Bul. Agron. (33) (2) 46 – 48 (2005)

RESEARCH NOTE

Floral Bud Length as Morphological Predictor for Microspore Developmental Stage in Sturt's Desert Pea (*Swainsona formosa*)

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Diterima 7 Februari 2005 / Disetujui 6 Juli 2005

ABSTRACT

This work was conducted to establish the relationship between microspore developmental stage and length of the floral bud in glasshouse-grown Sturt's desert pea, a native Australian legume. The stages of microspore development were segregated into tetrad, early-uninucleate, mid-uninucleate and late-uninucleate. The results showed that the stage of microspore development was highly dependent on the length of floral bud. The tetrad stage lasted longer than early-, mid- or late-uninucleate stages. The attempted induction of androgenesis in Sturt's desert pea using anthers from floral buds with similar size, as in the present work, was unsuccessful. However, our work showed that the floral bud length can be used as a reliable predictor of microspore developmental stage in Sturt's desert pea.

Key words: Sturt's desert pea, Swainsona formosa, androgenesis, legume.

Sturt's desert pea, *Swainsona formosa* (G.Don) J.Thompson, is one of Australia's most spectacular wild flowers, and is the floral emblem of South Australia. It is a papilionoid legume with chromosome number of 2*n* = 16 (Zulkarnain *et al*., 2002), and self-compatible but self-pollination is often prevented by the presence of stigmatic cuticle that precluded pollen germination until ruptured (Jusaitis, 1994).

One of the economic importance of this plant is in its use as cut flower plant (Williams and Taji, 1991). However, its commercialisation is impeded by the production of a large amount of pollen grains that reduces flower quality (Barth, 1990) due to petal staining by pollen grains released by the anther during transportation. In addition, self pollination of the flowers during transportation would easily occur, especially by rough handling, resulting in rapid degeneration of flowers. Developing strategies to produce male-sterile plants is then becoming the most appropriate method to solve this problem. One approach to create such sterility is via androgenesis using anther culture method.

Androgenesis is determined by a number of factors, including the microspore developmental stage at the time of the introduction to the *in vitro* environment. Unfortunately, the exact stage for successful plant regeneration is species dependent. Romeijn and Lammeren (1999) found that first pollen mitosis was a suitable stage for the induction of androgenesis in *Scabiosa columbaria*. Tetrad to mid-uninucleate stages were found to be useful in androgenesis of *Helianthus annuus* (Coumans and Zhong, 1995; Zhong *et al*., 1995). Meanwhile, the late-uninucleate to early-binucleate stages were believed to be more responsive in *Brassica napus* (Fan *et al.*, 1988). As the consequence, determining the correct stage of microspore development in Sturt's desert pea is a crucial step before anther culture initiation.

Conventionally, the determination of microspore developmental stage of a given floral bud has been using aceto-orcein or aceto-carmine staining technique prior to observation under a light microscope (Prakash, 2000). This method, however, is impractical and time-consuming, particularly for a large sample size such as in a routine anther or microspore culture programme.

To our knowledge, no practical and quick microspore staging protocol has been developed for Sturt's desert pea. The present study aimed at correlating the floral bud length as a morphometric attribute with microspore developmental stage for a better time prediction for Sturt's desert pea anther culture.

The experiment was conducted from July through to December 2001 at the Plant Biotechnology Laboratory, School of Rural Science and Agriculture, University of New England, Armidale, Australia. Plant materials were obtained from a field collection in South Australia, and grown in a temperate glasshouse. The

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