

E1-16: A novel technique to measure the body charge of honeybees

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The knowledge of net electrostatic body charge of the economically important honeybees has now become an important parameter in scientific research on the production and consumption of honey, behaviour and the navigation power of bees.

In this new method, a flying bee was considered as a moving charge. Two concentric hollow brass cylinders of radii 0.038 m and 0.062 m having the same length of 0.051 m, were fixed in front of the gate of a bee box. Bees fly through the inner cylinder so that the induced charge on the inner cylinder can be measured as a current passing through an electronic circuit to the ground. A current to voltage amplifier connected to the inner cylinder, followed by a non inverting amplifier and an integrater of which the output voltage was a measure of the bee charge, were developed to measure the charge with an accuracy of $5 \times 10^{11} \text{C}$. The earthed outer cylinder, electrically insulated from the inner cylinder, acts as a Faraday tube which reduced the noise due to variable external electric fields.

Measurements made using this technique under different external electric field conditions, show that the body charge of a bee increased with the prevailing electric field. Under fair weather atmospheric electric field conditions, the charge of a honeybee was found to vary between $2.0 \times 10^{-10} \text{C}$ to $4.28 \times 10^{-9} \text{C}$ and the average differed from one beehive to the other.