

CORRESPONDENCE

Corolla tubes, style sizes and natural selection

The experiments by Belavadi, Venkateshalu and Vivek (*Curr. Sci.*, 1997, 73, 287-290) are very interesting. It is observed that honey-bees can draw the nectar from the corolla tubes of cardamom flowers to a greater depth than their tongue (proboscis) can reach. They also report from the controlled experiments that larger the diameter of the style in the corolla tube, larger is the reach of the honey bee proboscis. Some interesting suggestions have been made regarding the evolution of the styles and the corolla tubes. In the same issue, Ganeshiah (*Curr. Sci.*, 1997, 73, 225-227) wonders whether it is the constraints that decide the biological designs. He emphasizes this point with a picture of the statue of Vishnu at the Somanathpur temple. This picture warns us against making hasty decisions often ignoring even the recognized facts.

Based on the experiments where the bees suck sugar solution from the capillary tubes, it is argued that surface tension forces help the bees to harvest the nectar to a greater depth.

I would like to point out that in this arrangement either with the capillary or the actual corolla tube surface tension forces should be irrelevant, since the bottom end of the tube is closed. The level of the nectar in such a tube is decided by the liquid volume present, but not by the surface tension. Hence

Figure 5 in this article is redundant. However, the interesting, though controversial, suggestions in this article should not get sidetracked by such an error. That is the purpose of this letter.

The observation of Belavadi *et al.* still needs an explanation. How does a honey-bee slurp or scoop the highly viscous nectar to such a depth? A good starting point to answer this question would be to closely observe the bees themselves.

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Response:

We are glad that Deshpande, a scientist from the National Aeronautical Laboratories, got interested in our work. We regret the error we committed in attributing the ability of the bees to draw nectar from levels deeper than their tongues can reach, to surface tension forces. However, the fact remains that bees do draw nectar from greater depths from cardamom corolla tubes. Three things that we pointed out and that we would like to emphasize again are,

- (i) In the absence of a style, bees can harvest nectar/sugar solution only to the extent of their tongue lengths.
- (ii) From a capillary tube filled completely with sugar solution, bee can draw the solution from well below the level its tongue can reach, but only in the presence of a style, and depending on the style thickness.
- (iii) From a capillary tube with sugar solution level deeper than the bee's tongue length, the bee is still able to draw the solution up to a certain level determined by the style thickness.

It is these observations that prompted us to wonder whether style has a role to play in the evolution of a pollinator-plant system.

As far as the mechanism involved in the raise in the level of nectar is concerned, as Deshpande points out, if it is not surface tension, the question 'How do they do it?' remains unanswered.

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