Termites and *Termitomyces* sp. an Insect – Fungus Symbiosis.

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Termites (Class Insecta, Order Isoptera), are found mostly in the tropics, some in temperate zones and very few in the cooler climates. With about 2600 species worldwide they are probably the dominant organism in tropical forest environments. One subfamily, the Macrotermitinae Termites found in the Old World and parts of Asia consume plant material, construct "combs" with their excreted 'psuedofaeces' and inoculated with the spores of an exosymbiont fungus, *Termitomyces* species, the fungus grows on the combs and produces a nutritious fungal compost containing a variety of energetically expensive nitrogen compounds, that is consumed by the termites. The fungal comb is a kind of extracorporeal digester to which the termites have 'outsourced' cellulose and lignin digestion. The fungus-enriched food allows the termite colony to mobilise energy at faster rates and are not limited by the bacterial endosymbionts of most other species of termite. A mature colony will have a total of about 40 kg of fungal combs, each comb located in a semi-enclosed gallery around the periphery of the aboveground mound nest and when the rains arrive the fungus *Termitomyces* produces mushrooms that penetrate the nest and emerge above ground. The edible and nutritious mushrooms are highly prized as a delicacy and contribute to the local economy.

There are more than 60 *Termitomyces* taxa described, but reliably only 18 species, collected mainly from West Africa, are reasonably well known, the rest are either synonyms or badly described and difficult to identify. A genus, *Sinotermitomyces* has been reported from China, but species are difficult to classify. Characteristically, *Termitomyces* has pinkish spores, a cap and stipe at the top of a long 'pseudorhiza' that arises from the comb and the cap has a 'perforatorium' or 'umbo' that assists the mushroom to penetrate the hard ground and there is a termite association. Recent molecular work supports the placement of *Termitomyces* in the Tricholomataceae.

Wild fungi parasitise the rich store of food in the nest but the evolution of fungistats and diligent weeding ensures that only Termitomyces grows. Abandoned nests are quickly taken over by other fungi, particularly *Xylaria* species.

Macrotermitinae Termites may be considered as small but remarkable 'ecological engineers' that have developed a set of successful agricultural strategies to ensure *Termitomyces* alone 'value-adds' their relatively low-grade plant material diet. Success in ensured by propagating fungal clones in huge monocultures, evolving fungistats that appear to co-evolve with pathogens and being intensely vigilant in monitoring the fungal combs to eradicate resistant pathogen mutants before an epidemiological outbreak. Of course, the fungus benefits in having a comfortable home, is well nourished and a variety of species are cultivated that are protected from wild fungal competitors. Perhaps, one measure of the termite's success is that they grow one of the world's largest mushrooms, *Termitomyces titanicus*. While *T. microcarpus*, one of the smallest of the genus has a cap diameter of 2 cm; the cap of *T. titanicus* is known to commonly reach 1 metre in diameter!