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COMPETITION FOR THE NECTAR OF TECOMA STANS FLOWERS BETWEEN  
OLIVE SUNBIRD (NECTARINA OLIVACEA) AND INSECTS

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## INTRODUCTION

Nectar is an energetically rich, easily utilised food that is potentially attractive to many animals. Competition for nectar among pollinating and non-pollinating animals can be severe and of great importance in the coevolution of plants and nectarivores. If floral nectar is equally available to animals of large and small body size, then small nectar feeders often keep the standing crop of available nectar so low that large nectarivores cannot forage profitably and are competitively excluded (Brown *et. al.* 1978). Plants are strongly affected by such competition, and those which utilise large pollinators often evolve mechanisms to prevent consumption of their nectar by small nectarivores. Many characteristics of bird-pollinated flowers are adaptations either to avoid attracting insect competitors or to prevent their taking nectar by having long constricted floral tubes with tough thickened walls (Heinrich 1975).

Results reported from studies by Primack and Howe (1975) and Stiles (1975) show competitive interaction between hummingbirds and insects. This paper examines the competitive interaction between the Sunbird, *Nectarina olivacea*, and insects at Obafemi Awolowo University Campus, Ile-Ife, Nigeria at the flowers of *Tecoma stans*, an exotic plant originating from tropical America and Australia. It produces 5-7 bright yellow flowers per inflorescence during the latter part of the dry season and early rains (February to mid-May) when many other flowers are out of bloom. The flowers are hypogynous, with a funnel-shaped gamopetalous corolla of five petals. The partially epipetalous stamens are included within the corolla tube below which is the nectar chamber.

## MATERIALS AND METHODS

The methods used for this study were similar to that of Gill *et. al.* (1982) in their study of the interaction between Hermit Hummingbirds and stingless bees. A total of 105 *Tecoma stans* flowers were examined initially for the presence of insects between 07.00 - 08.00h the dorsal entrance to the nectar chambers of some undamaged flowers were sealed with cellotape to prevent sunbirds from taking nectar and toothpaste (acting as an insect repellent) was smeared round the flower stalks and main axis of 18 inflorescences to exclude insects. All consumers were thus excluded from these flowers (protected).

Furthermore, on 5 April at 05.30h toothpaste was smeared on the dorsal entrance to the nectar chambers round each flower stalk and on the main axis of some additional undamaged flowers so as to exclude insects alone (partially protected). On 6 April at 05.30h only the dorsal entrance to the nectar chamber of additional undamaged flowers was sealed with cellotape to exclude sunbirds alone (partially protected) and the quantity of nectar was measured, on all occasions, with 1000ul capillary

tubes. All statistical tests were non-parametric Mann-Whitney U-tests or  $\chi^2$  tests, because the data was not distributed normally.

## RESULTS

At the beginning of this investigation it was observed that sunbirds particularly Nectarina olivacea and insects particularly the honeybee (Apis mellifera) and ants (Pheidole sp.) were attracted to the flowers of Tecoma stans.

Of the 105 flowers on 18 inflorescences examined for the presence of insects, 35 (33%) of them had bees and 60 (57%) of them had ants between 07.00 - 08.00h. Between 09.00 - 10.00h 55% of the flowers had bees and 66% had ants. Although there appeared to be an increase in insect activity over these hours, this was not statistically significant at 5% level.

Table 1: Quantities of nectar accumulated in 'protected' Tecoma stans flowers on three days.

Date	Sample	No of flowers examined (n)	Nectar (ul) measured between 11.00 - 12.00h	
			Range	Median
4 April	A	36	53 - 287	164
5 April	B	12	66 - 199	161
6 April	C	12	86 - 194	163

Nectar in 'protected' flowers averaged between 161 - 164ul per flower on all sampling occasions. It was found that differences between the medians of nectar volumes on 4 and 5 April, 4 and 6 April, and 5 and 6 April were not significant ( $P > 0.05$ ); the overall median quantity of nectar in these flowers was 163ul.

Table 2: Quantities of nectar found in unprotected and partially protected Tecoma stans flowers.

Date	Flowers with consumers	No of flowers examined (n)	Residual Nectar ( $\mu$ l) measured between 11.00 - 12.00h	
			Range	Median
4 April	Birds, Bees, Ants (Unprotected)	42	7 - 201	24
5 April	Birds, Bees, Ants (Unprotected)	42	10 - 127	21
5 April	Birds only (partially protected)	36	31 - 140	36
6 April	Bees and Ants only (partially protected)	17	9 - 106	41

There was no significant difference ( $P > 0.05$ ) between the medians of unprotected flowers on 4 and 5 April. Nectar in unprotected and in partially protected averaged between 21 - 41  $\mu$ l per flower between 11.00 - 12.00h and were not significantly different from each other ( $P > 0.05$ ).

#### DISCUSSION

Interspecific competition in the form of displacement or displays of territorial defence around flowers of Tecoma stans were not observed between different species of birds because only Nectarina olivacea was observed visiting flowers during the study. However, it was observed that honeybees (Apis mellifera) made aggressive displays which could scare away sunbirds. When a sunbird approached a flower a feeding bee would fly out of the corolla in a zig-zag manner, often directly at the sunbird's face. This caused the sunbird to abandon such a flower without feeding. This observation differs from those of Johnson and Hubbell (1974) where either birds or large insects could competitively exclude the other from a flower.

Unprotected and partially protected Tecoma stans flowers contained much less nectar than protected flowers and in the absence of each other, sunbirds and insects removed most of the nectar produced by the flowers. The niche overlap and competition for nectar reported here between members of different phyla needs further study to establish the conditions which allow co-existence.

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## SUMMARY

Competition for the nectar of Tecoma stans flowers between the Olive Sunbird, Nectarinia olivacea, and insects was studied by "consumer exclusion" experiments. In the absence of each other, sunbirds and insects removed most of the nectar produced by these flowers, revealing niche overlap. Honey bees were able to aggressively defend flowers from sunbirds.

## RESUME

La compétition pour le nectar des fleurs de Tecoma stans entre le Soui-manga olivâtre Nectarinia olivacea et les insectes fut étudiée par des expériences d'élimination de consommateur ("consumer exclusion"). En l'absence des uns ou des autres, soui-mangas et insectes prélevaient presque tout le nectar produit par ces fleurs, indiquant chevauchement de niches. Les abeilles étaient capables de défendre agressivement les fleurs contre les soui-mangas.

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