



CONFIRMATION OF PROPOSED POLYSACCHARIDE STRUCTURE OF *CASSIA HIRSUTE* LIN. SEEDS GALACTOMANNAN BY PERIODATE OXIDATION STUDIES

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ABSTRACT

Seeds of *Cassia hirsuta* Lin. yielded a water soluble polysaccharide as D-galactose and D-mannose in 1 : 4 molar ratio by alkaline hypiodite method. Reactions of the periodate oxidation is one of the most important in the structure determination of seeds polysaccharide in carbohydrate chemistry. Proposed by oxidation method was done with sodium metaperiodate as oxidant and it was proposed by Scientist Malaprade and Flurry and Lange's method. The mole of periodate consumption and formic acid liberation during periodate oxidation reaction of *Cassia hirsuta* Lin. Seeds. Polysaccharide was determined volumetrically. Composition and probable polysaccharide structures have also been elucidated with the information obtained from periodate oxidation of *Cassia hirsuta* Lin. seeds polysaccharide. After complete periodate oxidation reaction, it consumed 1.13 moles of oxidant with simultaneous liberation of 0.23 moles of formic acid per mole of anhydrohexose sugar unit of the polymer chain after 30 hrs. formic acid appear is to be originating from the reducing as well as non-reducing terminal unit of D-galactose and D-mannose are of (1-6)-a-type at non-reducing end while (1-4)-B-type at main polymer chain between D-mannose residues.

Key words: Periodate oxidation, Formic acid liberation, Periodate consumption, *Cassia hirsuta* seeds polysaccharide.

INTRODUCTION

Cassia hirsuta Linn plant belongs to family-Caesalpiaceae and commonly called as senna, hairy senna, khmer¹. It is a native of tropical America and distributed in Thailand, Malaysia, Indo-China, Asian & African topics, California, Brazil, Mecico, Peninsula, North Australia and India. In India, it occurs in Garhwal region of northern India and foot hill in Himalayas. It is a medicinal plant up to 150 cm in tall, rounded stem, flowers are sulphur

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colour. It has many medicinal properties like leaves used as herpes, skin diseases and plant parts used as healing innless in man². Plants are as a gifts of nature have many therapeutic properties and in chemotherapy as valuable as the synthetic drugs. Plant is widely used for stomach troubles, dysentery, rheumatism, fever etc. seeds of *Cassia hirsuta* Lin. Plant yielded a water soluble sugars extract by usual manner as D-galactose and D-mannose in 1 : 4 molar ratio on paper chromatogram³. Present manuscript mainly deals with the periodate oxidation studies of *cassia hirsuta* Lin. Seeds galactomannan for the confirmation of polysaccharide structure, which was obtained after methylation results, the periodate oxidation reaction was done with sodium metaperiodate as oxidant and it was prepared by Malaprare⁴, Fluery and Lange's⁵ method has been given a better method for more extensive use of periodic acid for the oxidation of glycols. Perlin⁶ has given two important reagents as periodic acid and lead tetraacetate showed that the glycol groups undergo cyclic ester formation with periodate oxidation and reaction considered to be dialdehyde type of the oxidation. Chatterjee⁷, Kumar⁸ and Sarkar⁹ have used the periodate oxidation to determine the polysaccharide structure. The central atom of the oxidation reagent must be able to coordinate at least two hydroxyl groups. After complete periodate oxidation reaction, polysaccharide consumed 1.13 moles of periodate oxidant and liberated 0.23 moles of formic acid per mole of anhydrohexose unit after 30 hrs.

EXPERIMENTAL

Materials and methods

Periodate oxidation of galactomannan were carried out by Abdel and Smith method¹⁰ seeds polysaccharide (600 mg) was oxidized with water (50 mL) and added sodium metaperiodate (0.124 M, 100 mL) then volume of reaction flasks was made up to 250 mL with water. Reaction flask was kept at 5-8°C in refrigerator for 30 hrs. The periodate consumption and formic liberation were carried out by Fluery and Lange's methods.

Determination of periodate consumption

The reaction of periodate consumption of polysaccharide were followed by Fluery and Lange's method. Aliquot (5 mL) was taken in iodine flask containing saturated borax solution (mL) then mixture diluted with water (50 mL) boric acid (25 g) and potassium iodide (40%, 20 mL) was added to the reaction mixture, the excess iodine liberated was titrated against sodium arsenite solution (0.12 N) using starch as an indicator. A blank titration was also carried out in a similar way. Difference between experiments and blank showed the periodate consumption of 1.13 moles after 30 hrs.

Determination of formic acid liberation

Formic acid released or liberation was carried out by Brown¹¹ and Halsall et al.,¹² method. Aliquot (5 mL) were taken out from each flask in conical flask and ethylene glycol (5 mL) was added to destroy the excess of periodate present in the reaction mixture. Formic acid involved was titrated against sodium hydroxide solution (0.1 N) free from carbon dioxide using methyl red dye as an indicator near the end point. A blank titration was also carried out in a similar way. It liberated 0.23 mole of formic acid per mole of an hydroexose unity after 30 hrs.

There two experiments were done at different time intervals. The titre values became constant after 30 hrs, which correspond to 1.13 mole of periodate consumption and 0.23 moles of formic acid liberation per mole of anhydroexose sugar units and result are given in Table 1.

Table 1: Periodate oxidation of *Cassia hirsuta* Lin. seeds polysaccharide

S. No.	Sugars present	Time (hrs.)					
		5	10	15	20	25	30
1	Periodate consumption (moles/mole)	0.25	0.45	0.70	1.00	1.13	1.13
2	Formic acid liberation (moles/mole)	0.06	0.10	0.16	0.20	0.23	0.23

RESULTS AND DISCUSSION

Seeds of *Cassia hirsuta* Linn plant yielded a water soluble sugars extract as D-galactose and D-mannose in 1 : 4 molar ratio as determined by alkaline hypiodite methods and monosacchrides identified by paper chromatographic analysis periodate oxidation reaction of seeds polysaccharide were carried out for the confirmation of polysaccharide structure, which was obtained after methylation studies periodate oxidation of polysaccharide was oxidized with sodium metaperiodate as oxidant by usual manner periodate oxidize polysaccharide liberated 0.23 moles of formic acid per equivalent of polysaccharide with consumption of 1.13 moles of periodate for each anhydrohexose sugar units of the polymer after 30 hrs formic acid appear is to be originating from the reducing as well as non-reducing terminal units of the D-galactose and D-mannose are of (1-6)-a- type at non reducing end while (1→4)-B-type at the main polymer chain polymer chain between D-mannose residues these linkages are also confirmed by free hydroxyl groups resulting in

the consumption of periodate oxidation results found to be in a good agreement with the polysaccharide structure of *Cassia hirsuta* Lin. Seeds. It is concluded from the above facts that probably one branch points occurs 5 repeating units of the galactomannan in the polysaccharide structure obtained after methylation result as shown in Fig. 1.

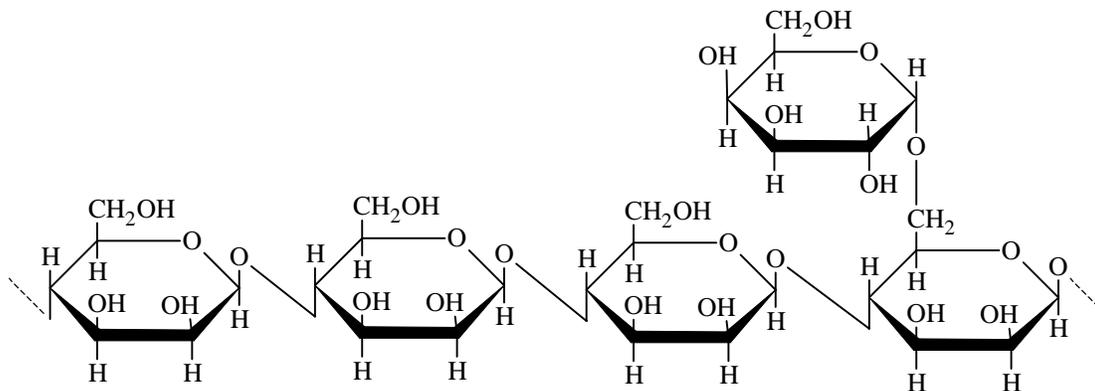


Fig. 1: Polysaccharide structure of *Cassia hirsuta* Lin. seeds galactomannan

Galactomannan of *cassia hirsuta* Linn seeds are commercially used in textile sugars; bakery; cosmetics food; ice-cream pudding industries and it is also explored in environment for air pollution minimizing capacity in the environment young pods and leaves are used for eaten purpose usually steamed or cooked in vegetable or in salads leaves are medically used for the treatment of herpes and a decoction of leaves used.

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Accepted : 05.05.2012