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B R I E F C O M M U N I C A T I O N S

CARBOHYDRATES FROM *Curcuma longa*

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Curcuma longa L. (turmeric) is a perennial herbaceous plant of the Zingiberaceae family. The rhizome powder is used as a spice, improves digestion, and possesses cholegogic, diuretic, and stimulatory activity. *C. longa* is included in the BGPh.

Herein we report the isolation and general characteristics of turmeric polysaccharides, the study of which is of great interest due to insufficient knowledge of their chemical structure and physiological activity. We studied air-dried ground rhizome (cylindrical side runners) from the plant cultivated in Morocco.

Polysaccharide fractions were isolated by working up ground raw material (100 g) with $CHCl_3$ to remove colored substances and noncarbohydrate components. Then, fractions were successively extracted with cold water to isolate water-soluble polysaccharides (WSPS); with oxalic acid/ammonium oxalate mixture (0.5%), pectinic substances (PS); and with base (5%), hemicellulose (HC).

The monosaccharide composition of the carbohydrates was established using acid hydrolysis [1]. Table 1 gives the content and monosaccharide composition of the carbohydrates. It can be seen that *C. longa* rhizomes contain mostly base-soluble polysaccharides, i.e., 17.4% HC.

The qualitative and quantitative monosaccharide composition was determined by paper chromatography (PC) (*n*-butanol:pyridine:water, 6:4:3, anilinium biphthalate developer) and GC.

GC traces were recorded on a Chrom-5 chromatograph with a flame-ionization detector, glass column (1.5 m × 0.3 cm) with 5% Silicone XE-60 on Chromaton NAW, 0.200 × 0.250 mm, 180°C, N_2 carrier gas, 60 mL/min, using aldononitrile acetates [2].

IR spectra were recorded on a Perkin—Elmer Model 2000 spectrophotometer in KBr disks.

WSPS were a friable white powder with a yellowish tint that were soluble in water to form a slightly cloudy solution. An aqueous solution of the polysaccharides gave a positive reaction with iodine, suggesting the presence of glucan-type polysaccharides. Table 1 shows that the monosaccharide composition of the WSPS was mainly rhamnose, xylose, mannose, glucose, and galactose. PC also identified glucuronic acid. The presence of uronic acid indicated that the isolated WSPS were a mixture of neutral and acidic polysaccharides.

PS were a light brown powder that dissolved with heating in water and gave a positive reaction with iodine for starch. The PS hydrolysate contained the neutral monosaccharides listed in Table 1. PC identified uronic acid.

The IR spectrum of the PS exhibited absorption bands at 3400, 2940, 1615, 1402, 1326, 1154, 1073, 812, and 762 cm^{-1}.

The content of free (Cf) and esterified (Ce) carboxylic acids in the PS, 2.3 and 3.2%, respectively, were determined by titration [3]. The degree of esterification (λ) was 58.3%. Therefore, the PS from *C. longa* are considered highly esterified PS.

HC was a friable light brown powder that dissolved in base. Aqueous solutions also gave a reaction with iodine for starch. The hydrolysate of HC contained rhamnose, xylose, glucose, and galactose. The dominant components were glucose and galactose. Therefore, the HC were a heteropolysaccharide.

Thus, roots of *C. longa* contain WSPS, PS, and HC. The predominance of glucose in the monosaccharide composition of the polysaccharides listed above indicates that they are glucan-type polysaccharides.

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TABLE 1. Content and Monosaccharide Composition of *Curcuma longa* Polysaccharides

Polysaccharide	PS yield, %	Ratio of monosaccharide units						
		Rha	Xyl	Ara	Man	Glc	Gal	UAc
WSPS	2.7	5.9	7.2	1.0	7.8	8.3	5.7	+
PS	1.4	2.2	1.0	Tr.	-	10.8	-	+
HC	17.9	1.5	1.1	1.0	-	8.6	3.5	-

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