



New record of coffee white stem borer *Xylotrechus quadripes* Chevrolat on *Psilanthus bengalensis* in India

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Xylotrechus quadripes Chevrolat (Coleoptera: Cerambycidae), commonly known as coffee white stem borer (WSB), is the most destructive insect pest of arabica coffee (*Coffea arabica* L.) in India. Incidence of *X. quadripes* was not recorded so far on any species of *Psilanthus*, a close wild relative of *Coffea*. For the first time, severe incidence of *X. quadripes* was observed on *P. bengalensis* (Heyne ex J.A. Schult) Leroy. Infested plants showed typical symptoms like wilting, defoliation and death of branches and whole plants. Typical ridges and exit holes were also seen on infested stems. Tunnels tightly packed with a white, powdery frass were recorded in the infested stems. Other two species of *Psilanthus* studied, viz., *P. travancorensis* and *P. wightianus* were not infested by the pest.

Coffea L. is the genus from which the beverage coffee is produced. Even though the genus *Coffea* comprises of 103 species (Davis *et al.*, 2006), *C. arabica* L. (arabica) and *C. canephora* Pierre ex Froehner (robusta) are the only two coffee species cultivated commercially worldwide. Arabica and robusta contribute around 65% and 35% to global coffee production, respectively (www.ico.org). Genus *Psilanthus* Hook. f. with 22 species is the closest relative of *Coffea* (Davis *et al.*, 2007). The two genera together constitute the tribe Coffeae DC (Robbrecht, 1988) and the species coming under them are generally called as coffees. *Xylotrechus quadripes* is the most destructive pest of arabica coffee in India (Anon., 1998; Seetharama *et al.*, 2005; Sreenath and Prakash 2006). The grubs bore into the stem and commonly kill the plants.

Plants of *P. bengalensis*, *P. travancorensis* (Wt. & Arn.) Leroy and *P. wightianus* (Wt & Arn.) Leroy along with several accessions of arabica and robusta coffee, as well as, other tree and bush species were grown in the experimental garden of about 0.75 ha at Plant

Biotechnology Division, Mysore (PBDM). Coffee plants grown in the experimental garden were 5 to 15 years old. *P. bengalensis* plants were raised from the seeds collected from wild plants growing at Regional Coffee Research Station, Diphu, Assam and from the seeds collected from the cultivated plants grown at Central Coffee Research Institute (CCRI), Chikmagalur, Karnataka. *P. bengalensis* plants grown at CCRI were raised from the seeds originally collected from North East India a few decades back. *P. travancorensis* and *P. wightianus* plants were raised from the seedlings collected from their natural habitats in the forests of Tamil Nadu. Coffee plants comprising arabica, robusta and *Psilanthus* species grown at PBDM were studied from October 2007 to September 2010 for natural infestation of *X. quadripes*. Initially the plants were screened for presence of external symptoms. The plants showing the external symptoms were further studied internally by splitting open the affected stems.

Out of three *Psilanthus* species screened, severe incidence of WSB was noticed on *P. bengalensis*. While the healthy plants retained the full complement of green leaves (Fig.1a), WSB-infested plants showed typical symptoms like wilting, defoliation and death of branches (Fig.1b) and whole plants (Fig. 1c). Circular exit holes of 2-3 mm diameter were seen on infested stems (Fig.1d), indicating the emergence of adult beetles. The infested stems showed also localized swellings, as well as, typical ridges (Fig.1e) and tunnels tightly packed with a white, powdery frass (Fig.1f). Pupal chambers were also seen at the ends of the tunnels just inside the exit holes (Fig.1g). Some dead stems of *P. bengalensis* plants killed by *X. quadripes* were seen colonized by termites. In such stems, the frass deposit was apparently consumed by termites and the tunnel was lined with mud (Fig.1h).

Adult beetles were trapped by caging the infested plants with nylon nets. The emergence of beetles from *P. bengalensis* coincided with the two emergence periods reported for *X. quadripes* on *C. arabica* i.e., April-May and October-December. One or two beetles (Fig. 1i) were trapped from each infested plant of *P. bengalensis*. The pest was identified as *X. quadripes* by studying

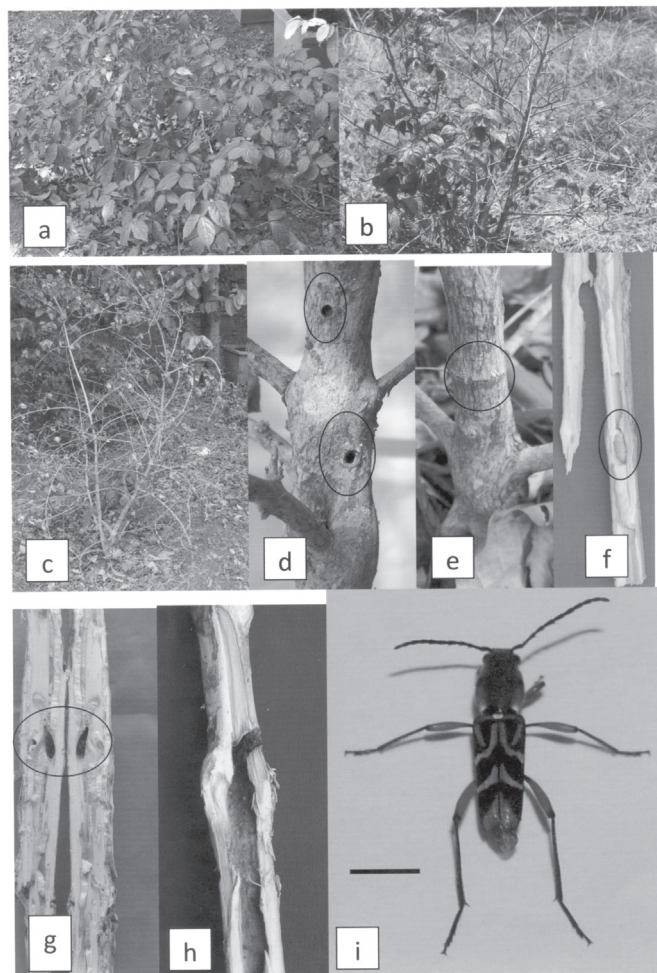


Fig.1. Incidence of *Xylotrechus quadripes* (coffee white stem borer) (Coleoptera: Cerambycidae) on *Psilanthus bengalensis*.

a, healthy plant; **b & c**, partially and completely dead plants respectively, due to *X. quadripes* infestation; **d**, exit holes (circled) formed by the emergence of *X. quadripes* beetles; **e**, ridge (circled) formed due to *X. quadripes* infestation; **f**, Infested stem split open to show tunnels tightly packed with powdery frass. A grub (circled) at advanced stage is also seen in the tunnel; **g**, WSB-infested stem split open to show tunnels filled with frass, as well as, a pupation chamber (circled); **h**, dead stem due to *X. quadripes* incidence subsequently colonized by termites, hollow tunnel lined with mud is seen; **i**, an adult beetle of *X. quadripes* trapped from *P. bengalensis* stem. Scale = 3 mm.

morphology of the adult beetles. Morphology of the beetles from *P. bengalensis* was identical to those from *C. arabica*, particularly in the inverted “V” markings on the fore wings which are characteristic of the species (Lan and Wintgens, 2004). The beetles also exhibited characteristically long antennae of the family Cerambycidae (commonly called long horned beetles), to which *X. quadripes* belongs. The length of the antennae was around half the length of the beetles. The beetles collected from the *P. bengalensis* varied in length from 5.4 mm to 10.4 mm and in breadth from 1.4 to 2.8 mm. The *X. quadripes* beetles from *C. arabica*, ranged in length from 10 mm to 20 mm and in breadth from 3.4 to 4.5 mm (Anon., 1998; Lan and Wintgens, 2004). Thus, *X. quadripes* beetles from *P. bengalensis* were significantly smaller in size compared to those from *C. arabica*. Both male and female beetles were trapped from *P. bengalensis*. The females were identified by the presence of ovipositor.

In the mature (>4 year old) plants of *P. bengalensis* the woody stems reached a thickness of about 2.5-3 cm near the ground and gradually narrowed upwards. The pest attack was seen restricted to woody stems that were at least 1 cm thick. The pest incidence was more towards the ground level. Just as in *C. arabica*, infested stems had tunnels tightly packed with a white, powdery frass resulting from the feeding of WSB grubs. The tunnel made by each grub was several cm long and up to 1 cm wide near the exit hole. The tunnels in *P. bengalensis* were seen mostly along the length of the stems, possibly restricted by the narrow stems. In contrast, in *arabica* the tunnels are made in all directions, possibly enabled by wider stems. Because of the narrow width of the stems of *P. bengalensis*, infestation by even 1 or 2 WSB grub could be enough to kill the affected branch. If the pest attack was not very close to the ground, while the affected branches were killed, the branches attached below the infested stems remained live. However, when the infestation was very close to the ground on the main stem, the whole plant was killed. Several mature plants of *P. bengalensis* grown in the premises were killed by the pest over a period.

In contrast to the above findings, none of the several plants of *P. travancorensis* and *P. wightianus* showed any symptom of *X. quadripes* infestation, indicating their non-preference to the pest. All *arabica* accessions grown in the premises showed severe infestation of *X. quadripes* with all the characteristic symptoms, including the exit holes. Several *arabica* plants also died due to *X. quadripes*. Robusta plants grown in the premises occasionally exhibited symptomatic ridges

of *X. quadripes* incidence, but there was no further damage, indicating the pest's inability to complete its life cycle on the species.

The present finding of the incidence of *X. quadripes* on *P. bengalensis* has enlarged the list of alternate hosts of the pest. Earlier, several species of plants like, *Cudrania javanensis*, *Jasminum dispernum*, *Rhus semiciliata*, *Gardenia species*, *Olea dioica*, *Ixora coccinea*, *Oroxylon indicum*, *Randia dumetorum*, *Randia spinosa*, *Wendlandia myriantha*, *Tectona grandis* are reported to be alternative hosts to the pest (Anon., 1998). However, most of these findings are based on laboratory experiments on cut stems; whether the pest is able to complete its life cycle on any live plant of these species is not clear. In teak (*Tectona grandis*) successful completion of borer development was possible only on dead/drying stems, but not on live plant (Venkatesha and Seetharama, 1999). Hence, the present study is one of the rare instances of *X. quadripes* completing its life cycle on a live host plant.

Geographically *X. quadripes* is distributed in India, Bangladesh, Myanmar (Burma), Southern China, Thailand, Vietnam, Java (Indonesia) and Sri Lanka (Anon., 1996; Rhainds *et al.*, 2002; Lan and Wintgens, 2004; Seetharama *et al.*, 2005). While *Psilanthus* species predominate South and South East Asia, all *Coffea* species occur naturally in tropical Africa and neighboring islands (Davis *et al.*, 2006). Thus, geographic distribution of the *X. quadripes* has more correlation with the geographic distribution of *Psilanthus* species rather than *Coffea* species. The present study has clearly shown that, *P. bengalensis*, one of the indigenous wild coffee species in India, is susceptible to *X. quadripes*, but *P. travancorensis* and *P. wightianus* are not-preferred by the pest.

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