

ABSTRACT

Anatomical and molecular aspects of abscission in *Cajanus cajan* (L) Millsp. (pigeonpea)

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Reduced pod yield due to premature abscission of flowers and young pods has been observed in *Cajanus cajan* (pigeonpea) with reported abscission rates as high as ninety percent. The process of abscission has been studied at the anatomical and molecular levels. Based on histological investigations, the anatomy of the abscission junctions of pigeonpea leaves and flowers is described and compared. Additionally, the isolation of a polygalacturonase gene expressed during pigeonpea leaf abscission was carried out using a RT-PCR strategy followed by isolation of the 5' end of the cDNA PG using a 5' RLM-rapid amplification of cDNA ends (RACE) protocol.

Typically, in both leaf (rachis/stem and lateral rachis/rachillae) and flower (pedicle/peduncle) junctions an anatomically distinct layer is not present prior to induction of abscission, however, at the terminal rachis/rachilla junction one is observed. At all junctions, separation occurs as a result of dissolution of the middle lamellae leaving intact cells on either separation face, except at the rachis/stem site where cell fracture occurs. Protection occurs as a result of suberisation of the exposed faces at all vegetative sites, however, at pedicel/peduncle junctions, periderm formation was observed.

Degenerate PG primers amplified the conserved DNA PG fragment of approximately 147 bp which showed similarity with polygalacturonases in the EMBL database. The cloned, sequenced 5' end of the cDNA had 68% homology to peach endopolygalacturonase and 64% homology with tomato abscission-related PGs. The predicted protein sequence of the isolated 5' cDNA showed on average 87% amino acid sequence similarity with plant PGs in the EMBL database. PG-related cDNA was not detected in untreated, non-abscising junctions but was readily isolated from ethylene induced abscising junctions. This result suggests that polygalacturonase is involved in the cell separation process in pigeonpea leaf abscission junctions.

Keywords: anatomy, gene expression, polygalacturonase.