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Micropropagation of *Albuca bracteata* and *A. nelsonii* — Indigenous ornamentals with medicinal value

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Abstract

In this study, two species from the genus *Albuca* (Hyacinthaceae) with ornamental and medicinal properties were micropropagated. Adventitious bulblets of *Albuca bracteata* were cut into quarters and used as explants to examine the effect of temperature (10, 15, 20, 25, 30 or 35 °C), carbohydrates (glucose, fructose or sucrose at 0, 87.5, 175, 262.5 or 350 mM) and hormones (BA, *m*TR, NAA, IAA, GA_3, ABA or methyl jasmonate each at 0, 0.1, 1.0 or 5.0 mg/L) on the induction and growth of bulblets. Temperatures above 35 °C completely inhibited bulb formation, while induction at all other temperatures was high. Heaviest and largest bulbs formed at 20 °C. Low concentrations (87.5 mM) of all tested carbohydrates increased bulb induction compared to media without a carbohydrate source, while higher levels decreased bulblet induction. The cytokinins *m*TR and BA inhibited bulb induction, diameter and mass at moderate (1.0 mg/L) and high (5.0 mg/L) concentrations. GA_3, NAA and particularly IAA promoted bulblet induction, while ABA and methyl jasmonate had no significant effect on the induction or bulblet growth. Leaf material and young inflorescences of *A. nelsonii* were removed, decontaminated, and dissected into seven explant types: leaves, peduncles, pedicels, whole flowers, tepals, ovaries and anthers. These were placed on MS media without hormones, or containing 0.5 mg/L *m*TR, 0.5 mg/L NAA or 0.5 mg/L *m*TR + 0.5 mg/L NAA to establish which explant type and hormone combination promoted shoot formation. Some tepal and pedicel explants were capable of shoot production on media with both *m*TR and NAA, but peduncle explants produced the most shoots when *m*TR and NAA were both present in the culture medium. Flowers, leaves, ovaries and anthers were completely unresponsive, irrespective of medium composition. These techniques will aid the further horticultural development of these plants, and can be easily adjusted for other species within the genus to promote conservation.

Keywords: Auxins; Carbohydrates; Cytokinins; Bulb formation; Shoot induction

1. Introduction

There are approximately 80 species of *Albuca*, of which about 60 are endemic to southern Africa (Manning et al., 2004). The Red Data List for South Africa lists three species as endangered (*A. clanwilliamigloria*), vulnerable (*A. crudenii*), and critically endangered (*A. thermarum*). Plants display a variety of flower size and colour (Fig. 1A and D), and have considerable potential for development as ornamental subjects.

Albuca species have been used for traditional medicine with bulb infusions taken as emetics to protect against sorcery and as general protective charms (Pooley, 1998). Several species are known to produce steroidal saponins, polyhydroxyalkaloids and homoisofavonoids (Dahlgren et al., 1985; Koorbanally et al., 2005), making them potential candidates for ethnomedicinal studies. Should unsustainable harvesting of these plants continue and escalate, more species could become threatened. This fact, combined with their ornamental potential, are significant motivating factors for exploration of micropropagation in this genus.

Our group has conducted much research into this particular area of micropropagation of plants with medicinal and ornamental value for conservation purposes. We have been successful in several genera, including *Crinum* (Fennell et al., 2001), *Tulbaghia*

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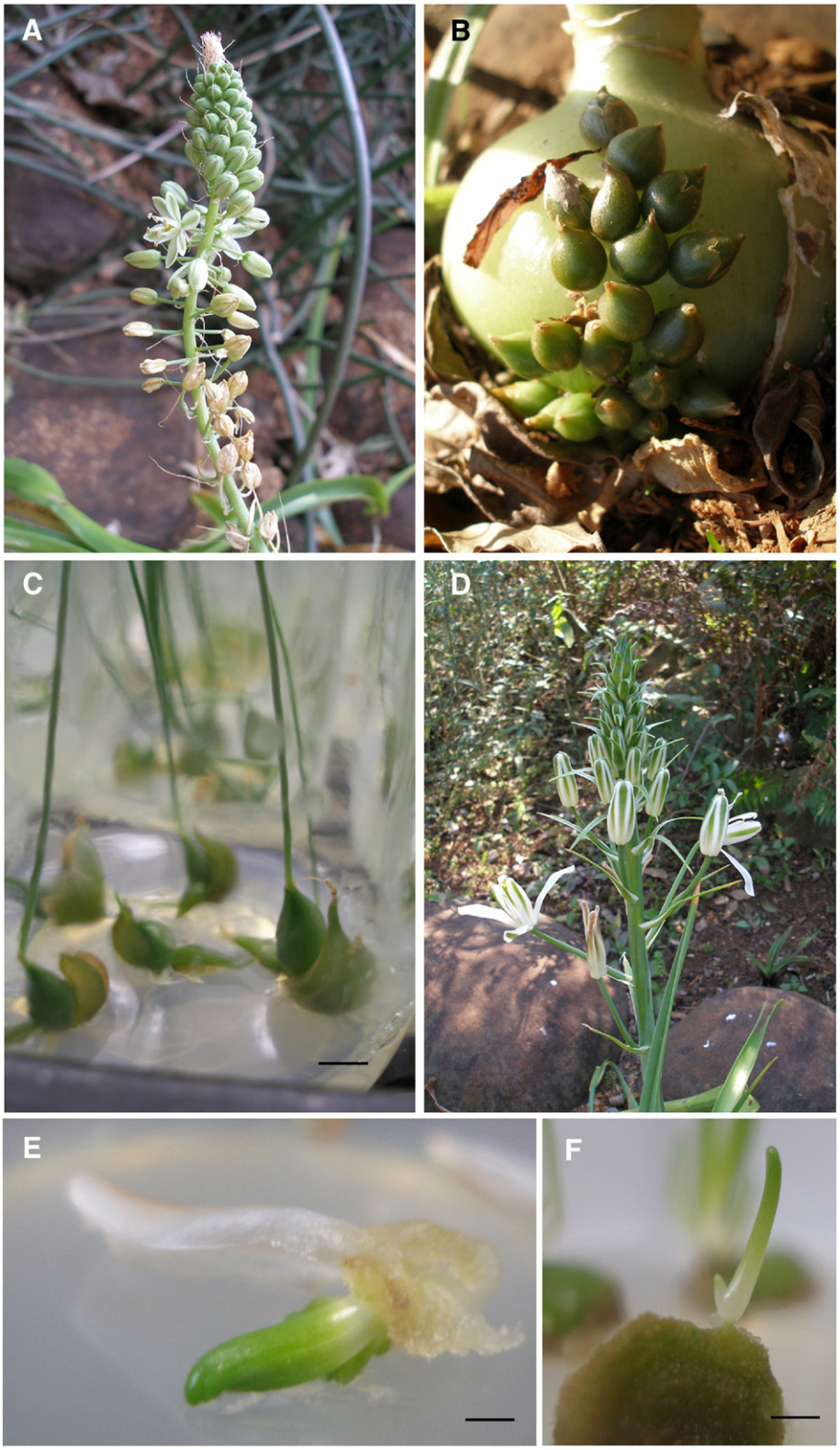

Fig. 1. Flowers and inflorescence of *Albuca bracteata* (A); adventitious daughter bulblets forming on outer scale of *A. bracteata* were used as explants (B); bulblets forming from quarter-bulb explants of *A. bracteata* (C, bar represents 5 mm); flowers and inflorescence of *A. nelsonii* (D); *in vitro* shoot formation from the base of a tepal (E, bar represents 2.5 mm); *in vitro* shoot production from peduncle explants after eight weeks on media containing 0.5 mg/L *m*TR+0.5 mg/L NAA (F, bar represents 2.5 mm). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)