Ornamental and weed potential of *Acacia baileyana* F. Muell: Investigations of fertility and leaf colour

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Abstract

Acacia baileyana F. Muell., is endemic to the Cootamundra region of New South Wales, Australia. It is a widely planted ornamental tree that produces attractive displays of yellow inflorescences. There are two main types, the typical green leaf form and a recently cultivated purple leaf form, variety *purpurea*. Outside its endemic range, the green leaf form has become a weed. The aim of this study was to develop an understanding of the fertility and leaf colour of *A. baileyana* in order to determine its weed potential, and to provide a basis for the commercial development of the species for its foliage, cut flowers and as a indoor flowering pot plant.

The purple colour of the leaves is due to anthocyanin pigments. To characterise the type of anthocyanins in leaf tissue, efficient extraction, separation (reverse-phase HPLC), purification and identification techniques were developed. Rapid purification and identification was achieved using high voltage paper electrophoresis in conjunction with mass spectrometry. The two main anthocyanin compounds of variety *purpurea* identified were delphinidin-3-glucoside and cyanidin-3-glucoside.

Leaf colour is a quantitative trait that was reliably assessed with a grading scale using four colour categories. Each category reflected the anthocyanin content of the tissue. Anthocyanin accumulation in the juvenile leaves was strongly induced at low temperature and at high light intensity. Intense purple leaves were produced only at temperatures below a mean of 21°C maximum and 12°C minimum when plants were grown outside, or at a constant 13°C day and 9°C night temperature when plants were grown in controlled environment rooms. The green foliage trait was found to be dominant over purple leaf colour.

Acacia baileyana required warm temperatures (above 18°C maximum, 13°C minimum) for bud formation and cool temperatures (below 16°C maximum, 9°C minimum) for flowering. Peak flowering was advanced by four months by controlling the time when plants were exposed to warm then cool temperatures. Double the number of plants flowered under these conditions compared with outside grown plants.

Both the green and purple leaf forms had similar reproductive strategies. They are highly self incompatible, have rapid growth and flower by two years of age. Controlled cross pollinations produced an average pod set of 23%, which was much greater than for self pollination (0.36%) and open pollination (less than 0.41%). Under natural conditions, total seed production was high due to the large number of flowers. A novel method using digital image analysis was developed to estimate flower numbers. Maximum flower number for a two-year old plant was 334,808, resulting in 8,007 seeds. For mature trees, flower numbers ranged from 1.25 to 13.2 million, with maximum seed number

of 19,559. Therefore, precocity and high flower numbers may partly explain the weed status of *A. baileyana*. The recessive purple leaf trait may explain why only the green leaf form has been recorded as a weed. However, given the obvious weed potential of the species, any commercialisation of *A. baileyana* should include a strategy to prevent its spread into the surrounding environment.