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Bionomics of weevil *Xanthochelus faunus,* a pest of medicinal plant (snow lotus) *Saussurea heteromalla* *

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The weevil *Xanthochelus faunas* Olivier (Coleoptera:Curculionidae) is a serious pest of *Saussurea heteromalla,* a wild medicinal plant in Poonch and Rajouri of Jammu. *Saussurea* of Asteraceae is well known for its role in ethnobotany, phytochemistry and ethnopharmacology (Duan *et al.* 2002, Pandey *et al.* 2007, Yu *et al.* 2007). Commonly known as sawwort and snow lotus, *S. heteromalla* is known from only Himalaya and reported as an endangered medicinal plant from China (Dennis 2006). Dried root is used as an anti-inflammatory drug, used for the treatment of rheumatoid arthritis, cough with cold, stomach ache, dysmenorrheal, and altitude sickness, and has been found to have antibacterial (Gautam *et al.* 2001), anti-inflammatory (Gokhle *et al.* 2002), cardiotonic, abortifacient, anticancer, and antifatigue actions (JingMing and ChunFu 2008). Plant extract had been used against stored pests, viz *Rhyzopertha*

Table 1 Bionomics and morphometrics of *Xanthochelus faunus* on *Saussurea heteromalla*

Egg period	9.8±0.53 (8–12)	Egg	L 1.01±0.03 (0.82–1.31) B 0.73±0.02 (0.60–0.97)
Larval period	48.6±0.78 (45–52)	I instar	L 0.98±0.08 (0.78–1.23) B 0.41±0.00 (0.40–0.42)
Pupal period	14.2±0.44 (12–16)	Head capsule	L 0.46±0.01 (0.45–0.48) B 0.45±0.00 (0.44–0.46)
Copulation (min.)	15–30	II instar	L 1.73±0.11 (1.35–2.51) B 0.60±0.03 (0.45–0.93)
Total life-cycle	66.8±0.85 (63–70)	Head capsule	L 0.52±0.01 (0.48–0.60) B 0.57±0.01 (0.48–0.60)
Gall size	L 15.14±0.22 (11.00–18.00) B 8.82±0.17 (6.00–11.00)	III instar	L 3.87±0.12 (3.00–4.00) B 1.50±0.00 (1.40–1.55)
Seasonal occurrence, generations	March–August, 2	Head capsule	L 0.95±0.01 (0.90–0.97) B 0.91±0.01 (0.86–0.93)
Infestation%	76.57±4.59 (50.4–93.4)	IV instar	L 4.62±0.18 (4.00–5.00) B 2.00±0.00 (1.90–2.10)
Pupa	L 12.07±0.24 (9.00–13.00) B 3.95±0.11 (3.50–5.00)	Head capsule	L 0.97±0.01 (0.93–1.05) B 0.92±0.01 (0.90–0.97)
Adult period (in gall)	5.8±0.25 (5–7)	V instar	L 9.62±0.50 (7.00–11.00) B 2.81±0.09 (2.50–3.00)
Pre-oviposition period	8.1±0.38 (7–10)	Head capsule	L 1.33±0.08 (1.05–1.68) B 1.24±0.05 (1.01–1.36)
Adult	L 13.5±0.60 (9.00–18.00) B 5.10±0.21 (3.50–7.00)		

*All periods in days and measurements in mm; L, length; B, breadth. Data in parentheses are range; otherwise Mean±SE (n=30)

*Short note

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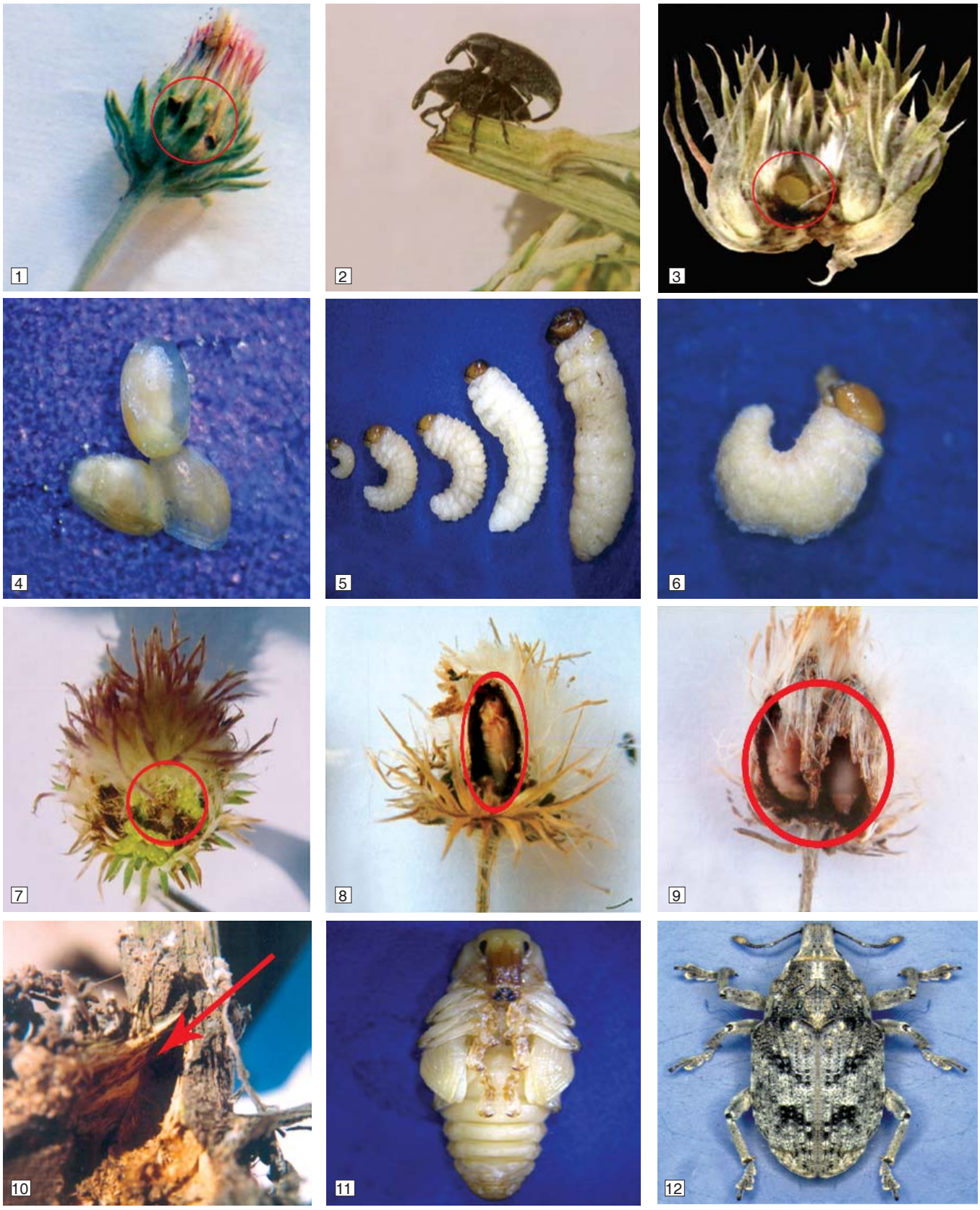

Figs 1–12 Damage due to oviposition; 2. Mating pair; 3. Egg in niche; 4. Eggs; 5. Different larvae; 6. Final larva; 7. Larva feeding immediately after hatching; 8. Single pupa; 9. Double pupae; 10. Damage due to gall at the base of stem; 11. Pupa; 12. Adult.

dominica (F.) (lesser grain borer) and *Tribolium castaneum* (Herbst) (rust-red flour beetle) (Harish *et al.* 2003, Chander *et al.* 2000). The importance of weevil *X. faunus* as a pest of *S. heteromalla* and details on its bionomics are provided herein.

The adult defoliates *Zizyphus* spp (ber) and *C. fulcarneri* too but breeding has been recorded only in the flower buds of *Saussurea*. Collections were made from Bhainchh, Kanoyian, Poonch, Khanetar and Lassana from Poonch district of Jammu, where *Saussurea* is commonly available during 2005–08. Rearings were made on potted cage plants, oviposition studied under field conditions in cages, and to determine the larval period cellular rearing was done. Freshly oviposited places on uninfested shoots were covered by thin wire mesh cages and examined regularly. For morphological studies larvae, pupae and adults were preserved in 90% ethyl alcohol, and for determining instars, Dyar's law was used (Dyar 1890).

Larvae more destructive, maximum of six adults and 14 individuals of different stages were recorded/plant, and incidence ranged between 50 and 93% with a mean of 76.57±4.59%. Scratched succulent stems, notched margins of leaves, and oviposition holes at the bases of flower buds are the symptoms (Fig 1). Dried skeletonized leaves, circular exit holes in the dried flower buds made by first generation adults, their development, and galls made by the larvae of second generation leads to loss of vitality and vigour, and sickly appearance. The details of bionomics provided in Table 1 reveal that adults emerge from third week of March to end of August, and development is slow and steady with overlapping generations. After 10–20 min. of courtship, the male succeeds in riding over the female, which was then held firmly by its legs and during the process of copulation; antennae remains raised directed upwards and forward (Fig 2); copulation usually lasts for 15–30 min. but if undisturbed continues for 3–4 hr. During copulatory process female moves from one branch to another, feeds on the soft stem by scratching with male on its back. With slight disturbance copulatory pair falls to the ground, get separated and feigns death.

Preoviposition period is of 7–10 days, with a mean of 8.1±0.38 days. Female makes a hole in the developing flower bud in the basal region sitting on the flower facing its head towards the soil, depth corresponding to the length of the snout. After preparing the egg niche, it turns around and deposits a single egg and subsequently plugs it with the chewed sepals mixed with a yellowish-sticky secretion spread into an oval flap. When fresh this flap is light-green, after one-and-a-half to two days turns black. The older flowers are avoided because the seeds are matured. Generally single egg observed but sometimes second also seen but in an opposite hole; also recorded four to five eggs per flower laid at equal distance when flower buds or host plants is limited. Freshly laid eggs are oval, elongate, shiny soft, creamish white (Fig 3, 4), later colour changes to light-brown.

Larval phase includes 5 instars (Figs 5, 6, Table 1). Immediately after hatching, the neonate larva begins to feed voraciously on the developing seeds around the site of injury within the flower (Fig 7). Feeding excludes the outer most 1 or 2 rows of seeds, which are used for protection. Morphometrics of measurements are given in Table 1. Larvae continue its feeding till it becomes fully mature and gets ready for pupation. Excreta are used for building an elongate, dome-shaped dark brown pupal chamber which is subsequently covered externally by the outer flower parts (Figs 8, 9).

In June the second generation adults were observed to lay eggs in the soil near the basal part. After hatching larvae penetrate into the basal part and develop galls (Fig 10) and pupate in the pupal chamber made within the gall. Pupa exarate, creamy white or light yellowish and transforms into teneral adult which emerges through emergence hole (Figs 11, 12). Females slightly larger than males, with a broader abdomen and dark brown snout. Elytra with fine light yellow hairs, two irregular grey scaling with hairs running obliquely on either side and black punctation in parallel rows present on each elytra dorsally. Adult very active and immediately responds to even a slight disturbance and by a little but prompt movement it just turns around the stem or moves on the ventral side of the leaf, and feign death. The ventral surface being dirty white with black spots exactly camouflages and fallen dry leaves seem to provide a successful protection.

SUMMARY

X. faunus Olivier has been observed as a serious pest of *S. heteromalla,* an important medicinal plant. Though adults also feed on *Zizyphus* spp (ber) and *Cersium fulcarneri,* its breeding has been recorded only in flower buds of *Saussurea*, being the first record of its occurrence as a pest. Adults remain active from third week of March to August and population reaches its peak during May, coinciding with the host availability, and a mean incidence of 76.57±4.59% recorded. Copulation normally lasts for 15–30 min. and generally a single egg observed/flower. Egg, larval and pupal periods are 8–12, 45–52 and 12–16 days, respectively. Larvae are whitish, apodous, C-shaped and pass through five instars. Teneral adults remain in the pupal chamber made within the gall for 5–7 days. Total life-cycle takes about 63–70 days and at least two generations observed from March to August.

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