

### Abstract:

In many commercial cut flowers, particularly those with spike or compound inflorescences, postharvest life and quality are highly dependent on the continued development of small buds to open blooms. Buds may be separated into two major types – those enclosed by a calyx, where petal growth is largely complete before the calyx opens or is shed, and those where the petals are naked and expand rapidly prior to opening. Plants employ an interesting range of mechanical systems to facilitate the rapid opening of the petals at anthesis, from the calyptrum of the poppies where the calyx encloses the fully expanded petals until the moment of opening, through the inverted umbrella of the cyclamen, where dramatic changes in cell size result in unfurling and reorientation of the fully grown petals. Growth of young buds of many different cut flowers can be sustained by the simple preservative solutions used in commercial floriculture, indicating that the primary components of the bud are present from very early in development, and that a sugar supply is all that is required to drive floral development. The rapid expansion that precedes or accompanies flower opening is usually associated with increased soluble sugar content of the petal cells. This change, which presumably provides the turgor necessary for growth, may be at the expense of stored complex carbohydrates (starch or inulin), or may reflect import of sugars from the plant or the vase solution. We have demonstrated changes in the expression of invertase genes during floral development of the ephemeral flowers of Four O'clock (*Mirabilis jalapa*) that correlate with the onset of rapid flower growth and suggest that sucrose metabolism may be a key component of the sink strength of the developing bud. Rapid growth of floral organs requires changes in the size and shape of the cell walls, and we have also demonstrated dramatic changes in the expression of genes encoding expansins, proteins associated with rapid expansion growth in other plant organs, during the growth of *M. jalapa* corollas.