Chemical studies on pectic substances extracted from some citrus fruit peel and egyptian prickly pear

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In the present work. the pectic substances of theprickly pear stems and orange peel have been investigatedand more information about the structural features ofthese polysaccharides were obtained. Besides valuableknowledge. about technological and chemical characterizationwere acquired to evaluate these pectins commercially.The yields of pectic substances from orange peel andEgyptian prickly pear pectin were 26.02% (orange peel pectin).14.27% (prickly pear pectin. fraction A), 13.9% (prickly pearpectin. fraCtion ”B”) and 17.41% (prickly pear pectin, mixedsample), on dry basis. The preliminary investigation of theproperties of extracted pectins were carried out. Theresults obtained were compared with those from citrus andother pectins. •I.R spectrum of these polysaccharides showed that themajor glycosidic linkages in t~e different types of pectinsunder the study are of the cr~ype in Cl pyranose conformations.also positive specific optical rotation can SUpport thisassumption.Molecular weight is one of the most important factorsaffecting pectin quality and has a marked influence on gellygrade. The mOleCUlar weights for different types of pectinswere determined and the results showed that average moleCUlarweights ranged from 50,000 to 78,000. Molecular sievechromatography were applied using 5300 and 5500. Theresults indicated that all samples under study had a widerange of molecular weights with relatively small differencesin distribution of neutral sugar between eluted fraction.These pectins are highly physically heterogeneous butchemically homogeneous in terms of Mw fractions.Pectin depolymerization was carried out using acidhydrolysis and enzymatic degradation. The examination ofthe hydrolysate by paper chromatography indicated that thebUilding units tOf pectins were galacturonic acid as majorcomponents. Galactose, rhamnose and arabinose were foundas minor components in the case of citrus pectin and orangepeel pectin. In the case of prickly pear pectin fractions”A”and ”S” galacttronic acid, arabinose galactose, rhamnoseand xylose were identified as bUilding units. No glucosewas detectable in any of the different types of pectin understudy, this support that pectins were free from dextrens.The results of the hydrolysis of pectins by acid and enzymatiChydrolysis indicated that the molar ratio of the bUildingsugars by the two methods were slightly different for eachpectin except prickly pear pectin fraction ”A” whichcon tains a high proportion. of neu tral sugar. The eateraseof the pentosanase 36L has different effects on each typeof pectin. This is due to the difference in the chemicalstructure of pectin and to the shape of the molecules.Also, polygalacturonase and lyase combined together hada different effect on each type of pectin under the study.Hydrolysis of pectin in 0.25 M trif1uoroacetic acid at100·C for one hour produced a white precipitate. Theinfra-red spectra for tQe white precipitate from differenttypes of,pectin was compared with that of po1ygalacturonicacid (obtained from Sigma Company). It was found that alarge degree of simi1arty existed between the spectrum ofthe po1ygalacturonic and those from the precipitateobtained.Fractionation of pectins was achieved by ion exchangechromatography, using DEAE-cellu1ose. A preliminaryfractionation of pectins on DEAE-cellu1ose was carried outto select the sUitable conditions for fractionation. Therecovery of samples was quite satisfactory of DEAE-cellu10se land a linear gradient (5-500 mM) Na phosphate at pH 6.5 wasaccomplished. Five fractions were obtained from theelution pattern of citrus pectin. on the other hand, fourf~actions

were obtained from the other type of pectins.The properties of the fractions were studied, the molarratios for pentoses, anhydroga1acturonic acid and neutralhexoses were calculated. Acid hydrolysis and enzymaticpectin breakdown were carried out. the results were in goodagreement with those of other pectins. Molecular weightsof the fractions for different types of pectins weredetermined from the relation between the molecular weightand intrinsic viscosity. l.R. spectra of the elutedfractions for the pectins was achieved. The resultsindicated that l.R spectra of eluted fractions for thedifferent pectins were similar to those of the originalpectins. These results, can roughly support that thereis a homogenity in type of linkage and groups in thedifferent pectin fract1ons.The methylation of pectins was accomplished usingdimethyl sulfoxide as a solvent and dimethylsulphonylanion (base) and iodomethane as methylating reagent.Separation and examination of the fission products of themethylated pectin using paper chromatography techniquemicroanalytical and phys1cal measurements. The resultsshowed the presence of 2-0-methyl-D-gala~turonic, 2,3-di-O-methyl-O-galacturonic ac~d. 2,3,4-tri-O-methyl-D-galact_uronic acid, 2,3,6-tri-O-methyl-O-galactopyranose, 3,4-di-O-methyl-L-rhamnopyranose. 2.3-di-O-methyl-L-arabino_furanose and 2,3,5-tri-O-methyl-L-arabinofuranose in thecase of orange peel pectin and citrus pectin while in thecase of prickly pear pectin (fraction A) and (fraction B)the presence of2,3-di-O-methyl-O-xylopyranose and 2,3,4-tri-O-methyl-D-xylopyranose were found, in addition to theabove methylated monomers.These resulLs proved that the presence of main backbonechain consists of 1,4 linked galacturonic acid. The presenceof 2-0-methyl-D-galacturonic acid may be most probably tothe presence of branching in the main chain by (1-+3) glycosidicbonds. The isolation of 3,4 di-O-methyl-L-rhamnopyranosepermitted the assumption that rhamnose may beincluded in the main chain polysaccharides chain by (1-+2)bonds or it may take part of side chain.The resulLs of methylation indicated that the neutralsugars may be presented as branchings and linked to themain chain of pectic acid. The galactone units are linkedby (1-i>4) glycosidic -linkage while the arabinose units arelinked by (1~5) glycosidic linkages. In addition to thatthe presence of 2,3,5 tri-O-methyl-L-arabinofuranoserepresents the terminal units of these branchings.Finally, (the presence of 2,3 di-O-methyl-D-xylopyranoseand 2,3,4 tri-O-methyl-D-xylopyranose from methylatedprickly pear pectins (UAU, ”8”) indicated that these neutralmonomers are branchings and linked by (1~4) glycosidiclinkages.The quality of pectins in the present work was determinedon the basis of the SAG tests. According to the resultsobtained, orange peel pectin, prickly pear pectin fraction(fraction B) and prickly pear pectin (mixed sample) aresuitable to form firm high gel strength in comparisonwith investigated pectin. as reported in literature.Prickly pear pectin (fraction A) can be used in thepurposes which require low content of AUA and lowmethoxyl content such as medical purposes.