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BRIEF COMMUNICATION

Methyl jasmonate inhibits growth and flowering in *Chenopodium rubrum*

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Abstract

C. rubrum plants of different age were treated with methyl jasmonate (JA-Me), in some cases in combination with photoperiodic flower induction. Plants treated with JA-Me (3×10^{-4}, 3×10^{-5} and 5×10^{-7}M) showed inhibition of growth and flowering. No effect of JA-Me application on ethylene formation was observed.

Jasmonates are thought to be ubiquitous in the plant kingdom and they have been found to be involved in many processes in plants (Parthier 1991). Jasmonic acid and its methyl derivate inhibit the growth of rice seedlings (Yamane *et al.* 1980, Yamane *et al.* 1981) and accelerate ontogenetic development: they have stimulatory effects in abscission (Curtis 1984), senescence (Satler and Thimann 1981, Saniewski *et al.* 1987 b) and seed dormancy (Beresetzky *et al.* 1991). These effects has been shown to involve changes in gene expression (Huang *et al.* 1991). Their relationship to plant hormones has also been studied, with similarities particularly ethylene (Czapski and Saniewski 1992, Saniewski *et al.* 1986, Saniewski *et al.* 1987 a, b) and ABA (Curtis 1984) in their effects on plants. It was found that production of ethylene and activity of ethylene-forming enzymes in tomatoes and apples are considerably increased by jasmonates (Czapski and Saniewski 1992, Saniewski *et al.* 1986, Saniewski *et al.* 1987 a, b). That is why, besides its effect on growth and flowering of *C. rubrum* we also tested the production of ethylene.

C. rubrum is a short-day plant, which requires from 1 to 3 inductive photoperiodic cycles (12 h darkness/12 h light) for flower induction, depending on the age (Ullmann *et al.* 1985). We used plants of different ages (from 4 to 8 d old), which were treated in two different ways: either they were grown on the JA-Me solution (5×10^{-7}M) for 12 and 24 h or a droplet (3 μl) of the JA-Me solution (3×10^{-4} or

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3×10^{-5}M) was applied to the plumule. In some experiments, treatment with JA-Me and photoperiodic flower induction were combined. The length of the main stem and of the first leaf and the percentage of flowering plants were evaluated 6 d after the start of treatment.

Table 1. The effect of JA-Me on growth of *C. rubrum*. Plants at age 4 d were grown on JA-Me solution (5×10^{-7}M) for 12 or 24 h. Some were subjected to photoperiodic flower induction (12 h of light/ 12 h of darkness, number of cycles depending on the age) after the JA-Me treatment. Plants were evaluated 6 d after treatment (10 plants for each treatment). Means ± standard error of the mean.

	Non-induced plants		Plants under photoperiodic flower induction		
	epicotyl [mm]	first leaf [mm]	flowering [%]	epicotyl [mm]	first leaf [mm]
JA-Me (24 h)	4.7 ± 0.08	4.15 ± 0.041	20	5.1 ± 0.13	2.25 ± 0.035
JA-Me (12 h)	5.0 ± 0.10	4.15 ± 0.058	40	5.2 ± 0.11	2.50 ± 0.010
control	6.6 ± 0.14	4.45 ± 0.056	70	7.4 ± 0.10	3.50 ± 0.060

The growth of plants after JA-Me treatment was inhibited (Table 1), which is in accordance with the data reported for rice seedlings by Yamane *et al.* 1980, 1981. The percentage of flowering was generally decreased (Table 2); this could be in consequence of the growth inhibition, which was more pronounced with photoperiodic flower induction (Table 1). Apical meristems in non-induced plants exhibited no changes in morphology after JA-Me treatment.

Table 2. The effect of JA-Me on flowering of *C. rubrum* plants. JA-Me was applied to the plumule at the beginning and at the end of every dark period. The inductive cycles (12 h of light/12 h of darkness) started at the given age. Flowering was evaluated 6 d after the induction (10 plants for each treatment).

	Flowering [%]						
Age of plants [d]	4.5	4.5	5.5	5.5	5.5	6.5	6.5
Number of ind. cycles	1	2	1	2	3	2	3
JA-Me [3×10^{-4} M]	0	40	0	0	0	0	30
JA-Me [3×10^{-5} M]	0	40	0	10	60	10	90
control	90	90	10	50	100	10	100

As higher ethylene level, which was found after JA-Me treatment (Czapski and Saniewski 1992, Saniewski *et al.* 1986, Saniewski *et al.* 1987 a, b), might be the cause of growth reduction (Yamane *et al.* 1980, 1981) and inhibition of flowering, we also tested the ethylene production after JA-Me treatment in *C. rubrum* (10-d-old plants were grown on 5×10^{-6} M JA-Me solution for 6 h) and ethylene production was determined 1 h later - Macháčková *et al.* 1986). Unlike previous authors (Czapski and Saniewski 1991, Saniewski *et al.* 1986, Saniewski *et al.* 1987 a, b), we found no increase in production of ethylene (data not shown), and so we can exclude the possibility that JA-Me induced growth retardation in *C. rubrum* might be

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