

# Exploring the diversity of nest architecture in mud wasps to understand their bioengineering principles

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Wasps that build their nests from mud are called mud wasps.



## Nest Size Diversity

Mud nests size varies from 0.8 X 0.6 to 15.9 X 2.8 cm

## Nest Shape Diversity

Some are globular, some are irregular, some are 'S' shaped, some are linear and cylindrical

## Nest Substratum Diversity

Some were built on plants, some on hanging sticks, some on walls and some on grills and even in glass

## Nest built by these wasps can be categorized into three groups

Category 1: Built in a safe place such that any amount of rain cannot wet the nest

Category 2: Built in a partially shaded place such that only heavy rain can wet the nest

Category 3: Built in an open area, not concealed at all, such a drizzling can even wet the nest



Few nest types that we encountered so far



Size: 2.6 X 1.5 cm; Built on a twig  
Shape: Globular; No. of holes: One  
Category: 3



Size: 0.8 X 0.7 cm; Built on a Araucaria  
Shape: Pot Shaped; No. of holes: One  
Category: 2



Size: 3.9 X 2.3 cm; Built on a fence  
Shape: Ovoid; No. of holes: One  
Category: 2



Size: 4.2 X 2.3 cm; Built on a stone wall  
Shape: elongated Ovoid; No. of holes: 4  
Category: 1

## Questions to be Answered....

What tests can be done to understand their bioengineering principles?

How do mud wasps build a nest that will survive heavy rains?

How do mud wasps protect nests from attack?



A parasitoid trying to enter the nest

## Parameters to be studied....

Kind of soil the wasp is selecting/ soil properties - using Energy Dispersive X-Ray Analysis (EDAX)

Soil grain size distribution in the nest - using SEM and X-Ray diffraction imaging

Size of the soil bolus carried by wasps - by direct observations

Water content of the bolus - by retrieving bolus from wasps

Strength of the constructed nest using vane shear apparatus and uniaxial compression tests

Quantifying preferred substratum interfaces for nest building, e.g. concrete, wood, leaves

Volume and cross sectional areas of the nest

Temperature and humidity control within the nests