masterol) fed to *T. granarium* in semidefined diets. These should permit us to determine unequivocally whether this insect dealkylates or metabolizes phytosterols to any significant extent. Our findings further emphasize the diversity that exists in the physiological and biochemical mechanisms involved in the utilization of sterols as essential nutrients by insects.

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Influence of photoinduction on aminotransferase activity in biloxi soybean, *Glycine max.* L., Merr.

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Summary. Increasing number of photoinductive cycles markedly influenced the activity of 5 different aminotransferase systems as compared to non-inductive cycles. The activity was related to the requirement of the corresponding aminoacid synthesised during the process of photoinduction in the leaves.

Aminotransferases are related to the growth and development of plants, and this activity was also found to be influenced by photoperiodic treatments[1-7]. However, the activity of glutamate-pyruvate and glutamate-oxaloacetate aminotransferases were not related to photoinduction in a long-day plant *Lolium temulantum*[6]. But the activity of glycine-aspartate system markedly increased due to 7 short-day cycles in biloxi soybean, a short-day plant[1].

An attempt was therefore made to study the changes in the activity of 5 different aminotransferase systems with the increasing number of short-day cycles in the leaves of biloxi soybean.

Materials and methods. Plants of biloxi soybean (*Glycine max.* L., Merr.) were grown under continuous light. After completion of 1 month, plants were divided into 4 groups and exposed to 3, 7 and 15 photoinductive cycles (8 h light and 16 h darkness). Control plants (0 photoinductive cycles) were kept under continuous light. More details about the experimental methods are described elsewhere[3]. Fully expanded green leaves were chopped and homogenated in phosphate buffer (pH 7.2) and centrifuged at 3000× g at −2 °C. The supernatant was dialysed against distilled water for 12 h with continuous stirring at 5 °C. The dialysed extract was used as a source of the enzyme and assayed for its activity using ^{14}C labelled amino acid as one of the substrates. The activity of 5 different aminotransferase systems, i.e. glutamate-oxaloacetate, glutamate-pyruvate, glutamate-glyoxylate, glycine-pyruvate and glycine-ketoglutrate, were assayed by taking a known amount of ^{14}C labelled glutamate/glycine along with ketoacids depending upon the aminotransferase system mixture, as detailed by Cossins and Sinha[8]. The reaction mixture was incubated for 1 h at 30 °C to allow the amino acid to be transaminated. For separation of end products, a similar method as described earlier by Sengupta et al.[9] was used. The ^{14}C activity was assayed in a tracerlab liquid scintillation counter. Enzyme protein after digestion of the enzyme precipitate, obtained by trichloroacetic acid, with sulphuric acid and hydrogen peroxide was estimated by nesserlization.

Results and discussion. The table shows that the increasing number of short-day cycles markedly enhanced the enzyme activity as compared to control, except at 3 cycles treatment where glycine was taken as a donor. 3 systems, i.e. glutamate-oxaloacetate, glutamate-pyruvate and glycine-ketoglutrate, showed the maximum activity at the stage of 7 inductive cycles, whereas other 2 systems, i.e. glutamate-glyoxylate and glycine-pyruvate, it was at 15 cycles. Number of flowers produced per plant also significantly increased with the increasing number of short-day cycles. Decrease and increase in some of the other biochemical constitutents were also observed with the increasing number of photoinductive cycles[3,7]. Endogenous concentrations of Cu and Fe micronutrients showed continuous increase up to 15 inductive cycles, while Zn and Mn increased only up to 7 cycles, and GA-like substances decreased up to 7 cycles in biloxi soybean[10,11].

It may be expected that the activity of 5 different aminotransferases investigated here differentially changed when

Effect of photo-induction on the aminotransferase activity of five different systems in biloxi soybean (*Glycine max.* L. Merr.)

Transaminase systems	Number of photoinductive cycles given (cpm/mg protein)			
	0	3	7	15
Glutamate-oxaloacetate	5500	7164	8595	7316
Glutamate-pyruvate	6774	7549	7610	6957
Glutamate-glyoxylate	7417	7862	8519	8679
Glycine-pyruvate	4039	4036	4119	6267
Glycine-ketoglutrate	3289	3263	3661	3582
Mean	5404	5975	6501	6560
Number of flowers/plant	0.0	1.63	15.9	34.6

CD 5% P for transaminase systems = 270.19; for flowering = 7.5.

the photoinductive cycles were given successively. For instance, the demand for alanine and glutamate, which are the end products of glycine-pyruvate and glycine-ketoglutrate systems, increased after the completion of 3 photoinductive cycles. Similarly the requirement of aspartate, alanine and glycine, which are the end products of other 3 reaction systems, i.e. glut-oxaloacetate, glut-pyruvate and glut-glycine, showed an increase right from the beginning of 3 photoinductive cycles. However, no direct reason could be given for the increase and decrease in the activity of 5 different transaminase systems during the process of photoinduction. But it can be stated that the transaminases play an important role in the process of floral induction in biloxi soybean. Whether these biochemical changes in the leaves may be attributed mainly to the direct or indirect effect of photoinduction has to be thoroughly explored.

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External nares and olfactory perception

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Summary. Lower vertebrates have more widely separated external nares than higher forms and are thus better adapted to utilize olfactory tropotaxis, or stereolfaction, than higher vertebrates which, on account of their flexible necks, must utilize klinotaxis. Snakes and tubenosed bats break the rule on account of their specialized life styles.

There is little experimental evidence to indicate whether the olfactory system of vertebrates operates by tropotaxis, when the signal perceived by each of the paired receptor organs is compared simultaneously, or by klinotaxis, when the head is moved from side to side so both organs together can compare the concentration or other quality of an odour. Studies with dogfish[1] and man[2] suggest that tropotaxis, or stereolfaction, occurs but behavioural observations on a large number of species indicates the widespread existence of klinotaxis. Since air or water to be sampled by the olfactory system must first be drawn into the external nares, the position of these structures on the head might play a part in enhancing olfactory perception through one or other, or perhaps both, of these sampling strategies.

For an accurate assessment to be made of the direction from which an odour emanates the sampling devices, or external nares, should either be as widely separated as possible thus providing a wide base for stereolfactory triangulation, or the post-cranial skeleton should be sufficiently flexible to allow the head to be swung from side to side providing a mechanism for klinotactic comparison. With the exception of a few notable exceptions in which the external nares are positioned on lateral projections extending outwards from the side of the head, viz. hammerhead sharks (Sphyrnidae) and tubenosed bats, (Nyctimeninae and Murininae), the maximum distance separating the nares is limited by the width of the skull. This, in its turn, is a product of the ecological niche occupied by the species. Examination of the ratio of the skull width to internarial width reveals that the nostrils are relatively more widely separated in lower vertebrates than in higher forms (table 1). Exceptions to this trend are snakes and tubenosed bats, with more widely spaced nostrils than might be expected, and the aquatic reptiles with nostrils more closely positioned than the trend line would predict.

Because large animal species have, potentially at least, more widely spaced nares than smaller species, consideration of the absolute separation must be restricted to species of more or less uniform size and in this analysis includes only those species with a maximum adult weight not exceeding 200 g (238 g in the case of snakes). The data shown in table 2 indicate that higher vertebrates have more closely set nostrils than lower vertebrates and once again the snakes and tubenosed bats stand apart from the trend.

Consideration of the data in the tables indicates that the position of the external nares might be related to factors

Table 1. Ratio of skull width to internarial width for a sample of 165 genera of vertebrates

	Number of specimens	Ratio	±SE
Elasmobranchs	12	1.8	0.21
Teleosts	21	2.4	0.44
Urodeles	9	2.8	0.22
Anurans	12	3.7	0.37
Snakes	18	2.0	0.20
Lizards	39	4.0	1.29
Turtles	3	7.6	-
Crocodiles	3	9.3	-
Birds	14	4.2	0.70
Tree shrews, Insectivores, Marsupials	16	5.1	0.69
Rodents	8	6.0	0.41
Tube nosed fruit bats	4	1.7	0.17
Tube nosed insectivorous bats	6	2.1	0.21

All measurements were made on spirit preserved museum specimens with the exception of 4 bird and 5 marsupial genera which were made on live specimens. All specimens were adult. The skull width is the maximum width of the head measured immediately anterior to the ears and the internarial width is the minimum separation between the inner edges of the external nares.