Architectural responses of intra- and inter-species plant-plant interactions

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Summary Plants interact with their environment and respond to a certain degree by incorporating morphological changes to avoid threats from neighbours. These architectural responses may be progressive increase in main stem length, reduced branching, elongation of petioles of main stem leaves, alteration in branching angles, alteration in orientation of leaves, enhanced specific leaf area and decreased root: shoot ratio. Plant architecture is recognised as a plant's main tool to capture essential resources such as water, light and nutrients. Cotton and *Hibiscus trionum* (L.) (bladder ketmia) interactions are examined at different planting densities in relation to these architectural and morphological adaptations.

Glasshouse studies on cotton intra-species plant-plant interactions were undertaken with different plant geometries on formulated hypothesis *viz.* plant height, stem biomass, stem diameter, bolls dry weight, main stem leaves biomass and main stem branches leaves and stem biomass. Experimental results revealed that all these parameters exhibited positive response to progressively less dense plant geometries (5, 10, 20 and 120 cm intra-row spacing).

Advances in computer technology have made it possible to study the architectural responses of plants to their neighbours at the plant level. Using a 3-D digitiser system, morphogenesis of plant structure is measured and recorded throughout the growth cycle. The software employs a generic, systematic and hierarchical approach to address the modular nature of plants. Complex plant architectures are built from limited sets of plant components and types within components. The data are processed using database software and virtual plants (computer simulations of 3-D structural dynamics of individual plants) are created on the basis of these real plants observations.

Keywords Cotton, bladder ketmia, 3-D digitiser system, morphogenesis, virtual plant, plant architecture.