SOME PHYSIOLOGICAL RESPONSES TO D,L ABSCISIN
(DORMIN)

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Summary. The responses to synthetic d,l abscisin have been studied in a variety of tests. When fed in aqueous solution continuously to leaves of seedlings growing under long day conditions, d,l abscisin caused the cessation of extension growth and the formation of typical resting-buds in Betula pubescens, Acer pseudoplatanus and Ribes nigrum. Abscis in also inhibited the growth of non-dormant buds of potato when applied to the whole tubers, but was much less effective when applied to isolated tuber plugs.

Abscis in accelerates the senescence of leaf discs of a wide variety of species, but is less effective when sprayed on to attached leaves, except at relatively high concentrations (50—100 ppm).

Abscis in inhibited flower induction in the long day species, Lolium temulentum and Spinacia oleracea, when applied to the leaves during a period of exposure to 15-long-day cycles. Abscis in promoted flowering in the short-day plants Phar bitis nil, Ribes nigrum and strawberry when applied under long day conditions, but it did not induce flowering in certain other typical short day plants. Tuberization in Solanum andigena and two cultivars of S. tuberosum was promoted by abscisin when applied to the leaves of plants growing under long-day conditions.

Introduction

The chemical structure of “abscisin II”, which accelerates petiole abscission in explants of cotton, was established by Okuma et al. (1965) and confirmed by synthesis by Cornforth et al. (1965b). This substance has been shown to be identical with “dormin” (Cornforth et al., 1965a), and has been shown to be present in a wide variety of plant tissues (Cornforth et al., 1966a). The present paper is a preliminary report on the physiological responses to synthetic d,l abscisin in a variety of tests. The natural product is the d (+) enantiomorph, whereas the synthetic material used in the present experiments is a racemic mixture of both d and l enantiomorphs. However, it has been shown that the l isomer has little activity in certain growth tests (Dr. T. W. Cornforth pers. commn.) and hence it may be provisionally assumed that the results of tests with the racemic mixture would be equally applicable for the natural d-form alone.

Experiments were carried out with d,l abscisin to test its effects on bud dormancy, leaf senescence, abscission, flowering (of both long day and short day plants) and tuberization.
Materials and Methods

The experiments on induction of bud dormancy in woody plants were carried out with seedlings of birch (Betula pubescens), "sycamore maple" (Acer pseu-

dotanum) and Ailanthus glandulosa and with clonal plants of blackcurrant (Ribes

nigrum c.v. "Wellington XXX"), grown in pots in a greenhouse. The seedlings

were used when approximately 15—20 cm tall and the blackcurrant plants, which

were derived from hardwood cuttings, when they were approximately 40—50 cms
tall.

The seedlings of Brussels sprouts (Brassica oleracea), used for studies on leaf

senescence, were about 10 cms tall. The leaves of various species used in tests with

leaf discs were collected from out-of-doors in September and October. For the

experiments on flowering, plants of the long-day species Lolium temulentum and

spinach (Spinacia oleracea), grown from seed obtained from the Welsh Plant

Breeding Station, Aberystwyth and from a commercial source, respectively, were

raised in pots in a greenhouse under short-day conditions (8-hour photoperiods).

The plants of soybeans c.v. "Biloxi", cocklebur (Xanthium pennsylvanicum) and

tobacco c.v. "Maryland Mammoth" were grown under long-day conditions (18-hour

photoperiods) from seed supplied by the U.S. Department of Agriculture, through

the kind assistance of Dr. H. A. Borthwick.

The plants of strawberry c.v. "Cambridge Favourite" were obtained as runners

from parent plants grown under 18-hour photoperiods. Night temperature condi-
tions were maintained above 15°C, but on a few occasions during the winter the

temperature fell below this level. The seedlings of Pharbitis nil and Chenopodium

rubrum were grown from seed supplied by Prof. Ishamura and Prof. W. W. Schwabe,

respectively. The methods used for growing these species are described in detail

below.

The plants of Solanum andigena were grown in pots from tubers, using a clone of

unknown origin which normally requires short-day conditions for tuberization.

All plants grown in pots were kept in a heated greenhouse with a minimum

night temperature of approximately 15°C, but considerably higher temperatures

occurred during the day. Where long-day conditions were required, the natural
daylength was extended to 18-hours by light from tungsten filament lamps giving

an intensity of approximately 100 lux at plant level. For short-day conditions the

plants were kept on trollies which were placed in cabinets in the greenhouse for the
dark periods, to give 8-hour photoperiods. In winter, supplementary illumination
during the photoperiods was provided by 700-watt high pressure, fluorescent-

coated, mercury-vapour lamps.

Aqueous solutions of d,1 abscisin were used, containing 0.01 ml/l Nonidet as a

wetting agent. When used as a spray, the solution was applied daily by means of a

commercial aerosol device. When applied continuously, the abscisin solution was

ted to the youngest fully expanded leaf, by dipping the leaf into a tube containing

the solution and which was attached to a stake in each pot. The solutions were

replenished daily.

Results

Induction of Bud Dormancy

We have previously reported (Eagles and Wareing, 1964) that partially purified inhibitor extracted from leaves of Betula pubescens
causes the cessation of extension-growth and the formation of terminal
buds when fed as an aqueous solution to seedlings of this species, growing under long days. Thus, application of inhibitor simulates the effects