Drastic Changes of Endogenous Phytohormones in Dormant Gladiolus Corms Treated with Methyl Disulfide

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Abstract. Effects of methyl disulfide (MeS₂) on sprouting and phytohormones in dormant corms of spring-flowering gladiolus (*Gladiolus* × *Tubergenii* Hort. 'Charm') were studied. Corms treated with MeS₂ sprouted 30 days earlier than nontreated corms. The concentrations of endogenous promoters in the corm tissue increased and inhibitors decreased within 24 h of treatments. High concentration of inhibitors were present in the nontreated corms.

The duration of corm dormancy of spring-flowering gladiolus was shortened by high-temperature storage (Hosoki, 1985a) or treatment with gases (ethanol, acetaldehyde, ethylene, or CO) (Hosoki, 1985b). Methyl disulfide (MeS₂) derived from garlic (*Allium sativum* L.) was effective in shortening dormancy of corms of spring-flowering gladiolus (Hosoki et al., 1986). Hosoki (1985a) reported that high-temperature storage gradually increased auxin-like substances and decreased inhibitors of *Avena* coleoptile growth in corm tissue stored for 25 to 50 days. My report deals with changes in endogenous phytohormones in the dormant corms of spring-flowering gladiolus treated with MeS₂.

Materials and Methods

'Charm' gladiolus corms were lifted on Hachijo Island, Tokyo, at the end of May and were sent to Shimane Univ., Matsue, Shimane, Japan, on 5 June. Twenty corms (averaging 4 cm in diameter, ≈17 g fresh weight) were placed in a sealed 6-liter glass vessel containing 200 ml 1% aqueous MeS₂ at 20°C. The corms were placed on a wire net in the vessel to avoid direct contact with the solution (Hosoki et al., 1986). The corms were removed from the vessel 4 h later, placed on a laboratory table, and stored 24 h at 25°C. Ten of the corms were planted in a tray containing sandy loam soil, maintained at 25°C to evaluate bud sprouting, and watered every other day. Sprouting was defined as a bud on the corm elongated to 1 cm. The remaining 10 corms were used for analysis of endogenous phytohormones (auxin-like substances and inhibitors). Nontreated (control) and MeS₂-treated corms were handled similarly.

After removal of scale leaves, 10 g of corm tissue (1 g from each of 10 corms) were

sampled, extracted at 4°C with 80% methanol for 24 h, and fractioned (Hosoki, 1985a). The acidic fraction then was separated by paper

chromatography with a solvent system consisting of 10 iso-propanol : 1 ammonia water : 1 water (by volume) and bioassayed by an *Avena* coleoptile straight growth test (Tsukamoto and Konoshima, 1972). Growth activities of phytohormones were represented in a histogram in which growth promotion and inhibition of eight *Avena* coleoptiles incubated in distilled water containing a paper strip of each Rf value were compared by least significant difference (LSD) test to those of eight *Avena* coleoptiles incubated in distilled water containing unused paper strip. The distance of solvent developed on the paper chromatogram was partitioned into tenths from the origin, and each partition (zone) was defined as a Rf value from 0.1 to 1.0. The mean length of the coleoptiles elongated in distilled water containing an unused paper strip was rated at 100%.

Results and Discussion

Bud sprouting. Corms treated with MeS₂ sprouted 30 days earlier than nontreated con-

Fig. 1. Effect of methyl disulfide (MeS₂) on sprouting of dormant corms of spring-flowering 'Charm' gladiolus. Arrows indicate the mean number of days to bud sprouting.

Fig. 2. Effect of auxin-like substances and inhibitors extracted from methyl disulfide (MeS₂)-treated and nontreated corms, as quantified with an *Avena* coleoptile straight growth test. Indoleacetic acid (IAA); abscisic acid (ABA). Dark and hatched areas represent significant ($P \leq 0.01$ and 0.05 , respectively) growth promotion and inhibition of *Avena* coleoptiles; mean growth length of coleoptiles incubated in distilled water containing unused paper strip was taken as 100%.

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trol corms (Fig. 1). The mean number of days to sprouting was 27 and 58, respectively (significantly different at $P \leq 0.001$ by t test).

Auxin-like substances and inhibitors. Auxin-like substances were detected at Rf 0.1, 0.2, 0.4, 0.7, 0.8, 0.9, and 1.0, of which Rf 0.1 and 0.2 were active ($P \leq 0.01$ by LSD test) in corms treated with MeS₂ (Fig. 2). The maximum activity of Rf 0.2 was equivalent to a concentration of 0.1 mg 1*H*-indole-3-acetic acid (indoleacetic acid)/liter. Inhibitors were detected at Rf 0.5. The activity was slightly greater than that of 0.01 mg abscisic acid (ABA)/liter. In control corms, no auxin-like substances were detected, but inhibitors were detected at most Rf values. The maximum inhibitor activity at Rf 0.5 of nontreated corms was higher than that of MeS₂. Growth promot-

ers increase and inhibitors decrease gradually during corm storage before termination of dormancy and during high-temperature storage of gladiolus (Hosoki, 1985a). In MeS₂-treated gladiolus corms, these changes occurred within 24 h of treatment. To our knowledge, such a drastic change in the concentration of endogenous phytohormones in corms has not been reported before. Such a rapid change and the corresponding increases in respiration rate (Hosoki, 1989) are involved in the release from dormancy of MeS₂-treated corms. Major phytohormones involved should be identified with further research.

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