

## BRIEF COMMUNICATIONS

### POLYSACCHARIDES FROM SEEDS OF HIGHER PLANTS. WATER-SOLUBLE POLYSACCHARIDES FROM PLANT SEEDS OF THE FAMILY Apiaceae

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We studied previously plants of the families Liliaceae [1, 2], Amaryllidaceae [3], Malvaceae [4], and Caryophyllaceae [5].

In continuation of work in this area, we studied water-soluble polysaccharides (WSPS) from seeds of higher plants of the family Apiaceae (Umbelliferae). The composition and content and physicochemical characteristics of seeds from representatives of this family have not been reported. Furthermore, many Umbelliferae plants have great economic value as food, drug, feed, and technical plants [6]. Therefore, our goal was to isolate and determine qualitatively and quantitatively WSPS from seeds of 15 plant species of the family Apiaceae.

The common determination method for WSPS from all seeds included grinding air-dried seeds (10 g), treatment with EtOH:CHCl<sub>3</sub> (1:2, v/v) to remove lipids and pigments, and extraction (3×) of WSPS with water at room temperature (1:10 ratio). The extracts were evaporated. Polysaccharides were precipitated by alcohol. The precipitate was washed with acetone and dried.

The monosaccharide composition of WSPS was established after total acid hydrolysis (H<sub>2</sub>SO<sub>4</sub>, 2 N, 100°C, 5 h) and subsequent analysis. GC of aldononitrile acetates [7] was performed on a Chrom-5 instrument with a flame-ionization detector, glass column (250 × 0.20 mm), 5% Silicone XE-60 on inerton NAW (0.200–0.250 μm), 205°C, N<sub>2</sub> carrier gas, 30 mL/min.

Samples of WSPS were white powders with a cream tint. They did not have reducing power and did not contain starch according to a negative test with iodine.

Fehling solution was added to aqueous solutions of the polysaccharides using the principle of selective precipitation of mannose-containing polysaccharide [8]. A precipitate formed for seeds of *Angelica ternata*, *Coriandrum sativum*, *Heraclim lehmannianum*, *Ferula tenuisecta*, *F. diversivittata*, *Foeniculum vulgare*, and *Mediasia macrophylla*. Polysaccharides of the mannan type were probably present in the isolated WSPS.

Table 1 shows that the studied polysaccharides were obtained in different yields from the seeds. The WSPS content was 0.38–5.96% and was greater in seeds of *Anethum graveolens*, *Daucus carota* L., *Ferula tschimganica* (>4%); and in *Foeniculum vulgare* (5.6%) and *Mediasia macrophylla* (5.96%).

The hydrolysis products of the WSPS contained from two to five monosaccharides. Rhamnose was present in all studied polysaccharides from plant seeds. The principal components were rhamnose, arabinose, glucose, and galactose. This indicated that the polysaccharide fractions contained rhamnoarabinogalactan, rhamnoxylogalactan, glucan, and rhamnoglucan.

Thus, screening of seeds from 15 plant species of the family Apiaceae found that the isolated WSPS differed in quantitative content of WSPS and monosaccharide composition. Some WSPS (*A. ternata*, *C. sativum*, *H. lehmannianum*, *F. tschimganica*, *F. diversivittata*, *F. vulgare*, *M. macrophylla*) contained mannan-type polysaccharides.

As stated above, polysaccharides affect the physiological activity of many food additives [9]. In this respect, screening of WSPS from seeds of *Anethum graveolens*, *C. sativum*, *Ferula*, *Foeniculum vulgare*, and *M. macrophylla* are interesting for further medical and biological testing.

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TABLE 1. Composition and Content of WSPS from Plant Seeds of the Family Apiaceae

| Species                                             | WSPS yield, % | Rham | Xyl | Ara | Man | Glc | Gal |
|-----------------------------------------------------|---------------|------|-----|-----|-----|-----|-----|
| <i>Albertia paleacea</i> Rgl.                       | 3.68          | 1    | Tr. | –   | Tr. | –   | –   |
| <i>Anethum graveolens</i> L.                        | 4.4           | 1    | –   | 7.5 | Tr. | –   | –   |
| <i>Angelica ternate</i> Regel                       | 0.82          | Tr.  | 2.5 | 2.7 | 1   | 2.5 | 3.1 |
| <i>Coriandrum sativum</i> L.                        | 2.6           | 1    | 3.8 | –   | 1.9 | 1   | –   |
| <i>Daucus carota</i> L.                             | 4.45          | 1.6  | –   | 3.1 | –   | 1   | Tr. |
| <i>Heraclim lehmannianum</i> Bunge                  | 3.7           | 1    | 1.1 | Tr. | 2.5 | –   | Tr. |
| <i>Ferula tenuisecta</i> Korov.                     | 3.8           | 1    | –   | 1.6 | Tr. | 1.4 | Tr. |
| <i>Ferula tschimganica</i> Korov.                   | 4.5           | 1.6  | –   | 2.8 | 1   | –   | 2.8 |
| <i>Ferula prangifolia</i> Korov.                    | 3.0           | 2.4  | 1   | 1   | –   | –   | 3.0 |
| <i>Ferula diversivittata</i> Regel                  | 0.130         | 1    | 1.9 | 2.2 | 1   | –   | Tr. |
| <i>Foeniculum vulgare</i> Mill.                     | 5.6           | 1    | 4.1 | –   | 3.1 | –   | 1   |
| <i>Mediasia macrophylla</i> Rgl. (Pimenov)          | 5.96          | 1    | 1   | –   | 5.8 | Tr. | Tr. |
| <i>Semenovia dasycarpa</i> Korov.                   | 0.38          | 1.3  | 1   | 2.6 | –   | Tr. | 1   |
| <i>Sphaenolobium tianschanicum</i> Pimenov (Korov.) | 4.39          | 2.1  | 1   | 3.4 | –   | Tr. | 1   |
| <i>Galagania tenuisecta</i> (Regel) Nevski          | 1.85          | 2.1  | 1   | 6   | –   | Tr. | Tr. |

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