SOUTHERN REGION SMALL FRUIT CONSORTIUM RESEARCH PROJECT
Progress Report for 2004 Grant

TITLE Identifying the Limiting Factor for Effective Pollination Period and Fruit Set of Rabbiteye Blueberries

INVESTIGATORS

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OBJECTIVES

Establish whether stigmatic receptivity or pollen tube growth rate is the most limiting factor for effective pollination period and consequently fruit set of rabbiteye blueberries.

JUSTIFICATION

Rabbiteye blueberries (*Vaccinium ashei* Reade) are extensively grown in the Southeast because they are one of the best adapted blueberry species to the growing conditions of the region. However, their low degree of self-fertility forces growers to adopt practices to aid pollination and improve fruit set (NeSmith, 2002). Effective pollination period (EPP) is the number of days during which pollination is effective enough to produce a fruit. Research has shown that short periods of flower receptivity are linked to low fruit set problems in crops such as apple, cherry, kiwi, pear, and plum (Sanzol and Herrero, 2001). During 2003, in a research project funded by the SRSFC, the authors assessed the EPP of rabbiteye blueberry in order to establish whether or not short periods of flower receptivity could also contribute to the low fruit set problems of this berry crop. Results from 2003 showed: 1) that pollination of rabbiteye blueberry flowers can result in some degree of fruit set for a period of 8 days after anthesis, and 2) that flowers of 'Brightwell' are more receptive than those of 'Tifblue' during the first two days after anthesis. This cultivar effect on the receptivity of flowers offers a partial explanation to the superior fruit setting performance of 'Brightwell' relative to 'Tifblue'. A reduced EPP can result from a shortened lifespan of the ovules, slow pollen tube growth rate or a shortened length of stigmatic receptivity (Sanzol and Herrero, 2001). Little is known about the parameters determining the EPP in rabbiteye blueberry and research in 2004 attempted to identify the most limiting factor to fruit set in this important small fruit crop.

METHODS

Experiment 1: Stigmatic receptivity. Potted plants of 'Brightwell' and 'Tifblue' rabbiteye blueberry were self- and cross-pollinated under growth chamber conditions (23/10ºC day/night temperature regime; 13 h daylight). Pollen loads were applied on emasculated flowers of different ages (0 to 8 days after anthesis, DAA). Half of the

flowers were detached from the plant one day after pollination to assess stigmatic receptivity, while the other half remained until fruit ripening to evaluate fruit set.

Experiment 2: Pollen tube growth. Plants of the same cultivars were kept in a growth chamber as described above. Emasculated flowers were self- and cross-pollinated 3 DAA and detached at different time intervals to estimate how many days are required for pollen tubes to reach the ovules. Pollen tube growth along the style was examined under a fluorescence microscope. Work is still underway to examine pollen tubes within the ovary using Scanning Electron Microscopy.

RESULTS

Fruit set following cross-pollination is shown in Fig. 1A. The trends observed in 2004 were quite similar to those from 2003. 'Tifblue' flowers exhibited again a limited receptivity shortly after anthesis. Stigmatic receptivity increased with flower age and no cultivar effect was found (Fig. 1B). The oldest flowers exhibited the highest stigmatic receptivity but the lowest fruit set. This apparent contradiction indicates that this parameter is not limiting the EPP. When flowers are pollinated shortly after anthesis, pollen germination occurs at a very slow rate. In spite of this, the ovules will be fertilized because the pollen tubes have enough time to reach the ovary. The low performance of 'Tifblue' flowers near anthesis is unlikely to be caused by the receptivity of the stigma, because pollen germination rates at the stigma were the same in both cultivars. The role of pollen tube growth rate will be better understood after completing all the evaluations from the second experiment.

IMPACT

These results help elucidate limitations to pollination in rabbiteye blueberries. The findings so far have indicated growers need to maximize cross-pollination potential, as overall fruit set can be low under optimum conditions, and the EPP is only 8 days long. Therefore, recommendations are to plant compatible cultivars in a 1:1 row pattern when possible. Planting solid blocks of rabbiteye cultivars is not recommended in Georgia. In fact, fields of multiple cultivars would likely be best for increasing cross-pollination potential.

LIST OF REFERENCES

NeSmith, D.S. 2002. Response of rabbiteye blueberry (*Vaccinium ashei* Reade) to the growth regulators CPPU and gibberellic acid. HortScience 37: 666-668.

Sanzol, J., and M. Herrero. 2001. The "effective pollination period" in fruit trees. Scientia Hort. 90:1-17.

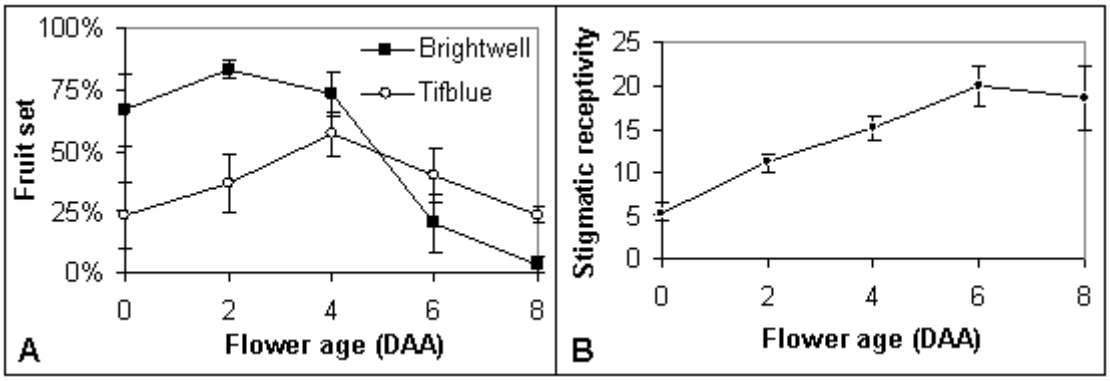

Fig.1. Effect of flower age on fruit set (A) and stigmatic receptivity (B) of two rabbiteye blueberry cultivars. Stigmatic receptivity is defined as the number of germinated pollen tetrads at the stigmatic surface 24 hours after pollination.