INTERNAL STRUCTURE OF *MELIPONA QUINQUEFASCIATA* LEPELETIER NESTS IN A CERRADO AREA, MINAS GERAIS, BRAZIL.

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INTRODUCTION

One of the world biodiversity hotspots is the Cerrado. In addition, it represents the second largest biome of Brazil, covering more than 20% of the Minas Gerais State (Leckie 1998, Klink & Machado 2005). This ecosystem has a high number of endemism. Moreover, the Cerrado has a great proportion of Neotropical species, for instance, 13% of butterflies species, 35% of bee species and 23% of termites species (Cavalcanti & Joly 2002). Although Cerrado relevance for conservation, this ecosystem has been the most devastated in Brazil (Klink & Machado 2005).

Meliponins is a group of native bees that occurs in the whole south hemisphere and presents high diversity of species shapes and sizes as well as nesting habits (Nogueira - Neto 1997). For instance, *Melipona quinquefasciata* belongs to subgenera *Melikerria* and was described by Lepeletier in 1836 (Moure 1975). The species distribution ranges from the south region of Espírito Santo State to Rio Grande do Sul, including areas of Minas Gerais, Goiás, Mato Grosso, Mato Grosso do Sul, southeast of Bolivia, Paraguay and north / northeast of Argentina (Mariano - Filho 1911, Schwarz 1932, Kerr 1948, Moure 1948, 1975, Viana & Melo 1987). Recently Lima - Verde & Freitas (2002) recorded the occurrence of this species in the State of Ceará, thus extending its distribution to the Brazilian northeast region.

The species nests in the soil deep layers. These are built with horizontal brood combs and big food pots (about 3 - 4 cm). Nests are usually built using existing cavities, like ant nests, termite nests, tunnels made by tree roots, etc (Wille & Michener 1973, Nogueira - Neto 1997, Lima - Verde & Freitas 2002) and reach down to 4 meters depth.

OBJECTIVES

The aim of this study is to describe internal structure of *M. quinquefasciata* nests, after excavation and transfence to rational nesting boxes.

MATERIAL AND METHODS

Study area

The State Park of Veredas of Peruaçú (PEVP) in the north region of Minas Gerais, is composed of large areas of Cerrado, varying in the conservation status. Namely, the area was impacted in the past by *Eucalyptus* plantations, cattle breeding and fire. There are also areas with secondary and primary vegetation. PEVP is a Cerrado area containing one of the largest continuous and preserved to Veredas vegetation in the State (Maillard & Alencar - Silva 2007).

The climate is semi - arid, with mean temperature above 25 ^{o} C, with two well defined dry and a wet seasons. Mean monthly precipitation reaches 124mm between October and April, and less than 2mm between September and May, thus resulting in 800 - 900 mm annual precipitation (Nimer & Brandão 1989).

Field collections and data analysis

Two field samples were taken: the first between 11 to 15/03/2009 for excavation of nests and its transference to rational nesting boxes; the a second one, between 29/04/2009 to 03/05/2009 for monitoring them. There were found 13 nests of *M. quinquefasciata*, all near to park's housing and facilities (UTM 539913 e 8348752). From these 13, we chose five that were less profound for excavation. We estimated nests depth by introducing a guiding cable on the entrance of the nest, despite uncertainties due to tunnels curvatures.

For each nest we measured internal temperature and humidity using a termo - hygrometer. Nest depth and external measures were taken using a measurer tape. Number and diameter of brood combs, number, height and diameter of

brood cells were taken using a pachymeter. The number of food pots of honey and pollen were counted.
After excavation, nests were transferred to rational boxes (model Uberlandia, measuring 21 x 21 cm). These boxes were left buried in the same place of original nests, but with depth of 15 to 25 cm. The original nest entrance was connected to the box using a hose called "conduíte", with 13 mm of diameter. A statistical analysis was made in software Minitab, version 15.0.

RESULTS AND DISCUSSION

All nests were found in sandy substract and none was built using existing cavities. Nests of *M. quinquefasciata* in sandy soil also were found by Alves *et al.*, (2006), excavated in the city of Juá, Viçosa do Ceará, CE. Mean depth of nests was 79,8 ± 10,6 cm (mean ± standard error of mean, n=5, hereafter), and the shallowest was at 57,0 cm depth and the deepest was at 110,0 cm (n=5). All of them presented a brownish entrance tower, made of batume, the same material used in to build the tunnel entrance, which connects nests exterior to the interior and usually makes curves. Mean high of towers was 2,5 ± 0,28 cm (n=4), and diameter was 1,4 ± 0,07 cm (n=4).
The bees isolate completely their nests from surrounding soil with an involucral layer. Around the brood combs there are involucral sheaths that protects even more the brood region. This internal organization agrees with previous descriptions made by Wille & Michener (1973).
Brood combs are horizontally disposed, one above another, and they were in number of 4 to 6 combs (mean=5,8 ± 0,49; n=5) in march, and 6 to 7 combs in may (mean =6,6 ± 0,25; n=5). The maintenance of a constant number of brood combs indicates that nests did not presented signals of weakness. Combs minimum diameter was 1,4 cm and maximum 9,7 cm (mean= 5,51 ± 2,33; n=31). Minimum number of cells per comb was 9 and maximum was 95 (47,04 ± 23,48; n=31). Average height of cells was 0,8 ± 0,11(n=5), and diameter was de 0,5 ± 0,06 (n=5).
Internal average temperature of nests in march was 33,4 ± 0,65 °C (n=5), and in may 29,5 ± 0,8 °C (n=5). Average internal humidity of nests in march was 41,80 ± 1,53 % (n=5) and in may was 49,60 ± 2,09 % (n=5). In march it was recorded 8 to 20 full honey pots per nest (mean= 14,20 ± 2,01; n=5) and in may 0 (zero) to 19 full honey pots (mean= 8,6 ± 3,36; n=5). We found none honey pots in one of excavated nest, eventually due to a heavy rain a week before sampling, which flooded the nest. In addition, both honey and pollen pots of this nest were with low quantity of food stocked. Pollen pots ranged from 5 to 15 pots per nest in march (mean= 9,60 ± 1,89; n=5), and in may from 5 to 6 (mean= 5 ± 0,32; n=5). It was recorded five empty pots and five partially empty pots. In may, nests transferred to rational boxes were reconstructed by bees using almost all available spaces in the boxes. Propolis, with reddish colour, deposition was made invariably on the ground of boxes, outside the involucral layer, besides entrance and had.
Some boxes had termites on them, but that, virtually did not disturbed the colonies.

CONCLUSION

Results indicate that excavated colonies, transferred from soil to rational boxes adapted to new conditions, once they did not show signals of weakness. Bees used successfully tunnel entrance made with hose. Therefore, this technique adopted to manage colonies of *M. quinquefasciata* is a feasible alternative to study nest ecology and production and traits of resources such as lie honey, pollen stock and propolis characteristics.

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REFERENCES

Cavalcanti, R. & Joly, C. 2002. The conservation of the Cerrados. In: P.S. Oliveira & R. J. Marquis (eds.). The Cerrado of Brazil. Ecology and natural history of a neotropical savanna. Columbia University Press, New York. pp. 351 - 367.

Freitas, B.M., Alves, J.E., Mesquita, F.L.A. & Araújo, Z. B. 2002. Adaptação de uruçu do chão (*Melipona quinquefasciata*) em colméias de madeira ao nível do solo. In: V Encontro sobre Abelhas. Anais. Ribeirão Preto, SP. p. 289.

Kerr, W.E. 1948. Estudos sobre a genética de *Melipona*. Tese de Doutorado. ESALQ.

Klink, C.A. & Machado, R.B. 2005. A conservação do Cerrado Brasileiro. Megadiversidade. 1(1): 147 - 155.

Lima - Verde, L.W. & Freitas, B.M. 2002. Occurrence and biogeographic aspects of *Melipona quinquefasciata* in NE Brazil (Hymenoptera, Apidae). Brazilian Journal Biology 62(3): 479 - 486.

Leckie, D. Forestry applications of imaging radar. 1998. In: Manual of remote sensing: principles and applica - tions of imaging radar. Bethesda: American Society of Photogrammetry and Remote Sensing.

Maillard, P. & Alencar - Silva, T. 2007. Delimitação e Caracterização do Ambiente de Vereda:I. O potencial das imagens RADARSAT - 1. Anais XIII Simpósio Brasileiro de Sensoriamento Remoto, Florianópolis, Brasil, INPE, p. 4751 - 4758.

Mariano - Filho, J. 1911. Ensaios sobre os meliponidas do Brasil. Tese de Doutorado. Faculdade de Medicina do Rio de Janeiro, Rio de Janeiro, 140 p.

Moure, J.S. 1948. Estudando as Abelhas do Brasil (pareceres de sistemática). Chacaras e Quintais 77: 339 - 341.

Moure, J.S. 1975. Notas sobre a espécie de *Melipona* descritas por Lepeletier em 1836. Revista Brasileira de Biologia. 35: 615 - 623.

Nimer, E & Brandão, A.M.P.M. 1989. Balanço hídrico e clima da região dos Cerrados. Rio de Janeiro: IBGE/EMBRAPA. 166p.

Nogueira - Neto, P. 1970. A criação de abelhas indígenas sem ferrão (Meliponinae). 2nd ed. Tecnapis: Chácaras e Quintais, São Paulo.

Nogueira - Neto, P. 1997. Vida e criação de abelhas indígenas sem ferrão. São Paulo. Ed. Nogueirapis. 445p.

Pereira, J.O.P. 2006. Diversidade genética da abelha sem ferrão *Melipona quinquefasciata* baseada no seqüenciamento das regiões ITS1 parcial e 18S do DNA ribossômico nuclear. Tese de Doutorado. Universidade Federal do Ceará, Fortaleza, Ceará. 142p.

Schwarz, H.F. 1932. The genus *Melipona*. The type genus of Meliponidae or stingless bees. Bulletin of the American Museum of Natural History 63: 231 - 459.

Viana, L.S. & Melo, G.A.R. 1987. Conservação de abelhas. Informativo Agropecuário. 13(149): 23 - 26.

Wille, A. & Michener, C.D. 1973. The nest architecture of stingless bees with special reference to those of Costa Rica. Revista de Biologia Tropical. 21(1): 1 - 278.