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BRIEF COMMUNICATION

Retardation of Inflorescence Development in *Calendula officinalis* by a Morphactin and its Application

H. Y. Mohan Ram and Usha Mehta

Department of Botany, University of Delhi, Delhi-7, India

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Abstract. The morphactin — chlorflurenol at 1, 5, 25, 125 and 625 μg/plant either caused total damage of the shoot apices or allowed a few inflorescences to develop with few or no flowers. The inflorescences arising in the lateral branches showed suppressed bracts and modified flowers. With time the treated plants recovered and showed a significant increase in the growth of laterals and the number of inflorescences. Thus morphactin can be used for prolonging the growth period and for obtaining more wholesome plants.

Morphactins are a group of synthetic fluorene compounds that have recently been shown to bring about profound changes in form and developmental pattern of a wide range of flowering plants (Schneider 1970). Von Denffer *et al.* (1969) reported suppression of floral organs and entire flowers by chlorflurenol in explants of *Begonia* × *richmondensis in vitro*. Congenital fusions and reduction of floral organs have also been observed in *Arabidopsis*, *Heliotropium* (Sankhla and Sankhla 1968, Sankhla 1970), *Pharbitis* (Harada 1969), *Cannabis* (Mohan Ram and Jaiswal 1971) and *Linum* (Uma 1972). Production of leaf-like structures in place of flowers has been recorded in *Ballota* (Schneider 1969) and *Utricularia* (Mohan Ram *et al.* 1972). We became interested in studying the effects of morphactin on floral morphogenesis in *Calendula officinalis* L.

Seeds were sown in mid-October and when the seedlings were 2—3 weeks old, they were transplanted to earthen pots (25 cm diameter) containing garden soil.

The morphactin used in the experiment was chlorflurenol (methyl-2-chloro-9-hydroxyfluorene-(9) carboxylate) and five concentrations of it were tried (0.1, 0.5, 2.5, 12.5 and 62.5 μg/0.1 ml). 0.1 ml was applied to the shoot tip daily for ten days. Thus the total amount of chlorflurenol given to each plant was 1, 5, 25, 125 and 625 μg respectively. Treatment was given at two stages: Stage I (plant with 6—8 leaves, vegetative), Stage II (plant with 10—12 leaves, just after the onset of flowering). Twenty-four plants were used for each treatment. Triton X-114 at 0.01% was used as wetting agent. The control plants received only the wetting agent. The plants were kept under natural conditions existing in the University Botanical Garden from October 1971 to May 1972.

In *C. officinalis* L., the inflorescence is a capitulum. It is heterogamous and globose (Fig. 1*A*). The ray florets are female, and asepalous, with a strap-shaped, yellow or orange corolla. The disc florets are tubular and bisexual but are functionally male and bear 5 epipetalous stamens and syngenesious anthers. Fruits are polymorphic and are produced by the ray florets. The plant is characterised by the development of a terminal inflorescence, after the appearance of which the axillary branches arise basipetally and bear inflorescences. The number of axillary branches varies from 10—14. The florets develop centripetally and gradually cover the entire surface of the thalamus.

The various effects of applied morphactin on the inflorescence at both stages of development and at various concentrations are being studied in detail and will be published subsequently. In this paper only the salient observations are reported.

In general, the treated plants showed reduced activity of the shoot meristem, release of inhibition of laterals and retardation of internodal elongation. The main shoot apices of plants of Stage II were destroyed by chlorfluorenol at all concentrations. The first 4—6 axillary branches remained inhibited at concentrations from 1 to 25 μg/plant. The higher concentrations inhibited the development of axillary branches approximately upto the 11th node. The apices of plants of Stage I developed slowly and organised an inflorescence with very few florets at concentrations upto 25 μg/plant. At concentrations of 125 and 625 μg, the inflorescence apex remained barren. The leaves became thick, distorted, deep green, reduced and occasionally fused. The latter concentration proved lethal and the plants were destroyed after 6—7 weeks of treatment.

The capitula in the lateral branches arising after treatment were small; a few of them (3 to 5%) remained enclosed within the involucre. Condensation of the internodes and lateral branches, and fusion of the capitula were commonly observed. The inflorescences showed partial or total suppression of bracts, absence of ray florets and presence of only a few disc florets (Fig. 1*B—D*). Extreme degree of retardation was observed in the capitula which lacked peduncle, bracts, ray and disc florets and appeared to arise from the centre of fused foliage leaves (Fig. 1*E*). In some instances the ray florets were minute and had tubular corolla, or they were apetalous. The pistils were reduced and failed to set fruits. In the disc florets normal looking pistils were observed but the stamens were either totally absent or if present had non-viable pollen.

Attempts were made to reverse the floricidal effect of chlorflurenol by applying gibberellic acid (25, 50 and 100 μg/plant) to the surface of the capitula. The peduncles elongated, but no flower primordia were formed in response to this treatment.

After 8—10 weeks of treatment, when presumably the effect of chlorflurenol had waned, axillary branches started developing with normal leaves and inflorescences.

Morphactin can thus retard the growth of plants during early winter Treatment with morphactin also increases the growth of the lateral branches thereby giving the plants a more bushy appearance. The number of inflorescences is also highly increased and the plants thus look more wholesome

As it is difficult to germinate the seeds in late winter, morphactin application can be used for prolonging the flowering period beyond the normal season.

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Figures at the end of the issue.

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