

**DIFFERENTIAL ATTRACTION OF LARVAE OF THE EGYPTIAN  
COTTON LEAFWORM, *SPODOPTERA LITTORALIS* (BOISDUVAL)  
(LEPIDOPTERA : NOCTUIDAE), TO SEVERAL COLOURS**

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**ABSTRACT**

Lamellae of Styropor (foamed polystyrene) treated with 3% sucrose and varying concentrations of brown, yellow, and green dyes (food colours) were offered to larvae of *Spodoptera littoralis* in choice and no-choice experiments. In no-choice experiments, lamellae treated with 3% sucrose and green, brown, or yellow dyes were about equally phagostimulative, whereas in a choice situation the larvae consumed about twice as much on the brown as on the green or yellow colour.

KEY WORDS: *Spodoptera littoralis*, food colours; attraction; foamed polystyrene.

**INTRODUCTION**

In a previous work (Meisner and Ascher, 1973) it was found that in choice trials larvae of the Egyptian cotton leafworm, *Spodoptera littoralis* (Boisd.), fed more intensely on lamellae of Styropor (foamed polystyrene) treated with a mixture of 3% sucrose and varying concentrations of some food colours than on white lamellae treated with 3% sucrose alone. All the colours which are situated in the colour circle (Kornerup and Wanscher, 1967) in the area of the primary colours green and yellow were highly active. In subsequent choice trials, the yellow colours were more attractive than the green ones. In order to find whether these results are applicable to poisoned wheat bran baits used in the control of this insect, we conducted choice experiments with non-poisoned bran pellets which had been dipped in solutions of the different active colours. Surprisingly, it was found that pellets treated with green and yellow were not more attractive in choice experiments than untreated pellets. It was suspected that the brown colour of wheat bran may be an optical stimulus of the same magnitude as green or yellow. This led us to study the attraction of *S. littoralis* larvae to brown colours, in choice trials with the yellow and green colours previously found to be active. Styropor was again used as a substrate and sucrose as a phagostimulant.

**MATERIALS AND METHODS**

**Biological material**

Weighed larvae of *Spodoptera littoralis* reared at 27°C and 60% RH on alfalfa were used in all the experiments which were conducted at 27°C.

**Chemicals**

The following food colours, produced formerly by ICI, UK and then by Williams (Hounslow) Ltd., UK, were employed in the experiments [determination of colours according to Kornerup and Wanscher (1967) in brackets]: Edilake Yellow FCS [3A4], Edicol Supra Yellow FCS [6A6], Certolake Milk Chocolate Colour (175285) [5B3], Certolake Plain Chocolate Colour (175290) [5B2], Certolake Green Colour (172257) [27B4] (Meisner and Ascher, 1973). The Certolake colours are aluminum lakes containing a high proportion of alumina as extender of the corresponding Certicol (Edicol Supra) dyes which are sodium salts; the Certolakes contain only a quarter or less of the corresponding Certicol.

### Experiments with Styropor lamellae

To assess phagostimulation we used the Styropor method (Ascher and Meisner, 1973): lamellae (6 × 3 cm) of Styropor (foamed polystyrene) of density 0.016 ( $P_{16}$ ), with dry sucrose residues as phagostimulant, were offered in large Petri dishes (15 cm diam.) to larvae of *S. littoralis* weighing 170–190 mg, under ordinary day-and-night conditions of illumination and at 27°C. The lamellae were painted with 3% sucrose and varying concentrations of colours in water-ethanol 9:1, containing one drop of Triton X-100 per 10 ml of solution as spreader and were left to dry for 24 h. Then one larva was introduced per dish (20 replications per experiment) and each experiment was repeated several times. Both choice trials (two differently treated lamellae per dish) and no-choice trials (only one lamella per dish) were conducted. The weight of Styropor consumed per larva served as the criterion of phagostimulation, the results being recorded after 48 h.

### RESULTS AND DISCUSSION

In choice experiments between lamellae treated with 3% sucrose plus varying concentrations of either brown, yellow, or green dyes, *S. littoralis* larvae consumed about twice the quantity of brown lamellae as compared with yellow or green ones (Table 1). In no-choice experiments, feeding on lamellae treated again with 3% sucrose and green, brown, or yellow dyes was about equal (Certolake Green Colour, 5.9; Certolake Plain Chocolate Colour, 5.6; Edilake Yellow FCS, 4.8 mg/larva). Since larvae of some other Lepidoptera species, e.g., *Vanessa* sp., *Pieris brassicae* L. (Götz, 1936), and *Lymantria monacha* L. (Hundertmark, 1937), are attracted more strongly by green than by brown, the present results may explain the anomaly of the equal attraction of coloured and non-coloured wheat bran pellets for *S. littoralis* larvae.

TABLE 1  
Feeding of *Spodoptera littoralis* larvae in choice tests between lamellae of Styropor treated with a mixture of 3% sucrose and varying concentrations of brown, green, and yellow colours

A Dye + 3% sucrose	vs	B Dye + 3% sucrose	48-h feeding ratio (A:B)
0.05% Certolake Plain Chocolate		0.05% Edilake Yellow FCS	2.2
0.5% Certolake Plain Chocolate		0.5% Edilake Yellow FCS	1.9
1.0% Certolake Plain Chocolate		0.25% Edicol Supra Yellow FCS	1.7
1.0% Certolake Plain Chocolate		1.0% Edicol Supra Yellow FCS	2.5
0.5% Certolake Milk Chocolate		0.1% Edicol Supra Yellow FCS	2.2
0.5% Certolake Milk Chocolate		0.5% Edilake Yellow FCS	1.7
0.5% Certolake Milk Chocolate		0.25% Certolake Green	1.7
0.5% Certolake Milk Chocolate		0.5% Certolake Green	1.7

### REFERENCES

- Ascher, K.R.S. and Meisner, J. 1973. Evaluation of a method for assay of phagostimulants with *Spodoptera littoralis* larvae under various conditions. *Entomologia experimentalis et applicata* 16:101–114.
- Götz, B. 1936. Beiträge zur Analyse des Verhaltens von Schmetterlingsraupen beim Aufsuchen des Futters und des Verpuppungsplatzes. *Zeitschrift für vergleichende Physiologie* 22:429–503.
- Hundertmark, A. 1937. Helligkeits- und Farbenunterscheidungsvermögen der Eiraupe der Nonne (*Lymantria monacha* L.). *Zeitschrift für vergleichende Physiologie* 24:42–57.
- Kornerup, A. and Wanscher, J.H. 1967. *Methuen Handbook of Colour*, Second edition. Methuen, London, UK.
- Meisner, J. and Ascher, K.R.S. 1973. Attraction of *Spodoptera littoralis* larvae to colours. *Nature (London)* 242:332–334.