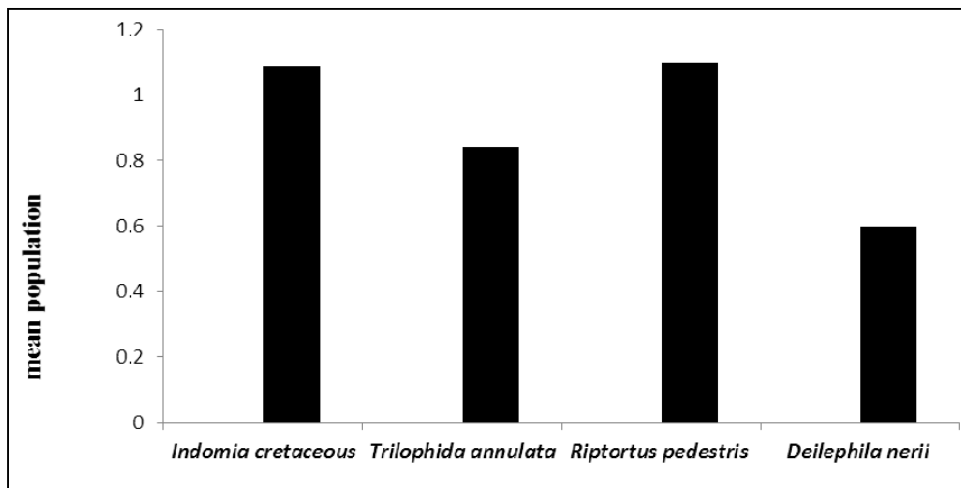


Fig 4: Relative abundance of insect pests on Sarpagandha at Shivamogga dairy, SHIMUL

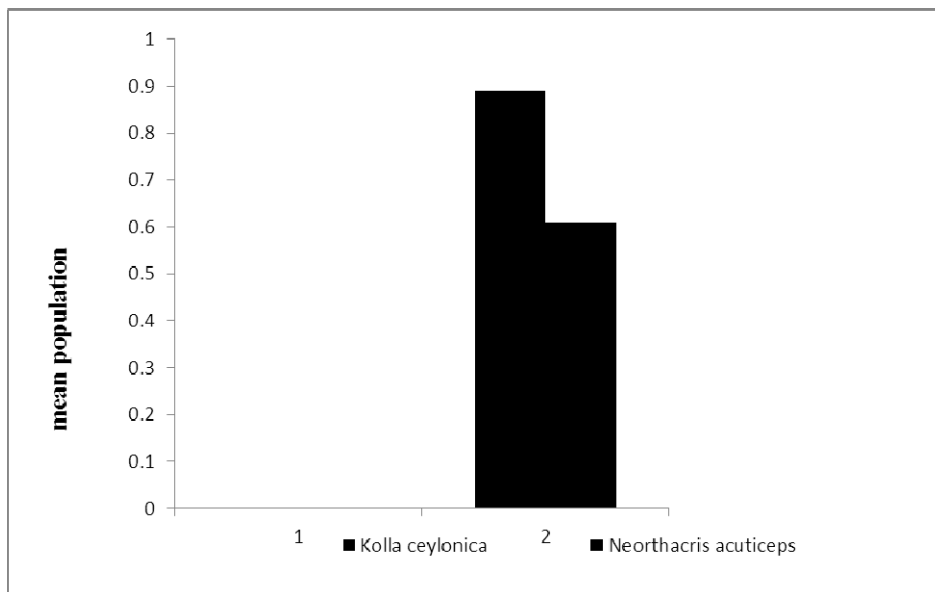


Fig 5: Relative abundance of insect pests on Amruthaballi at Shivamogga dairy, SHIMUL

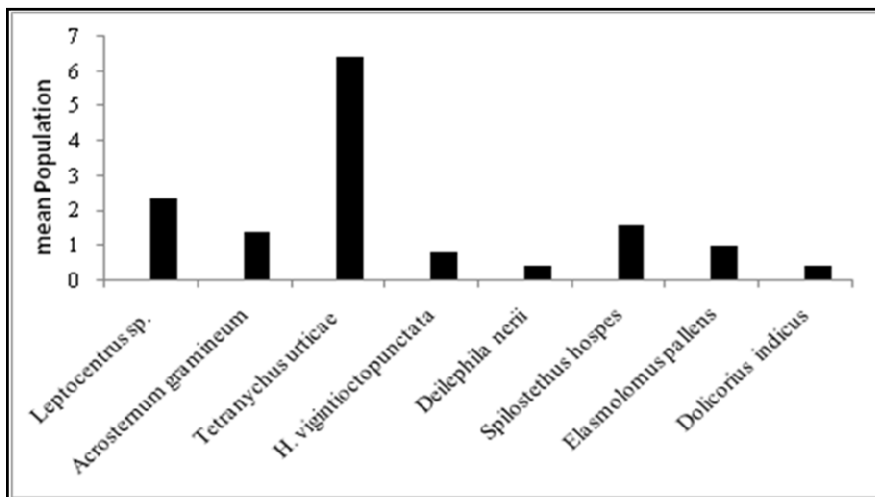


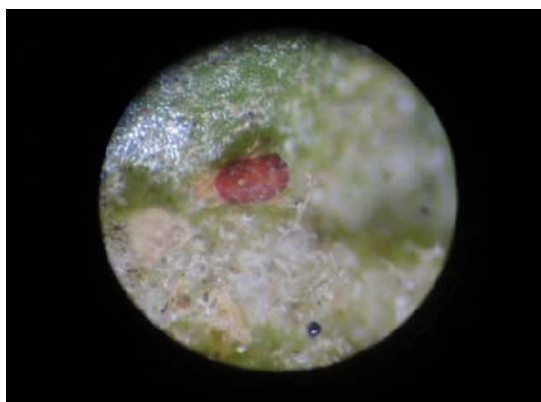
Fig 6: Relative abundance of insect pests on Ashwagandha at OFRC, Shivamogga



a) *Leptocentrus* sp.



b) *Acrosternum gramineum*



c) *Tetranychus urticae* Koch



d) *Helicoverpa armigera*



e) *Deilephila nerii*

Plate 1: Insect pests of Ashwagandha at Ayurvedic College, Machenahalli



a) *Aphis gossypii*



b) *Leptocentrus* sp.



c) *Nezara viridula*

Plate 2: Insect pests of Solanum at Ayurvedic College, Machenahalli



a) Grubs of Chrysomellid



b) Adult of Chrysomellid

Plate 3: Insect pests of Shatavari at Ayurvedic College, Machenahalli



a) *Riptortus pedestris*



b) *Trilophida annulata*



c) *Indomia cretaceous*

Plate 4: Insect pests of Sarpagandha at Shivamogga dairy, SHIMUL, Shivamogga



a) *Neorthacris acuticeps*



b) *Kolla ceylonica*

Plate 5: Insect pests of Amruthaballi at Shivamogga dairy, SHIMUL, Shivamogga



a) *Spilostethus hospes*



b) *Tetranychus spurticae*



c) *Leptocentrus* sp.

d) *Deilephila nerii*



e) *Acrosternum gramineum*



f) *Elasmolomus pallens*

Plate 6.1: Insect pests of Ashwagandha at OFRC, Shivamogga



a) *Dolicoris indicus*

Plate 6.2: Insect pests of Ashwagandha at OFRC, Shivamogga

4 Conclusions

The present study revealed that the major pests which causing economic damage to important medicinal plants. These pests have been categorized as defoliators (five species), sucking pests (16 species) and flower and fruit feeders (two species) based on their feeding habit. Among the different orders, Hemiptera recorded maximum number of species (14 species) followed by Orthoptera (three species), Lepidoptera (two species), Coleoptera (two species) and Acarina (one species).

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