GENERAL DISCUSSION

Mango fruit lenticels originate from existing stomata on the fruit surface as also described by Dietz *et al.* (1988). The first guard cells are visible in the epidermis of ovaries shortly prior to anthesis, becoming functional shortly after anthesis.

Loss of stomatal integrity is due to increased cell division in the epidermis of 'TA' and 'Keitt' fruitlets 12 to 15 mm in size. The lenticels are pushed outwards, above the epidermis, looking like volcanic-like protuberances. Undulation of the epidermis is lost in fruit of about 20 mm, however, stomatal guard cells do not return to their original position, render it impossible for the guard cells to be still functional. 'Kent' stomata loose their integrity only in fruit of about 30 to 40 mm only due to stretching of the epidermis because of a rapid increase of fruit size. The lenticels can be regarded as atypical lenticels because of the absence of a periderm. In comparison with 'TA' and 'Keitt', lenticels of 'Kent' are considerably smaller and also contain a relative thick cuticle in the sublenticellular cavity, which is continuous with the cuticle of the epidermis. Suberized cells are also present in 'Kent' lenticels. Lenticels of 'Kent' fruit, therefore, can be regarded as well insulated. On the contrary, 'TA' and 'Keitt' lenticels consist of a rather large cavity, containing only a thin, inconspicuous cuticle as reported by Tamjinda *et al.* (1992). Loose dead cells are also common in 'TA' and 'Keitt' lenticels.

In 'Kent' fruit a second type of lenticel develop from a resin duct differentiating to close to the epidermis in fruitlets of about 6 mm. Rupturing of the epidermis occur above the resin duct, leaving a cup-like cavity. A phellogen, or rather a wound cambium, develops below this structure as fruit size increase. In a further developmental stage this structure will resemble a typical lenticel as observed in marula fruit. These lenticels also are well protected.

Resin, occurring in the resin ducts in the skin of the fruit, seem to play a major roll in the discolouration of the lenticels. As mentioned by O'Hare and Prasad

(1992) and Loveys *et al.* (1992), resin consist of two phases or fractions, namely a protein polysaccharide (PPS) fraction and an oil fraction. The ratio of the oil fraction to the PPS fraction varied between the three cultivars, with 'TA' the greatest (35%), 'Kent' the smallest (5%) and 'Keitt' (18%) an intermediate amount. When both fractions of the three cultivars were applied reciprocally to the skin of each cultivar after the resin had been separated, no effect could be observed in any trail concerning the PPS fraction. On the contrary, the degree of damage on the fruit surface caused by the oil fraction was different for the three cultivars. Oil fraction of 'TA' had the greatest effect, 'Keitt' was next and 'Kent' had almost no effect whatsoever. This results correlate with the normal manifestation of lenticel discolouration of the three different cultivars.

An explanation for spontaneous lenticel discolouration can be that the volatile terpenes present in the oil fraction volatilise, move out of the resin ducts through sublenticellular cells, via the lenticels to the outside of the fruit. The moving of terpenes through sublenticellular cells cause the loss of cell compartmentalization, letting plastid bound phenols to come into contact with polyphenol oxidase. The product of the resultant reaction taking place is a brownish quinone, accumulating in the cell walls and are visible as black markings on the fruit surface.

Lenticel discolouration may also occur due to maltreatment i.e. rough handling, to high temperatures in the warm water bath, extended period on brushes on packline, breaking of the cold chain and spilling of resin onto the surface of the fruit. This all may cause the sublenticellular cells and even subepidermal cells to get damaged leading to the above mentioned reaction to take place.

Therefore, great care must be taken during the harvesting process for the fruit to be handled as careful as possible. All will depend on strict management practices to be applied during harvesting, packaging and the following handling of the fruit to minimize lenticel discolouration as much as possible.

REFERENCE LIST

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LOVEYS, B.R., ROBINSON, S.P., BROPHY, J.J. and CHACKO, E.K. 1992. Mango sapburn: components of fruit sap and their role in causing skin damage. *Aust. J. Plant Physiol.* 19, 449-457.

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TAMJINDA, B., SIRIPHANICH, J. and NOBUCHI, T. 1992. Anatomy of lenticels and the occurrence of their discolouration in mangoes (*Mangifera indica* cv. *Namdokmai*). *Kasetsart J.* 26, 57-64.

APPENDIX

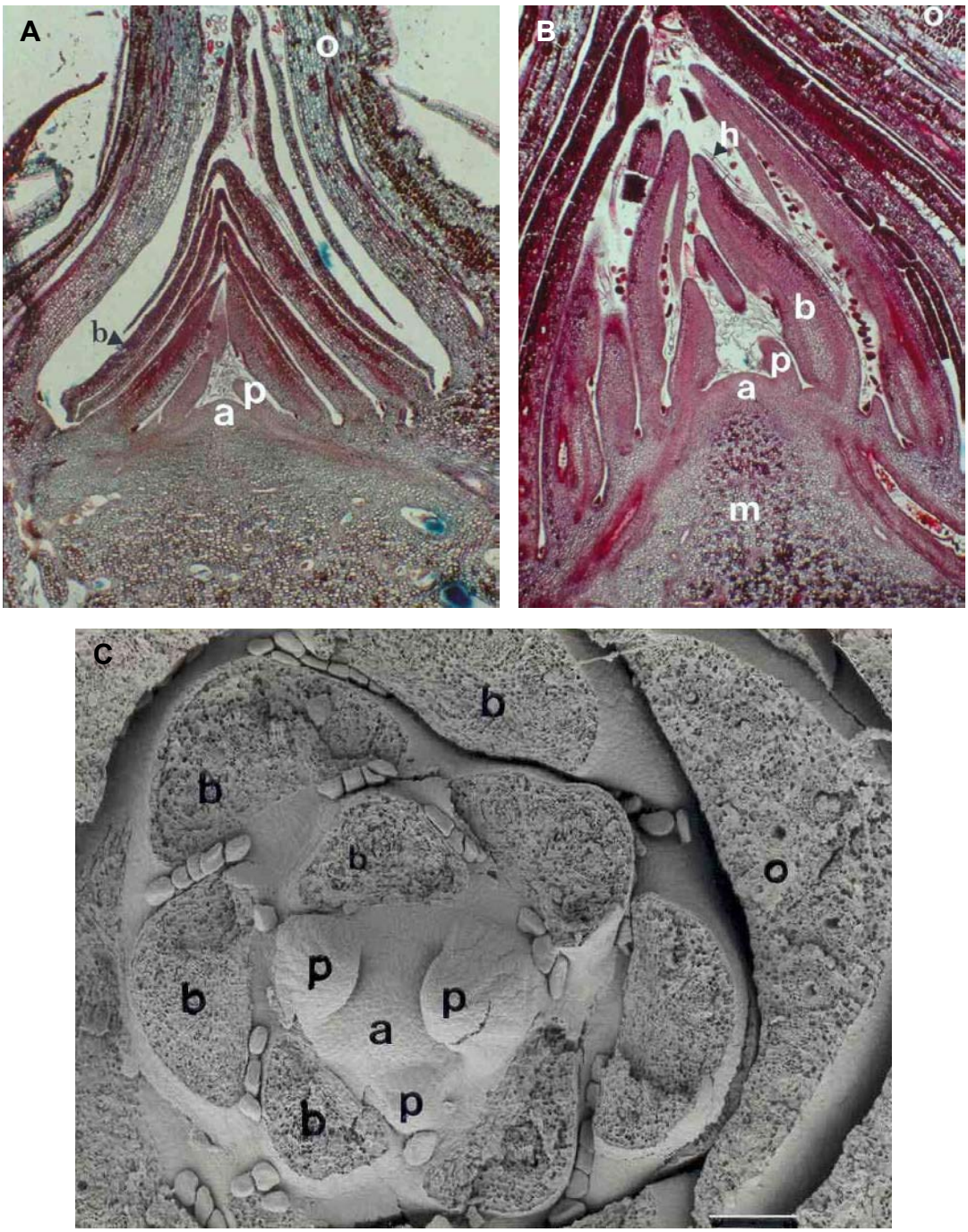

Figure 1 Light micrograph of (A) a "resting bud". No meristematic activity in preformed leaf primordia axils (stage1). (B) an activated bud showing elongation of main axis (primary inflorescence axis) (late stage 1). (C) Scanning electron micrograph of apical buds with leaf (bract) primordia removed; same stage as A, showing resting bud with quiescent apical meristem (a), youngest leaf primordia (p) scars of outer bud scales (o) and inner bract scars (b). (Courtesy Robbertse, *et al.,* 2001)

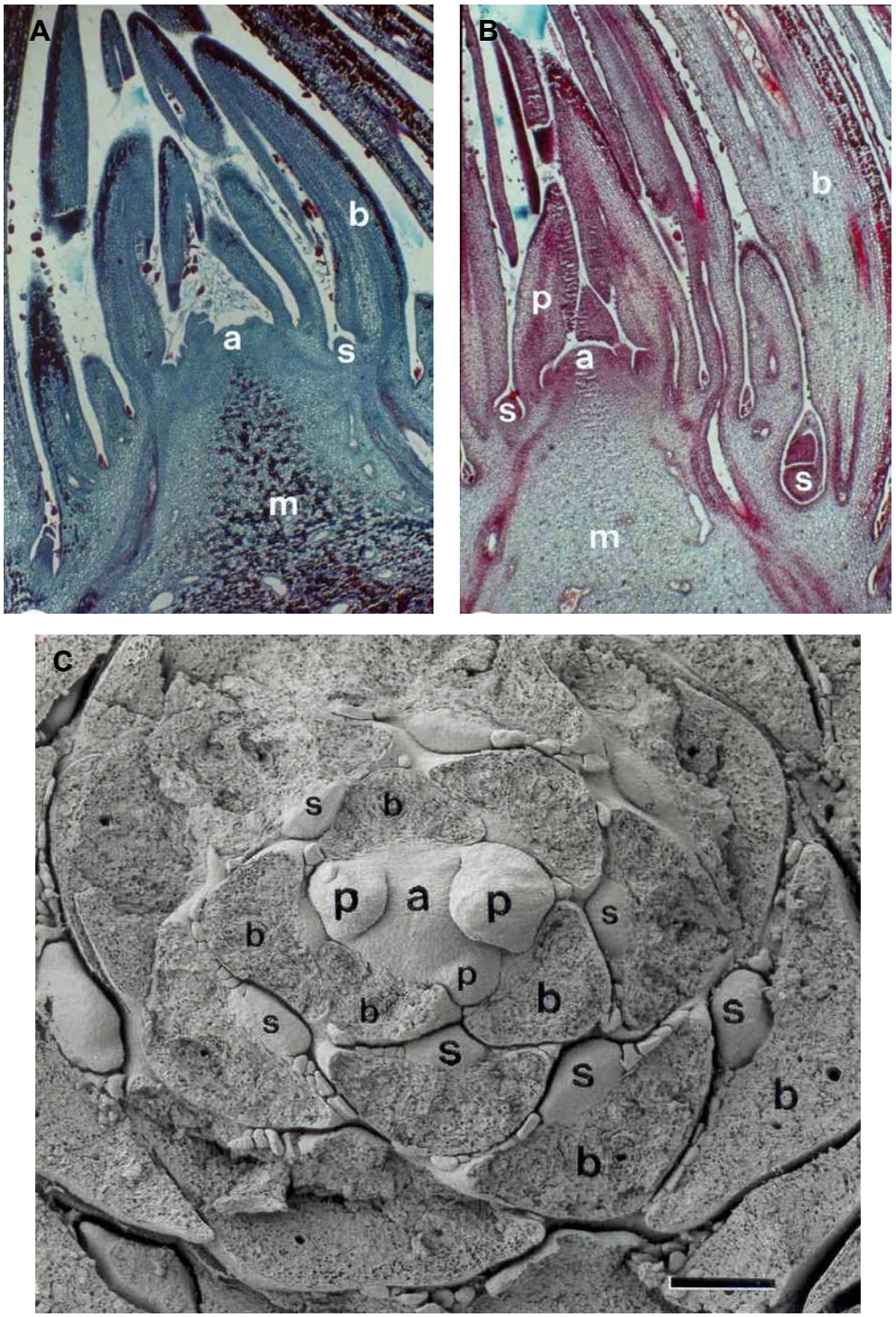

Figure 2 (A and B) Light micrograph of differentiating apical buds (stages 2 and 3) showing elongating primary inflorescence axis (m) and appearance of first lateral bud meristem (s) that will become secondary inflorescence axes apical meristems (s) producing new leaf (bract) primordia (p). (C) Scanning electron micrograph of activated bud induced to produce lateral inflorescence axis meristems (s) in the axils of the bracts (b). (Courtesy Robbertse, *et al.,* 2001)

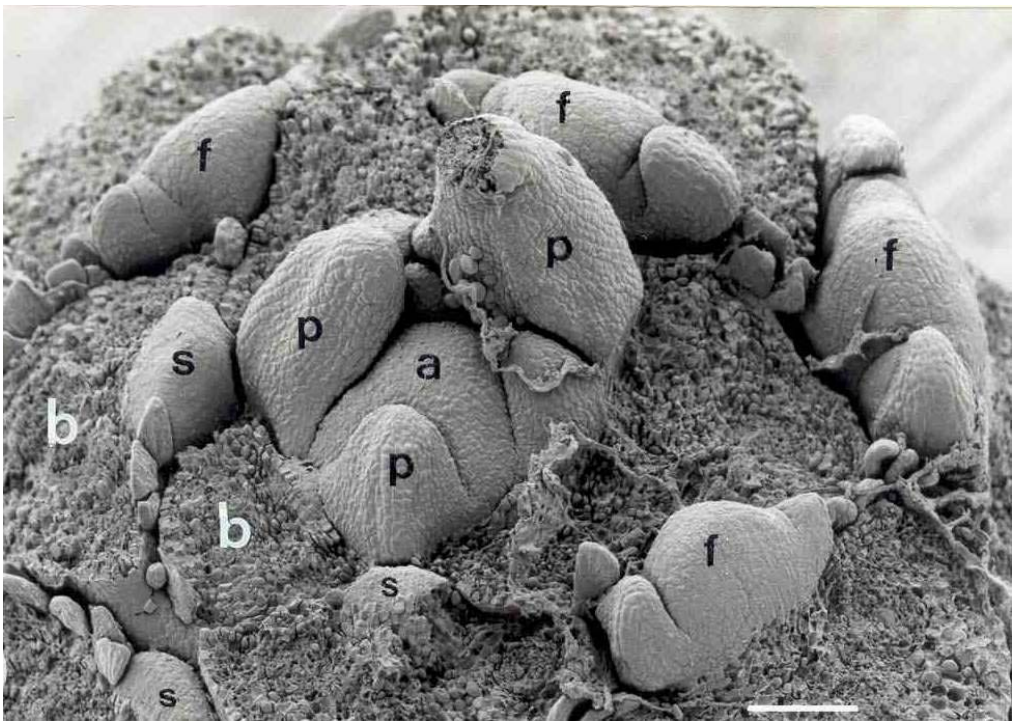

Figure 3 Scanning electron micrograph of stage 3 buds with preformed bracts removed to show secondary inflorescence axis buds (f). Note that the apical meristem (a) is producing new bract primordia (p) and secondary axis primordia (s). (Courtesy Robbertse, *et al.,* 2001)

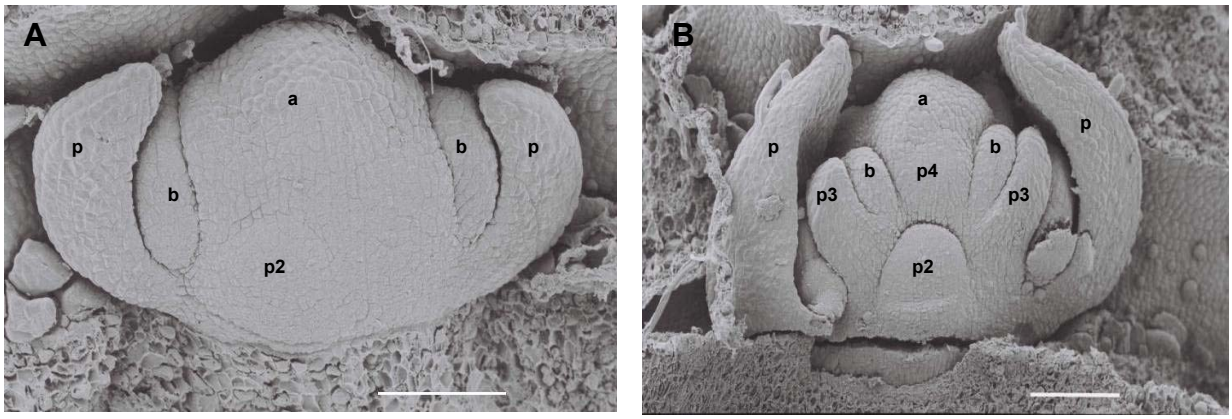

Figure 4 (A and B) Scanning electron micrographs of two stages of secondary axis differentiation. Note the apical meristem (a) producing opposite, decussate bracts (p-p4) each subtending a bud primordium (B) which are meristems producing tertiary inflorescence axis. (Courtesy Robbertse, *et al.,* 2001)

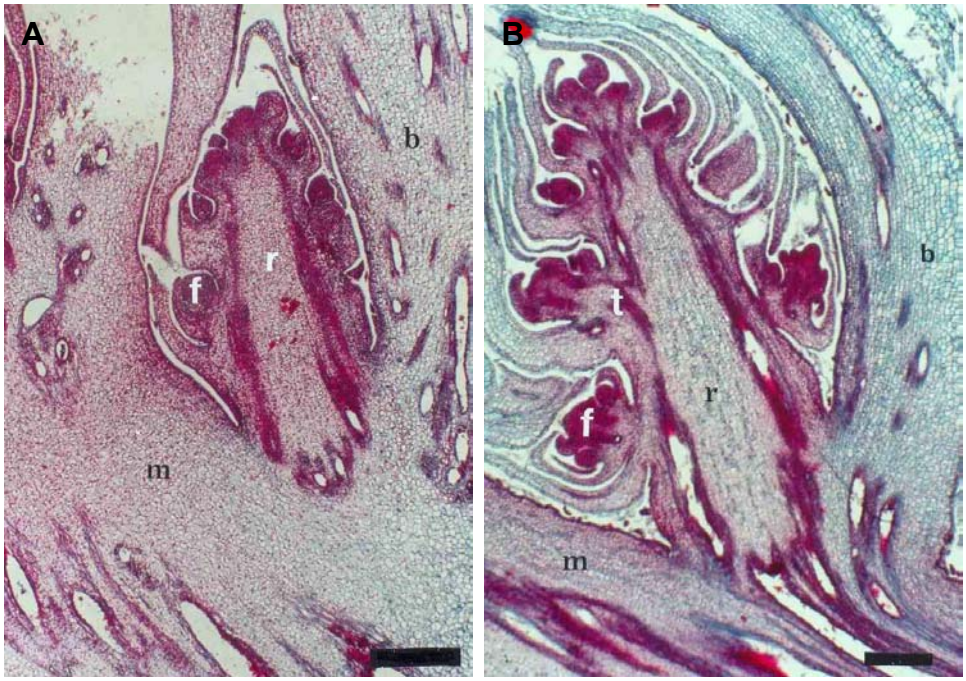

Figure 5 (A and B) Sections of two stages of lateral inflorescence axis differentiation; each forming a number of tertiary axes with terminal flower bud primordia (f). (Courtesy Robbertse, *et al.,* 2001.)

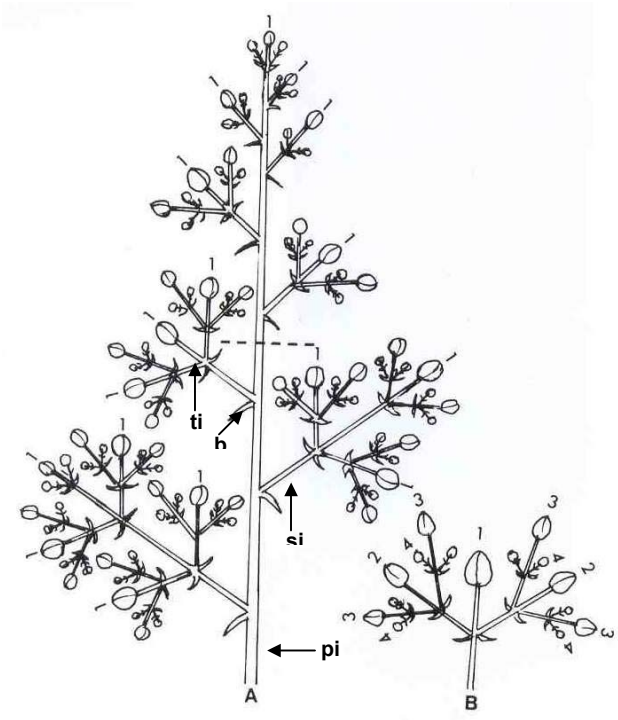

Figure 6 (A) Diagram of mango inflorescence. (B) shows one sympodial tertiary inflorescence branch. Numbers indicate the sequence of branching, ending in first, second third and forth order branches. - Monopodial primary inflorescence axis (pi), secondary inflorescence axes (si), bract axil (b) and tertiary inflorescence axes (ti). (Courtesy Robbertse, *et al.,* 2001)