# First report of stem borer (*Xylotrechus smei*) occurrence on red sanders plantations of Tamil Nadu and Gujarat


## Abstract

The first occurrence of the stem borer *Xylotrechus smei* (Cerambycidae: Coleoptera) in red sanders from Tamil Nadu and Gujarat, India, is reported in this communication. The pest was observed in plantations of red sanders in Dharmapuri and Tenkasi districts of Tamil Nadu and also in Surat, Navsari and Tapi districts of Gujarat, India, during August 2023. In both places, young (2-16 year age) trees were attacked, with incidence levels ranging from 2.24 to 10.86% in the affected plantations. Infected trees show the presence of galleries, bore holes in cut stems, complete drying and mortality. Larvae initially feed on the bark and later instars tunnel through the cambium and wood of red sanders, where they can obstruct nutrition and lead to tree mortality. The larval stage of stem borer tunnelling deep inside the wood, thus making it hard to kill with pesticides. The beetle has peak emergences during April to May and November to December, when the adult beetles find mates and select host plants for egg-laying. This report serves to characterize red sanders damage and document monitoring efforts to assist with interim management programs.



Key words: Stem borer, *Xylotrechus smei*, red sanders, First record, Tamil Nadu, Gujarat, Interim management




## Introduction

*Pterocarpus santalinus* L. f., commonly known as red sanders, is an endemic tree species confined to the southern pockets of the Eastern Ghats, India. The tree is valued for its blood red coloured hard heartwood for which the demand in global market is increasing in a faster pace similar to gold. The wood is used in making high value furniture, musical instruments and the santalins extracted from wood is put to use in textile, food and pharmaceutical industries. Besides, the heartwood is also used for medicinal purposes in the treatment of coughs, digestive tract problems and fluid retention. In its recent threat assessment, International Union for Conservation of Nature and Natural Resources has placed the species in 'Endangered' category, up listing from its earlier 'Near Threatened' category. The species is listed in Appendix 1 of CITES which restricts international trade of its wood and wood products from natural sources. The species is naturally distributed in 3.98 lakh hectares of scattered forests. The cultivation of this species on farmland is

getting popular. Extensive cultivation by State Forest Department and farmers has lead to incidence and spread of insect pests in nursery and plantations. The insect-pest complex of red sanders that attacks nurseries, plantations and natural forests is undetermined.

**Material and Methods**

A field survey was conducted to evaluate insect pests of red sanders in Dharmapuri and Tenkasi District of Tamil Nadu and Surat, Navsari, Tapi Districts of Gujarat. For comparison study experiment was conducted in both natural population and plantations in Tamil Nadu. For present study 2-30 years old plantation was selected in all the locations. Diameter at breast height (DBH) was measured for each sample tree and mean annual increment (DBH/year) was calculated for each stand. The number of holes bored by stem borers and their height from the ground level were recorded for each sample tree. In addition, felled red sanders trees and identified the attacking insects and determined their developmental stages.

**Results and Discussion**

During the month of August 2023 survey was undertaken different districts of Tamil Nadu and Gujarat. Out of which plantations in Dharmapuri and Madurai districts of Tamil Nadu and Surat, Navsari districts were severely infested by the stem borer and caused 10.86 per cent mortality in 2 to 16 year old plantations. Infected trees show the presence of galleries, bore holes in cut stems, complete drying and mortality as shown in Fig 1. This is a first report of stem borer infestation on red sanders plantations in Tamil Nadu and Gujarat states of India. Studies on biology of pest would enable the development of specific management measures. Control of such insect-pests has a potential role in substantial economic gain.



Fig. 1. Stem borer damage in red sanders: (a) Grub visible in the tunnel (b) Tree mortality (c) Adult emergence/exit holes from infected tree (d) Heap of infested dead trees in plantations

**Habit:** Female lay eggs only when bark is present, debarked, sawn and seasoned timber are not attacked. The maximum number of eggs laid by a female is 190 and maximum laid in 24 hours to 60. The longest recorded oviposition-period is 6 days in April. Eggs are laid in cervices and covered depressions on the surface of bark in large clusters. The eggs hatch in 4 to 5 days in April (Beeson,1941).

**Larva:** White, robust, head is dark with mandibles strong. The larvae on the inner aspect of the bark and outer aspect of the sapwood excavate tunnels of regular natureand ultimately proceed inwardly where they make deeper tunnels densely packed with wood dust. Such tunnels remain intercalated speaking of a crowded chamber. The rate of larval development is variable. By inoculating newly hatched larvae in the freshly cut logs between the 5$^{th}$ and the 14$^{th}$April the emergence of beetles was obtained as early as the 14$^{th}$ June. The shortest larval period under these conditions was 52 days in April and May (Beeson, 1941). According to Gardner (1927), the head capsule of larva is sub rectangular, slightly wider behind and not

strongly transverse. Antennae are prominent with second joint distinctly longer than third. Legs are hardly visible with a hand lens but under the microscope leg isseen to consist of two very short circular joints with minute apical spines. The first stage larva has biforous spiracles. *X. smei* attacks newly felled trees within a month of felling and also several months after felling; grilled trees and the crowns of dying or stag headed trees are dead. Logs stored in sun are more liable to be attacked than logs stored in the shade but the preference is not very strongly marked. The larval tunnels are excavated on the surfaces of the sapwood and inner bark, are flattened ovalin section and tightly packed with barkand wood-dust; in a crowded infestation the tunnels closely interlace. In the timbers havea strongly differentiated heart-wood, the borings are confined to the sap-wood, but in homogenous wood the tunnels may run right in the centre of the log and trend irregularly or are more or less concentric with the zones of growth. The beetle escapes by the prepupal tunnel and makes a circular exit hole in the bark (Beeson,1941).

**Pupa:** Length of pupa is 17 mm, head rounded, cheeks shorts, abruptly hooked attheir apex and above carinate along the cutter side, pubescent at the base, labrum longitudinally striate, with short recumbentsetae, clypeus transversally striate, pubescent at sides, forehead with V-shaped carina, the tip of which reaches the level oflower margin of the eyes and the ends exceedthe level of antennal supports forming anoval-elongate flat tubercle and reaches thehind margin of the head. Joints of the palpi subquadrate, their end rounded. Antennae are short, $10^{th}$ joint reach the front knees.Pronotum is rounded, very feebly constricted at the base, smooth, with twolittle cluster of 7-8 sparse short conical spinules at each side, one at the base and another a little behind the middle of lateral margin, well visible from the ventral side; mesonotum and metanotum fairly punctate. Pupal chamber is about 15-20 cm long formed at a short depth in the sapwood. The chamber is continuous withthe larval tunnel. They however do not formany such chamber in the heart wood Vitali (2004).

**Adult:** Beetle is 10-18 mm long, brown witha greyish or yellowish pubescence on head, prothorax and forming bands or spots on elytra. The colour of marking varies from almost entirely yellow to grey and elytra pattern varies from an apical and basal bandand 2 lateral spots to an apical and basal band connected to a post-median and an antemedian band and a humeral spot. Theprothorax may be reddish (Beeson,1941).According to Stebbing (1914), length ofbeetle is 11-17 mm in length and 3-5 mm inbreadth, brown from above with a grayish or yellowish pubescence covering the head andmost of the prothorax and forming

bands andspots on the elytra. Body from beneath ismarked with spots or bands of whitishpubescence.

**Life cycle:** Emergence of *X. smei* begins at the end of March from over wintered broods and is at its peak in May-June and continues to the end of the November. Eggs laid in April-May give rise to short-cycle and long-cycle generations,the former taking 2 to 7 month and emerging between the beginning of July and the end ofNovember and the later hibernating to emerge in the second year. Eggs laid at thebeginning of July and later in the year do not produce a complete generation in the same year, as the immature beetle or larva passes the cold weather in resting stage and the adult emerges in the second year between the April and November. The shortest life-cycle of overwintering broods is about 6 months and longest might be 6-16 months.

**Other host plants:**

*Adina cordifolia, Aegle marmelos, Anogeissus latifolia, Bauhinia retusa, Bombax malabaricum, Cassia fistula, Dalbergia latifolia, Dalbergia sissoo, Ficus religiosa, Gmelia arborea, Grewia tiliaefolia, Holoptelia integrifolia, Mallotus philippinensis, Mangifera indica, Morus indica, Shorea robusta, Tectona grandis, Terminalia tomentosa, Vitis latifolia* (Beeson,1941).

**Extent of Damage/Status:**

A survey was conducted at Dharmapuri, Madurai and Tenkasi, districts of Tamil Nadu during August 2023. Outbreak of stem borer was observed in 2 to 16 years old red sanders plantation nearly 7.10 to 9.42 % damage. Infected trees show the presence of galleries, bore holes in cut stems, complete drying and mortality. During second fortnight of August survey was carried out to assess the stem borer infestation in red sanders plantations of Navsari, Surat and Tapi district of Gujarat. Severe outbreak of stem borer was noticed in farmers cultivated plantations, exit holes with wood frass were noticed in infected trees. Maximum stem borer infestation (10.85%) was noticed in 15 year old plantation in Dhamdod village, Surat. Details of survey and documentation of stem borer and their incidence in red sanders plantations is given in Table 1.

**Table 1 Localities surveyed for *Xylotrechus smei* in Tamil Nadu and Gujarat, India and extent of damage on red sander plantations**

| Locality | GPS coordinates | Area surveyed (in acres) | Number of trees infested | Number of Larvae/grub per tree |
|---|---|---|---|---|
| Harur, Dharmapuri District, Tamil Nadu | $12.04696^0$N $78.48327^0$E | 5.00 | 39 | 4 |
| Puliyankudi, Tenkasi District, Tamil Nadu | $9.17589^0$N $77.39552^0$E | 20.00 | 78 | 2 |
| Dhamdod village, Surat District, Gujarat | $21.50182^0$N $73.00123^0$E | 18.75 | 83 | 7 |
| Tapi, Gujarat | $21.2789^0$N $73.6065^0$E | 2.00 | 35 | 5 |
| Sunthwad Village, Navsari District, Gujarat | $20.49530^0$N $73.05439^0$E | 0.25 | 4 | 3 |

Farmers are facing problem in their plantation due to a severe infestation of stem borer. Tree growers are following shifting cultivation due to pest invasion. Stem borer causes the mortality of trees and it is a potential threat to red sanders cultivation. It reduces the quality of timber there by being a significant factor in the decline of this tree species that must be managed. Farmers are practicing traditional method such as smearing of red mud to bark of red sanders at the height of 150 cm from base, though pest incidenceis not under control or tolerance level. Since, there is no specific management measures exist as of now, only prophylactic measures are given here to control the stem borer in red sanders plantations.

**Interim management:**

Sanitation of the red sanders plantation, affected parts should be pruned and buried or burnt before the flight period starts (April–May and October–December). After two years, temporary shade species are planted to avoid direct sunlight to stem. Follow common

technique such as hand-picking of larvae and destroy it. Cross vane pheromone traps are mainly used to attract the beetles during the peak flight periods. Trapping can be effective in bringing down the pest incidence at low densities and also helps in proper monitoring of the field. Use botanicals such as stem swabbing with Neem oil @ 5 ml per litre of water during the time of November and April to avoid egg laying. Application of white muscardine fungus *Beaveria bassiana* @ 2.5 % to bore holes.

**Conclusion**

The present study reports the infestation of red sanders by *X. smei* for the first time from Tamil Nadu and Gujarat, India. Considering the importance of red sanders and severity of *X. smei* on red sanders, control measures are needed for effective management of this pest from both economic and conservation point of view.

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