

# Comparative Study on the Structural Features and Elemental Compositions in the Nest Material of Two Selected Arboreal Ants, *Crematogaster rogenhoferi* (Mayr, 1879) & *Polyrhachis dives*. (Smith, 1857)

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## Short Communication

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## ABSTRACT

The aim of this study was to determine the difference between the structural features and elemental compositions in the nest material of the two selected arboreal ants, *Crematogaster rogenhoferi* and *Polyrhachis dives*. The nest surfaces were observed with a scanning electron microscope (SEM). During this study we found that Carbon content was 46.96% and Oxygen 49.40% in *C. rogenhoferi*, whereas in *P. dives* the Carbon content was 57.50% and Oxygen 46.25% respectively. Si, Ca, K, Cu, Br, Hg, Na, Mg and Fe were also detected which was in trace amounts in both the nest material of the selected arboreal ant. This elemental composition of these two selected arboreal ants shows a significant difference.

## INTRODUCTION

The ability of social insects to locate suitable nesting sites and, through manipulation of the environment, to construct often highly complex nests is key to the success of the colony and of social insects in general [1]. The architecture of the nests themselves is believed to be key in the evolution of division of labor, which has contributed to the ecological success of ant societies [1]. The internal structure of a nest and the internal arrangement of ants and the brood within it can potentially also have important implications for the spread of infectious diseases within colonies [2]. In this study, the nest materials of *Crematogaster rogenhoferi* and *Polyrhachis dives* collected from Jaintia Hills District of Meghalaya were studied to identify the differences in structural features and elemental composition in the nest material of the selected arboreal ant. The main objective of this study was to compare their structural features and some elemental composition.

## METHODOLOGY

### Study Area

The West Jaintia Hills district is the easternmost district of Meghalaya and covers a total geographical area of 1,693 km<sup>2</sup> (654 sq. mi). It lies between North latitude 24058' and 26003' and East longitude 91059' and 92051' and covers about 17 percent of the total area of Meghalaya. The nest of *Crematogaster rogenhoferi* and *Polyrhachis dives* ant was collected from Sohmynting Village, West Jaintia Hills District Meghalaya, India which is located at altitude 1295 m. The nests were taken and stored in the Entomology Laboratory at Zoology Department of North Eastern Hill University, Shillong, India.

### Methods

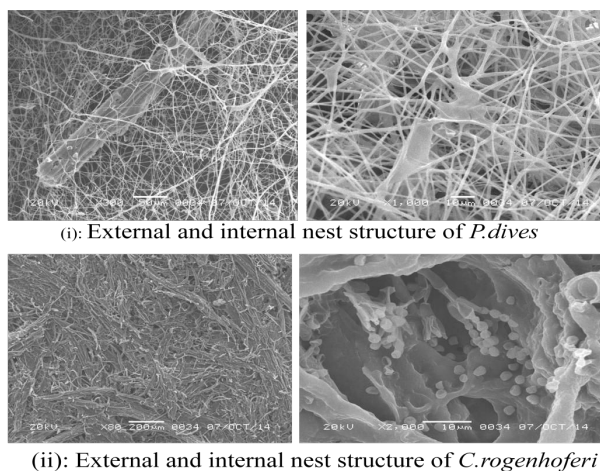
Small fragments from nest wall were observed with a stereomicroscope (OLYMPUS) and scanning electron microscope (JSM-6360, Jeol). The elemental composition analysis was made by SEM.

### RESULTS

The nest morphology of *Crematogaster rogenhoferi* is spheroidal to sub spheroidal in shape in **Figure 1**, where the nest structure of *Polyrhachis dives* is conical and elongated in shape. The nest is thick and condensed constituting of plant fibers, soil particles etc., while in *Polyrhachis dives* it is made of dead leaves which is stitched with silk. The nests are made up of numerous chambers and are arranged in a concentric manner as seen in the nest of *C. rogenhoferi* while in *P. dives* the chambers are less (**Figure 2**).



**Figure 1.** (a) Nest of *Crematogaster rogenhoferi* and (b) Nest of *Polyrhachis dives*.



**Figure 2.** External and internal structure of *P. devis* and *C. rogenhoferi*.

The elemental composition of the nest wall was analyzed with EDX; it shows that Carbon and Oxygen are the major elements of the nests' fragments of each nest. Silicon, Calcium, Aluminium, Potassium, Copper, Mercury and Bromine were found in the fragment of the nest walls. The concentrations of elements and EDX spectra are shown in **Table 1** and **Figures 3 and 4** [3-8].

**Table 1.** Elements composition and their concentrations of nest fragment according to EDX analysis.

Element compositions	Concentration (%)	
	<i>Crematogaster</i> sp.	<i>Polyrhachis</i> sp.
Carbon (C)	46.96	57.5
Oxygen (O)	49.4	46.25
Aluminium (Al)	0.41	0.31

Silicon (Si)	0.58	1.08
Calcium (Ca)	0.65	0.57
Potassium (K)	0.52	0.22
Copper (Cu)	0.37	0.39
Bromine (Br)	0.41	0.35
Mercury (Hg)	0.37	0.32
Sodium (Na)	0.05	0.03
Magnesium (Mg)	0.09	0.1
Iron (Fe)	0.64	0.52

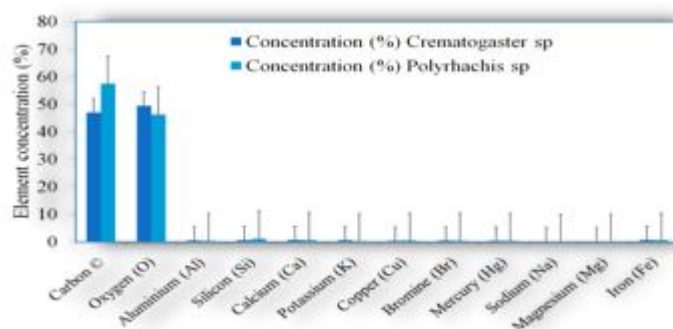


Figure 3. Graph showing the element concentration (%) in the nest material of *Crematogaster sp.* and *Polyrhachis sp.*

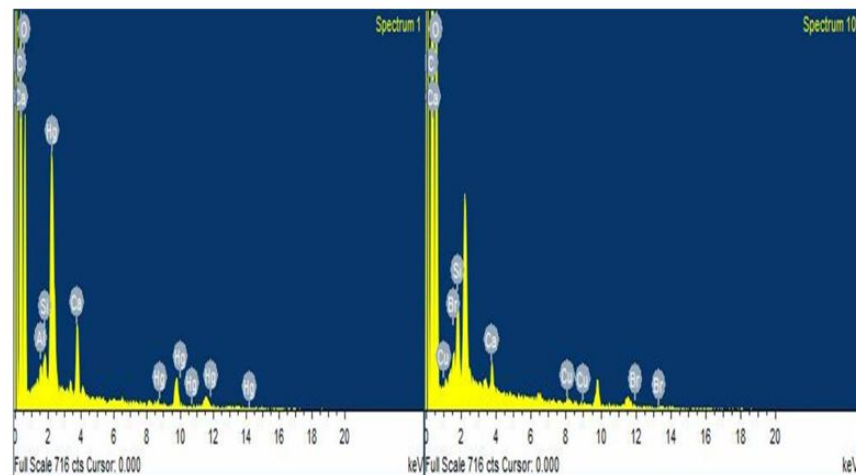


Figure 4. EDX Spectra of elements embedded in the wall of nest of (a) *Crematogaster rogenhoferi* and (b) *Polyrhachies dives*.

## DISCUSSION

Given the lack of information on the nest structure and elemental composition of *Crematogaster rogenhoferi* and *Polyrhachies dives*. The present study has shed light on some of important features of the nest structure and its element compositions. A higher carbon and oxygen indicate the organic nature of the nest material along with few inorganic materials used for building the nest. This study will be helpful to gain insights into the functional relationship among the element compositions and the morphological structure of the nest materials.

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