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Short Communication

Changes in endogenous hormone contents of pear stock (*Pyrus betulaefolia* Bge. and *Pyrus calleryana* Dcne.) seeds during cold stratification

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In this study, changes in endogenous hormone contents of pear stock seeds during cold stratification were investigated. Abscisic acid (ABA) content decreased with increase in the periods of stratification of pear stock seeds. However, gibberellic acid (GA) and indole-3-acetic acid (IAA) contents of *Pyrus betulaefolia* and *Pyrus calleryana* gradually increased and then decreased, and the GA and IAA contents of *P. betulaefolia* and *P. calleryana* seeds reached maximum level at 40 and 50 days, respectively. The results suggest that ABA and GA had regulatory roles in dormancy release, but IAA seems to be involved in the germination process.

Key words: Pear stock seed, cold stratification, hormone.

INTRODUCTION

It is well known that plant hormones have impacts on seed dormancy and germination. Abscisic acid (ABA) is involved in the regulation of numerous physiological processes during the seed development, including embryo maturation, storage product deposition, inhibition of precocious germination, desiccation tolerance and dormancy (Nambara and Marion-Poll, 2005). In developing seeds, ABA is necessary for inducing the synthesis of reserved proteins and lipids as well as for the onset of seed dormancy. Control of seed physiological processes by ABA depends on active hormone levels, endogenous ABA levels during seed maturation and the onset of primary dormancy. ABA levels in the seeds decreases and hence the seeds exhibit enhanced ability to germinate due to the weaker dormancy (Finkelstein et al., 2002; Koornneef et al., 2002), whereas gibberellic acid (GA) played an essential role in promoting the germination of seeds. The level of GA was a critical determinant for seed germination (Groot and Karssen, 1987).

The mature seeds of *Pyrus betulaefolia* Bge. and *Pyrus calleryana* Dcne. are in deep dormancy, for the removal of which a cold stratification for long duration is necessary. There has been very little research on the changes of endogenous hormone contents in pear stock seeds during cold stratification. The objective of the present study was to investigate the effects of cold stratification on the endogenous ABA, GA and IAA of pear stock seeds.

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Abbreviations: ABA, Abscisic acid; **GA,** gibberellic acid; **IAA,** indole-3-acetic acid.

MATERIALS AND METHODS

Seed collection, sorting and storage methods were carried out as described by Bao and Zhang (2010). Stock seeds of species were stratified and chilled in plastic bags containing wet river sand at 4 ± 1°C in a refrigerator for 0, 10, 20, 30, 40, 50 and 60 days. At the completion of the treatments, the seeds were removed from the plastic bags and extracted for ABA, GA and IAA. Endogenous hormone contents were determined by HPLC and measured according to Kelen et al. (2004) with some modifications.

The data were statistically evaluated by ANOVA and correlation analyses were conducted using SPSS 13.0 for windows

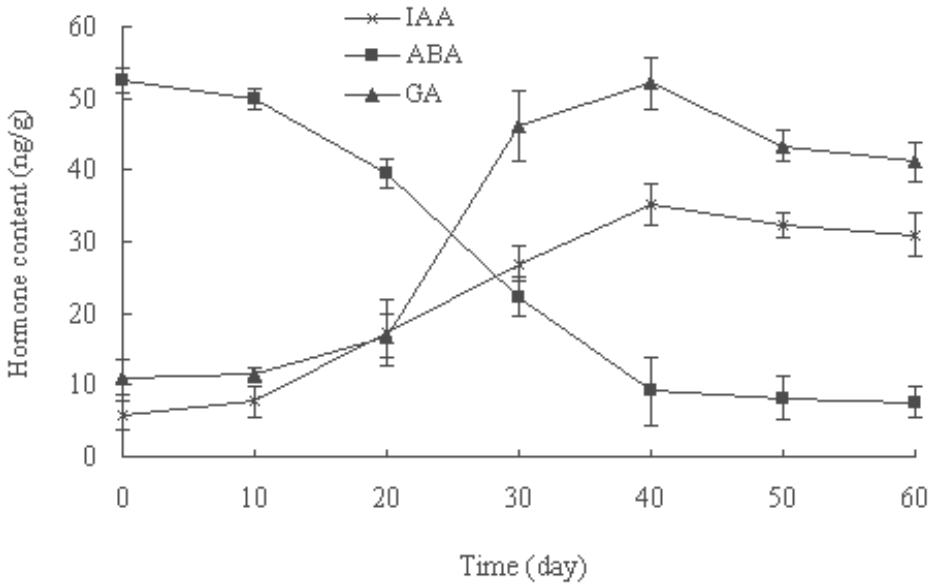

Figure 1. Changes in hormone contents of *P. betulaefolia* during cold stratification. Each point represents the mean of three observations, and error bars are ±SE of the mean.

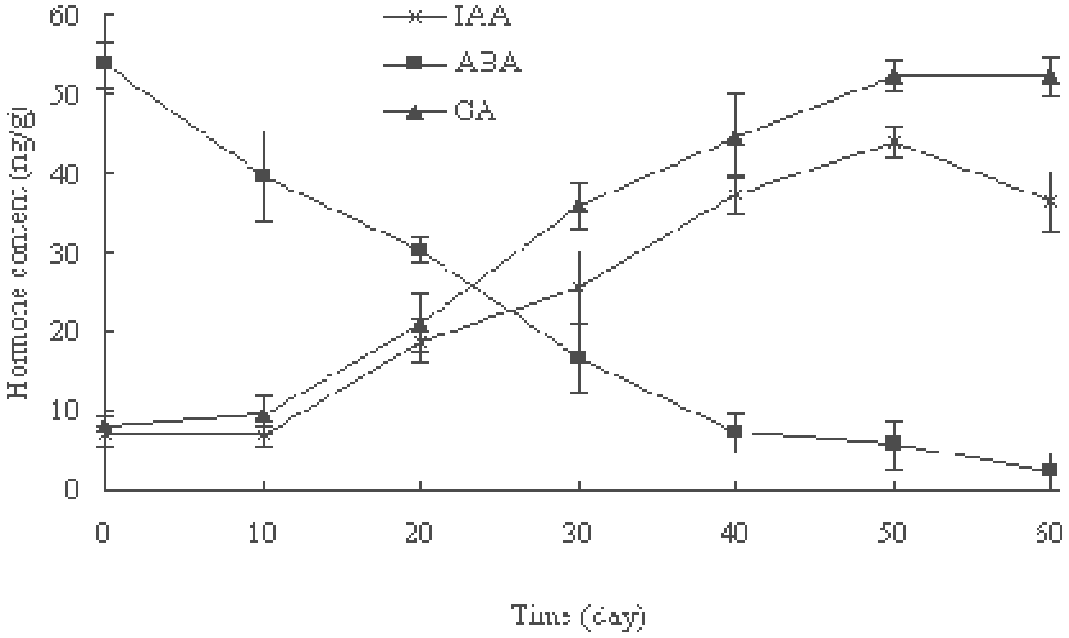

Figure 2. Changes in hormone contents of *P. calleryana* during cold stratification. Each point represents the mean of three observations, and error bars are ±SE of the mean.

(reference). The means were compared by using Tukey's test at the $p < 0.05$ level.

RESULTS AND DISCUSSION

Hormone contents of pear stock seeds are shown in Figures 1 and 2. ABA content continuously decreased, ABA content had a rapid decrease between 0 and 40 days, and reached the minimum value at 60 days during the cold stratification. Both GA and IAA contents of *P. betulaefolia* first increased and then decreased, and reached the highest level at 40 days. In *P. calleryana*, GA and IAA contents had a gradual increase from 0 to 10 days, a dramatic increase in GA and IAA contents was noted between 20 and 50 days of cold stratification, and

then decreased. Our previous investigations (Bao and Zhang, 2011) revealed that the optimal chilling time for *P. betulaefolia* and *P. calleryana* was about 40 and 50 days, respectively. These results, taken in conjunction with reduced ABA content and increased GA and IAA contents, showed that endogenous ABA inhibited release of dormancy and that endogenous gibberellins were involved in germination.

In this study, ABA content of pear stock seeds decreased during stratification, whereas GA and IAA contents increased. Similar results were obtained with other species such as *Arabidopsis thaliana* (Ali-Rachedi et al., 2004), *Fraxinus excelsior*, *Pseudotsuga menziesii* and apple seeds (Rudnicki et al., 1972; Subbaiah and Powell, 1992; Blake et al., 2002; Corbineau et al., 2002; Ali-Rachedi et al., 2004).

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