

ORIGINAL ARTICLE

Gut Bacterial Diversity and Putative Functional Roles in Red Weaver Ant (*Oecophylla smaragdina*)

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ABSTRACT

Oecophylla smaragdina (red weaver ant) is traditionally consumed across various regions including Mexico and Africa as a protein and nutrient-rich food source, as well as for its medicinal properties as recognized by indigenous healers. Like other animals, ants engage in mutualistic associations with microbial symbionts residing within their bodies. These endosymbionts play critical roles in host biology, including nutritional supplementation, digestion, nitrogen recycling, and pathogen defense. Despite their importance, the gut-specific bacterial communities of ants and their functional contributions particularly in the context of bioactive compound production remain underexplored. In this study, the gut microbiota of *O. smaragdina* colonies collected from India was investigated using 16S rRNA gene sequencing and biochemical characterization of culturable isolates. Several bacterial genera were identified for the first time in this species, with members of the families Enterobacteriaceae and Staphylococcaceae emerging as the most dominant. Notably, the gut bacterial profile observed in this study diverges from those reported in previous investigations, suggesting unique microbial diversity within *O. smaragdina* collected from India. Interestingly, some endosymbionts exhibited similarities to human gut microbiota, highlighting the potential complexity and diversity of the ant gut ecosystem. The identification of diverse and unique gut-associated bacterial taxa in *O. smaragdina* highlights their potential as promising candidates for future bioprospecting and exploration of microbial metabolites with prospective health benefits.

1 | Introduction

Ants (family: Formicidae) are ecologically important insects with diverse interactions across trophic levels (Heil 2008; Rajagopal et al. 2019). They are especially well-known for their division of labor and well-developed social organization (Offenberg 2001; Wernegreen et al. 2003; Peng and Christian 2004). Amongst ants, *Oecophylla smaragdina* is of special importance as it has been used in modern medicine as well as by traditional healers for their nutritional and medicinal value (Chellappandian et al. 2014; Vidhu and Evans 2015; Langthasa et al. 2017; Van Huis 2021). It is also being consumed in various parts of the world due to its high nutritive value in both raw and cooked

forms (Roy and Rao 1957; Srivastava et al. 2009; Chakravorty et al. 2016; Pattarayingsakul et al. 2017).

Throughout their lifetime, ants form various associations with different organisms which range from mutualistic to parasitic (Hölldobler and Wilson 1990; Davidson et al. 2003; Eilms and Heil 2009; Kautz et al. 2013). Among these associations, their interaction with endosymbionts is vital for their life processes (Currie et al. 1999; Lanan et al. 2016). Within class Insecta, ants are known to harbor the most abundant microbiota in their gut (Hosmath and Timmappa 2019). These symbiotic microbes associated with ants play an important role in the development, nutrition, reproduction, and survival of their host (Werren 1997;