

PLANT LECTINS: General Account

Introduction:

Many plant species contain carbohydrate binding proteins, which are commonly referred as either 'lectins' or agglutinins. The word **Lectins** originate from a Latin word 'Lectus' means 'To gather' or to select. Generally speaking, lectins are proteins that bind reversibly to specific mono- or oligosaccharides. Since the initial discovery of a hemagglutinating factor in castor bean extracts by Stillmark in 1888, several hundred of these proteins have been isolated and characterized in some detail with respect to their carbohydrate-binding specificity, molecular structure, and biochemical properties. Lectins from different plant species often differ with respect to their molecular structure and specificity. It is important, therefore, to realize that all plant lectins are artificially classified together solely on the basis of their ability to recognize and bind carbohydrates.

Lectins are present in all organisms

- Viruses--Influenza hemagglutinin/neuraminidase
- Bacteria--binding of microbe or toxin to host cells
- Plants --- Many have been purified and characterized

Physiological functions are generally unknown

Plant Lectins

Leguminosae - ConA (Concanavalin A from Jack bean)

Phaseolus Vulgaris - (PHA-L and PHE)

Soy bean - agglutinin

Graminae - Wheat germ agglutinin

Solanaceae - Tomato lectin, Potato lectins.

Structure of Plant lectins

Compact β barrel, no alpha helices

Anti-parallel beta-sheets

Many require metals (leguminosae) Ca^{++} and Mn^{++}

Metals do not participate directly in the binding but are required for tertiary structure

Functions of Plant lectins

Little is known

In legume seeds lectins can comprise up to 30% of the total protein.

They are expressed in other parts of the plant

–Nodulation factor in roots

•May function in pathogen defense

•Some lectins possess other activities besides carbohydrate binding

–RCAII (Ricin) RNA-N-glycosidase

– Defining glycosylation status of target glycoconjugates
CRD.

Uses of Plant lectins

•Agglutination of cells and blood typing

•Cell separation and analysis

•Bacterial typing

•Identification and selection of mutated cells with altered
glycosylation

•Toxic conjugates for tumor cell killing

•Cytochemical characterization/staining of cells and tissues

•Mitogenesis of cells

•Mapping neuronal pathways

•Purification of glycoconjugates

•Assays of glycosyltransferases and glycosidase.

Conclusion:

Lectins are carbohydrate binding proteins that are highly specific for sugar groups of other molecules. Lectins have a role in recognition on the cellular and molecular level and play numerous roles in biological recognition phenomenon involving cells, carbohydrates and proteins. Lectins also mediate attachment and binding of bacteria and viruses to their intended targets.

CONJUGATE PROTEINS

Conjugate proteins are proteins that contain non protein constituent or prosthetic groups

Non covalent linkage with the side chain of certain amino acids.

Conjugate proteins are divided into three major class:-

1. **Chromoprotein**
2. **Glycoprotein**
3. **Lipoprotein**

1. **Chromoprotein :-**

The chromoproteins are a heterogeneous group of conjugated proteins related to each other only in that they all possess color. The prosthetic group of chromoproteins, such as the heme group of hemoglobin and the cytochromes are bound to the polypeptide portion of the molecule through a combination of covalent and non-covalent bonds.

Eg. Flavoprotein with FMN/FAD, Hemoglobin, Cytochrome with iron, Haemocyanin, Chloroplastin etc.

2. **Glycoprotein :-**

Glycoproteins are protein that contain various amount of carbohydrates. A number of very important proteins fall in this class, including blood plasma protein and large number of enzymes and hormones. The surface of most cells also contain quantities of glycoproteins, and these molecules serve here as antigenic determinants and as receptor sites. They are found throughout *matrices*. They are classified in :-

- ✓ **N glycosidic Linkage**
- ✓ **Glycosidic Linkage**

3. **Lipoprotein :-**

Lipid containing protein are called Lipoprotein. This class includes some of the blood plasma proteins and also a large number of membrane proteins. The lipid content of lipoprotein is often very high. The amount of lipid markedly affects the density of the molecule, and this property is often used as the basis for lipoprotein classification.

Eg. Cholesterol, HDL, LDL etc.