

# The Role of Plant Resins and the Cadaghi Enigma

By Bob Luttrell

The Stingless bees of the Genera *Trigona* and *Austroplebeia* collect plant resins and use them to extend the wax that they produce from glands in their abdomens. The *Trigona*, especially *T. carbonaria*, collect and use quite large amounts of this material from a range of trees.

What role does resin play in a stingless bee colony? First there is defence. The stockpiles of resin strategically located just inside the entrance, are used by defenders to arm themselves to act defensively against any threat, even if much larger than themselves.



**Figure 1** In this illustration, an unfortunate cockroach has become stuck down with resin in the entrance of a *Trigona carbonaria* colony, forming a macabre takeoff platform for the bees.

Some is mixed with wax to make the cerumen cells used by the bees with the highest proportion of wax reserved for brood cells, carefully recycled to maximize use. Then a higher proportion of resin is added for honey and pollen pots where the anti-fungal, anti-bacterial and other biological activity of the plant resins aid in the preservation of honey and pollen. There is some contribution to the flavour of the distinctive 'sugarbag' honey. Some plant material and even dirt are added to the mix with ever increasing amounts of resin to make the

tougher structural components of the nest, then even more dirt etc added to make the tough outer layer of the nest, the batumen plugs that seal off the occupied hollow from all comers in the hollow.



**Trigona sp workers collecting resin exuding from a gland/pore in the bark of a Kauri pine**



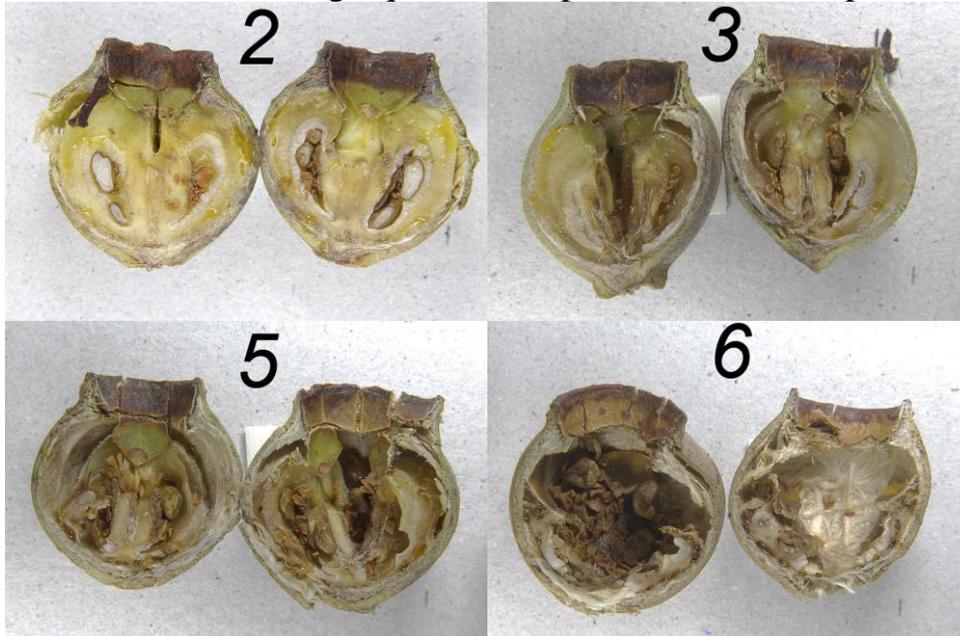
**Trigona workers collecting resin from oozing from the sapwood of a cypress, the exotic Cupressus arizonica**

They have been observed using Turpentine (*Syncarpia glommerula*), Kauri Pine, Cypress pines including the exotic *Cupressus arizonica*, *Corymbia citriodora*, *Corymbia torelliana* (cadaghi) and some *Ficus* species. Cadaghi is enthusiastically, even addictively, visited by *Trigona* workers after flowering as the seed capsules dry and open revealing the special resin in a readily collectable form. This results in a mutual ‘benefit’ as seed from the cadaghi become attached to the resin loads carried by the bees, and is distributed across the landscape further spreading this sometimes unwelcome tree. Ironically in its natural habitat on the eastern edge of the Atherton Tableland, cadaghi was quite limited in distribution even though the same bees are present.



**Figure 2 Trigona worker collecting resin from inside cadaghi seed capsule**

The resin from the cadaghi seed capsule is presented inside the seed capsule as it dries after maturation of the seed. The capsule vent splits and the centre collapses to allow the stingless bees access to the golden beads of resin that form from the concentrating liquids in the pith that once occupied the capsule.



Stages of development of resin in drying cadaghi seed capsules, golden beads of resin

One assumes that this resin is identified by the stingless bees as being highly valuable as they invest a huge amount of effort into its harvest while it is available. Perhaps it is the chemical composition that they judge to be suitable for their purpose, perhaps it is the distinctive odour that allows them to find it, perhaps there is some other characteristic, but this resin is gathered in very large amounts sometimes lining the inside surfaces of the nest whether it be in a tree hollow or log. The softer nature of this resin has caused problems to colonies by predisposing to the collapse of support structures and even destruction of the colony as a result of the collapse. Cadaghi resin is always accompanied by large numbers of seeds which end up stored in the resin mass, even though many are discarded outside the hive to produce mini-forests of seedlings after rain, graphic evidence of the viability of the seed and the bee's role in the spread of the tree. Stingless beekeepers with hive in areas within reach of cadaghi trees, observe seedlings of cadaghi coming up on the flight path from the source trees. The combined effects of widespread landscape planting of cadaghi, and the spreading by *Trigona* has resulted in this tree

becoming a weed species in some areas and its planting is now discouraged.



**Trigona worker leaving a cadaghi capsule with an attached seed. No matter how hard it tries, the bee cannot rid itself of the extra load, and can fly with 2 such seeds.**

No doubt there are many other sources of resin. Should anyone reading this, observe stingless bees collecting resin from any plant or tree, I am always interested to hear. Just send me an email with the details.

How is this resin used? On her return to the hive, the field worker deposits the resin into a ‘stockpile’ and it is progressively used from that store. In the case of an artificial box hive with a clear inspection inner cover, these stockpiles can look like a large drop of semi-liquid resin hanging from the cover. In the case of cadaghi resin, it is collected in such large amounts that the entire inside surface of the nest hollow or box can be coated. It is mixed with wax to make cerumen, and with other material including pollen, plant material and even dirt to make structural supports of the nest, and protective barriers around the colony including a fine ‘varnish’ layer that seals the inside of the hollow of box.

This is a very intriguing aspect of stingless bee biology, and I would appreciate any observations that you might have on the plants used by the stingless bees as a source of resin. Just send in your comments in an email using the contact form provided.

Bob the Beeman