

such as continued washing or dry-cleaning. Several types of chlorinated aromatic sulphonic acids are commercially available which combine with wool from the dye-bath to give a satisfactory permanent result¹. The industrial application of such methods has been limited, due probably to the fact that the amounts required (at least 1 per cent of the weight of wool) can result in a treatment which is considered to be too expensive.

In experiments to ascertain the effectiveness of 'Dieldrin' and 'Aldrin' for these purposes, it has been observed that 'Dieldrin' in low concentrations is a most effective mothproofing agent, producing a result which is unexpectedly fast to both washing and dry-cleaning.

Samples of worsted fabric (4 gm.) were treated with petroleum ether solutions of each insecticide, the amount applied being regulated by the weight of solution taken up by the sample. After each treatment, the solvent was removed by evaporation at room temperature. To assess washing fastness, each sample was washed in a wash-wheel using 120 ml. of 0.2 per cent soap solution at 45° C., the solution being renewed every 15 min. To determine the effect of dry-cleaning, a sample was placed in a jar with 120 ml. white spirit and rotated for the required time, the solvent being renewed every 15 min.

The effectiveness of each treatment against clothes moth (*Tineola bisselliella*) was evaluated by exposing each of four samples of the various fabrics to ten larvæ for a period of fourteen days and observing loss in weight of fabric and mortality of larvæ.

The results, which will be reported in detail elsewhere, show that 0.05 per cent 'Dieldrin' on the weight of wool gives a mothproof effect which persists after 1½ hr. washing and 1 hr. dry-cleaning.

Preliminary experiments indicate that 'Dieldrin' is also very effective against furniture carpet beetle (*Anthrenus flavipes* Le Conte). As application from aqueous suspension gives similar results, the method offers the possibility of a convenient technique for protecting wool against insect attack.

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¹ Clark, *J. Soc. Dyers and Color.*, 59, 213 (1943). Langer, *Helv. Chim. Acta*, 27, 71 (1944).

Tanning of Blowfly Puparia

THE nature of the aromatic component responsible for the tanning of the cuticle of blowfly puparia is not entirely clear. Pryor, Russell and Todd¹ isolated protocatechuic acid from puparia of *Calliphora erythrocephala*, but could not find any phenolic material in *Lucilia caesar*. They used large quantities of insects preserved in sulphur dioxide solution. I have re-investigated the problem on small quantities of fresh material, using paper chromatograms.

With *m*-cresol-acetic acid-water solvent, and developing with ferric chloride, small concentrations of dioxyphenylalanine were found in mature larvæ of *Calliphora* and *Lucilia*, but no protocatechuic

acid, although by the same method it was possible to demonstrate the presence of protocatechuic acid in fresh oothecæ of *Periplaneta* and of 3-4 dihydroxyphenylacetic acid in preserved imagines of *Tenebrio molitor* and *Sitophilus granarius*. Besides dioxyphenylalanine, *Calliphora* extracts showed the presence only of two substances giving a colour with ferric chloride; one, pink, at *R_F* 0.54, and another, a brownish-pink, at *R_F* 0.75. Repeating the experiment with butanol-acetic acid-water as solvent, and developing with Ehrlich's reagent, ninhydrin, diazotized sulphanilic acid, and ferric chloride, these spots were shown to be due to kynurenin and 3-oxykynurenin; compared with authentic samples they showed the same *R_F* values, gave the same colours with the various developers, and showed the same fluorescence in ultra-violet light. Both substances are present in relatively high concentration.

A comparison with Levenbook's² findings on the blood of *Gastrophilus intestinalis* suggests that the unknown aromatic amino-acid which he found to be present in high concentration was in fact 3-oxykynurenin. Levenbook suggested that his unknown amino-acid was important for the hardening of the puparium, and the behaviour of 3-oxykynurenin with extract of larval cuticle confirms this. When incubated in a respirometer with cuticle extract at pH 7.0, 3-oxykynurenin absorbs oxygen nearly as fast as an equimolar concentration of catechol under the same conditions.

These preliminary observations suggest that in *Calliphora*, and probably in other insects, there is an alternative method of tanning the cuticle, using aminophenols derived from tryptophan instead of dihydroxyphenols derived from tyrosine. Butenandt *et al.*³ have shown that insect eye pigments, as well as the insectorubins described by Goodwin⁴, are formed by the condensation of two molecules of 3-oxykynurenin; it is tempting to suppose that the formation of these pigments is a byproduct of a mechanism for tanning the cuticle.

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¹ Pryor, Russell and Todd, *Nature*, 159, 399 (1947).

² Levenbook, *Biochem. J.*, 47, 336 (1950).

³ Butenandt, Schiedt, Biekert and Kornmann, *Liebigs Ann.*, 586, 217 (1954). Butenandt, Schiedt and Biekert, *Liebigs Ann.*, 586, 229; 588, 106 (1954).

⁴ Goodwin, *Biol. Rev.*, 27, 439 (1952).

Cytological Contributions to the Phylogeny and Classification of the Rodent Genus *Gerbillus*

THE Gerbillinae are highly differentiated rodents exhibiting many instances of parallel specializations in external and anatomical features evolved in independent lines. Consequently, the present state of the taxonomy of this group is unsatisfactory. Three years ago we started an extensive study of the chromosome complements in the species occurring in Israel. The comprehensive cytological studies of Matthey^{1,2} enabled us to compare the idiograms of our species with those of others from different parts of the family range.