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BRIEF COMMUNICATIONS

CARBOHYDRATE COMPOSITION OF THE MUCILAGE ON OCIMUM BASILICUM L. SEEDS

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A great number of seeds are able to form a mucilaginous coat after wetting. The functions usually ascribed to the mucilage are directed towards the maintenance of the species. Because of its capacity to retain water the mucilage may protect the seeds against desiccation, create a suitable environment for its development (FREY-WYSSLING & MÜHLETHALER 1965) and play a role in seed dispersal. Dependent upon the plant species the seeds produce mucilages which consist of neutral polysaccharides or acidic polysaccharides; some of the latter can be associated with cellulose (Aspinall 1970).

Electronmicroscopic studies on basil seeds (*Ocimum basilicum*, Labiatae) have shown that the secondary wall of the epidermis cells of the seed coat is mucilaginous. It contains amorphous material in which microfibrils are present as a densely packed helical ribbon (SASSEN & BEKERS 1977). Wetting of the seeds causes swelling and extrusion of the amorphous and fibrillar polysaccharides. Globular particles with a diameter of 1.5–4.0 μm present in the lumen of the epidermis cells are extruded together with the mucilage (SASSEN & BEKERS 1977).

In this report some information is given on the carbohydrate composition of the *O. basilicum* mucilage. The mucilage was removed mechanically from the seed coat after immersing the seeds for 10 minutes in destilled water and was then examined for its carbohydrate composition. Quantities of total carbohydrate and of acidic carbohydrate were determined by the phenol-sulfuric acid method (DUBOIS et al. 1956) and the carbazole method (DISCHE 1962), respectively. In addition, mucilage was extracted successively for 15 minutes with water at 20°, 0.1 N HCl at 70°, 1.0 N HCl at 100°, 2 and 5% KOH at 80°. The total amount of carbohydrate was determined in the H_2O-, HCl-, and KOH-soluble fractions and in the KOH-insoluble fraction which contains the fibrillar material. For a qualitative determination of monosaccharides, the H_2O-, HCl-, and KOH-soluble fractions were hydrolyzed with 2 N trifluoroacetic acid (TFA) and the KOH-insoluble fraction with 10 N TFA. After removal of the TFA and separation of the neutral and acidic components by Dowex-1 exchange resin the hydrolyzates were checked for their monosaccharide composition by thin layer chromatography using as solvents ethyl acetate-pyridine-water (8:2:1, by vol.) for the neutral sugars (WILLAMS

& BEVENUE 1953) and acetone-n-butanol-0.1 M NaH_2PO_4 (4:2.5:3.5, by vol.) for uronic acids (ERNST 1968). Alkaline silver nitrate was used as spray for the detection of the sugars (TREVELYAN et al. 1950).

Hydrated mucilage collected from 10 seeds contains 3 to 4 mg of polysaccharide of which about 21% represent uronic acid material. *Table 1* shows that there are no qualitative differences in the monosaccharide composition of the H_2O- and 0.1 N HCl fractions of the mucilage which contain 6.5 and 10.5%, respectively, of the total carbohydrate. In both fractions galactose (Gal), glucose (Glu), mannose (Man), arabinose (Ara), xylose (Xyl) and rhamnose (Rha) are present as neutral sugars, which are well known components in plant mucilage (FREY-WYSSLING 1976). By qualitative assessment of the plates, xylose appears to be the main component with lesser amounts of galactose and the other sugars. As sugar acids galacturonic acid (GalA) and glucuronic acid (GluA) are present in these fractions. Galacturonic acid is a generally occurring component in seed mucilages (FREY-WYSSLING 1976). Glucuronic acid, as 4-0-methyl-D-glucuronic acid, has been reported so far only in the mucilage of *Lepidium sativum* seeds (TYLER 1965). Glucuronic acid is absent in *Ocimum canum* mucilage (ANJANEYALU & THARANATHAN 1971). As well as galacturonic acid this mucilage contains mannuronic acid, a sugar acid which is found usually in extracellular bacterial polysaccharides and alginic acid (ANJANEYALU & THARANATHAN 1971). The major part of the non-fibrillar material of the *O. ocimum* mucilage is released by 1.0 N HCl (Table 1). This fraction contains the same monosaccharides apparently in the same amount as the H_2O- and 0.1 N HCl-fractions with exception of galacturonic- and glucuronic acid the presence of which appears questionable. KOH in 2 and 5% solutions released only 4% of the mucilage carbohydrates. Glucose is the main component in this fraction which also contains galactose, arabinose and xylose. Rhamnose could be detected only in one of the four mucilage samples examined. The globular particles which were still present in the 2 N HCl-resistant material are also dissolved by KOH. Because it was not possible

Table 1. Carbohydrate contents and monosaccharides detected in hydrolyzates of *Ocimum basilicum* mucilage.*

Fraction	% of total carbohydrate recovered	Monosaccharide** Gal	Glu	Man	Ara	Xyl	Rha	GluA	GalA
Water-soluble	6.5	+	+	+	+	+	+	+	+
0.1 N HCl-soluble	10.5	+	+	+	+	+	+	+	+
1.0 N HCl-soluble	20.5	+	+	+	+	+	+	?	?
2,5% KOH-soluble	4.5	+	+	+	+	+	(+)	−	−
2,5% KOH-insoluble	58.0	−	+	−	−	−	−	−	−

*The symbol ? is used when the presence of a sugar was questionable, the symbol (+) when a sugar could not be detected in all mucilage samples examined.
**Position on plate.

to separate these particles from the amorphous and fibrillar mucilage before extraction with alkali, we are not able to associate one or more of the sugars from the KOH-soluble fraction with the globular particles. Their composition remains, therefore, unknown. The KOH-insoluble fraction which contains the fibrillar residue of the mucilage, constitutes 58% of the total carbohydrate and on hydrolysis yields glucose. The finding that glucose is the hydrolysis product of the fibrillar portion of the mucilage supports the suggestion by SASSEN & BEKERS (1977) that the fibrils consist of cellulose. In contrast, the acid- and alkali-insoluble fibrous material of the *O. canum* mucilage represents a galacto-gluco-mannan (ANJANEYALU & THARANATHAN 1971).

From the results one may conclude that the mucilage of *O. basilicum* seeds belongs to the type of acidic polysaccharides which are associated with cellulose. The mucilage appears to consist of different polysaccharides as the differences in solubility and carbohydrate composition indicates. The qualitative differences in the acidic and fibrous carbohydrates between the mucilages of *O. basilicum* and *O. canum* seeds suggest that the carbohydrate composition of seed mucilages is species specific.

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