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The Possible Role Of Calcium in Determining Sex-Ratio Favourable To The Female Lac-Insect

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In South India, including Konkan in the West, Cocanada in the East and Travancore in the South there is a wild species of lac insect which has never been utilized to grow lac on a large scale. The insect is *Kerria communis* and in Mysore its favourite host plant is *Ficus mysorensis*, in the city of Hyderabad India, it is seen on *Ficus bengalensis* which appears as an avenue tree. Why this lac insect does not yield a large crop has been determined. During the rainy season the insect grows well but as mother-insect they produce the next generation which comprises entirely of winged males. That the insect does continue to exist is then a problem. What happens is that the larvae destined to become winged males when carried singly by some fly become bisexual and as such give rise to a generation with females and males and the species manages to exist. Anxious to find a plant on which this insect could be grown experimentally I found *Acacia farnesiana* answered the purpose. Then taking two plots with this host plant one was irrigated while the other left dry. The insects on the plants receiving water grew well but gave the expected sex ratio with all males and these were the winged form. The plants not irrigated showed a high death rate among the lac insects but those that did survive delivered a generation with female insects predominating. The ratio between the sexes was 1:1 but often more favourable to the female. Here were the experimental facts that moisture reaching the mother lac insects induces it to produce more males.

Now when we speak of moisture it implies water containing minerals present in the soil. What then was the mineral which dissolved in water may be considered as responsible for the male sex formation.

Looking for reference with similar findings I came across the work of an American scientist, Miss King. She

took some freshly laid frog's eggs and fertilized them with the semen produced by the male frog. The progeny comprised of the normal ratio with female predominating. Then she took another batch of the same eggs and allowed them to be soaked in water for some time and were subsequently fertilized. The generation which issued from such eggs comprised entirely of male frogs. The case was identical with the experiments with the lac insect *Kerria communis* on irrigated host plants.

As far as I know King's experiments have not been repeated and the mechanism of sex determination favourable to the male has not yet been explained.

In the case of lac insects its symbiotic yeast no doubt played among others a respiratory role. That the germ produced Tyrosinase would indicate it. Experiments with these yeasts indicated that when there is less moisture they produce more tyrosinase which means better explanation of the sex-ratio variability among lac insects. I could then infer that fertilized eggs which were sufficiently oxygenated would produce more females. Beyond this hypothesis my work did not give a better explanation of the sex-ratio variability among lac insects.

Recently I came the illumination work of prof. Duke of Dublin on the role of "Mitochondrial Calcium Metabolism in *Drosophila*", fruit-fly. When excess of water leaches out calcium from mitochondria in the egg before it is fertilized the sex that result would be male. With loss of calcium there will be a lower degree of respiration which would favour the male sex formation. The above hypothesis is based on the importance of calcium in insect metabolism as revealed by the pioneering work of Duke. The hypothesis would also explain the findings of King who found frog's eggs soaked before fertilization gave rise to male sex formation.

Key words : Lac-insects, Sex-ratio, Calcium.

Reference

1. Duke, E.J.A.R. Krall *et.al.* *Mitochondrial Calcium Metabolism in Drosophila* (Biochemical Society Transaction, 1988), pp. 235.