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硕士学位论文

红树植物胎生过程中ABA、GA3和糖分含量的变化

Changes in the content of ABA, GA3 and carbohydrate in the viviparity of mangrove plants

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摘　要

应用高效液相色谱法（HPLC）和蒽酮硫酸比色法，对比显胎生红树植物木榄、秋茄，隐胎生红树植物桐花树、白骨壤繁殖器官在花蕾期、种子期、种子萌发早期、种子萌发晚期内源激素GA3、ABA含量以及可溶性糖、淀粉含量的动态变化，探讨胎生发生的可能机制，实验结果如下：

1、四种红树植物繁殖器官不同发育时期内源激素含量的变化

（1）四个发育时期GA3含量变化规律基本相同，从花蕾期到萌发晚期都表现出先升高后降低的趋势：在种子期GA3达到最高值；从花蕾期到种子期GA3含量增幅最大，进入种子萌发早期后GA3含量小幅下降；在种子萌发晚期GA3含量进一步下降。

（2）显胎生的木榄和秋茄四个发育时期的ABA含量变化趋势一致，均为花蕾期ABA含量最高，到种子期时含量下降，种子萌发早期ABA含量最低，之后种子萌发晚期ABA含量上升。对于隐胎生红树植物桐花树和白骨壤来说四个发育时期的ABA含量变化趋势也是一致的，花蕾期ABA含量最高，到种子期时迅速下降为四个时期的最低值，萌发之后ABA含量上升。

(3)四种红树植物繁殖器官的四个发育时期GA3/ABA比值的变化趋势是相同的，均是先升后降的变化。种子期，GA3/ABA比值升至最高，在40-48之间；种子萌发早期显胎生红树植物GA3/ABA比值有所下降，而隐胎生红树植物GA3/ABA比值下降非常明显，但仍较花蕾期和种子萌发晚期为高；同种红树植物花蕾期与种子萌发晚期GA3/ABA比值差别不大。

(4)四种红树植物叶片中内源激素GA3、ABA以及GA3/ABA比值的比较：木榄叶片中GA3含量最高，秋茄、桐花树和白骨壤叶片中GA3含量差别不大。显胎生植物和隐胎生植物叶片中ABA含量差别不大，与GA3相比含量均很低。四种植物叶片中GA3/ABA比值明显低于种子期，但又远高于花期和种子萌发晚期。

2、四种红树植物繁殖器官不同发育时期可溶性糖、淀粉含量变化

（1）木榄和白骨壤繁殖器官在四个发育时期可溶性糖含量呈逐渐增加趋势，并在种子萌发晚期达到最大值；从花蕾期到种子萌发早期，秋茄和桐花树繁殖器官的可溶性糖含量逐渐增加，并在种子萌发早期达到最大值，而到了种子萌发晚期可溶性

糖含量有所下降。

（2）木榄繁殖器官淀粉含量在四个发育时期表现出先升后降再升的变化趋势，其中以种子期含量最高，种子萌发早期含量最低。秋茄、桐花树和白骨壤繁殖器官四个发育时期淀粉含量变化趋势一直，表现出从花蕾期到种子萌发晚期逐渐增加的趋势，并在萌发晚期达到最大值；四个发育时期中的种子期和萌发早期淀粉含量差别不大。

（3）四种红树植物繁殖器官四个发育时期的可溶性糖/淀粉比值变化趋势一致，从花蕾期到种子萌发晚期均为先升高后降低的趋势。在种子萌发早期达到最大值，到了种子萌发晚期有不同程度下降；花蕾期和种子期比值很接近，从种子期到种子萌发早期增幅最显著。

（4）四种红树植物叶片中可溶性糖、淀粉以及可溶性糖/淀粉比值的比较：显胎生红树植物叶片中可溶性糖含量远高于隐胎生植物叶片，以木榄叶片含量最高，秋茄次之，桐花树和白骨壤叶片可溶性糖含量差别不大。秋茄叶片中淀粉含量最低，其他三种红树植物叶片中淀粉含量相差较小。显胎生植物叶片中可溶性糖/淀粉比值明显高于隐胎生植物叶片。

关键词：红树植物；内源激素；糖分

Abstract

Using high performance liquid chromatographyHPLCand anthrone sulfuric acid method,we studied significant viviparous mangrove species Bruguiera gymnorrhiza, Kandelia obovata and hidden viviparous mangrove species Aegiceras corniculatum, Avicennia marina at their different developmental periodsflower-bud period, seed period, early germinating period and late germinating period. Possible viviparous mechanism is proposed and discussed by observing contents and ratios of GA3, ABA, soluble sugar and starch.

Experimental results are showed as follows:

1.Changes of endogenetic hormones content in different developmental stages of reproductive organs of four mangrove species

(1)Changes of GA3 content is similar in four developmental stages for viviparous mangrove species: it is increasing from seed period to late germinating period. Viviparous mangrove species have highest GA3 content in seed period. It has the highest amplification of GA3 content from flower-bud period to seed period, and then it decreases from early germinating period to late geminating period.

(2)For Bruguiera gymnorrhiza and Kandelia obovata,the changing of ABA content has the same trend: highest in flower-bud period, and decrease in seed period, and lowest in early germinating period , then increase after germination. For Aegiceras corniculatum and Avicennia marina, the changing of ABA content has the same trend: highest in flower-bud period, lowest in seed period, and then increase after germination.

(3)For four viviparous mangrove species, the changing of the ratio of GA3 /ABA has the same trend in different developmental stages: increase and then decrease. The ratio of GA3 /ABA is highest in seed period, ranging from 40 to 48. For significant viviparous mangrove species, the ratio of GA3/ABA decreases a little in early germinating period. For hidden viviparous mangrove species, the

ratio of GA3/ABA declines very significantly in early germinating period, but still higher than flower-bud period and late germinating period. The ratio of GA3/ABA shows no difference between flower-bud period and late germinating period for the same mangrove species.

(4)The comparison of endogenic hormones GA3, ABA, and the ratio of GA3/ABA in leaves of four mangrove species is showed as follows: The content of GA3 in leaves of Bruguiera gymnorrhiza is highest, and the rest of other three mangrove species show little difference. There is no significant difference among the ratio of GA3 /ABA in leaves of four mangrove species, but the ratio is much lower than seed period, higher than flower-bud period and late germinating period.

2.Changes of soluble sugar and starch contents in reproductive organs of four viviparous mangrove species

(1)The content of soluble sugar increases gradually in different developmental stages for Bruguiera gymnorrhiza and Avicennia marina. For Kandelia Obovata and Aegiceras corniculatum,the content of soluble sugar increases from flower-bud period to early germinating period, and then decreases after germination.

(2)For Bruguiera gymnorrhiza, the changing of starch content has the trend as follows: highest in seed period, lowest in early germinating period. The changing of starch content is similar in four developmental stages for the other viviparous mangrove species: increases from flower-bud period to late germinating period.

(3)For four mangrove species, the changing of the ratio of sugar/starch has the same trend: increases firstly and then decreases. The ratio is highest in early germinating period, then decreases with varying degrees in late germinating period. In flower-bud period the ratio is similar to seed period, and great changing happened from seed period to early germinating period.

(4)The comparison of soluble sugar, starch and the ratio of sugar/starch in leaves of four mangrove species is showed as follows: The soluble sugar content in leaves of significant viviparous mangrove species is much higher than hidden

viviparous mangrove species. There is the lowest starch content in Kandelia obovata leaves, and starch content shows no significant difference among the other mangrove species. The ratio of sugar/starch in leaves of significant viviparous species is much higher than hidden viviparous species.

Keywords: mangrove plant; endogenic hormone; carbohydrate

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