

## NOTE

## Effect of tannins on the palatability of mangrove leaves to the tropical sesarminid crab *Neosarmatium smithi*

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**ABSTRACT:** A significant correlation has been demonstrated between consumption rates and flavolan concentration for the sesarminid crab *Neosarmatium smithi* feeding on litter of the mangrove *Ceriops tagal*. Further, a causative relation between flavolan presence and feeding rates was unequivocally verified by restoring the concentration of flavologlycans (FG) in leaf litter from which the FG present initially had been removed by aging in sea water.

**Introduction.** Although tannins probably evolved in plants as a defense against microbial attack, they are also thought by many authors to be instrumental in regulating terrestrial herbivory, and hence affect diverse animals (Swain 1979). While not the only compounds responsible for deterring herbivores, tannins appear to be the most important. As tannin concentrations in mangrove leaves are high (Walsh 1974), it is quite likely they deter leaf consumption by herbivores.

Recently, water-soluble complexes consisting of gly-cans and flavolans (condensed tannins) were found in significant amounts in mangroves (Neilson et al. 1986) and strong evidence was presented that the 2 poly-meric types are covalently linked. These compounds are designated as flavologlycans (FG). Our work on the feeding ecology of the tropical crab *Neosarmatium smithi* (Giddins et al. 1986) strongly indicated that the presence of such flavolans as FGs was directly affect-ing the palatability of litter to *N. smithi*; the crabs preferred aged leaves containing negligible amounts of FGs. Here we provide evidence in support of this probability.

**Methods.** Consumption rate is expressed as 'relative consumption rate' (RCR) as defined by Giddins et al. (1986), for leaf litter decomposed for different lengths

of time. FG analysis was performed as in Giddins et al. (1986) and Neilson et al. (1986).

To test the effect of flavolan on litter palatability, *Ceriops tagal* leaves aged *in situ* for 10 wk (and subse-quently FG-free; Giddins et al. 1986), were dried under vacuum (1 mm Hg) for 1 h at 25 °C. They were weighed and then soaked in a 2 % aqueous FG solution. They were then surface dried (by blotting) and reweighed, the difference in weight corresponding to the amount of FG solution, and hence FG, present in the leaves; 5.4 g of semi-dried leaves absorbed 6.7 g of a 2.0 % FG solution. With an average leaf dry weight of 29 %, this gives an FG concentration in the leaves of 3.8 %. Leaves treated in this way and control (untreated) leaves were then fed to the crabs in paired consump-tion experiments. Water in the container was placed within a Petri dish to prevent FG leaching from experi-mental leaves. Conditions were identical in control containers. Specific consumption rate (Giddins et al. 1986) was used as an indicator of palatability.

**Results.** The relation between RCR and flavolan (Fig. 1) shows a strong negative linear correlation ( $r = 0.763$ ,  $F = 269.69$ ,  $p \leq 0.0005$ ). Table 1 lists the mean specific consumption rates for *Neosarmatium smithi* fed on FG-free and FG-added leaves. A Paired T-Test on the data shows that the consumption rates were significantly greater for the FG-free leaves ( $p = 0.0011$ ).

**Discussion.** The correlation between flavolan con-tent and RCR reveals that consumption of litter by *Neosarmatium smithi* increases when the flavolan con-tent is reduced by leaf aging. This agrees with the view that 'tannins' can deter herbivory but does not prove a causative relation as some other factor may have also varied the consumption rate simultaneously.

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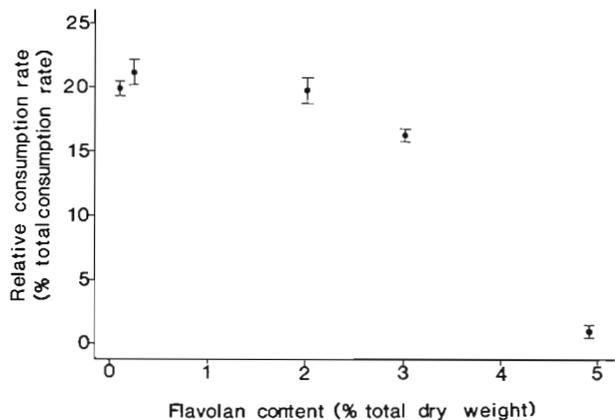


Fig. 1. *Neosarmatium smithi*. Relative consumption rates of crabs fed on *Ceriops tagal* litter with different flavolan contents. Plotted as mean  $\pm$  1 standard deviation

Table 1. *Neosarmatium smithi*. Comparison of specific consumption rates exhibited by 4 individuals when fed on flavolan-free and flavolan-added *Ceriops tagal* litter

Crab	Mean specific consumption rate	
	Flavolan-added (g dw leaf g <sup>-1</sup> crab <sup>-1</sup> 24 h <sup>-1</sup> )	Flavolan-free (g dw leaf g <sup>-1</sup> crab <sup>-1</sup> 24 h <sup>-1</sup> )
1	0.026 (0.006)*	0.045 (0.008)
2	0.024 (0.003)	0.025 (0.006)
3	0.009 (0.001)	0.015 (0.001)
4	0.005 (0.002)	0.007 (0.001)

\*  $\pm$  1 standard deviation

The significantly lower consumption rates for 10 wk old leaves with an artificially induced FG concentration has shown that this flavolan conjugate exerts

a definite effect on consumption rate. This supports the views expressed by Swain (1979) and Cameron & la Point (1978) that 'tannins' can reduce consumer pressure by a reduction in palatability.

Although high concentrations of 'tannins' in mangrove leaves have been suggested to effect palatability (Walsh 1974), there has been little work to test this theory. Our study shows that 'tannin' concentration is strongly negatively correlated with consumption rate, and thus demonstrates a causative relation between a flavolan found in mangrove leaves and consumption rate.

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