The role of AmRLK in cell shaping

BY

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ABSTRACT

The production of brightly coloured flowers is thought to be one of many strategies employed by plants to attract pollinators. In *Antirrhinum majus*, flower colour is largely determined by the presence of anthocyanin in the epidermal cells of their petals. However, the conical shape of these cells also enhances the colour intensity of the pigmentation. The inactivation of MIXTA, a MYB transcription factor, inhibits conical cell formation in the petal epidermis (Noda et al., 1994). The dull colour of petals in *mixta* mutant flowers demonstrates the degree to which cell form can influence pigmentation intensity. Unravelling and characterising the targets of MIXTA should reveal how MIXTA directs changes in cell shape. This in turn should provide a model to understand cell expansion events in more complex systems. A differential-display PCR using mRNA from wild type and *mixta* mutant flowers identified a gene encoding a novel receptor like kinase (AmRLK), upregulated in the *mixta* mutant of Antirrhinum (Bhatt, 2001).

This thesis characterises the role of AmRLK in cell shaping and its relationship with MIXTA. *AmRLK* is expressed in the epidermis of petals of wild type Antirrhinum flowers when conical cells initiate. *AmRLK* transcript levels are elevated in the absence of *MIXTA* and lower in *MIXTA* overexpressing lines, suggesting that MIXTA represses *AmRLK*. Experiments using a 5' promoter region of *AmRLK* to drive GUS expression in tobacco, suggested that this repression operates through the *AmRLK* promoter. Functional analysis suggested that AmRLK is sufficient to induce conical cell formation. The silencing of an *AmRLK* homologue in *N. benthamiana*, *NbRLK*, resulted in inhibition of proper conical cell expansion in petals. Furthermore, the overexpression of *AmRLK* in *Nicotiana tabaccum* induced outgrowth formation in normally flat carpel epidermal cells, redirecting the polarity of growth. Analysis of a AmRLK:YFP protein fusion in tobacco epidermal cells suggested that AmRLK is polarly localised in the plasma membrane of expanding conical cells and root hair cells, consistent with a function of AmRLK in cell expansion and shaping. A model whereby AmRLK initiates the process of conical cell formation and MIXTA directs the formation of full grown conical cells is proposed.