Physilogy and Molecular Biology of Ethylene Synthesis in *Dendrobium* Flowers Following Compatible and Incompatible Pollination

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Abstract

Open flowers of *Dendrobium* 'Miss teen' (or 'Kenny') were cross pollinated by placing pollinia from five cultivars of *Dendrobium* namely 'Miss Teen', 'Karen', 'Sakura', 'Willie'' and 'Pomoadour'. The pollinated flowers were held in distilled water at ambient temperature. The characteristics of ethylene production and post-pollination development were monitored. The pollinated flowers were devied into two groups. The first group was compatible pollination which consisted of flowers pollinated by pollinia from 'Sakura', 'Willie'' and 'Pomoadour'. In this group, the premature senescence of perianth took place within a day. The second group was incompatible pollination which consisted of flowers pollinated by 'Karen' and 'Miss Teen' pollinia. Incompatible pollinated flowers did not exhibit postpollination symptoms. Compatible pollination of 'Miss Teen' flowers resulted in an immediate burst of ethylene production and a rapid stimulation of ovary growth followed by an increase in pollen tube length. In contrast, when 'Miss Teen' flowers were self-pollinated or pollinated with 'Karen' pollinia, these changes did not occur. Pollinia of the cultivars 'Pompadour', 'Sakura' and 'Whllie' had greater amounts of auxin and 1-aminocyclopropane -1-carboxylic acicd (ACC) than that of the 'Miss Teen' and 'Karen' pollinia. Compatible pollination resulted an increament in higher ACC synthase and ACC oxidase activities than that of incompatible pollination. ACC oxidase activities of compatibly pollinated flowers rapidly increased within 12 h after pollination. Nonpollinated flowers showed a low ACC oxidase activity, while, column plus pedicel contained higher ACC oxidase activity than petal plus sepal and lip. *ACO* mRNAs was highly up-regulated by compatible pollination in the *Dendrobium* 'Miss Teen'

Soaking pollinia in distilled water before pollination reduced ovary growth of pollinated flower and lowered auxin content in soaked pollinia. Application of auxin transport inhibitors, 2, 3, 5-triiodobenzoic (TIBA) and α-p-chlorophenoxy isobutyric acid (PCIB), delayed effect of pollination induced ovary groeth. In addition, pretreatment with ethylene inhibitors, aminooxyacetic acid (AOA) and/or 1-methylcyclopropene (1-MCP), compleately inhibited effect of pollination. This indicated that both auxin and ethylene are necessary for postpollination development. Application of octanoic acid to the stima of *Dendrobium* 'Miss Teen' prior to pollination by 'Karen' pollinia or application of 1-aminocyclopropane -1- carboxylic acicd and/or ethylene did not the sensitivity to ethylene of 'Miss Teen' flowers. All treated flowers exhibited indifferent symptoms from flowers without octanoic acid application. This observation indicated that octonoic acid was not the ethylene sensitivity factor of pollinated *Dendrobium* ' Miss Teen' flowers.

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