

**Title** Effects of fruit bagging on coloring and related physiology, and qualities of red Chinese sand pears during fruit maturation

**Author** Chunhui Huang, Bo Yu, Yuanwen Teng, Jun Su, Qun Shu, Zaiquan Cheng and Liqiong Zeng

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### Abstract

Red Chinese sand pears (*Pyrus pyrifolia* Nakai) are particular to China. In order to determine the effects of fruit bagging treatments (including bag types, bag removal patterns and dates) on fruit qualities and to understand the mechanism of coloring of red Chinese sand pears, two experiments were carried out. In the first experiment, fruit of 'Meirensu' were firstly covered by light-impermeable paper bags with different levels of light permeable liners during their early development stage, then, the whole bag were/not removed or only the outer layer of bags were removed 3, 2 or 1 weeks before harvest. Thus, the fruit were/not totally re-exposed or were under different levels of sunlight transmission (80.31% or 34.71%). Non-bagged fruit were used as the control. Bagging treatments significantly affected the concentration of anthocyanin and the visual qualities of pear fruit. Compared to control, fruit re-exposed totally for 2 or 3 weeks accumulated the largest amount of anthocyanin and fruit receiving 80.31% and 34.71% of sunlight for 1–3 weeks could synthesize a little anthocyanin, indicating that high light intensity is imperative for coloring in red Chinese sand pears. Bagging treatments did not affect contents of total soluble sugars, but decreased organic acids contents in fruit. In the second experiment, fruit of 'Meirensu' and 'Yunhongli No. 1' were covered with only one type of light-impermeable bag during the early development stage and totally re-exposed after the bag removal 15 days before harvest. Fruit were then collected at different intervals to trace the time-course of coloring, and related physiology and inner qualities. With increasing time after the bag removal, the concentration of chlorophyll, carotenoid, flavonoid and total phenols changed little, but the concentration of anthocyanin accumulated extremely fast within 10 days after the bag removal in both cultivars and thereafter kept constant. 'Yunhongli No. 1' had higher anthocyanin contents and lower hue angle than 'Meirensu', indicating a higher potential of anthocyanin synthesis. After the bag removal, the sucrose contents and PAL activities increased gradually and correlation analysis revealed that they were highly correlated with anthocyanin accumulation in two cultivars. This study suggests that anthocyanin biosynthesis in red Chinese sand pears is a highly light dependent process and modified by

genotypes. Based on the current results, in order to obtain red Chinese sand pear fruit with attractive appearance and good inner qualities, fruit must be covered with light-impermeable bags at the early stage of fruit development and the bag should be removed totally at least 10 days before harvest.