treatments and subsequent periods in air at the same temperature. McIntosh fruits exposed to nitrogen for 36, 72 or 108 h were free of scald on removal, but afterwards developed scald on exposure to air (Fig. 1). The incidence and severity of scald were directly proportional to the duration of anaerobiosis. The rate of scald development in air following nitrogen induction was considerably lower at 0° C than at 20° C. This dependence on temperature clearly links the developmental phase of this disorder with aerobic respiration. Thus, scald was induced anaerobically and developed aerobically.

To relate physiologically the symptoms of induced and naturally occurring scald, Red Rome apples, which had been treated prior to storage with diphenylamine (DPA), a scald inhibitor[8], were compared with a comparable non-DPA-treated sample. One-half of each fruit sample received a nitrogen atmosphere for 108 h. The other half was maintained in air for the same period. All fruits were evaluated for scald after an additional 36 h in air. Diphenylamine significantly inhibited or retarded scald development on apples exposed to 0–108 h of nitrogen (Table 1). The scald-inhibiting properties of DPA counteracted or reduced the inductive influence of anaerobiosis on scald development aerobically. Therefore, it is likely that naturally occurring scald and anaerobically induced scald are the same disorder.

Table 1. Incidence of Scalded Red Rome Apples 36 h after 108 h of Aerobic or Anaerobic Atmospheres as affected by Pre-treatment with 2,000 p.p.m. Diphenylamine (DPA)

Atmosphere	Mean per cent scalded fruits* Non-treated	Treated
Aerobic (air)	9·4*a*	0*a*
Anaerobic (N_2)	34·4*b*	7·3*a*

* Means followed by dissimilar subscripts differ at odds of 19 : 1.

Apparently, apple scald is composed of two physiologically distinct phases, one of anaerobic induction and one of aerobic development. This pattern is compatible with most theories on development and control of this disorder. The mechanism of scald induction and development is under investigation.

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Reciprocal Effects of Insect and Plant-growth Substances

Injection of homogenates of active prothoracic glands into fourth instar locust larvæ, a day after moulting, causes them to moult again prematurely. The instar is shortened by about 12–18 h (Fig. 1). The active agent appears to be an ecdysone (which we have named ecdysone-λ). Injection of those fractions of extracts of whole locusts that contain ecdysone-λ have a similar effect. The plant growth hormone gibberellic acid likewise shortens the instar when injected at the appropriate time into larvæ of both *Locusta migratoria migratorioides* (R. and F.) and *Schistocerca gregaria* (Forskål) (Fig. 1).

Blood taken from locusts about to moult and ecdysone from *Bombyx* (ecdysone-α) have specific effects on the nervous system of locusts that results in reduced locomotory activity[1]. Fresh homogenates of active prothoracic glands of locusts, solutions of gibberellic acid and locust extracts containing ecdysone-λ all have a similar effect.

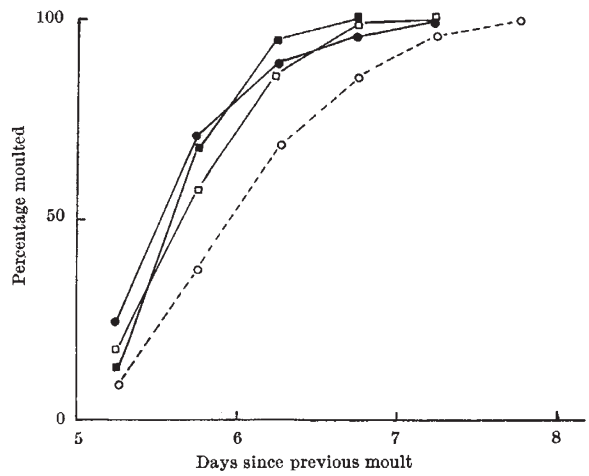

Fig. 1. Cumulative percentage of locusts moulting in successive periods of 12 h after injection of: ○ – – ○, solvent alone; ■, fresh homogenate of prothoracic gland, one gland per animal; □, whole-locust extract; ●, gibberellic acid, 1 μg per animal. 366 fourth instar *Locusta migratoria* were used and injected 18–30 h after the previous moult

Growth of the internodes of dwarf pea plants is greatly increased by the addition of gibberellic acid. Fractions of the locust extracts have been tested on dwarf pea seedlings, var. 'Meteor', in a standard bioassay for gibberellin activity[2]. Those fractions containing large amounts of ecdysone-λ exert a significant stimulation of growth (Fig. 2), corresponding to approximately 10 per cent of that exerted by gibberellin-A_3.

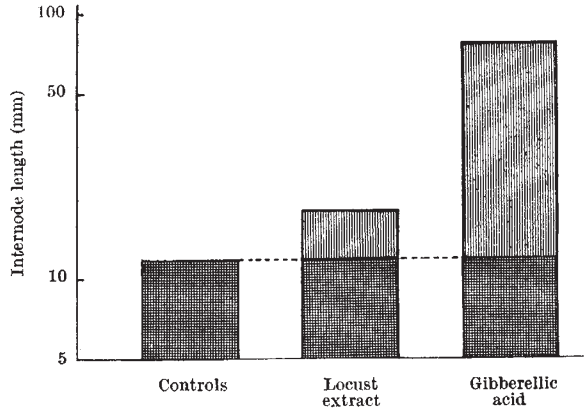

Fig. 2. The mean internode length in dwarf peas var. 'Meteor' treated with solvent alone ('controls'), with the same locust extract as that used in the the experiment illustrated in Fig. 1, and with gibberellin-A_3. The dose of the latter material was chosen to produce optimal growth. 108 plants were used; 3 internodes per plant

Thus the insect growth-substance ecdysone-λ and the plant growth-substance gibberellic acid have similar effects on both plants and locusts.

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