

A Survey of Some Insect Pests Associated with *Juglans regia* L. (Juglandaceae) From Kashmir, India

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ABSTRACT

The aim of the present study was to document some insect pests associated with *Juglans regia* L. Juglandaceae from Kashmir, India. During the survey period (first week of April 2017 to last week of October 2017), nine species of insect pests, such as, *Apodiphus pilipes* Horvath, 1889, *Chaetoprocta odata* Hewitson, 1865, *Chromaphis juglandicola* Kaltenbach, 1843, *Erschoviella musculana* Erschoff, 1874, *Megacoelum stramineum* Walker, 1873, *Myllocerus fotedari* Ahmad, 1974, *Panaphis juglandis* Goeze, 1778, *Paracopium cingalensis* Walker, 1873 and *Scolytus nitidus* Schedl, 1936 were found to infest walnut trees. Brief diagnoses and feeding activity of all aforementioned pests have been provided, and, therefore, has a great relevance in development of ecological pest management strategies in the walnut orchards.

Keywords: Survey, *Juglans regia*, Diagnoses, Feeding Activity, Kashmir

INTRODUCTION

Walnut trees (*Juglans*), well known for their characteristic walnut seeds belong to the Juglandaceae family of plants. The genus comprises about 21 species and includes members that grow in temperate zones across the world (Whittemore & Stone, 1997; Aradhya et al., 2007). In India, walnuts are grown in states; Jammu & Kashmir, Arunachal Pradesh, Himachal Pradesh and Uttarakhand. Jammu & Kashmir contributes around 98% of the country's output. Kashmiri walnuts are exported to different countries like Middle East, Western Europe, Eastern Europe, United Arab Emirates and Asian countries (Rather, 2013). Walnut trees can be raised either from seeds or through budding or grafting methods; however, it has been observed that pest attacks can reduce quality as well as quantity of walnuts (UCIPM, 2011).

The extent of damage depends on the incidence of each pest on the fruit kernel, leaves, branches and trunk (Mir and Wani, 2005). Some pests cause drying of branches by development of grayish nipple specks by which fruit appears shrivelled and wrinkled. Most of the pests on the walnut are leaf defoliators which damage the sprouting buds and are very active during the late March to August (UCIPM, 2011). These pests usually oviposit on the leaves, twigs and

branches from which larva develops and feed insatiably, usually early stages are voracious feeders which lead to nut drop (Khan et al. 2011). Some coleopteran pests feeding on foliage have been reported to influence the photosynthetic rate and thus longevity of host trees (Paunekar, 2015). Certain dipteran flies feed inside walnut husk causing blackening of shells which reduces the market value (Kasana and Aliniyee, 1995). Walnut aphids were reported to have direct influence on walnut production because they cause accumulation of honeydew on the husk which has phyto-toxic effect leading to general blackening of surface with subsequent development of sooty mould (Sibbett et al. 1971). The aim of the present study was to document some insect pests associated with *J. regia* that has a great relevance in development of ecological pest management strategies in the walnut orchards.

MATERIAL AND METHODS

Sampling on the occurrence of pests allied with walnut trees were carried out in three districts of Central Kashmir (Figure 1). Based on the preliminary surveys, severe to moderate infestations were observed in the selected sites. Since the host tree (*Juglans regia*) was infested by different pest species, therefore, sampling was done as per the earlier studies of Mir and Wani, 2005; Weiher and Keddy, 1996; Khanday

and Buhroo, 2015. From first week of April (2017) to last week of October (2017), walnut trees at selected sites (S1 to S3-Figure 1) were continuously monitored for pest activity and data obtained during the experimental period was recorded. The collected specimens were preserved in 70% ethanol and later card mounted for taxonomic studies. Few specimens were directly dry mounted and preserved. Photographs during the study were taken by using Canon EOS600 D with 300 mm wide angle lenses and Cannon DSLR EOS 1200 D with 18-55 mm wide angle lens. All the collected specimens are deposited in Kashmir University Insect Collection, University of Kashmir, and Srinagar (KUIC).

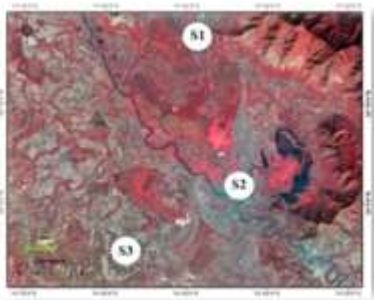


Figure1. Map showing study sites (S1–S3)

RESULTS

Surveys (first week of April 2017 to last week of October 2017) revealed that nine species of insect pests, such as, *Apodiphus pilipes* (Horvath, 1889), *Chaetoprocta odata* (Hewitson, 1865), *Chromaphis juglandicola* (Kaltenbach, 1843), *Erschoviella musculana* Erschoff, 1874, *Megacoelum stramineum* (Walker, 1873), *Myllocerus fotedari* Ahmad, 1974, *Panaphis juglandis* (Goeze, 1778), *Paracopium cingalensis* (Walker, 1873) and *Scolytus nitidus* Schedl, 1936 severely infest walnut plantation in Kashmir. Details of each pest are presented below:

Order: Hemiptera; Family: Pentatomidae;
***Apodiphus pilipes* (Horvath, 1889)**

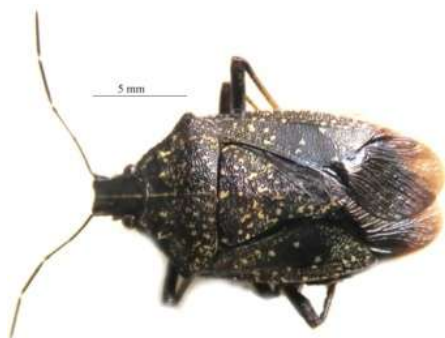


Figure2. *Apodiphus pilipes*

Diagnosis (Fig.2)

Commonly known as stink bug. Female, body length 17-18 mm. Head blackish brown, densely punctate; pronotum & scutellum black. Eyes reddish brown with red ocelli. Brownish rostrum present except apical segment which is dark and extending beyond the hind coxae; levigate ochraceous spots raised; corum cinnamon-brown. Antennae 5 segmented. Thorax brownish; pronotum with a distinct transverse series of four ochraceous spots on anterior area. Scutellum shows gradual narrowing apically with three ochraceous spots at base, well developed scent gland ostiole with peritreme long, semicircular, almost extending upto outer margin of evaporatoria. Abdomen has central impunctate line with dark brown dorsum with alternate dark and yellow patches except reddish patch nearly in the middle legs are piceous, bases of the femora.

Feeding: Both nymphs and adults suck the sap by piercing their rostrum into the plant tissues and lower its vitality.

Active period: May-September

Family: Aphididae; *Chromaphis juglandicola* (Kaltenbach, 1843)



Figure3. *Chromaphis juglandicola*

Diagnosis (Fig.3)

Commonly known as walnut green aphid. Adult body length about 1.5-2.4 mm, pale yellow in colour, antennae very short and antennal hairs with dark brown tips. Pronotum has only one anterior and one posterior pair of spinal hairs. Rs vein in forewing absent. M & Cu veins are dusky for short distance and pterostigma is outlined with dusky grey. There is presence of two hamuli on hind wings. Dorsal abdominal hairs are very less in number mostly 2-6 hairs on each tergite except tergite 8 which has 8-18. Siphunculi are conical and smooth with marginal hairs. Cauda has distinct transverse knob having 15-20 hairs. All viviparae are alate. Oviparae develop differently with abdominal bands on 3-5 tergites. Immature morphs have

dark spots present on abdominal tergite 5, usually having hairs all over body.

Feeding: Damage is due to sucking out tree nutrients and to excreting much honeydew, which is colonized by sooty mold. Large populations may reduce the current season's nut yield and its quality, along with reductions in the following season's crop.

Activity period: April-October

***Panaphis juglandis* (Goeze, 1778)**

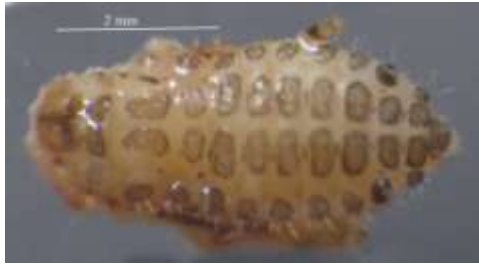


Figure 4. *Panaphis juglandis*

Diagnosis (Fig.4)

Commonly known as dusky-veined aphid. They are about 3.5-4.5 mm with large stout body, short antennae (0.3-0.4 mm) with antennal hairs long and fine. Head occipital hairs in transverse rows. Pronotum diamond shaped area (dusky). Wings have normal venation but Rs in forewing weak over middle part of its course; Cu2 is dark bordered but less than Coastal area. Hind wing has 7-9 hamuli. Abdomen has dark marginal sclerites and broad dark bands across tergites 3-7 with broken ones across tergites. Siphunculi 1-2 are located on dorsum of 6th abdominal segment with pores to release pheromones.

Cauda is present which has tail like protrusion with oval knob bearing numerous hairs.

All viviparous females are winged; Oviparae and immatures have dark paired marginal sclerites along the 7th abdominal tergite with 8th tergite having undivided band.

Feeding activity: It is present on adaxial surface of leaf feeding usually near mid rib.

Activity period: April-October

Family: *Tingidae; Paracopium cingalensis* (Walker, 1873)

Diagnosis (Fig.5)

Commonly known as lace bug. Adult body length about 4 mm, pale ochraceous. Head obscurely centrally carinate which extend from base to about centre of inner margins of eyes and is not produced in front of antenniferous tubercles.

It has very robust and stout antennae and each segment having variable size as first is longer than second, third very long, fourth a little longer than first and second together. Pronotum tricarinate, granulate with areolate apex, anterior margin truncate, a little concavely sinuate, posterior margin longly, angularly, posteriorly developed, its disk tricarinate, central carination straight, almost continuous, the two other carinations much shorter, with their apices inwardly curved before reaching anterior margin; elytra areolate, hemielytra with the costal area only defined. Sutural area distinct and well defined in membranaceous form; femora and tibia well developed sub-equal in length.

Feeding: Adults and Nymphs feed on the lower surface of leaves while depositing brownish excrement on them.

Period of Activity: April-October

Family: *Miridae; Megacoelum stramineum* (Walker, 1873)



Figure 6. *Megacoelum stramineum*

Diagnosis (Fig.6)

Commonly known as capsid bug. Adult body length about 7-8 mm, pale yellowish brown; corium with a slight greenish tinge; eyes and apex of scutellum black; membrane pale transparent; apical area of posterior femora brownish-yellow; a number of oblique striae on each side of vertex in front of eyes, interior margin of clavus, apical margin of corium and on membrane, reddish; head with a distinctive central sulcation; antennae with first and second segments brownish-yellow remaining dark brown; head, pronotum and scutellum finely pilose; tibiae with long hairs.

Feeding: Both adults and nymphs were found to feed on the lower surface of leaves, emerging buds and fruits.

Period of Activity: April to October

Order: Lepidoptera; Family: Lycaenidae;
Chaetoprocta odata (Hewitson, 1865)



Figure7. *Chaetoprocta odata*

Diagnosis (Fig.7)

Adult body length about 7.86 mm with head 1.87 mm, thorax 3.40 mm and abdomen 4.29 mm. Wing span of 27.35 mm, wing length and breadth about 14.41 mm and 9.11 mm respectively. Radial (R) veins of forewing simple, not forked and hind wing has thread-like extensions. It has the distal band of the central symmetry system in the M-cells of hind-wing underside reduced or absent. Antenna cylindrical, club shaped. Eyes of adults indented near antennae and face narrow. It has blue or brown streaked markings and is commonly called as hairstreaks. Males dull violet-blue, dorsally creamy white with circular marks ventrally, however, females are faintly brown dorsally and creamy white with circular marks ventrally. During flying state upper blue surface of wings becomes visible erratically and at resting state wings are placed in vertical position due to which creamy white colored surface of wings remain visible. Larvae are green in colour feeding on young leaves.

Feeding: Its larva is present on foliage and young shoots of walnut while as adults feed on the nearby vegetation feeding on nectar.

Activity period: March-July

Family: Nolidae; *Erschoviella musculana*
Erschoff, 1874



Figure8. *Erschoviella musculana*

Diagnosis (Fig. 8)

Commonly known as Asian walnut moth. Adult body length about 8-9 mm with wing span of about 18-23 mm. Thorax grey or brownish-grey with transverse dark stripe. Antenna light brown in colour covered with small hairs. The palp are well developed long, thin grey with dark tops. The body and inner surface of wings is monochrome light grey in colour. The forewing and hind wing shows remarkable distinct characters as fore-wing has general, leaden grey with transverse bands of brown, white and black while as hind wings are usually monochrome grey. Hind wing shows Sc+ R1 arise from the middle of the discal cell which is the characteristic feature of family Nolidae.

Feeding: Its larva is present inside nuts and young shoots while as adults are usually present on nearby flowers feeding on nectar.

Activity period: May- August

Order: Coleoptera; Family:Curculionidae;
Mylocerus fotedari Ahmad, 1974



Figure9. *Mylocerus fotedari*

Diagnosis (Fig.9)

Body colour piceous, the legs being a shade lighter. Greyish-white scaling over the body. The antennae and thorax piceous black in colour. Head transverse with dorsally visible scrobes. Antennae measuring about 3.3 mm in length and possessing dark clubs. The mandibles obtuse and pincer-like. Mentum small and almost circular in shape, submentum without any peduncle. Scape elongated, curved and extending beyond the anterior margin of prothorax. Funicle seven jointed with two basal segments longer than the rest. Elytra sub-oblong in shape and measuring about 4.2 mm in length much broader than the prothorax at shoulders and measuring about 1.5 mm in width at the base. Outer margins of elytra sub-parallel and ten distinct striae present on each elytra. The tarsi bearing a stout seta on each leg, the tarsal set a on hind legs being very sharp. Tarsal pulvinus measuring about 35, 13 and 14 microns in the first, second and third pairs of legs respectively. Hind legs devoid of claws, the

femora serrated at both sides while the tibia serrated on one edge only. The three pairs of legs measuring 4.0 mm, 2.1 mm and 4.4 mm in length respectively.

Feeding: Adults are usually present on the foliage of walnut trees and larvae bore the internal tissue of tree and are concealed feeders.

Activity period: April-September

***Scolytus nitidus* Schedl, 1936**



Figure 10. *Scolytus nitidus*

Diagnosis (Fig.10)

The adult body measures about 3-4 mm in length and 1-2 mm in width. It has shining black pronotum and dark red brown elytra with declivous abdomen. The second abdominal sternite ascends abruptly and perpendicularly with a minute pointed tubercle in the middle near its posterior border.

Feeding: The main damage to the tree is caused by adults entering the main branches and twigs during maturation feeding. After beetle attack, the infested branches or sometimes the entire tree may be killed during the establishment of the mother and larval galleries (Buhroo and Lakatos, 2007).

Activity period: March to November

DISCUSSION

The taxonomic range of pests attacking walnut trees is found to be very broad and includes aphids, beetles and bugs (UCIPM, 2011). In the present study, nine species of insect pests were found to feed on host tree (*J. regia*).

Megacoelum stramineum and *P.cingalensis* were reported for the first time from the sites of Central Kashmir, whereas, *C. juglandicola* and *P. juglandis* were observed as an active pest feeding on leaf sap.

Earlier, role of aphids as agriculture pests were reported by various workers like Fotedar and Kapur (1943), Nehru et al. (2005), Bhat (2008) and Arora et al. (2009).

Jaskiewicz and Kmiec (2007) reported *C. juglandicola* as one of the serious pest causing damage from early spring to autumn, mostly in the months of June and July, which result in the browning of the nerve and slight wrinkling of the walnut leaves. The population dynamics of aphids seems to be directly influenced by temperature and leaflet age; among natural enemies *Coccinella* spp.

Actively control aphid population at higher densities (Sluss, 1967). Ginzel (2010) reported that aphid pests play a major role for reduced tree vigour, nut size and yield. Further, the excretion of honey dew by aphids is the most influencing factor for declining of crop yield.

We reported three bugs *M. stramineum*, *A. pilipes* and *P. cingalensis* feeding on walnut leaf sap. They possess long stylets which are inserted into leaves which result in the aridness and dropping of the nuts due to peroxidase activity (Bostock et al., 1987).

McGavin (1993) observed that herbivory bugs have wide host range and their damage result in the formation of galls & bumps on leaves and a vulnerable source for the transmission of various viral diseases.

Our study is in conformity with Jones and Jones (1966) who reported *Mylocerus* sp. as the serious pest attacking leaves by skeletonizing it and leaving behind only mid rib. Among lepidopteron pests *Chaetoprocta odata* and *Ershoviella musculana* was found to cause more damage.

All larval stages were found to feed voraciously and were similar with the findings of Khan et al (2013) who revealed pest causes defoliation and damage to sprouting buds affecting both young and old walnut trees.

Two Curculionid beetles, i.e., *M. fotedari* and *S. nitidus* were also found to infest walnut trees. Adult stage of *M. fotedari* is usually present on the foliage of walnut trees and larvae bore the internal tissue of tree.

The weevil attains potentially injurious dimensions in the month of June, when its incidence is higher on account of an increase in the population density due to the rise in temperature and the emergence of new generation adults (Ahmad and Dar, 1974).

In the present study, adults of *M. fotedari* were observed as active feeders of foliage and thus reduced the photosynthetic capacity of host tree, which seems to have direct influence on overall

yield. In our study, we also reported both larvae and adult stages of *S. nitidus* under the bark of host tree. *Scolytus nitidus* is a predominant shot-holeborer which has caused considerable losses to fruit trees especially apple plantations in Kashmir (Buhroo and Lakatos, 2007).

Thus survey of pest species found associated with walnut shows different type of damage. In Kashmir most of the pest species have not been studied in detail; further research is needed mostly in developing the specific integrated management practices which are eco friendly like use of entomopathogens. Furthermore, the present study revealed the different pests, their taxonomic characters and feeding activity on different parts of tree. Thus, correct identification of the pest and to know its type of damage is essential component of any pest control management.

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