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PRESENCE OF PERIODATE OXIDATION STUDIES OF WATER SOLUBLE *PELTOPHORUM FERRUGINEUM* BENTH. SEEDS POLYSACCHARIDE

R. B. SINGH[*] and SHAILENDRA RAGHAV[a]

UGC Scientist 'B', Department of Zoology, School of Life Sciences, Dr. B. R. Ambedkar University, Khandari Campus, AGRA – 282002 (U.P.) INDIA
[a]Department of Chemistry, K. K. (P.G.) College, ETAWAH – 206001 (U.P.) INDIA

ABSTRACT

Oxidation of water soluble *Peltophorum ferrugineum* Benth. seeds polysaccharide was done with sodium meta periodate as oxidant. It consumed 1.32 moles of periodate and liberated 0.23 moles of formic acid per mole of anhydrohexose sugar units after 55 hrs. The isolated water soluble seed extract yielded sugars as D-galactose and D-mannose in the molar ratio of 2 : 5 moles. Presence of (1 → 4)-β-type and (1 → 6)-α-type linkages are also confirmed by periodate oxidation results for the confirmation of polysaccharide structure of *Peltophorum ferrugineum* Benth. plant.

Key words: Periodate consumption, Formic acid, *Peltophorum ferrugineum* Benth. seeds polysaccharide.

INTRODUCTION

Peltophorum ferrugineum Benth[1]. plant belongs to the family- Caesalpiniaceae and commonly called as Gulmohar Ke Yellow Flower. It occurs in coastal forest of Andaman & Nicobar Islands, Northern India, Sri Lanka, Malaysia, Peninsula, North Australia and North Vietnam. It is a handsome tree and its bark is used in dysentery, tooth powder, muscular pain, etc. Present work mainly deals with the periodate oxidation studies for the confirmation of water soluble non-ionic seeds polysaccharide structure. Seeds contain a water soluble polysaccharide containing D-galactose and D-mannose in 2 : 5 molar ratio as confirmed by GLC, TLC, column and paper chromatographic analysis. The periodate oxidation reaction in carbohydrate chemistry was first discovered by Malaprade[2], Fluery and Lange[3] have given periodic acid for oxidation of glycol but Perlin[4] observed that the periodic acid and lead tetraacetate oxidation showed that the glycol groups undergo cyclic ester formation with oxidants.

[*]Author for correspondence; E-mail: rbsinghugc@gmail.com, sraghav59@gmail.com

EXPERIMENTAL

For periodate oxidation studies[5] purified *Peltophorum ferrugineum* Benth. seeds polysaccharide (560 mg) were dissolved in water (50 mL) and a cold solution of sodium metaperiodate (0.124 M, 100 mL) was added. Then the volume was made upto 250 mL with water. Afterwards, the reaction mixture was kept in dark at 4-8^{0}C in refrigerator for 55 hrs. Aliquot (5 mL) was pipetted out at different intervals of time and sodium bicarbonate solution (0.1 N, 5 mL), sodium arsenite (0.01 N, 25 mL) and potassium iodide (40%, 2 mL) were added. The reaction mixture was left for 1 hr and iodine solution (0.01 N, 5 mL) was added. It was titrated against sodium thiosulphate solution (0.1 N) using starch as an indicator. A blank titration was also carried out in a similar way. The difference between blank and experiment values gives the value of periodate consumption[3] (1.32 moles) per anhydrohexose sugar units after 55 hrs (Table 1).

The formic acid released[6-8] from periodate oxidation studies was determined by taking the aliquot (5 mL) in a conical flask and then adding ethylene glycol (10 mL) to destroy the excess of periodate present in the reaction mixture for 45 min. The formic acid evolved was titrated against sodium hydroxide solution (0.01 N) using methyl red dye as an indicator. A blank titration was also carried out in a similar way for the estimation of the formic acid. It liberated 0.23 moles of formic acid per mole of anhydrohexose sugar unit after 55 hrs and results are given in Table 1.

Table 1: Periodate oxidation of *Peltophorum ferrugineum* Benth. seeds polysaccharide

S. No.	Sugar unit	Time (hrs)						
		10	**20**	**30**	**40**	**45**	**50**	**55**
1.	Periodate consumption per anhydrohexose sugar unit (moles/mole)	0.45	0.75	1.04	1.28	1.32	1.32	1.32
2.	Formic acid liberation per anhydrohexose sugar unit (moles/mole)	0.09	0.15	0.19	0.22	0.23	0.23	0.23

RESULTS AND DISCUSSION

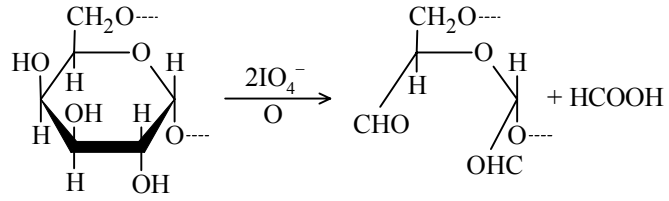
The water soluble *Peltophorum ferrugineum* Benth. seeds mucilage yielded sugars D-galactose and D-mannose in 2 : 5 molar ratio. The purified seeds polysaccharide was oxidized with sodium metaperiodate by usual manner. It liberated 0.23 moles of formic acid

per equivalent of polysaccharide with simultaneous consumption of 1.32 moles of periodate for each anhydrohexose sugar unit of the polymer in 55 hrs. The presence of (1 → 4)-β-type and (1 → 6)-α-type linkages are also confirmed by the periodate oxidation results. Seeds polysaccharides containing free hydroxyl groups resulted in the consumption of the periodate ions during the oxidation reaction. It is concluded from the above facts that probably there is one branching point from repeating unit of the galactomannan. The formic acid appears to be originating from reducing as well as non-reducing terminal unit of the galactomannan.

The periodate oxidation showed the consumption of 1.32 moles of periodate ions per anhydrohexose sugar units as determined volumetrically. The probable reaction is the periodate oxidation of the seeds polysaccharide.

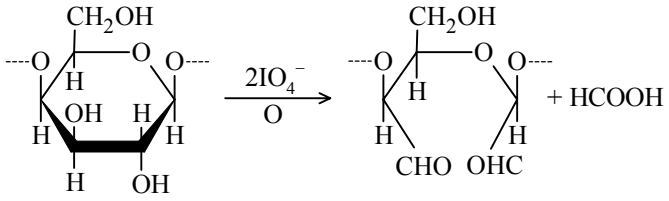
This reaction showed that the D-galactopyranose unit contain free hydroxyl groups resulting in the consumption of periodate ions during periodate reaction. The periodate consumption indicates that on increasing the time from 45 to 55 hrs, the consumption of moles of periodate becomes constant (1.32 moles).

The formic acid appears to be originating from reducing as well as non-reducing terminal unit of the D-galactopyranose as shown in the following reactions:



(1→6)-α-linked D-galactose

Formic acid



(1→4)-α-linked D-galactose

Formic acid

These reactions showed that the terminal D-galactopyranose units of the polysaccharide are not substituted. The amount of released formic acid increases from 0.09

to 0.23 moles with increase in time from 45 to 55 hrs. The amount of released formic acid becomes constant (0.23 moles). Recently, the periodate oxidation studies were carried out from *Cassia hirsuta* Linn. plant[9]. The polysaccharide structure of *Peltophorum ferrugineum* Benth. Seeds polysaccharide (Fig. 1) was also confirmed by the periodate oxidation results.

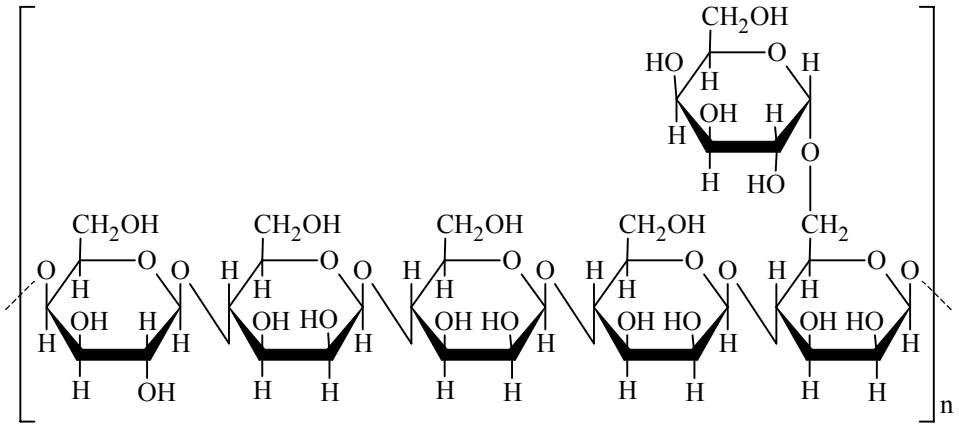


Fig. 1: Polysaccharide structure of *Peltophorum ferrugineum* Benth seeds

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