

植物に対する cytochalasin E の毒性

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The Toxicity of Cytochalasin E on Plants

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沢井 功*・奥野智旦*・伊藤貴子*: 植物に対する cytochalasin E の毒性

Key Words: *Rosellinia necatrix*, cytochalasin E, lettuce, apple wilting.

Cytochalasin E was first isolated from *Rosellinia necatrix*¹⁾ and then from *Aspergillus clavatus*²⁾. So far, the physiological activity of cytochalasin E to mammalian cells^{3,4,5)} has been reported in detail, but such studies on plants⁶⁾ or microorganisms⁶⁾ are little known. This paper deals with the isolation of cytochalasin E from *Rosellinia necatrix* and its toxicity to lettuce seeds (*Lactuca sativa* L. var. Grand Rapid) and young apple leaves (Fuji).

The fungus was surface-cultured on potato-dextrose medium (2 % sucrose) for 17 days at 27~30 C. The culture filtrate was adjusted to pH 7.0, and extracted with chloroform. The extract (500 mg) was subjected to column chromatography on silica gel, and the column (2×22 cm) was eluted 2 % ethyl alcohol in chloroform. Effluents were collected in 8 ml fractions and solids emerged in fractions 22~26. The solids were combined, and recrystallized from benzene repeatedly. The colorless prismatic crystals (30 mg) obtained were found to be cytochalasin E from following experimental data: mp, 220~221 C (uncorrect); MS m/z : 495 (M^+); Anal. Found: C, 66.47; H, 6.83; N, 2.91 %; Calcd. for $C_{28}H_{33}NO_7$: C, 67.88; H, 6.67; N, 2.83 %; PMR (60 MHz, $CDCl_3$) δ : 1.04 (3H, d, $J=6$ Hz, methyl), 1.15 (3H, d, $J=6$ Hz, methyl), 1.28 (3H, s, methyl), 1.45 (3H, s, methyl), 1.90~3.24 (9H, m, methylene and methin), 3.78 (1H, m, C (3)-H), 4.25 (1H, s, C (18)-OH), 4.90~5.90 (2H, m, C (13)-H and C (14)-H), 5.45 (1H, d, $J=11$ Hz, C (19)-H), 6.37 (1H, d, $J=11$ Hz, C (20)-H), 7.22 (6H, m, aromatic and NH); CMR (60 MHz, $CDCl_3$) δ : 13~25 (4 quartet signals), 35~87 (2 triplet, 6 doublet and 3 singlet signals), 120~211 (4 singlet and 9 doublet signals).

Cytochalasin E was dissolved in small amount of acetone and the solution was diluted with water in concentrations of 1 and 10 ppm. The diluted solutions were transferred into individual Petri dishes, in which two sheets of filter paper were layered. To remove acetone, Petri dishes were put in a steam bath for 30 min, and then the conventional germination-test was done at 20 C by using lettuce seeds. As shown in Table 1, cytochalasin E remarkably inhibited not only root growth but also formation of root-hairs. After 7 days, all roots, except control ones, turned to brown and rotted around their bases.

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Table 1. Inhibiting effect of cytochalasin E to germination of 20 lettuce seeds during 7 day incubation at 20 C

Concentration of cytochalasin E (ppm)	Incubation period (day)	Germination (%) of		Average length (mm) of		Number of root-hairs per root
		Root	Cotyledon	Root	Stem	
0	1	100	0	3.2	—	0
	2	100	0	7.3	—	many
	3	100	90	14.7	—	many
	4	100	100	19.7	3.0	many
	7	100	100	37.0	15.3	many
1	1	70	0	2.4	—	0
	2	90	0	4.3	—	0
	3	100	10	6.8	—	0
	4	100	40	9.0	0.5	0
	7	100	100	13.8	2.5	0
10	1	65	0	1.4	—	0
	2	90	0	2.9	—	0
	3	100	0	4.1	—	0
	4	100	5	4.4	—	0
	7	100	80	5.1	0.3	0

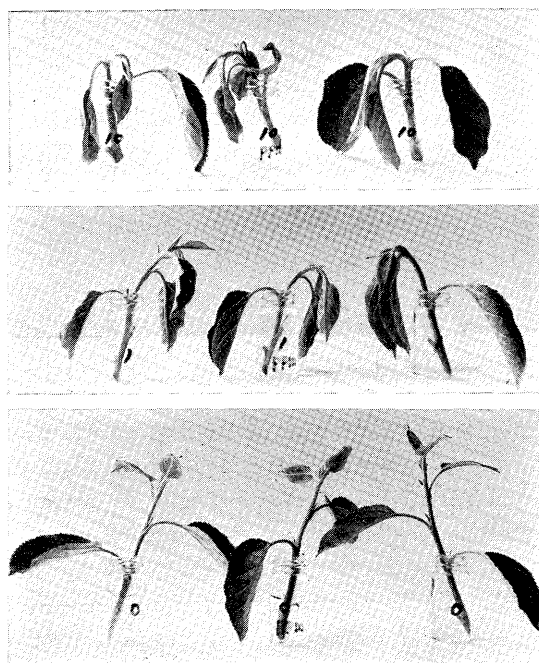


Fig. 1. Wilting effect of cytochalasin E to apple twig-cuttings. Upper and middle three cuttings were soaked into cytochalasin E solutions of 10 ppm and 1 ppm respectively, and below three cuttings, into distilled water. These pictures were taken after 3 day's soak at room temperature.

Apple twig-cuttings having four leaves were soaked into the aqueous solutions of cytochalasin E (1 and 10 ppm) that described above. After one day, small leaves near the growing point of the cutting did not show any change, but both sides of the central vein of large leaves below small ones curved. Such deformation progressed in proportion to soaked time, and, every cutting treated with both 1 and 10 ppm solutions for 3 days resulted in wilt. Appearances of cuttings of three days later were shown in Fig. 1.

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