- **Dept. Of Botany**
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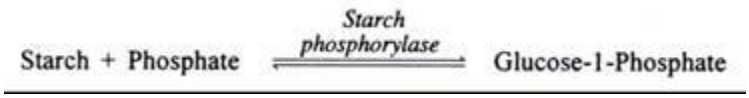
- **6th sem (hons)**
- **Paper: C13T unit:3**

Breakdown of starch

Breakdown of starch means hydrolysis of starch molecule. The hydrolysis of starch means to produce D glucose molecules. This process takes place by two ways, these are—

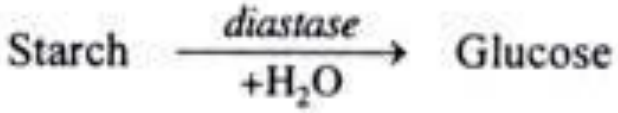
A. **By the enzyme starch phosphorylase**: starch binds with the phosphate and in the presence of starch phosphorylase enzyme it's turned into glucose-1 phosphate. After this glucose-1 phosphate converted into glucose by the enzyme phosphatase.



B. By the enzyme diastase: Diastase is not a single enzyme it's made off with several enzymes and forms an enzyme complex. This enzyme is listed below:

1.a-amylase,
2. B- amylase
3. Maltase
4. And R-enzyme

Both the amylase attack 1:4 linkages of amylose and amylopectin R enzymes attacks the 1:6 linkages of amylopectin so starch is hydrolyzed and formed disaccharide (maltose) units. Finally, the maltase enzyme converted maltose into glucose.



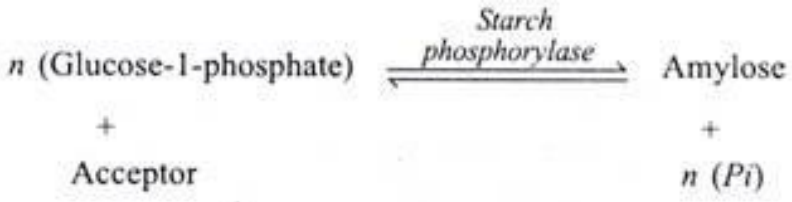
Synthesis of Starch:

Synthesis of starch involves the simultaneous synthesis of amylose (with α-(1: 4) glycosidic linkages) and amylopectin (with α-(1: 6) glycosidic linkages), the two important constituents of starch.

(A) Synthesis of Amylose (Or α-(1: 4) Glycosidic Linkages):

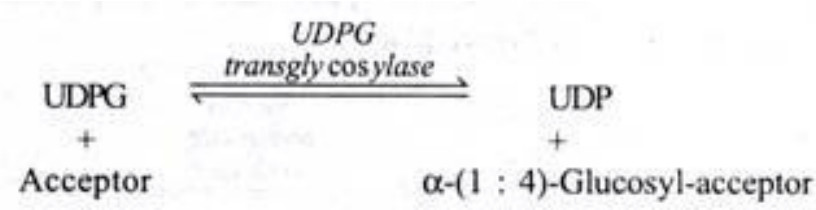
Synthesis of amylose may take place by any of the following ways: -

(1) According to Hanes (1940) amylose can be synthesized in the presence of the enzyme starch phosphorylase from glucose-1-phosphate and an acceptor molecule consisting of about 3 to 20 glucose units joined together by α-(1: 4) glycosidic linkages.

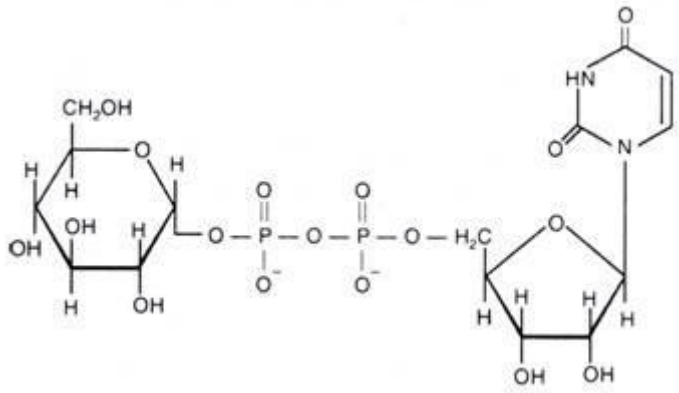


(2) Formation of α-(1: 4) glycosidic linkages may also take place in the presence of the enzyme UDPG-transglycosylase (amylose synthetase) by the transfer of glucose from UDPG (Uridine Di Phosphate Glucose) to

an acceptor molecule consisting of 2 to 4 or more glucose units joined together by α-(1: 4) glycosidic linkages or even a starch molecule.



The structure of UDPG is given below:



UDPG (Uridine Diphosphate Glucose)

(3) According to Akazawa et al (1964) glucose molecule obtained as a result of the hydrolysis of sucrose in the presence of enzyme sucrase is transferred to UDP (Uridine Di Phosphate) molecule to form UDPG. Form UDPG the glucose molecule is transferred to starch (Fig. 13.2)

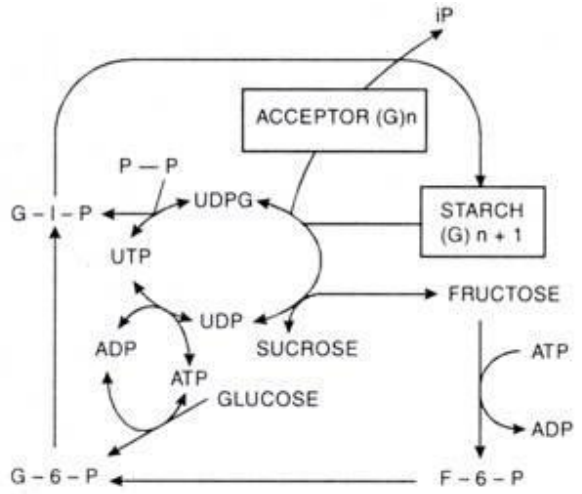


Fig. 13.2 Diagrammatic representation of starch synthesis.

(4) Formation of α-(1: 4) glycosidic linkages leading to the synthesis of amylose may also take place in the presence of D-Enzyme by the transfer of two or more glucose units from maltodextrins (consisting of more than two glucose units) to a variety of acceptors such as maltotroise, maltotetrose molecules.

(B) Synthesis of Amylopectin (Or α-(1: 6) Glycosidic Linkages):

It takes place in the presence of Q-Enzyme by the transfer of small chains of glucose units joined together by α-(1: 4) glycosidic linkages to an acceptor molecule consisting of at least four α (1:4) linked glucose units. The α-(1: 6) glycosidic bond is established between C-1 of the terminal glucose unit of donor molecule and C-6 of one of the glucose units of the acceptor molecule (Fig. 13.3).

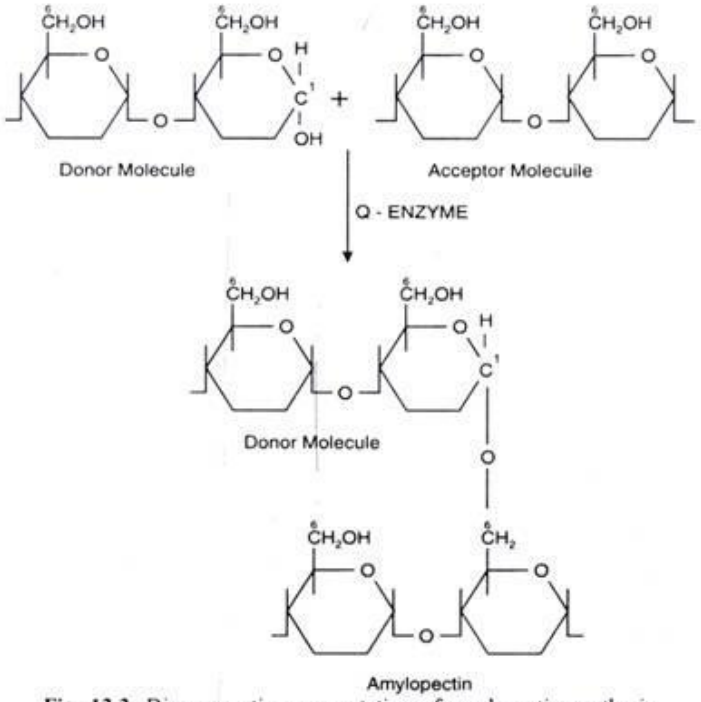


Fig. 13.3. Diagrammatic representation of amylopectin synthesis