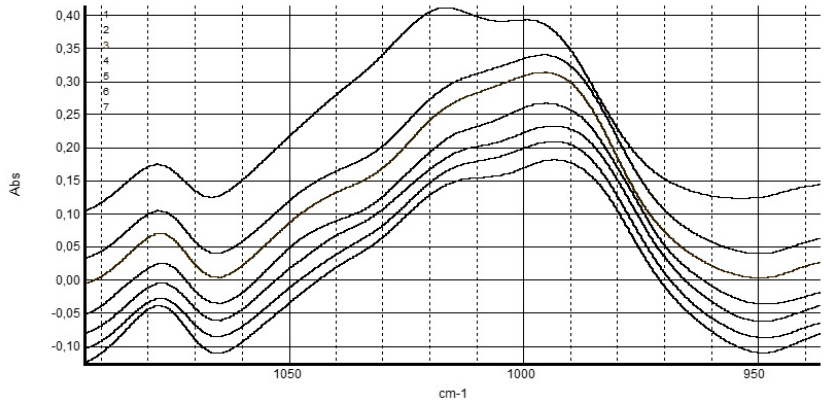

Fig. 5. The low-frequency region of the IR spectra of amylopectin (1), samples of starch listed in Table 2 (No 6) and amylose (7).

its relation to the spectral band, which depends little on the length of the sugar chain. This can be a line close to that of $\alpha(1\rightarrow4)$ in respect to its intensity and directly adjacent to it, i.e. it refers to the high frequency component mentioned above. It is assumed that the complex of νCO, νCC and δCOH vibrations [3, 15-17] is manifested in the IR spectra.

Then, a linear correlation between the ratio of the low- to the high-frequency component and that of the number of α1.4-glycosidic bonds to the number of pyranose cycles in the sugar molecules can be used to estimate the average degree of polymerization. The structural unit of the polymer is referred here to a pyranose ring.

The calculations can be done using the simple formula:

$n = 9.37/(5.335\text{-}S_1 / S_2)$,

where S_1 and S_2 are the areas of the low- and the high-frequency component of the spectral band in the range of 960 cm^{-1} - 1060 cm^{-1}. Thus, the problem of estimating the molecular composition of oligosaccharides by IR spectra, which is noted in refs. [11, 14], can be partially solved.

It is interesting to compare the spectrum of amylose, as an extreme member of a series of linear carbohydrates with $\alpha(1\rightarrow4)$bonds, with the spectrum of amylopectin, which is the second highly polymerized macrocomponent of natural starch, but with a different structure. As it turns out, the spectra of both polysaccharides are very close in magnitude, frequency, and profile in respect to most of the lines. This does not apply to the lines dominant in the spectra of both amylose and amylopectin, which have a different profile with an equal relative value (Fig. 3). The bands under consideration in both polysaccharides' spectra can be graphically divided not into two, as in oligomers, but into three components, the areas of which are of ratios of 56/33/11 in amylose and of 42/48/10 in amylopectin. The frequency of the peaks in these ratios increases from left to right. The highest frequency component provides an almost identical but not very large contribution to the dominant maximum, whereas the other two determine in fact the spectral line shape. The amylose/amylopectin ratio in the substances contained by such polysaccharides, for example starch, can be estimated on the ground of these two design bands.

Fig. 5 shows that the dominant lines in the spectra of starch provided by different manufacturers are intermediate between the maxima of amylose and amylopectin. Contrary to the expectations, they resemble much more the spectrum of a linear polysaccharide, while much less that of amylopectin.

It should be noted that there are samples among the starches studied in this work, whose spectra in the range of 960 cm^{-1} - 1060 cm^{-1} are very close to that of amylose. None of these samples shows a spectrum close to that of amylopectin.

CONCLUSIONS

It is concluded that the individual oligosaccharides from maltotriose to malteptaose have IR Fourier spectra of a similar nature. Maltose and amylose can be considered a natural continuation of this series, where they have a different location. The main differences in the spectra of the polysaccharides studied refer to the dominant maxima lying in the range of 960 cm^{-1} - 1060 cm^{-1}. The graphical analysis carried out shows that such maxima