

烟草花发育过程中花药和花粉 IAA 分布规律的研究

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摘要: 以烟草(*Nicotiana tabacum* L.)花药为材料,通过 4',6-二脒基-2-苯基吲哚(DAPI)染色详细观察花粉发育过程,获得了花药发育时期与花蕾大小的对应关系;通过吲哚乙酸(IAA)单克隆抗体、免疫组织化学技术以及 *DR5::GUS*转基因植株的 GUS 活性对花药和花粉发育过程中生长素的分布规律进行了研究。免疫酶标记结果表明,在不同的花药发育时期 IAA 水平呈现出明显的差别。小孢子母细胞时期,IAA 在整个花药中均有分布,并且在小孢子母细胞发育晚期,IAA 信号集中在小孢子母细胞的细胞核中;随着小孢子母细胞减数分裂后形成四分体,IAA 信号逐渐减弱,四分体中几乎没有信号;单核花粉期的花药中 IAA 信号进一步减弱,仅存在于花药壁中;待小孢子继续发育为成熟二核期时,花粉和整个花药组织中均出现较强的 IAA 信号。GUS 活性检测结果表明,烟草 *DR5::GUS*转基因植株中花药和花粉粒的 GUS 信号与 IAA 免疫酶定位结果基本一致。总的来说,IAA 在烟草花药和花粉中的积累呈现出由强到弱、再由弱到强的分布规律,暗示 IAA 在被子植物花药和花粉发育过程中可能起着较为重要的作用。

关键词: 烟草;花药;花粉;吲哚乙酸(IAA);免疫酶定位;GUS 活性

中图分类号: Q945.4

文献标识码: A

文章编号: 1000-470X(2009)05-0541-07

IAA Distribution of Anther and Pollen during Flower Development of *Nicotiana tabacum* L.

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Abstract: In this study, different stages of anthers of *Nicotiana tabacum* L. were detailed investigated. With the aid of DAPI (4',6-diamidino-2-phenylindole) staining, the process of pollen development was observed, and the relationship between the anther developmental stages and the length of flowers were determined. The distribution of Indole-3-acetic acid (IAA) during anther and pollen development was studied with auxin IAA monoantibody, immunohistochemistry techniques and GUS activity assay of *DR5::GUS* transgenic plants. The results of immunoenzyme localization displayed that IAA level differed evidently in different stages of anther and pollen development. In microspore mother cell stage, strong IAA signal was detected in the whole anther, and condensed in the nucleus of late stage of microspore mother cells. With the formation of tetrad through meiosis, the signal of IAA was gradually reduced, and almost disappeared in late stage of tetrad. In the stage of mono-nucleate pollens, IAA signal was decreased further, and was merely present in anther wall. With the further development of microspores, strong IAA signal was present in mature dual-nucleate pollens and the whole anther wall. GUS activity assay showed that the GUS signal of anthers and pollens in *DR5::GUS* transgenic plants were basically in accordance with IAA immunoenzyme localization. Overall, the accumulation of free auxin IAA during anther and pollen development of tobacco presented a pattern from high level to low level and then to high level again, suggesting that IAA may play functional and essential roles in anther and pollen development of angiosperm.

Key words: *Nicotiana tabacum* L.; Anther; Pollen; Indole-3-acetic acid (IAA); Immunoenzyme localization; GUS activity

生长素是植物体内天然存在的一类小分子有机化合物,是 5 大类经典植物激素之一,其生物活性影

响植物生长发育的各个方面。吲哚乙酸(Indole-3-acetic acid, IAA)在植物中的分离鉴定始于 1942 年,

收稿日期:2008-10-15,修回日期:2009-03-05。

基金项目:2007 年国家大学生创新性实验项目资助;国家基础科学人才培养基金项目(J0630648)资助。

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