As can be seen from Table 1, the amount of ESs in the ripe fruit, that of HMCs in the unripe fruit, and that of ESs in the seeds were high. The ESs contained free glucose, fructose, sucrose, and its homologs. The high amount of HMCs in the unripe fruit is connected with the presence of starch in them. All the polysaccharides formed a blue coloration with a solution of iodine [5]. Analyses of the IR and ^{13}C NMR spectra of the polysaccharides unambiguously showed that the arabinose had the furanose form and the other sugars the pyranose form.

Thus, the edible fruit of the pawpaw [4] can be used in the food industry independently or in combination with other fruits as a jellifying agent.

LITERATURE CITED

1. L. Gogolashvili, Priusadevnoe Khozyaistvo, No. 2, 63 (1982).
2. A. Takhtajan, Flowering Plants. Origin and Dispersal, Oliver and Boyd, Edinburgh (1969).
3. R. E. Fries, in Annonaceae in die Naturlichen Pflanzenfamilien, A. Engler and K. Plantl, eds., 2nd edn., Dunker und Humbolt, Berlin (1959).
4. M. Leboeuf, A. Cave, P. K. Bhaumik, B. Mukherjee, and R. Mukherjee, Phytochemistry, 21, 2783 (1982).
5. P. Kooiman, Phytochemistry, 6, 1665 (1967).
6. P. Kooiman, Carbohydr. Res., 29, 329 (1971).
7. Kh. A. Arifkhodzhaev and E. S. Kondratenko, Khim. Prir. Soedin., 229 (1983).

CARBOHYDRATES OF *Hyacinthus litwinovii*

D. A. Rakhimov

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Continuing a chemical investigation of plants of the family *Liliaceae* [1, 2], we have studied the carbohydrates of the bulbs of the *Hyacinthus litwinovii* Czerniak (Litwinow's hyacinth) collected in the Ashkhabad province in the flowering period. From a weighted sample of the air-dry raw material the carbohydrates were isolated by the well-known method of fractional extraction successively with 80% ethanol, water, a mixture of 0.5% solutions of oxalic acid and ammonium oxalate at 70°C, and caustic soda [3].

The polysaccharide fractions were hydrolyzed with 2 N H_2SO_4 at 100°C for 10-24 h, and the monosaccharides in the hydrolysates were identified by PC and GLC [2].

Glucose, fructose, sucrose, and oligosaccharides containing fructose were found in the ethanolic extract (yield 20%).

The water-soluble polysaccharides were obtained with a yield of 9.7%. They consisted of a white amorphous powder and dissolved in water forming a viscous solution giving no starch reaction with iodine. The IR spectrum of the water-soluble polysaccharide had adsorption bands at (cm^{-1}): 820 (pyranose ring); 880 (β-glycosidic bond); and 1250 and 1740 (ester group). Arabinose (Ara), mannose (Man), glucose (Glc), and galactose (Gal) were found in the hydrolysis products in a ratio of 1:35.2:2.8:1. The polysaccharide was separated with the aid of Fehling's solution into two fractions: a glucomannan and a polysaccharide — from the mother solution by dialysis and precipitation with ethanol. On hydrolysis, the polysaccharide gave Ara, Man, Glc, and Gal in a ratio of 1:2.7:3.8:2. The IR spectrum of the glucomannan lacked the absorption band of the ester groups. In a hydrolysate of it, glucose and mannose were found in a ratio of 1:13.5. In the products of the periodate oxidation of the glucomannan (30 mg, 10 ml of 0.3 M $NaIO_4$, 20°C, 18 days) followed by reduction of the polyaldehyde (60 mg of $NaBH_4$, 16 h), and hydrolysis (0.5 N H_2SO_4, 100°C, 8 h), PC (propan-1-ol—ethyl acetate—water (7:1:2) system with visualization by a saturated aqueous solution of KIO_4 followed by a 1% solution of $KMnO_4$) showed the presence of considerable amounts of erythritol

Institute of the Chemistry of Plant Substances, Academy of Sciences of the Uzbek SSR, Tashkent.

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and glycerol, and also traces of mannose. The formation of erythritol shows the predominance of β-1 → 4-bonds between hexopyranose residues. From a comparison of the results obtained and those given in the literature [4] it follows that the glucomannan that we had isolated differed from known glucomannans by a high mannose content.

The bulbs contained a total of 8.4% of combined polysaccharides (isolated with ammonium oxalate and oxalic acid) consisting of a uronic acid and the neutral sugars rhamnose (Rha), Glc, and Gal in a ratio of 1:16.2:3.6, together with traces of Ara and Man.

The combined polysaccharides gave a blue coloration with iodine. Consequently they contained a glucan of the starch type.

The alkali-soluble polysaccharides consisted of hemicelluloses A and B with yields of 4.3 and 2.1%, respectively. In hemicellulose A we found Rha, Ara, Xyl, Man, Glc, and Gal in a ratio of 1:10.8:3.6:17.5:6. The same sugars with the exception of Ara were found in hemicellulose B, in a ratio of 1:7.6:8.6:28.5:8.3.

Thus, fractionation has shown that the carbohydrate complex of the bulbs of *Hyacinthus litwinovii* includes mono- and oligosaccharides, a water-soluble polysaccharide (a natively acetylated glucomannan), an acidic polysaccharide, starch, and hemicelluloses.

LITERATURE CITED

1. D. A. Rakhimov, Z. F. Ismailov, S. A. Taizhanov, and S. A. Khamidkhozhaev, Khim. Prir. Soedin., 651 (1976).
2. D. A. Rakhimov, A. O. Arifkhodzhaev, A. Dzhabbarov, Z. F. Ismailov, Khim. Prir. Soedin., 823 (1980).
3. A. O. Arifkhodzhaev, D. A. Rakhimov, and Z. F. Ismailov, Khim. Prir. Soedin., 246 (1980).
4. N. K. Shcherbukhin, Usp. Biol. Khim., 11, 226 (1970).

FATTY ACID COMPOSITION OF OILS OF VARIOUS TYPES OF *Olea europaea*

M. É. Mamedova and S. M. Aslanov

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Information on the main physicochemical indices and composition of the fatty acids of the oil of the olive *Olea europae* L. is given in the literature [1-5].

We have studied the qualitative and quantitative compositions of the fatty oils obtained from the flesh with skin and the seeds of various varieties of olive (Baky-zeituny, Agostino, Santa Katarina, Ragiakhi) of the 1983 harvest grown on the Apsheron peninsula (Azerbaidzhan SSR) [4, 5].

The oil was extracted with n-hexane in a Soxhlet apparatus [6]. The composition and relative percentage amounts of the fatty acids in the oils were studied by gas-liquid chromatography on a Chrom-4 chromatograph with a 4 mm × 2.5 m column filled with 17% of ethylene succinate on Chromaton NAW-DMCS at 196°C. The fatty acids of the oils were chromatographed in the form of their methyl esters. The peaks of the fatty acid methyl esters were identified from their relative retention times [7].

The oils of the flesh with skin and of the seeds of the varieties studied did not differ in relation to the qualitative compositions of the fatty acids but there were some differences in their relative amounts (Table 1).

The oils of the seeds of the varieties mentioned were characterized by higher amounts of oleic (18:1), linoleic (18:2), and stearic (18:0) acids, and the oils of the flesh with skin

V. L. Komarov Institute of Botany, Academy of Sciences of the Azerbaidzhan SSR, Baku.
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