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STUDIES ON TERMITE INFESTATION ON *TERMINALIA ARJUNA* AND POSSIBLE MANAGEMENT PRACTICES

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ABSTRACT

Termites are polyphagous eusocial soil arthropods and most dangerous insect pest for different cultivated crops. Similarly in tasar sericulture sector also the termite damage on silkworm host plants has negative impact on quality leaf production. Present study was conducted at Bilaspur and Kargi Kota (Chhattisgarh) to know the level of infestation of termites on Terminalia arjuna plants. Study revealed that on an average of 4.50 % and 6.76 % of plants were infested with termites at Kargi Kota and Bilaspur, respectively. Plant mortality due to termite attack was also high on young plants in comparison to matured plants. Newly transplanted saplings were more frequently attacked by the termites and infected plants dries-up immediately and such saplings were get pulled out easily from the soil. Termites feed on mature T. arjuna plants without killing them. Infestation was found up to 4-5 ft above ground level. Visually, infected plants appears poor & stunted growth, less leaf yield and sickly appearance were the common symptoms of termite infestation on mature plants. The study confirmed that both young and mature plants get affected by the termites resulting in poor growth and development of plants.

KEY WORDS: *Termite, Soil arthropods, Chhattisgarh, Terminalia arjuna*

INTRODUCTION

Sericulture is an employment oriented and low capital activity for poor tribal families best suited as an agro-based industry. It is an effective approach of rural upliftment which has number of advantage. India is a unique country which has advantage of having all the four varieties of Silks namely Tasar, Mulberry, Muga and Eri. The role of tasar sericulture industry is now well established as an ideal forest based system which can cater the needs of low income group stakeholders. Tasar silk is famous as Kosa Silk all over India. The *Antheraea mylitta* belongs to the family Saturniidae and is usually known as tasar silkworm. This insect can prosper on leaves of several plants like Arjun, Ber, Asan, Sidha, etc. The host plants of tasar are available as natural plantation or in from of economic plantation done by Central Silk Board, State Department of Sericulture or Forest Department.

Termites, popularly known as the 'white ants' belong to the order 'Isoptera', are found abundantly in the terrestrial ecosystems and live in colony as a social animal in the soil by constructing earthen mound. Termite infestation is detrimental for many forest plant species including tasar host plant (Mandal et al., 2010). The stakeholders are not aware or concerned about its implications. Due to lack of information and negligence on the part of stakeholders, the situation is becoming a matter of concern in traditional tasar zones. Termite infests taproots of especially young host plants immediately below the soil, this intern results in damage to the central root system and creation of cavities which then becomes filled with soil. The infested plant not only experience root damage but in extreme conditions, the infestation reaches up to the bark, resulting in secondary infection and ultimately leading to death of the plant. This results directly on economic loss and has a negative impact on income of marginal farmers due to reduced silkworm brushing capacity and cocoon yield.

In Indian termite fauna has approximately 338 species, 37 genera and 07 families. About 35 species have been reported damaging crops and timber in buildings. Various termite species are known to attack on crop plant are belonging to family Termopsidae, Hodotermitidae, Kalotermitidae, Rhinotermitidae, Stylotermitidae, Indotermitidae and Termitidae. Major

pestiferous species in Termitidae are *Odontotermes boveni* (Thakur), *Odontotermes brunneus* (Hagen), *Odontotermes feae* (Wasmann), *Odontotermes guptai* (Roonwal and Bose), *Odontotermes indicus* (Thakur), *Odontotermes obesus* (Rambar), *Odontotermes redemanni* (Wasmann), *Odontotermes wallonensis* (Wasmann), *Macrotermes convulsionaries* (Konig), *Microceretermes beesoni* (snyder) and *Microtermes obesi* (Wasmann), and in Rhinotermitidae are *Coptotermes hemi* (Wasmann), and *Heterotermes indicola* (Wasmann) (Roonwal and Chhotani, 1989; Mahapatro and Chatterjee, 2018; Paul et al., 2018).

The *T. arjuna* plantation, both block as well as natural plantation, utilizing for rearing of tasar silkworm are usually in the rainfed condition and such plantation is susceptible for termites. In this communication, we are reporting the occurrence and feeding behavior of termite on *T. arjuna* plants and possible management strategies adopted for their control.

MATERIALS AND METHOD

The study was conducted at Bilaspur and Kargi Kota regions of Chhattisgarh. Bilaspur is situated between 21°47 and 23°8 North latitudes and 81°14 and 83°15 East Longitudes. The climate is sub-tropical, semi-arid, continental and monsoon type. A total of 2.5 ha area having nearly 7000 Arjuna plants was selected for the study at Bilaspur. The Kargi Kota is located at 22.3°N 82.03°E AMSL 330 m and nearly 17.5 ha areas having more than 30000 Arjuna plant were selected for this study. The climate in Kargi Kota is similar to Bilaspur.

Survey was conducted during summer, 2018 for termite infestation and recorded the percentage of infestation and nature of damage caused by the termites on young and mature *T. arjuna* plants.

RESULT AND DISCUSSIONS

Study revealed that on an average of 4.50 % and 6.76 % of plants were infested with termites at Kota and Bilaspur, respectively. Observations indicated that the termite infestation was substantially high at the base of the plants compare to middle and top of the plants. Plant mortality due to termite attack was also high on young plants compare to matured plants.

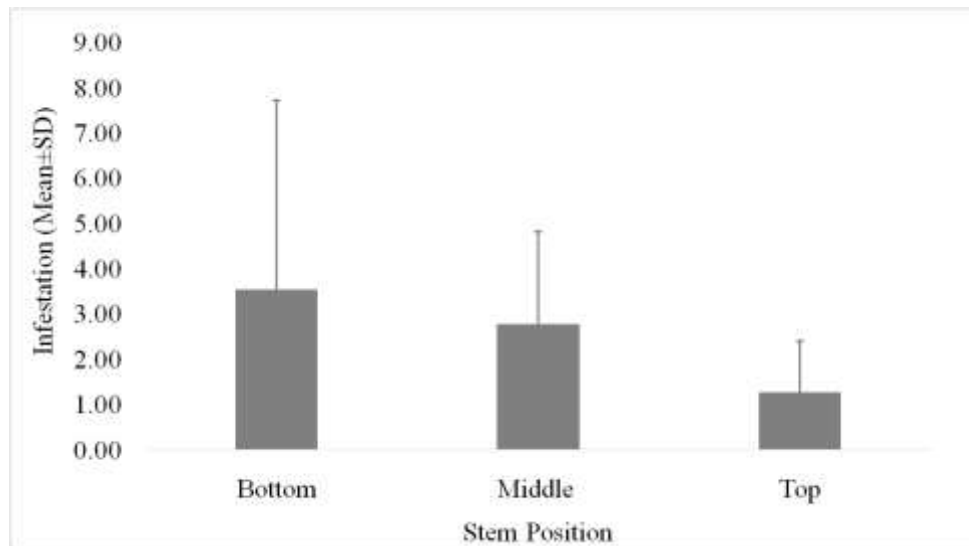


Fig. 1 Termite infestation (Mean±SD) on *T. arjuna* at bottom, middle and top of the plants

Newly transplanted saplings were more frequently attacked by the termites. They live in the soil and feed on root system as well as main stem by constructing earthen runways. Entire plant dries up and such saplings were easily pulled out from the soil. During severe damage, the earthen run ways was

visible at collar region of the plant. Initially, leaves become yellow and later on dries up immediately by exhibiting dieback symptom on the young plants. Termites further feed on such dead young plants by constructing earthen runways throughout the plant.



Fig. 1 Young *T. arjuna* plants infested by the termite

Termites feed on mature *T. arjuna* plants without killing them. Infestation was found from ground level to 4-5 ft above ground level. They constructed earthen runways and feed inside on dead part of the plants, preferably outer bark, inner bark (cork cambium & secondary xylem), vascular cambium

and sap wood of the plant. It affects translocation of food and water, thereby affecting the vigor of the plants. Visually, poor & stunted growth, less leaf yield and sickly appearance were the common symptoms of mature plants infested by the termites.



Fig. 3 Termite mound, infected plants of *T. arjuna* plant and their feeding pattern.

Nageswara Rao and Sammaiah (2012) studied the seasonal foraging activity of subterranean termites on forest plants of Mulakalapally region, Khammam (A.P). Two distinct foraging patterns were identified in the species of termites. The *Microtermes* sp. and *Coptotermes* sp. have strong foraging activity in the wet season. Whereas, peak foraging activity of *Odontotermes* sp., and *Macrotermes* sp., was recorded during the dry season.

The possible management strategy for termites includes clean cultivation, regular agronomic practices, crop rotation and intercropping of non-host plants. The biological control measures by predators and microbial agents are not feasible under tasar sericulture sector due to their effect on silkworm. The spraying of chemicals in the off-season protects the infestation of termites. The Insecticides found effective against termites were Imidacloprid, Carbofuran, Chlorpyrifos, Phorate, Quinalphos and Methyl parathion (Santharam et al., 2002; Singh et al., 2001; Singh and Singh, 2002; Kumawat, 2001).

Ibrahim et al., (2015) conducted a study to promote indigenous pesticides for the control of subterranean termites. Different concentrations (0.5%, 1% & 1.5%) of ethanolic leaf extract of *Gliricidiasepium* (Jacq.) and Dieldrin were prepared respectively and tested against termite infestation. Stakes treated with 0.5% of ethanolic leaf extract of *G. sepium* were severely damaged by termites in one year, similarly stakes treated with 1% were damaged by termites whereas stakes treated with 1.5% were found to be highly effective against termites and Dieldrin treated remained un attacked by termites up to one year. Controlled stakes were severely damaged by termites within six months.

Though there are effective chemical measures for the control of termites but the residual percent of these chemicals have negative impact on tasar rearing as well as on soil fauna during rains, which adversely influence the productivity of raw silk. Hence, in order to have a sustainable approach toward environment, use of botanicals such as crude Neem oil, extracts of *Acacia catechu* (L.), *Canarium strictum* Roxb., *Gardenia gummifera* L.f., *Ferula jaeschkeana* L., *Aloe vera*, *Calotropis latex*, *Tagetes erecta* L., *Musa paradisiacal* L. *Diospyros sylvatica* L. *Uncaria gambier* (Hunter) Roxb., *Swartzia madagascariensis* Desv. *Quassia indica* (Gaertn.) Noot., *Jatropha curcas*, *Maesa lanceolata*, *Chenopodium ambrosoids*, *Vernonia hymenolepis*, *Achyranthes aspera* presents alluring prospects for control of termite infestation in fields (Beeson, 1941; Giridhar et al. 1988; Cheng et al. 2007; Patel and Narasimhacharya, 2017; Addisu et al., 2014). These preparations are readily available in local market and their aqueous extract can easily be prepared at effective concentrations i.e. 25-35 % w/v. Neem oil spray at 0.5% dilution has shown significant results in controlling the infestation. Moreover, one main significant factors like non-toxic nature towards the ecosystem. They have minimum residual effects. In the above context there is urgent need to adopt these greener ways to bring better survivability of saplings and sustenance of tasar sericulture.

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