

Oxygen Uptake of Various Reaction Systems

Reaction	$\mu\text{l. O}_2/\text{hr.}$
1. Catechol + Tea oxidase	198
2. Reduced cytochrome C + Tea oxidase	0
3. " " + Succinate + Tea oxidase	3
4. " " + Succinate + Heart muscle oxidase	46
5. " " + Succinate + A succinic dehydrogenase preparation	9
6. Reaction 5 + Tea oxidase	11

The succinic dehydrogenase preparation used in the last two reactions had comparatively only a slight cytochrome oxidase activity. If tea enzyme had consisted of cytochrome oxidase it should have induced a greater O_2 uptake in reactions 2, 3 and 6 due to an increase in cytochrome oxidase concentration.

These results demonstrate unequivocally that tea oxidase cannot be identified with cytochrome oxidase. It appears, therefore, that without any positive evidence for the presence in the leaf of the components of the system Robert's cytochrome theory of tea fermentation cannot be considered as valid. On the other hand our previous finding⁵ that tea oxidase is a polyphenol oxidase with an established specificity for O-dihydric phenols provides a simpler and a more satisfactory explanation of the tea fermentation process.

Details will be published elsewhere.

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May 5, 1943.

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CATALYSIS OF DICHROMATE-HYDROBROMIC ACID REACTION BY THE OXALATE ION

IN a previous publication¹ we have reported the marked catalytic effect that oxalate ion exerts on the reaction between dichromate and hydriodic acid. We have now found that the oxalate ion also catalyses the reaction between dichromate and hydrobromic acid. Under the conditions of our experiments and at the hydrogen-ion concentration employed, the velocity of the reaction between dichromate and hydrobromic acid is extremely slow, but in the presence of a small concentration of oxalate the speed of reaction becomes appreciable.

The reaction was followed by the estimation of the bromine liberated iodometrically, after extraction with carbon tetrachloride. The concentration of oxalate used was between .025N to .075N; in this range of concentration the rate of reaction was from 20 to 45 times more than the rate of reaction in the absence of the oxalate ion.

The catalytic effect of the oxalate ion is so pronounced that we can set up a lecture demonstration experiment using this reaction.

The quantitative aspect of the reaction is under investigation.

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DESCRIPTION OF AN EGG-LAYING FEMALE OF THE INDIAN GLOW-WORM, *LAMPORPHORUS TENEBROSUS* WALKER

PAIVA, C. A. (1919) has given for the first time a very short description of the adult female Indian Glow-worm. Hutson, J. C., and Austin, G. D. (1924) in their bulletin on the Indian Glow-worm deal mostly with the breeding habits of the female. A detailed study of the structure of the adult female has not been made till now.

The females appear to be very rare and seasonal in occurrence. Till now only six specimens have been collected by me from inside Tambaram bushes at night just after heavy rains and one was actually reared out of a larva inside the laboratory. They vary from 55 mm. to 70 mm. in length and most of them have been observed to become dark and assume piceous margins round the terga soon after death.

The following description of the structure of the egg-laying female *Lamprophorus tenebrosus* Wlk. is based on a single specimen collected on 2nd December 1942, from the College premises, Tambaram, Chingleput District. My thanks are due to Prof. C. Lakshminarayanan, under whose supervision and guidance this study was made.

Length—70 mm.; Breadth—17 mm.

The whole body is pale ochreous with the lateral tergal areas clear and more or less diaphanous. The inner luminous mass of ovary is clearly visible at night through the thin dorsal plates. The head is highly retractile into the thorax and the extensive cervical integument presents during retraction a double folding which is rarely straightened out completely. The adipose tissue is concentrated at special regions of the body. Dorsally it occurs as milky white patches on either side of the terga, but somewhat diffused ventrally. It is also discernible through the translucent pleurites. The female exoskeleton is delicate and least chitinised. Certain articular sclerites in the basal region of the thoracic legs which are strongly chitinised and differentiated in the larva are ill-defined and imperfectly chitinised in the female. The adult female is apterous and larviform and appears to be degenerate. Although the plates are thin and clear with least pigmentation and the body plumpy and delicate, the tarsi and antennæ present adult coleopteran structure. The abdomen has become loose and plumpy to accommodate the large mass of ovary inside. The female moves about actively at night producing a most brilliant greenish white light outrivalling the larva or her own mate. At night she is frequently noticed to assume a peculiar pose with her abdomen curled up and the photogenic organs exhibited to the best advantage to the flying males.

Head (length—6 mm.; breadth—5 mm.).—Head is prognathous, dorso-ventrally flattened, glabrous and slightly darker than the rest of the body. Head-capsule is foveate and flat with a wide mid-ventral gap accommodating the labio-maxillary plate. Posteriorly the head-capsule is connected on the ventral side by a chitinous bar, the gular bridge. The median ill-defined epicranial suture divides the head-capsule into a median dark frontal and lateral parietals. The frontal is deeply notched anteriorly by the V-shaped fronto-clypeal suture, beyond which lies the triangular and centrally infuscate clypeus. The parietals extend anteriorly up to the base of the antenna and are separated from the ventro-lateral genæ by a longitudinal suture. A fuscous black eye-spot occurs at the anterior margin of each parietal. Antennæ are six-jointed and take their origin from the head-capsule in between the lateral margin of the clypeus and the front margin of the parietals. Each antenna is placed over a short, stout, whitish basal piece which Paiva (1919) describes as the basal antennal joint. This is not a true joint but only the membranous antacoria into which is the antenna often telescoped. The true basal antennal point (the second joint of

Paiva) is as long as or slightly longer than all the remaining joints put together. It is little chitinised but bears anteriorly a few rufous hairs. Beyond this there are five small distinct, strongly chitinised joints, each with a few delicate hairs. The distal joint is rounded and unimucronate and carries two conspicuous rufous hairs. Paiva appears to have missed one of these joints and so he also describes the antenna as six-jointed. Mandibles are dark reddish brown, falcate, and without the mandibular canal so characteristic of the larva. The mandibles articulate with the head-capsule both dorsally and ventrally by strong condylar articulations. The mandibular postartis is rounded and articulates with the acetabulum in the genal postcoila. The hypopharynx, mandibular appendages and other tufts of stiff hairs of the larvæ appear to be very much reduced. The labio-maxillary plate consists of the narrow median labium and the stout lateral maxillæ. The base of the maxilla is formed of the small cardo and the large stipes which is very slightly and irregularly chitinised and carries a strong ventral spine. The maxillary palp is stout, strongly setose and four-jointed, of which the penultimate joint is very narrow and the distal one globular with a bright oval sensory streak. The galeæ are two-jointed with the distal joint carrying a few tactile hairs and the basal joint with a row of about five stiff hairs. Internally the galeæ form two sharp cutting edges. The labium is divided into a prelabium and a postlabium by the labial suture. The postlabium includes the mental and the submental regions. The postlabium in the larva is strengthened by a single postlabial sclerite which represents both the mentum and the submentum. In the female the submentum is not chitinised but the mentum is strongly chitinised into a long cylindrical posteriorly narrowed sclerite. The prelabial sclerite is strong. The labial palp is two-jointed, the basal joint being stouter than the distal. The prelabium bears dorsally a median cutting edge which works along with those of the maxillary galeæ.

Thorax.—The terga are feebly channelled by a mid-dorsal sulcus. The pronotum is beautifully arched in front and broadened posteriorly with a slight elevated disc in the middle and ventro-laterally depressed lateral areas. The meso and metanotum are not arched but are sub-rectangular with lateral margins rounded.

Pronotum—l. 10 mm.; b. 14 mm. Mesonotum—l. 8 mm.; b. 18 mm. Metanotum—l. 8 mm.; b. 20 mm.

The marginal ridge of the terga is strongly developed round the anterior border of the pronotum. Ventrally the sclerites are ill-defined. Thoracic legs have well-developed tarsi. All the legs are more or less similar. Coxa stout. Coxo-trochanteral articulation dicondylic. Postcondylar trochanteral area rounded. Trochanter long and narrowed distally with a distinct transverse suture dividing it into two sub-joints, the proximal joint carrying the condyles for coxal articulation and the distal immovably fixed with the femur.

Femur stout and broad distally with two prominent rows of hairs. Tibia cylindrical and narrow. Femoro-tibial articulation di-condylic. Tarsus four-jointed, basal three joints piceous and small and distal joint very long and stout with two strong claws.

Abdomen.—Abdomen consists of nine distinct segments. The abdominal terga form a row of imbricate plates. All the plates except the ninth are channelled by a mid-dorsal sulcus. The posterior plates have their posterolateral areas more rounded. Ventrally the sternal plates are roughly rectangular and each is provided with four longitudinal ridges each carrying a row of soft spines. The pleurites are squarish plates carrying the spiracles. The pleurites of the penultimate segment are 'eburated' (Gorham, H. S., 1880) and form the photogenic area. The last abdominal segment carries the anal brush.

Internal Anatomy.—Immediately beneath the tergal plates is an extensive sheet of adipose tissue, below which is the massive ovary extending into the thorax and even into the cervix. The alimentary canal lies considerably flattened under the ovary. The long narrow oesophagus runs from the pharynx to a small sac-like pouch which leads into an elongated depressed and almost empty mid-intestine, whose walls carry longitudinal folds. The mid-intestine is followed by the coiled intestine. Four Malpighian tubules occur. Below the alimentary canal is the long chain of ganglionated double ventral nerve cord. The thoracic and abdominal ganglia are similar in size. The pro-, meso- and metathoracic ganglia supply the three pairs of legs. The metathoracic and first abdominal ganglia are close to each other. First five abdominal ganglia are very distinct, placed uniformly apart and supply the spiracles. The remaining abdominal ganglia are crowded and very close to each other. Below the nerve cord is another layer of fat.

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FLUCTUATION IN THE WEIGHT OF A PLANT

ALTHOUGH extensive work has been done by Miller (1925) and others¹ on the increase in the weight of a plant at intervals of a week or more, still no reference is noticed on the fluctuations in weight at short intervals. In his papers on leaf movements the author^{2,3} has mentioned that this movement is brought about by the variation in the turgidity of the plant body, indicating a fluctuation in the water content of the plant. Further work done in this line denoted a relationship between the direction of leaf movement and the fluctuation in the weight of a plant, whether the plants were exposed to natural light or artificial light. The author's observations on *Lycopersicum esculentum* are mentioned in the following note.

The potted plants, about twenty days old, were selected for observation. Since the leaf movement and weight fluctuation could not be studied from the same plant at the same time the two aspects had to be studied from different plants exposed to similar external conditions. The plant for the study of weight was removed from the pot, and its root system was carefully washed before the plant was weighed. The weight of the plant was 1.253 gm. The solution for the plant was prepared from the manured soil in which the plant was growing, and was thoroughly aerated. The plant was suspended from the beam of a balance but enabled the root system to be within the soil solution in a trough free from the balance. This enabled the free movement of the beam and the connected lever. By a suitable arrangement the level of the solution was maintained constant. Actual recording was started about an hour or more after setting up the experiment. The recording was done between 10-15 a.m. and 3 p.m. (new time), with the plants exposed to the sky light from the northern window, but not to direct sun. The room temperature, which was 77° F. when the experiment was started, showed a rise of 2° F. in the course of six hours, the first perceptible rise being after 12 noon. Readings were taken at intervals of 15 minutes with the help of levers magnifying 15 times. The three graphs A, B and C are drawn to a magnification of 75.

The weight curve (A) shows that the plant was losing weight till about 11 a.m., and that after this there was a continuous increase in weight. The graph for the leaf movement (B) indicates that the leaf also changes its direction of movement about the same time, the upward and downward movement of the leaf thus coinciding with the oscillation in the weight of a plant. Graph C explains the rate of change in the weight of a plant.

The above observations prove that although the plant shows an increase in weight from day to day, still it will be losing weight during certain hours of the day. The movement of the leaf directly signifying a variation in the turgidity of the plant-body at regular intervals, may also be taken to be an indirect expression of the fluctuating weight of the plant