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New records of host plants used by a weaver ants *Camponotus textor* Forel, 1899 (Hymenoptera: Formicidae)

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ABSTRACT

Weaver ants nest on plants, but the extent of such associations is unknown for many species. Literature records of weaver ant host plants from 1945 to 2016 showed that *Camponotus textor* Forel (= *Camponotus senex*), the Brazilian savanna weaver ant, was recorded on 17 plant species belonging to 11 families. The field survey recorded nine plant species in eight families at Brazilian Cerrado. Overall, The list was expanded to a total of 24 host plant species and 14 families, including economically important tree species as mango, citrus and jambo trees. This host plants show potential to enhance the establishment of weaver ants, facilitating the role in biocontrol as deterrents of phytophagous insect pests of economically important plants.

Keywords: Brazilian savanna, *Camponotus senex*, host plant, nest, nidification, survey.

Introduction

In tropical regions, ants are among the most abundant arthropods (Hölldolbler & Wilson, 1990; Majer et al., 1994). Ants developed several relationships with plant and animal species ranging from facultative to neutral to obligatory (Jolivet, 1996; Bronstein, 1998; Delabie, 2001; Del-Claro & Torezan-Silingardi, 2012). Specifically, a group of ants, known as weaver ants, are capable of producing the nests with the silk produced by their larvae on host plants (Hölldobler & Wilson, 1977, 1990). The plants used by these ants are considered host because the use of foliage to build nests. For instance, *Oecophylla smaragdina* Fabricius typically uses leaves of a certain 'normal' size that are not very waxy (Blüthgen & Fiedler, 2002) and has been observed some ant benefit to these plant species (Way & Khoo, 1991).

The ants can utilize many plants in a wide range of habitats (Hölldobler, 1993). Host plants also serve as an arboreal hunting ground provisioned with insects and other arthropods that the ant preys on, support trophobiont species that the ant tends for honeydew and nectar exudates that the ant consumes (Blüthgen et al., 2004). Many host plants used by weaver ants have an economic value which could derive benefit from weaver ant occupancy; the prospective applications for this biological control agent are considerable (e.g., Way & Khoo, 1991, 1992; Peng et al., 1995; Sporleder & Rapp, 1998; Van Mele & Cuc, 2000; Van Mele & Van Lenteren, 2002; Van Mele, 2008).

Camponotus textor Forel (= *C. senex*) is an arboreal Neotropical weaver ant that inhabits mature rainforest canopy, where it builds their nests using the silk produced by their larvae to attach leaves (Forel, 1899, 1905; Wheeler, 1915; Schremmer, 1979; Holldobler & Wilson, 1983). The present study brings together all host plant

species records for *C. textor* published since 1899 and through surveys of host plant species used by these ants in the Brazilian Savanna. It may serve as a reference to screen for host plant species to which weaver ant protection could be applied (Van Mele, 2008), as well as hint towards possible plant species with which existing perennial cropping systems could be enriched.

Material and Methods

Checking taxon of weaver ants

It was considered some weaver ants previously classified as *Camponotus senex* (Smith, 1858) and *C.* (*Myrmobrachys*) *textor* Forel due to a historical confusion about these taxa (see Longino, 2006). According to Longino (2006), *C. senex* should be disassociated weaver ants, and in this study, all weaver ants previously named *C. senex* were considered as *C. textor.*

Literature survey

A literature survey was carried out to identify host plants recorded worldwide for *C. textor*. The literature survey was extensively conducted on the "Web of Science" database that included international archives dating back to 1945 (https://www.webofknowledge.com/) and, additionally, in the "Scholar Google." The search terms '*Camponotus textor'* and '*Camponotus senex'* were used to obtain records for this species, and 'weaver ant' was used to locate articles that considered this species as a weaver one. For the purpose of this survey, 'host plants' were those that the ant was reported to nest. The plant names were checked against other standardized databases using the system proposed by Angiosperm Phylogeny Group (APG III, 2009), R package to query the Brazilian Flora 2020 dataset. The dataset included in the package was kindly made available by the Brazilian Flora 2020, which is a joint effort by hundreds of taxonomists to provide an improved checklist of plants and fungi that occur in Brazil and supplemented with information in Missouri Botanical Garden website (http://www.tropicos.org/NameSearch.aspx/).

Host plant survey

During the period between 2011 and 2012, 35 ha of forest remnants were surveyed at Parque do Sabiá, Uberlândia, Minas Gerais State, Brazil (18°54'52"S and 48°14'02"W). Located in the eastern sector of the municipality of Uberlândia, Minas Gerais State, Brazil, the Parque do Sabiá complex comprises an area of 1,850,000 m² with 350,000 m² of forest remnants, seven reservoirs, one large and seven smaller lakes. The Parque do Sabiá complex was created with the main purpose of sports practices and to the conservation of remnants fragments of forest. The vegetation consisted of savannah remnants with effects of local anthropic interference (Rosa & Schiavini, 2006). A plant was considered a host species only when the ant was confirmed nesting on it. Some records of host plants of personal observations also incorporated into this study. Host plants were classified into morphospecies in the field, and later at the species level in the Herbarium of the Universidade Federal de Uberlândia (UFU). The classification of species of host plants also followed the system proposed by APG III and scientific host plant names were checked in Missouri Botanical Garden website.

Results

The "Web of Science" and "Scholar Google" database search for '*Camponotus textor'* and '*Camponotus senex'* returned 539 and 298 records, respectively. The literature survey and the data from this study showed that *C. textor* may host on 17 plant species in 11 families while *C. senex* was recorded in nine plant species in seven families including economically important plant species (see Table 1). The field results showed that *C. textor* uses more frequently individuals of *Mangifera. indica* (n = 21) (80%) (Figure 1). Other plant species were less frequent: *Pachira aquatica* Aubl. (Malvaceae) (n = 2) (8%); *Syzygium jambos* (L.) Alston (Myrtaceae) (n = 1) (4%); *Pinus elliottii* L. (Pinaceae) (n = 1) (4%) and *Inga laurina* (Sw.) Willd. (Mimosaceae) (n = 1) (4%) (Table 1, Fig. 1). Finally, personal observations have reported the occurrence of *C. textor* the following plants: native species as *Guazuma ulmifolia* Lam. (Malvaceae) and *Poincianella pluviosa* var. peltophoroides (Benth.) L.P. Queiroz (Fabaceae); and naturalized species like lemon *Citrus x limon* (L.) Osbeck (Rutaceae), and guava *Psidium guajava* L. (Myrtaceae). Overall (literature and field survey), we recorded a total of 24 host species and 14 families of plants that host *C. textor*.

Table 1. Records of *Camponotus* (*Myrmobrachys*) *textor* host plants from a survey of the literature (1945-2016) and in the field.

Host plant species	Host plant family	Life form	Establishment	Considered ants species	References
Ceiba pentandra (L.) Gaertn.	Malvaceae	Tree	Native	*Camponotus senex* (Smith)	Yanoviak & Kaspari (2000)
Chrysobalanus icaco L.	Chrysobalanaceae	Tree/Shrub	Native	*Camponotus textor* (Forel)	Pérez-Lachaud et al (2013)

Citrus reticulata Blanco	Rutaceae	Tree	Naturalized	*Camponotus* sp. aff. *textor*/*Camponotus textor* (Forel)	Pérez-Lachaud & Lachaud (2014)/ Hansson et al. (2011)
Citrus x limon (L.) Osbeck	Rutaceae	Tree	Naturalized	*Camponotus textor* (Forel)	This paper
Coffea arabica L.	Rubiaceae	Shrub	Cultivated	*Camponotus senex* (Smith) *Camponotus textor* (Forel)	Schremmer 1979ab, Philpott 2005/ Philpott et al. (2008)
Conostegia xalapensis (Bonpl.) D. Don ex DC.	Melastomataceae	Tree	-	*Camponotus textor* (Forel)	Gonthier (2012)
Dipteryx oleifera Benth.	Fabaceae	Tree	-	*Camponotus senex* (Smith)	Yanoviak & Kaspari (2000)
Faramea hyacinthine Mart	Rubiaceae	Tree/Shrub	Native	*Camponotus senex* (Smith)	Santos & Del-Claro (2009)
Guazuma ulmifolia Lam.	Malvaceae	Tree	Native	*Camponotus textor* (Forel)	This paper
Inga laurina (Sw.) Willd.	Mimosaceae	Tree	Native	*Camponotus textor* (Forel)	This paper
Inga sp.1 Mill*	Fabaceae	Tree	Native	*Camponotus textor* (Forel)	Longino (2006)
Inga sp.2 Mill*	Fabaceae	Tree	Native	*Camponotus* sp. aff. *textor*	Pérez-Lachaud & Lachaud (2014)
Licania apetala (E.Mey.) Fritsch var. *apetala*	Chrysobalanaceae	Tree	Native	*Camponotus senex* (Smith)	Santos & Del-Claro (2009)
Mangifera indica L.	Anacardiaceae	Tree	Cultivated	*Camponotus senex* (Smith)	Santos & Del-Claro (2009)/This paper
Pachira aquatica Aubl.	Melastomataceae	Tree	Native	*Camponotus textor* (Forel)	This paper
Pinus elliottii L.	Pinaceae	Tree	Naturalized	*Camponotus textor* (Forel)	This paper
Poincianella pluviosa var. *peltophoroides* (Benth.) L.P. Queiroz	Fabaceae	Tree	Native	*Camponotus textor* (Forel)	This paper
Pseudobombax septenatum (Jacq.) Dugand	Melastomataceae	Tree	Native	*Camponotus senex* (Smith)	Yanoviak & Kaspari (2000)
Psidium guajava L.	Myrtaceae	Tree	Naturalized	*Camponotus textor* (Forel)	This paper
Styrax camporum Pohl	Styracaceae	Tree/Shrub	Native	*Camponotus senex* (Smith)	Santos & Del-Claro (2009)
Syzygium jambos (L.) Alston	Myrtaceae	Tree	Naturalized	*Camponotus textor* (Forel)	Pérez-Lachaud et al (2013)/This paper
Tapirira guianensis Aubl.	Anacardiaceae	Tree	Native	*Camponotus senex* (Smith)	Santos & Del-Claro (2009)
Virola koschnyi Warb.	Myristicaceae	Tree	-	*Camponotus textor* (Forel)	Longino (2006)
Vochysia ferruginea Mart.	Vochysiaceae	Tree	Native	*Camponotus textor* (Forel)	Longino (2006)

Figure 1. A *Camponotus textor* nest built on a *Syzygium jambos* (Myrtaceae) at Parque do Sabiá, Uberlândia, Minas Gerais, Brazil.

Discussion

Several host plant species (24 species) can favor the weaver ant *Camponotus textor*, but this number is low when compared with the *Oecophylla* spp. Lim et al. (2008) examined the literature records of weaver ant host plants from 1900 to 2006. They revealed that *Oecophylla smaragdina*, native to Asia, was recorded on 175 plant species in 46 families and *Oecophylla longinoda* Latreille, 1802. Native to Africa was recorded on 66 plant species in 34 families (Lim et al., 2008). Both *Oecophylla* spp. shared host records on 17 economically important plant species. Such host plants could be used to augment establishment of weaver ants, facilitating their role as deterrents of phytophagous insect pests of economically important plants (Lim et al., 2008).

This study also revealed that *C. textor* (= *C. senex*) occurred on host plant species with important economic value or that have a value to human society (e.g., *M. indica* and *Coffea. arabica*). The results of the host plant survey suggested that the ant preferred some host plant species (e.g., *M. indica*) to others, but they were not conclusive. Comparing the relative abundance of ant-occupied trees for various host plant species in the same habitat could determine the selection preferences of the ant for those present case.

Conclusion

Recent studies suggest that *C. senex* (= *C. textor*) demonstrates high efficiency on removing herbivores in mango trees consequently reducing the foliar damage in those trees (Aguiar & Santos, unpublished data). Although some studies suggest the potential of *C. textor* in biocontrol (e.g. Santos et al. 2005), very few studies were done with this species in this scope. On the other hand, many studies have shown high efficiency of weaver ants in biocontrol in many cultures as mango, cocoa, coffee, citrus, cashew, among others (see Van Mele, 2008 for a review).

Studies aiming to increase the locations record and the host plant species to *C. textor* are highly desirable due to its great importance in future research in the scope of biocontrol of these species. In this way, the present study represents a significant contribution to the future studies aiming biocontrol with these species of weaver ants introducing new hosts species that can be used in biocontrol systems.

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