THE CARBOHYDRATES OF HARRISIA CACTUS

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Polysaccharides isolated and identified from Harrisia cactus (*Eriocereus martinii*) include an arabinogalactan, pectin, and starch as amylose and amylopectin. On hydrolysis, the arabinogalactan yields arabinose, galactose, rhamnose (6-deoxy-L-mannose), and an unidentified constituent. Hydrolysis of the pectin yields galactose, rhamnose, and an unidentified constituent, while hydrolysis of starch yields only glucose, of course. The unidentified constituents from pectin and the arabinogalactan display similar properties under ultraviolet light and with spray reagents, and are probably discaccharide residues containing galacturonic acid.

There are, naturally, other carbohydrates in the plant. Cellulose forms a large proportion of the dry weight of the plant, while the simple sugars of the plant have been tentatively identified as glucose, fructose, and sucrose. Two important points should be made: firstly, the Cactaceae as a family are low in protein, fat, and ash, and carbohydrates constitute the greatest part of the dry weight of the plant; secondly, the only pentose sugar identified in *Eriocereus martinii* in these analyses is arabinose from the arabinogalactan.

The distribution of polysaccharides within the plant is given in the Table.

	Starch	Pectin	Arabinogalactan
Young tuber	-	+	+
Tuber	+++++	+++	-
Young stem	+	++	++
Stem	++	++++	++++
Green fruit	-	++	+++
Ripe fruit	-	+++++	-

The arabinogalactan is seen to occur in all parts of the plant where water conservation is important. In the growing tuber the arabinogalactan disappears and is replaced by starch, while in the fruit it is replaced by pectin. However, it is the probable conversion of starch to arabinogalactan in the stem, in response to high temperatures and low moisture, which is interesting.

The conversion of hexose-polysaccharides to pentosans is a feature of xerophyte physiology. The complex, highly branched structure of arabinogalactans from cacti (which are succulent xerophytes) make them capable of forming extremely stable lyophilic sols of high hydration capacity and viscosity. Pentosans combine with proteins to form stable biocolloids of high hydration and imbibitional capacity, and the conversion of hexose-polysaccharides of low imbibition capacity to pentose-polysaccharides of high hydration capacity is considered to constitute the basis of permanent succulence in plants.

The importance of this mucilage (biocolloid) is stressed first, by a New South Wales report, which shows prickly pear with a high mucilage content is not attacked by *Cactoblastis*, and second, the proposal, by several workers, that the binding of phenoxycarboxylic acid herbicides by mucilage is responsible for their reduced effectiveness against *Opuntia* spp. In this connection, Brian and Rideal have linked susceptibility of wheat, cress, and tomato plants to MCPA with the adsorption of this chemical by protein and lipoprotein monolayers from these plants. While a full discussion of such possibilities is beyond the scope of this paper, some speculation based upon data presented is not.

The cacti are not resistant to the phenoxycarboxylic acids in that they do not render such acids harmless by metabolic detoxification mechanisms. Herbicides applied to the stems of Harrisia cactus often fail to kill the tubers, while herbicides applied to the soil can kill the whole plant. Since starch and pectin are present in the tubers but arabinogalactan is not, the arabinogalactan would seem to be the main plant components which could be correlated with reduced herbicidal effectiveness.

Herbicides of the 2,4-D type move into the symplast, whence they move through the cells, and into the phloem for transport. In Harrisia, the vascular tissue is composed of separate bundles in a ring inside a cylinder of thin-walled, nonvacuolate, parenchymatous tissue. The arabinogalactan is thought to occur as a graded molecular weight polysaccharide packed from the inside of the walls and decreasing in molecular weight towards the centres of the cells, the colloid or mucilage completely filling the cells. Herbicide applied to the epidermis must thus traverse several layers of cells filled with arabinogalactan in order to reach the phloem. The movement of herbicide may be restricted by chemical interaction between the herbicide molecule and the arabinogalactan, or by the viscosity of the arabinogalactan colloid.

Fruitful areas for research clearly include:

(1) further work on the identification of the polysaccharides, and elucidation of their chemical structures, particularly the arabinogalactan

(2) confirmation of the distribution of the polysaccharides of Harrisia cactus at a cellular level

(3) determining whether the polysaccharides (or other plant constituents) are capable of direct chemical combination with herbicide molecules

(4) more investigations like those of Brian and Rideal on the adsorption of herbicides by films of plant constituents

(5) elucidation of the pathways by which herbicides move into the plant and by which they are moved in the plant

ADONIS SPP. IN SOUTH-EASTERN AUSTRALIA

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The annual species of *Adonis* (*Adonis* Sect. *Adonis*), known generally as pheasants's eye, originated in the Mediterranean basin. Most species have been spread throughout the world and some have reached Australia.

It was first noted at Inverell in New South Wales and Goondiwindi in southern Queensland in 1905. The first collections in South Australia were made in 1915 at Roseworthy and in 1917 between Blyth and Clare in the Lower North (Black, 1940). Since then it has spread considerably and is now also recorded in Victoria. In South Australia, it has become a serious weed of the pasture years of crop-pasture rotations. Some interim results of current studies concerning the taxonomy and