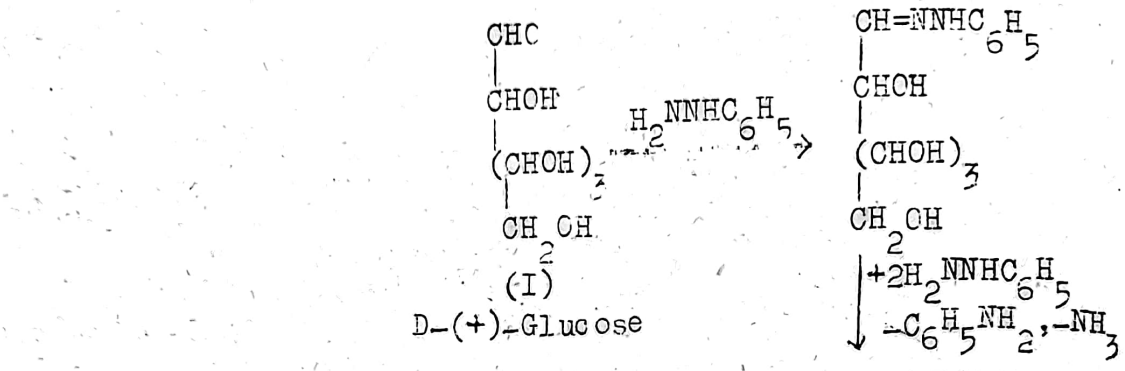
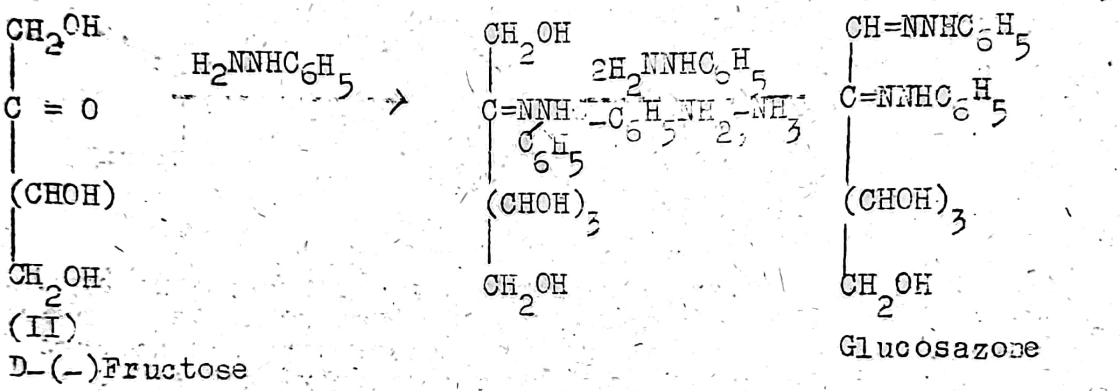
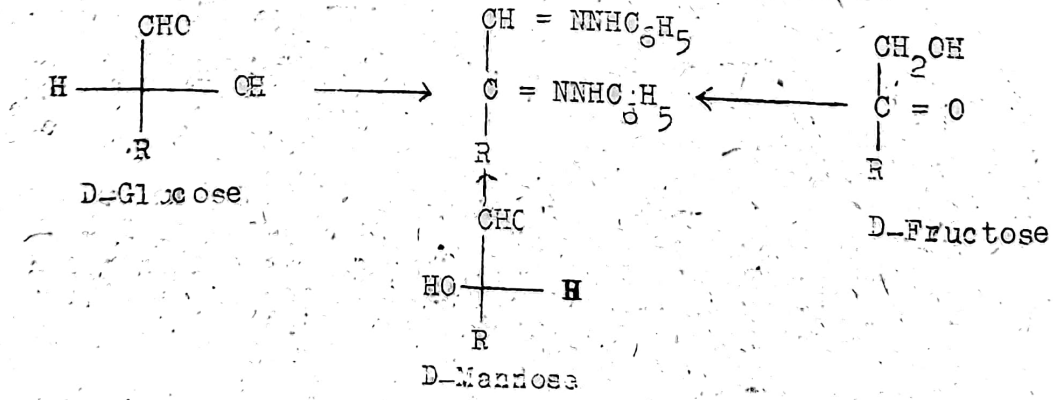
ACTION OF PHENYL HYDRAZINE ON SUGARS OSAZONE FORMATION (I.U: 1939)

Glucose and fructose react with a molecule of phenylhydrazine to give the corresponding phenylhydrazones. But if there is an excess of the reagent in the reaction mixture, a compound containing two phenylhydrazine residues, known as Osazone, is obtained. Glucose and fructose form the same osazone and this fact has been of great help in establishing the structural relationship between them.

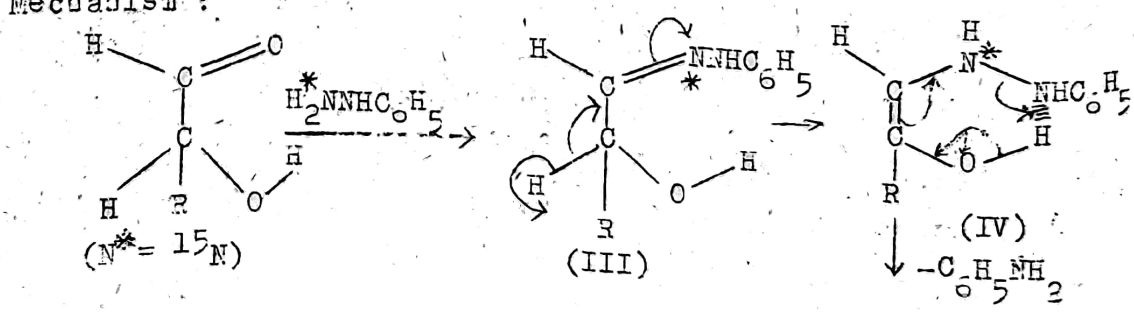


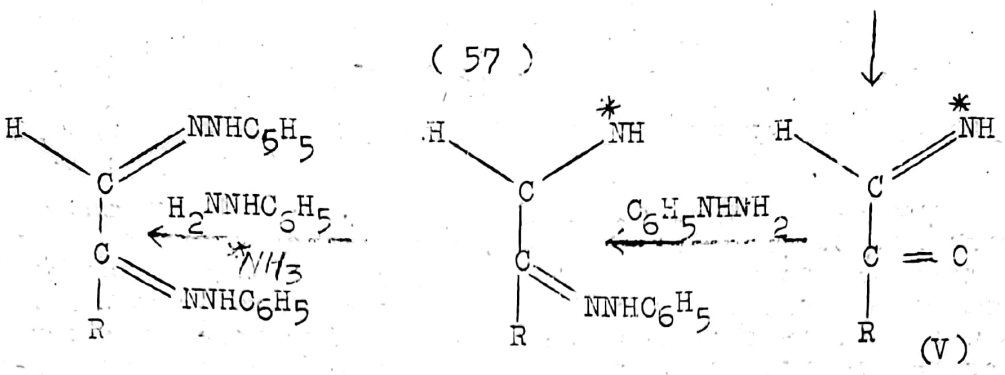


The whole reaction sequence requires participation of three molecules of phenylhydrazine accompanied by the expulsion of one molecule each of aniline and ammonia. Since osazone formation involves the first two carbon atoms, D-mannose, which differs from D-glucose only in the stereo-chemistry around carbon 2, also gives the same osazone as obtained from D-glucose and D-fructose.



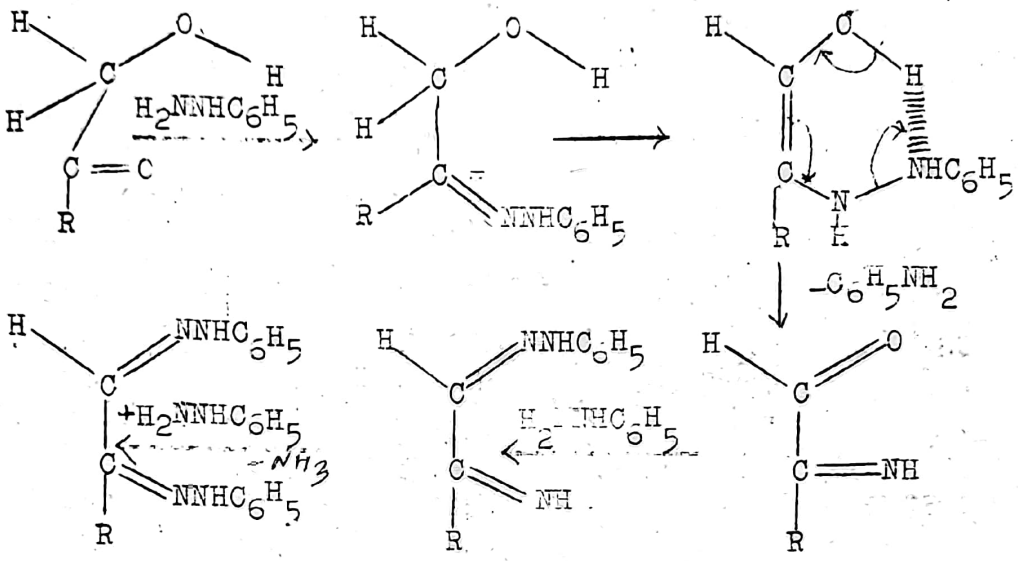
Mechanism :



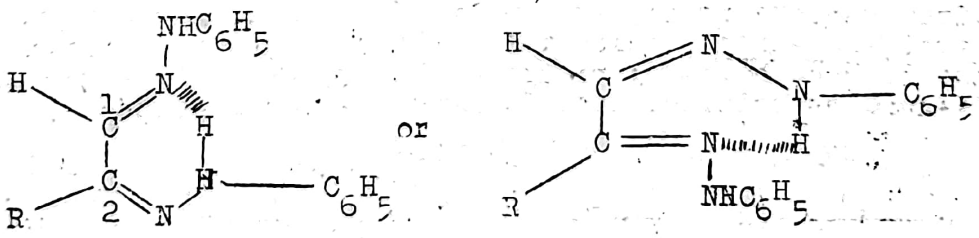


(V)

Formation of osazone from fructose may also be written on similar lines.

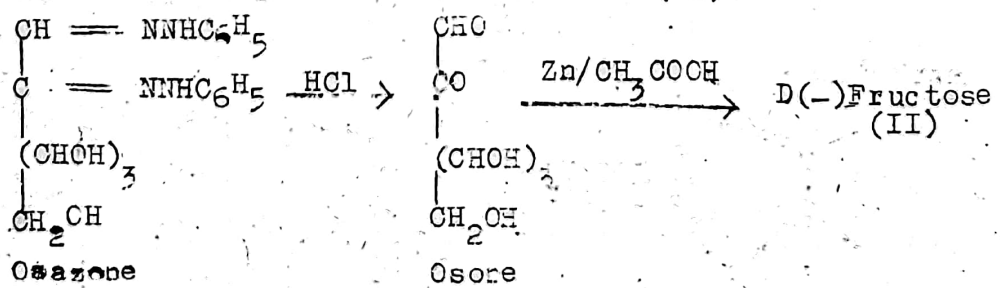


However, the above mechanism does not explain why the reaction stops with the introduction of two residues of phenyl hydrzaine. In other words, why the osazone does not undergo a further intramolecular rearrangement involving the C – 2 position ? It has been proposed and subsequently established by spectroscopic methods that furtner reaction of the osazone is prevented due to its stability bychelation.



INTERCONVERSION OF GLUCOSE AND FRUCTOSE :

i) Conversion of glucose to fructose. Hydrolysis of osazone formed from glucose yields a ketonic aldehyde called osone. The aldehyde group of osone is reduced to a primary alcohol with powdered zinc and acetic acid resulting in the formation of (II).



Osazone Osone

ii) Conversion of fructose to glucose : Reduction of fructose (II) yields a polyhydric alcohol which can be oxidized to a monocarboxylic acid. On heating this acid, a lactone is formed which is subsequently reduced to glucose (I).