Structural Basis for Carbohydrate Specificity of Basic Winged Bean Lectin

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Lectins, multivalent carbohydrate binding proteins, which recognize diverse sugars specifically, provide a unique system to understand protein carbohydrate interactions. One of the major concerns in the lectin research is the elucidation of the structural basis of this interaction. As part of an ongoing program on the study of structure and function of lectins, we have solved the structure of basic lectin from Winged beans (*Psophocarpus tetragonolobus*) (WBAI) in complex with four monosaccharides (Gal, GalNAc, me-O- α -GalNAc, Tn-antigen), two disaccharides (Gal α (1,3)Gal and Gal α (1,4)Gal) and two trisaccharides (Gal α (1,3)Gal β (1,4)Gal and Gal α (1,3)Gal β (1,4)Glc).

These structures reveal that among the four loops (A, B, C, D) which establish the sugar binding pocket, the first three are substantially conserved and provide the essential structural framework required for binding of monosaccharides. The D loop of this lectin is the longest observed in legume lectins, which makes the binding pocket extended. The enhanced affinity of WBAI for GalNAc, me-O- α -GalNAc and Tn-antigen can be attributed to the additional interactions made by the sugar with loops B and C. In case of disaccharides and trisaccharides the additional interactions required for the stabilization of sugar moieties at the reducing end are provided by the loop D. These observations further emphasizes the role of D loop in determining the specificity.

Keywords: legume lectin, carbohydrates, basic winged bean lectin