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Confirmation of gum polysaccharide structure from *Moringa oleifera* Lam. plant by periodate oxidation studies

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Abstract
Periodate oxidation studies of the water soluble gum polysaccharide from *Moringa oleifera* Lam. plant is the most important chemical reaction in the structural determination of gum polysaccharide. It was done by using sodium metaperiodate as oxidant and results showed the consumption of 6.024 moles of periodate and liberation of 1.264 moles of periodate of formic acid per equivalent of gum polysaccharide after 60 hrs.

Keywords: Periodate consumption, formic acid liberation, *Moringa oleifera* gum polysaccharide).

1. Introduction
Moringa oleifera Lam. Plant [1] belong to family-Moringaceae and commonly called as *Sainjna* upto 10 m in height. It occurs in Northern and Southern India, Thailand, Pakistan, Sri Lanka, Africa, Afghanistan, Nepal, Mexico, America, Philippines, etc. Plants are used in indigenous system of medicine for the treatment of cardiovascular and gastrointestinal diseases. Gum used for dental infection, astringent and blood pressure. Pods are used as pickles and vegetables. Leaves are rich in Vitamin A and C, β-Carotene, Protein, Ca and K used in scurby and good source of natural antioxidant. Seeds are antipyretic, acrid bitter and seed oils used in rheumatism. Leaves extract are used for piles, fevers, bronchitis, eyes and ear infection. Leaves have a potential source for antitumor and anticancer activities and leaves alkaloid Niazimian has been proposed to be a potent chemopreventive agent in chemical carcinogenesis. Seeds extract have also been found to be effective on hepatic carcinogen metabolizing enzyme and antioxidant parameter and have specific protein fractions for skin and hair cure. Seeds peptide are also used to protects the human skin aging with dual activity as antipollution and conditioning of hairs. Gum contains a water soluble polysaccharide [2] as L-arabinose andD-galactose in 1:4 molar ratio with traces of L-fucose. Present manuscript mainly deals with the periodate oxidation studies of water soluble gum polysaccharide from *Moringa oleifera* Lam. for the confirmation of gum polysaccharide structure (Figure-1). Periodate oxidation studies are used in carbohydrate chemistry and also applicable as gum polysaccharide. It was first discovered by Malaprade [3] and Fluery & Lange [4] have given a better method for more extensive uses of periodic acid for the oxidation of glycol. The glycol groups undergo cyclic ester formation with oxidant and reaction is considered to be a dialdehyde type of oxidation [5].

2. Materials and Methods
2.1 Periodate oxidation of gum polysaccharide
The purified *Moringa oleifera* Lam. gum polysaccharide (260 mg) was oxidized[4] with distilled water (50 ml) and sodium metaperiodate (350 mg). The reaction mixture was kept at room temperature for 4 days. After destroying the excess of sodium metaperiodate with ethylene glycol and liberation of formic acid was titrated against sodium hydroxide solution (0.01 N). Formic acid produced per equivalent of the gum was found to be 1.264 moles per equivalent of gum polysaccharide. After correction for titrable acidity of the gum and the periodate consumption at this stage was 6.024 moles per equivalent of gum polysaccharide after 60 hrs.

2.2 Hydrolysis of periodate oxidised gum polysaccharide
Gum polysaccharide (180 mg) was oxidised with distilled water (50 ml) then potassium chloride (3 gm) and sodium metaperiodate (400 mg) was added. The reaction mixture was kept

in dark at room temperature. In order to follow the course of oxidation and reaction mixture (1 ml) was withdrawn after every 24 hrs and excess of periodate was destroyed by the ethylene glycol and filtered against sodium hydroxide solution (0.01 N). The oxidation was completed after 150 hrs and excess of periodate was destroyed by ethylene glycol and the inorganic ions removed by dialysis. The dialysed solution was acidified with sulphuric acid, so as to make the strength of resulting solution (1 N) and heated on water-bath for 14 hrs. The hydrolysate was neutralized with barium carbonate slurry, filtered and filtrate concentrated to a syrup. The paper chromatographic analysis [6] of hydrolysed syrup indicated the presence of D-galactose, using solvent mixture (v/v), (A) *n*-butanol, ethanol, water (4:1:5, upper layer) [7] and (R) *p*-anisidine phosphate were used as spray reagent [8].

3. Results and Discussion

Moringa oleifera Lam. gum polysaccharide was oxidized with sodium metaperiodate with usual manner. It liberated 1.264 moles of formic acid per equivalent of the gum polysaccharide with concomitant consumption of 6.024 moles of periodate after 60 hrs. Analysis of periodate oxidized gum polysaccharide showed that some of D-galactose units had escaped oxidation. This finding supports the idea of highly branched nature of the gum and also indicates that those of D-galactose residues which have survived periodate oxidation are involved in branching chain. The presence of linkage of (1→6)-β, (1→3)-β and (1→5)-α-type linkages are also confirmed by the periodate oxidation results. The highly branched character of gum polysaccharide and the presence of (1→3)-β-type linkages are further confirmed by periodate oxidation results. The presence of D-galactose as a hydrolysis product of the periodate oxidized *Moringa oleifera* Lam. gum polysaccharide may also be due to the existence of (1→3)-β-type linkages in the molecule. The final decision regarding the confirmation of detailed molecular structure of the *Moringa oleifera* Lam. gum polysaccharide (Figure-1) can only be made by methylation and periodate oxidation results.

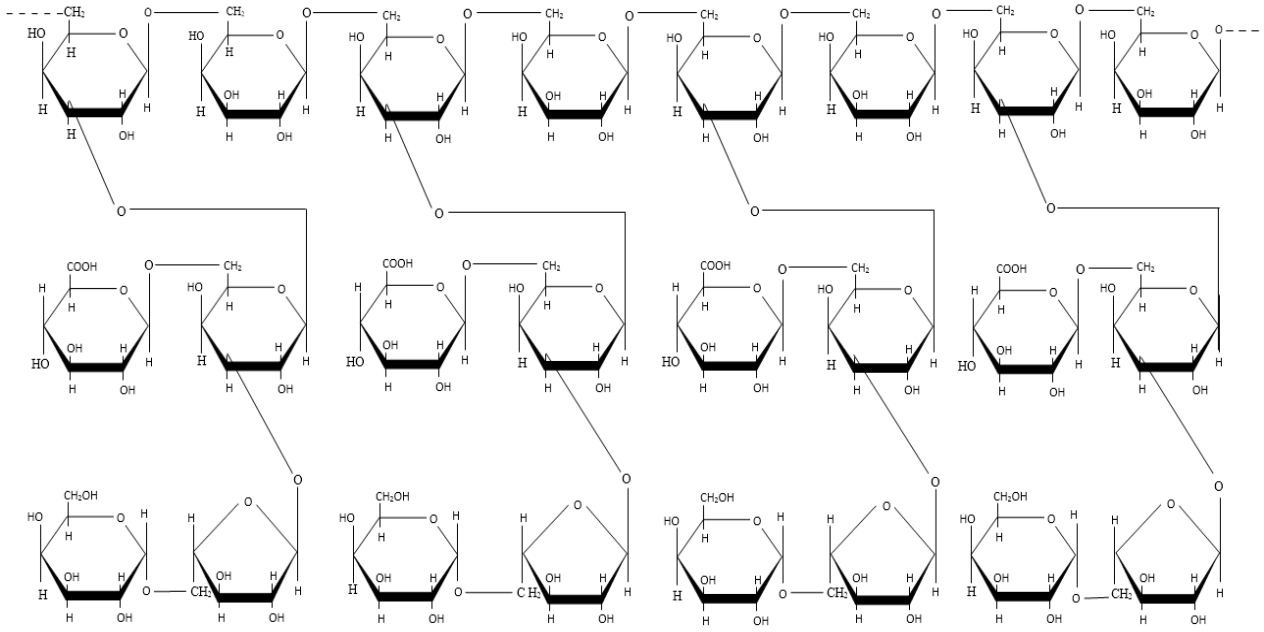

Fig 1: Polysaccharide structure of *Moringa oleifera* Lam. gum polysaccharide.

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