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Variation of Pollination Rate on *Eucalyptus grandis* and *E. tereticornis*

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Abstract: The most widely used clones were all breed by artificial hybrids steps in China, therefore it is important to research on pollination rate. Three individual trees of *E. grandis* and *E. tereticornis* were selected as female while the pollen of hybrid clone DH32-29, *E. grandis*, *E. pellita*, *E. tereticornis* and *E. urophylla* were collected as male. The results indicated that *E. grandis* family 4 always had higher pollination rate with different male pollen than other *E. grandis* families. Family 116 had higher pollination rate with DH32-29 and *E. urophylla* than family 41 while family 41 had higher pollination rate with *E. grandis* and *E. tereticornis* than family 116. Though different families had different pollination rate, the studied *E. grandis* families all had higher pollination rate (above 75%) with different male pollen. *E. tereticornis* family 243-1 always had higher pollination rate (nearly 100%) with different male pollen than other *E. tereticornis* families while *E. tereticornis* family 238-2 always had lower pollination rate (nearly 60%) with different male pollen than other *E. tereticornis* families. All the male pollen had similar pollination rate with family 238-1 and 243-1. *E. grandis* pollen had higher pollination rate with family 238-2 than other male pollens.

Keywords: Pollination, Stigma, *Eucalyptus*

1. Introduction

Most of eucalypt species are naturally distributed in the continental Australia of Oceania, and a few native to the Timor Island of Indonesia and Papua New Guinea [1]. Due to the fast-growing, well adaptability, short-rotation, excellent wood properties, vigorous hybrids and large natural genetic populations occur, Eucalypt has become suitable plantation species around the world [2-4]. For the last thirty years, the eucalypt plantations have experienced an important development and considerable successful improvements also have been achieved by genetic breeding in China [5-6]. Eucalypt plantations now cover an estimated area of more than 4.0 million hectares, principally in Guangdong, Guangxi, Hainan Island, Yunnan, Sichuan and Fujian provinces while more than 1.4 million hectares in Guangxi [7-8].

Beyond the traditional recurrent way for genetic improvement of the pure species, eucalypts enter quickly to produce commercially interesting interspecific hybrids by natural or artificial reciprocal recurrent way because *Eucalyptus* genus is very poly specific, and its species are genetically close and are frequently crossable [9-13]. Therefore, the interspecific hybrids can give very rapid gains and the most widely used clones in China were all breed by artificial hybrids step with *Eucalyptus urophylla*, *E. grandis* and *E. tereticornis* etc [14-18]. However, information on pollination rate on *Eucalyptus* is limited in China.

The objectives of this study were to compare the pollination rate on *E. grandis* and *E. tereticornis* with different pollen at same time and this information will be used to develop appropriate breeding strategies for breeding.

2. Methods

The trial was established in the town of Shaping, Qingyuan City, Guangdong (24°33′26″N, 112°5′31″E). This locationis affected by the north tropical monsoon, with an annual mean temperature of 18.8°C and an annual mean rainfall of1800 mm. The field design was randomised complete block with six replications and 5-tree line plots planted with spacing of 3 m ×

2 m. Planting pits (50 cm × 50 cm × 40 cm) were prepared and compound fertilizer was applied in the first 2 years with individual tree applications. The dominant plants in the undergrowth of the original tree canopy included *Dicranopteris pedata (Honutt.) Nakaike, Mussaenda pubescens* Ait and *Rhodomyrtus tomentosa* Hassk.. Three individual trees of *E. grandis* and three individual trees of *E. tereticornis* were selected for female. The pollen of hybrid clone DH32-29, *E. grandis*, *E. pellita*, *E. tereticornis* and *E. urophylla* were collected from Guangdong province.

The experiment circuit diagram of pollination was present in Figure 1. When the flower was same like in figure A, the pistils were nearly open or open in a short time and the pistils were removed. Cottons were put on the two side of the inflorescence for adding wire. And then a paper bag were covered the whole inflorescence for four days (figure B). Different species pollens were pollinated on stigma and then the bags were closed for seven days (figure C) meanwhile write the date on the bags. After seven days, the bags were removed and a label with parent information and date was added near the flower. During remove the bags, the amount of success and failure pollinated flowers were counted.

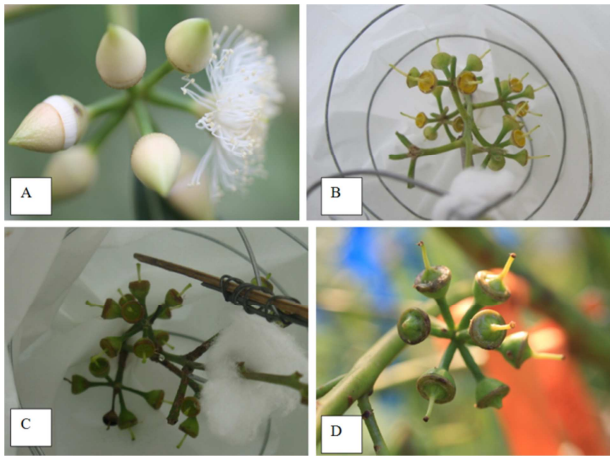

Figure 1. *Pollination steps.*

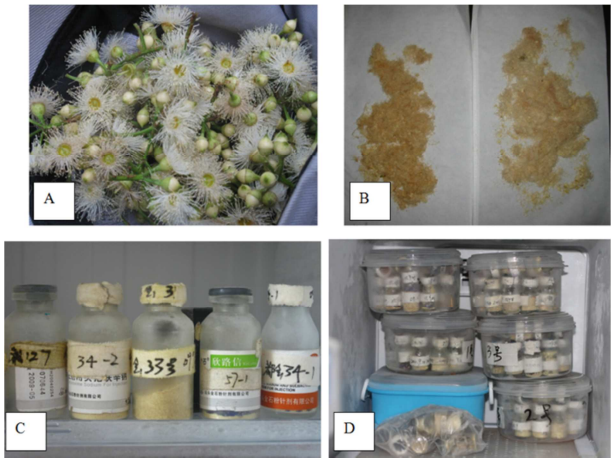

Figure 2. *Pollination steps.*

The collection steps of pollen were given in Figure 2. The pollen was collected from DH32-29, *E. grandis*, *E. tereticornis*, *E. urophylla* and *E. pellita*. The flowers were collected in a separate bag (Figure A) and the stamen was removed on a clean paper with desiccant in a dry container (Figure B). After two to three days, the stamen was selected by sieve and put into small bottle (Figure C). All the bottles should be vacuumized and signed with species, date and location in refrigerator under three to five temperature (Figure D).

3. Results and Discussion

3.1. Pollination Rate on E. grandis

The pollination rates of *E. grandis* were presented in Figure 3. The results indicated that *E. grandis* family 4 always had higher pollination rate with different male pollen than other *E. grandis* families. Family 116 had higher pollination rate with DH32-29 and E. urophylla than family 41 while family 41 had higher pollination rate with *E. grandis* and *E. tereticornis* than family 116. Though different families had different pollination rate, the studied families all had higher pollination rate (above 75%) with different male pollen.

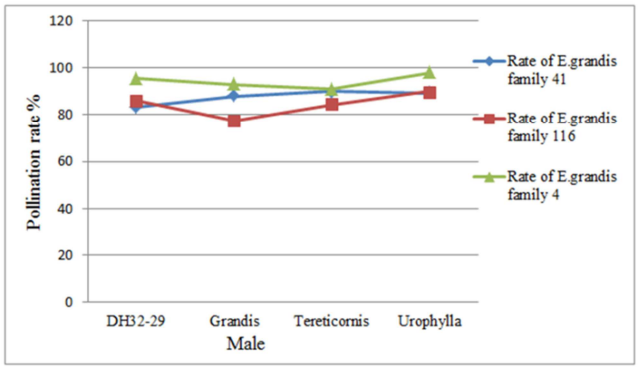

Figure 3. *Pollination rate with different pollen of species on E. grandis.*

3.2. Pollination Rate on E. tereticornis

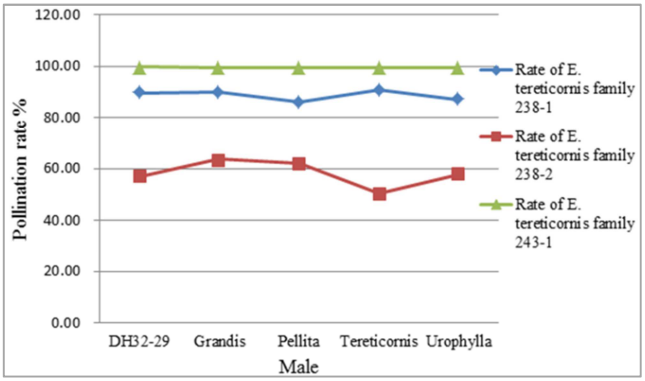

Figure 4. *Pollination rate with different pollen of species on E. tereticornis.*

The pollination rates of E. tereticornis were presented in Figure 4. The results indicated that *E. tereticornis* family 243-1 always had higher pollination rate (nearly 100%) with different male pollen than other *E. tereticornis* families while

E. tereticornis family 238-2 always had lower pollination rate (nearly 60%) with different male pollen than other *E. tereticornis* families. All the male pollen had similar pollination rate with family 238-1 and 243-1. *E. grandis* pollen had higher pollination rate with family 238-2 than other male pollens. In general, the pollination variation of *E. tereticornis* was higher than that of *E. grandis*.

4. Conclusion

In the present study, the pollination rate of *E. grandis* and *E. tereticornis* with different pollen were compared. In addition, the pollination rates of different individual tree were also discussed. Joint analysis of pollination rate in the present study showed three implications for tree breeding in China. Primarily, *E. grandis* and *E. tereticornis* had different pollination rate, and *E. grandis* generally had stable pollination rate. Secondly, different individuals trees had different pollination rate. Thirdly, different pollen also had different pollination rate. This information will be used to develop appropriate breeding strategies for breeding.

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