for conversion of orotic acid to pyrimidines remains unaffected. This observation implies that the depression of RNA-synthesis in irradiated rat receiving actinomycin D might be associated with inhibition of yet another crucial enzyme functioning in this pathway.

Thus the present findings suggest that, besides changes at the transcriptional level[1–3], whole-body exposure of rats to X-rays also causes a significant stimulation in the synthsis of ribonucleotides in liver. Increase an RNA-synthesis and accelerated rates of formation of ribonucleoside precursors could probably be interlinked as can be conjectured from the above findings and also other reports[11,12]. The levels of ribonucleotides are not elevated significantly in the liver of irradiated rat as compared to those from non-irradiated ones. This could possibly be due to increased demand for nucleotides to meet the enhanced rate of RNA-synthesis. Mandel and coworkers[13] have shown that in regenerating rat liver, although there is no increase in the levels of ribonucleoside precursors, the enzymes responsible for the synthesis of ribonucleosides are significantly activated.

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Orientation of *Papilio demoleus* larvae to coloured solutions

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Summary. The present work compares the taxis of *Papilio demoleus* larvae to different coloured solutions. The larval positive taxis, i.e., attraction, is maximum for yellow colour and declines with the increase or decrease in the wavelength of maximum light transmission. Red and bluish-green colours repel the larvae.

Several insects have been reported to show different orientational responses to different colours (Mazokhin-Porshnyakov[1]). But there are very few reports on this with respect to lepidopterous larvae. Götz[2] and Hundertmark[3] studied the orientational responses of the larvae of certain lepidopterans to different colours. Meisner and Ascher[4], though reporting attraction of the larvae of *Spodoptera littoralis* to various colours, studied their role in the larval feeding. Electrophysiological study of colour perception by *Bombyx mori* larvae was undertaken by Ishikawa[5]. In the course of our study of the role of visual stimuli in determining the relationships between various plants and *Papilio demoleus* larvae, their orientational responses to different colours have been tested and the results are given here.

Material and methods. Newly emerged last (fifth) instar larvae of *Papilio demoleus* were taken from culture, maintained as described before[6], and starved for 4–6 h before testing their orientational responses to different colours. The sources of stimuli used were 0.1% aqueous solutions of certain dyes mixed in different proportions to give different colours (table). Each solution was filled in a thin-walled, rectangular glass trough which was 75 mm long, 20 mm high and 5 mm in depth. Its 1 wall (75 × 20 mm) was externally lined with a white filter paper to form a reflecting surface for the light incident through the opposite transparent wall.

The orientational response of the larvae was studied on a grid by the method developed by Saxena et al[7]. The grid consisted of 13 longitudinal ribs intersecting 17 transverse ribs at right angles at about 2 cm distance. The grid was placed flat on a horizontal fluorescent white screen, uniformly illuminated from underneath by 2 20 W fluorescent lights. The glass trough containing the desired coloured solution was placed vertically on 1 side of the central transverse rib, parallel to it, at 1 cm distance from its central intersection with the central longitudinal rib. The centre of the glass trough was held at the level of the central longitudinal rib and the colour of its solution could be seen through its transparent wall facing the central intersection. Each larva was allowed to move on the central transverse rib towards the central intersection from the preceding intersection. On reaching the intersection, the larva might continue to move forward or turn and move on the central longitudinal rib towards the coloured solution on one side or towards the opposite blank side. The next larva was then tested from the opposite direction. On the basis of 10 tests in each replicate, the percentages of the larvae moving forward (F), turning towards the stimulus source (S) and towards the blank side (B) were recorded. The difference (S–B) between the percentages of the larvae turning towards the stimulus source and the blank side would show their orientational preference, its positive values indicating the attraction and negative values repulsion of the larvae by the coloured solution. Each experiment was repeated five times.

Results and discussion. The maximum percentage (92%) of the larvae turned towards the yellow coloured solution, the opposite blank side drawing only 4% larvae and the remaining ones moving forward on the grid (table). Consequently, the orientational preference of the larvae for the yellow solution was the highest (88%). With the decrease in the range of wavelengths for maximum transmission of light through different coloured solutions, the percentage of larvae turning and showing orientational preference towards the solutions declined. Thus, the larval preference for the yellowish-green solution was $^{7}/_{8}$, for the greenish-yellow $^{2}/_{3}$, for the green $^{2}/_{5}$ and for the greenish-blue $^{1}/_{3}$ of that for the yellow. A further decrease in the wavelength for maximum light transmission resulted

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Orientational responses of last (fifth) instar larvae of *Papilio demoleus* to different coloured solutions[a]

Dye solutions[b]	Colour	Spectral region (nm) for maximum light transmission	Larvae turning/moving (%)[g] (mean ± SE)		Orientational preference[h]
			S	B	
Methylene blue	blue	430–450	22 ± 8.6	36 ± 6.0	– 14
Methylene blue + auramin O (4:1, v/v)	bluish-green[c]	440–460	32 ± 3.7	20 ± 5.5	– 12
Methylene blue + auramin O (3:2, v/v)	greenish-blue[d]	470–490	46 ± 8.1	22 ± 2.0	24
Methylene blue + auramin O (5:5, v/v)	green	480–510	46 ± 8.1	14 ± 4.0	32
Methylene blue + auramin O (2:3, v/v	greenish-yellow[e]	490–520	70 ± 6.3	12 ± 2.0	58
Methylene blue + auramin O (1:4, v/v)	yellowish-green[f]	500–530	80 ± 3.2	4 ± 2.5	76
Auramin O	yellow	530–650	92 ± 3.7	4 ± 2.5	88
Auramin O + acridin red (1:1, v/v)	orange	600–650	64 ± 4.0	22 ± 3.7	42
Acridin red	red	620–650	12 ± 3.7	42 ± 2.0	– 30

[a] Each solution was presented in a rectangular glass trough (75 × 20 × 5 mm) on one side of the larvae on the grid. [b] Each dye was used as 0.1% aqueous solution. [c] The colour was more bluish and less greenish. [d] The colour was more greenish and less bluish. [e] The colour was more greenish and less yellowish. [f] The colour was more yellowish and less greenish. [g] The remaining percentages of larvae moved forward. [h] Calculated as the difference (S–B). S, B, percentages of the larvae turning towards the stimulus source (coloured solution) and the opposite blank side respectively.

in a slight repulsion of the larvae by the coloured solutions viz., bluish-green, blue. Even a rise in the wavelength for maximum light transmission above that for the yellow solution resulted in a decrease in the orientational preference to 42% for the orange solution. A further rise caused the larval repulsion by the red solution.

These observations show that *P. demoleus* larvae can discriminate between different colours, some of which attract and others repel the insects. Certain other lepidopterous larvae have also been reported to show differences in their orientational responses to different colours[2,3]. According to Götz[2], a comparison of the responses of *Vanessa io* larvae to white, green, brown and black revealed their maximum attraction to green when the larvae were young and hungry, and to brown or black when they were about to pupate. Hundertmark[3] studied the orientational responses of *Lymantria monacha* larvae to blue, yellow, bluish-green and red colours, each of which was given as a choice against 2–4 other columns of different shades of grey and black. His experiments showed larval discrimination of these 4 colours relative to the shades of grey and black but not relative to one another. Nevertheless, Hundertmark[3] concluded that *L. monacha* larvae could distinguish blue, yellow and bluish-green colours from grey or black, and red was indistinguishable from black. The larvae of *Bombyx mori* were also shown by electrophysiological techniques to distinguish different colours, their spectral sensitivity curves showing one peak in the near UV and another hump or peak in the blue-green region of the spectrum[5]. Thus, these reports give information on the ability of the lepidopterous larvae to distinguish only a few different colours. In this respect, the present work has advanced our knowledge by showing that a lepidopterous larva, e.g., that of *P. demoleus*, cannot only distinguish but also show positive or negative taxis to several different colours ranging from blue to red in the visible region of the light spectrum.

Voltage variation in *Lilium longiflorum* pistils induced by pollination

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Summary. Voltage variations in *Lilium longiflorum* pistils arose 120 min after pollination with pollen of the same flower. No action potential was registered if pollen of *Petunia hybrida* was placed on the stigma. Apparently the voltage variations were evoked by the germination of the pollen grains, and/or the penetration of the style by the pollen tubes.

After pollination, the ovaries of many plants show metabolic changes before the pollen tube reaches the ovules[1–3]. Apparently, the ovaries receive an early signal containing information about the germination of the pollen or the interaction between the pollen tubes and the transmitting tissue in the style. The study reported here indicates that pollination induces an electrophysiological signal.

About 24 h after anthesis, a microelectrode was inserted into the pistils of *Lilium longiflorum* cv. Mount Everest (figure 1). Voltage variations were recorded monophasically on a FM tape recorder for about 6 h after microelectrode insertion. Some erratic electrical activity was observed for less than 30 min after microelectrode insertion. Pollinations with incompatible pollen from the same flower were made at various periods after microelectrode insertion. The voltage variation observed was quite distinct with a duration time from 30 to 65 sec and an amplitude of from -2 to -6 mV (figure 2). The