p-coumeric acid (R_f 0.35, light blue coloration with reagent I, pink coloration with reagent II) were identified.

In addition, two spots fluorescing bright blue were detected on the chromatogram which did not change their color in UV light after treatment with ammonia and did not give colors in the azo coupling reaction (R_f 0.28 and 0.33).

Gas–Liquid Chromatography. The phenols and phenolic alcohols were separated on a Khrom-41 chromatograph with a flame-ionization detector; stainless-steel column with dimensions of 120 × 0.3 cm; liquid phase DS-550, 15%, on Chromaton N-AW DMCS (0.160-0.200 mm). Rate of flow of the carrier gas (nitrogen) 30 ml/min, temperature of the evaporator 255°C. Separation was performed with programming of the column temperature: a rise from 100 to 160°C at the rate of 5 °C/min, isothermal heating at 160°C for 2 min, and a rise from 160 to 230°C at the rate of 2 °C/min.

SUMMARY

1. The plant material of *Fucus vesiculosus* has been treated with metallic sodium in liquid ammonia. The total yield of products extractable by ether was 1.1%.

2. In the products of the decomposition of the lignin of *Fucus vesiculosus* 12 phenols and acids have been identified by paper chromatography and gas–liquid chromatography and it has thereby been established that the lignin of algae consists of p-coumaryl, guaiacyl, and syringyl structural units.

3. The composition of the decomposition products confirms the hypothesis expressed previously that the brown alga *Fucus vesiculosus* contains lignin.

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THE CHEMICAL COMPOSITION OF AQUEOUS EXTRACTS OF CONIFEROUS NEEDLES

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It follows from information in the literature that the chemical composition of conifer needles is complex and diverse [1-5]. The water-soluble fraction of the needles, which is used as a nutrient medium for the cultivation of organisms producing protein, has been studied inadequately. In the light of this fact, it appears of interest to study the group composition of the extracts, particularly of those of its compounds that are nutrients for microorganisms or exert a definite action on their development.

It can be seen from the results that we have obtained that in their quantitative and qualitative composition the components of aqueous extracts of pine and spruce needles differ insignificantly. So far as concerns the water-soluble fractions of the protein of pine and spruce needles, their amounts are practically identical. There are very slight differences also in their oligosaccharide contents. The presence of certain phenolic compounds apparently reduces the nutrient value of the aqueous extracts. This fraction of the extracts requires more detailed consideration, and it is possible that additional enrichment of the nutrient medium is necessary.

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The amounts of some componnets of aqueous extracts of needles are as follows (% on the dry residue):

Component	Pine	Spruce
Phenolic compounds	9.8	11.7
Total protein	2.7	2.9
Oligosaccharides	13.4	15.8
Monosaccharides	30.5	31.1
Ascorbic acid, mg/%	223	230
Vitamins of the B group, mg/%	8.2	8.9

An important position in the group of physiologically active compounds is occupied by vitamins. Among the water-soluble vitamins a large percentage is due to ascorbic acid, which is present in both the pine and the spruce extracts. Of the vitamins of the B group in the extract we have determined the amounts of inositol, nicotinic acid, pantothenic acid, biotin, and vitamins B_1 and B_6.

Information on the amounts of the group B vitamins present is given below (mg-%):

Vitamin	Pine	Spruce
Inositol	2.02	2.12
Biotin	0.00008	0.00008
Pantothenic acid	1.949	1.680
Vitamin B_1	1.048	1.939
Vitamin B_6	1.415	1.220
Nicotinic acid	1.731	1.980

Consequently, in their vitamin contents the extracts differ little from one another, inositol being present in the largest amount (2.12 mg-%) and biotin in the smallest amount (0.00008 mg-%).

In the aqueous extracts of the needles we determined the monosaccharides as the main sources of carbonaceous nutriment for microorganisms. The composition of the monosaccharides of aqueous extracts of the needles were as follows (% on the dry residue):

	Spruce	Pine
Total RSs	31.1	30.6
Including:		
glucose	6.50	9.53
mannose	5.07	2.92
xylose	5.36	16.52
arabinose	1.43	1.57
galactose	12.76	0.26

As can be seen from the results given above, the monosaccharides of aqueous extracts of pine and spruce needles consist of glucose, galactose, mannose, xylose, and arabinose. In the quantitative respect, in the pine extract xylose and glucose predominate and in the spruce extract galactose and glucose, the amount of glucose in the pine extract being higher than in the spruce extract and amounting to 30% of the total amount of monosaccharides. The spruce extract is rich in galactose, making up about 13%, while the pine extract contains only a very small amount of galactose. However, the pine extract has more than three times as much xylose as the spruce extract.

EXPERIMENTAL

Needles of *Pinus sylvestris* and *Picea obovata* collected in the winter period (February) when the amounts of the components are stable and fairly high [6], were subjected to comminution in a disk mill with simultaneous extraction by cold water (liquor ratio 6) for 15-20 min. The extract obtained was filtered and dried in vacuum. In the dry residue, amounting to 23% of the needles, using the literature methods indicated, we determined the amounts of total nitrogen [7], phenolic compounds [8], reducing substances [9], monosaccharides [10], oligosaccharides [9], ascorbic acid [11], and vitamins of the B group [12].

SUMMARY

1. The group compositions of aqueous extracts of pine and spruce needles have been established. In their chemical compositions the extracts are similar to one another.

2. The individual composition of the monosaccharides have been determined. They contain glucose, mannose, galactose, xylose, and arabinose.

3. The component compositions of the vitamins have been studied. Ascorbic acid and vitamins of the B group have been found such as inositol, biotin, nicotinic and pantothenic acids, and vitamins B_1 and B_6.

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