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RESEARCH ARTICLE

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USE OF PLANT EXTRACTS ON THE STUDY OF AGGLUTINATION REACTIONS ON RBC ANTIGENS

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Manuscript Info

Key words:-
Rh factor, Agglutination reaction, RBC antigen, Plant Lectins

Abstract

Animals and plants contain numerous carbohydrate binding proteins of non-immune origin called lectins with the ability to recognize specific sugars existing on cell surface. These lectins have attracted great interest due to their various physiological roles in cell agglutination. Rhesus (Rh) factor is an inherited protein found on the surface of red blood cells. If RBC has the surface protein, it is Rh positive in nature else as Rh-negative in nature. In this project we study the effect of thirty-six various cold water and hot water extracted plants on RBC antigens using agglutination reactions as an alternative to commercial monoclonal antibodies. Plant lectins are widely used for the detection, segregation and characterization of glycoconjugates based on their carbohydrate binding properties. Extensive study of sequence homology and 3-D structure of various plant lectins suggests that they are conserved throughout evolution and thus may play, yet unknown, important physiological roles. Some of the lectins are significant reagents for identification of cell surface receptors in various bacteria, protozoa, and higher organisms.

Introduction:-

Plant extracts contain lectins which are carbohydrate binding proteins present in seeds of many plants, especially corals and beans, in fungi and bacteria, and in animals[1]. Apart from their hemagglutinating property, a wide range of functions have been attributed to them. Their importance in the area of immunohematology is immense[2]. They are used to detect specific red cell antigens, to activate different types of lymphocytes, in order to resolve problems related to poly agglutination[3]. Lectins are powerful tools for recognition of formidable range of oligosaccharides, which have been widely used in many branches of cell biology, biochemistry and food technology in applications[4]. These are glycoprotein domains containing highly specific pockets for their counter sugar moieties of polysaccharides, glycolipids, glycoproteins, proteoglycans and peptidoglycans present as outer surface markers or antigens on exterior walls or membranes of both vertebrate and invertebrate cells and micro-organisms[5]. In fact, lectins participate in biological recognition phenomena in cell to cell contact of all

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living organisms involving cells and micro-organisms, for example binding of microorganisms to target tissues, sorting out proteins, control of morphogenesis, cellular differentiation, fertilization, adhesion and trafficking of leukocytes, metastasis, and inhibition of natural killer cell activity against healthy cells[6]. Different plant lectins have been studied for lectin binding activity on ABO blood group system individually to study their suitability for consumption[7]. 45% of plants were found to show blood group agglutination activity against A, B, AB and O groups. In this project Blood samples of blood types A+, A-, B+, O+, O-, AB+ and AB- were taken and tested for the effect of thirty six various cold water and hot water extracted plants on RBC antigens using agglutination reactions as an alternative to commercial monoclonal antibodies[8].

Materials & Methods:-

Materials:

Leaf samples, distilled water, Eppendorf tubes, tissue grinders, centrifuge, anticoagulant, micro-pipettes, micro tips, glassware, Blood samples of blood types A+, A-, B+, O+, O-, AB+ and AB-.

Preparation of extracts:

Leaf samples of 36 different plants were collected and made into smoothie[9]. To 50 ug of leaf sample 1ml of hot and 1ml of cold water was added respectively and the extract was prepared using a tissue grinder. The prepared extracts were centrifuged and the supernatant was separated and stored separately.

Agglutination reactions on RBC agents:

The blood samples from different individuals having blood groups A+, A-, B+, O+, O-, AB+ and, AB-were collected and stored by adding anticoagulant. The experiment was performed by adding 20ul of blood sample and 20ul of plant extract in the ELISA plates. The ELISA plates were placed in the mixer for 10 minutes and the results were tabulated[10].

Results And Discussions:-

Statistical Analysis

The results of the studies in table 1, were expressed as (P) if the sample shows an agglutination reaction, (PP) if the sample shows a high agglutination reaction and as (-) if the sample shows no agglutination reaction.

Table 1:-

S. NO	COMMON NAME	SCIENTIFIC NAME	SAMPLE	A+	A-	B+	AB+	AB-	O+	O-
1.	Banana	Musa paradisiaca	Hot	-	-	-	P	P	-	-
2.	Banana	Musa paradisiaca	Cold	-	-	-	P	P	-	-
3.	Drumstick	Moringa oleifera	Hot	P	-	P	P	P	-	-
4.	Drumstick	Moringa oleifera	Cold	-	-	-	-	P	-	-
5.	black gram	Vigna mungo	Hot	P	P	P	-	-	-	-
6.	Black gram	Vigna mungo	Cold	P	P	-	P	P	P	-
7.	Henna	Lawsonia inermis	Hot	-	-	-	-	-	-	-
8.	Henna	Lawsonia inermis	Cold	P	P	PP	P	-	-	P
9.	Night floweri ng jasmine	Nyctanthes arbor-tristis	Hot	-	-	-	-	-	-	-
10.	Night floweri ng jasmine	Nyctanthes arbor-tristis	Cold	-	-	-	P	P	-	-
11.	Bottle guard	Lagenaria siceraria	Hot	-	-	-	P	P	-	P

12.	Bottle guard	Lagenaria siceraria	Cold	-	P	P	P	-	P	P
13.	Holy basil	Ocimum tenuiflorum	Hot	-	-	-	-	-	-	-
14.	Holy basil	Ocimum tenuiflorum	Cold	-	-	-	P	P	P	-
15.	Basil	Ocimum basilicum	Hot	-	-	P	-	-	P	P
16.	Basil	Ocimum basilicum	Cold	-	P	-	-	-	P	-
17.	Yellow cucumber	Cucumis sativus	Hot	-	P	P	P	-	P	P
18.	Yellow cucumber	Cucumis sativus	Cold	-	P	-	-	-	P	-
19.	Madonna lily	Lilium candidum	Hot	-	P	P	-	-	P	-
20.	Madonna lily	Lilium candidum	Cold	-	-	-	-	-	P	-
21.	Marigold flower leaf	Tagetes Erecta	Hot	-	-	P	-	P	P	-
22.	Marigold flower leaf	Tagetes Erecta	Cold	-	-	-	-	-	-	-
23.	Tomato	Solanum lycopersicum	Hot	-	-	P	-	-	-	-
24.	Tomato	Solanum lycopersicum	Cold	-	-	P	-	-	-	-
25.	Snake gourd	Trichosanthes cucumerina	Hot	-	-	P	-	-	-	-
26.	Snake gourd	Trichosanthes cucumerina	Cold	-	-	-	-	-	-	-
27.	Lesser mallow	Hibiscus hirtus	Hot	-	-	P	P	-	-	P
28.	Lesser mallow	Hibiscus hirtus	Cold	-	-	-	-	-	-	-
29.	Ridge gourd	Luffa acutangula	Hot	P	P	PP	-	-	P	PP
30.	Ridge gourd	Luffa acutangula	Cold	P	P	P	-	-	P	PP
31.	Brinjal	Solanum melongena	Hot	P	P	-	-	-	-	P
32.	Brinjal	Solanum melongena	Cold	P	-	PP	-	-	-	P
33.	Bitter gourd	Momordica charantia	Hot	-	-	-	-	-	-	-
34.	Bitter gourd	Momordica charantia	Cold	-	-	-	-	-	-	-
35.	Periwinkle	Catharanthus roseus	Hot	P	P	-	-	P	P	-
36.	Periwinkle	Catharanthus roseus	Cold	P	P	P	P	P	-	P
37.	winter jasmine	Jasminum multiflorum	Hot	-	P	P	-	P	PP	P
38.	winter jasmine	Jasminum multiflorum	Cold	-	P	P	-	P	P	P
39.	Aloe Vera	Aloe barbadensis	Hot	-	-	P	-	PP	-	P

40.	Sodom apple	Calotropis procera	Cold	-	P	P	PP	PP	PP	PP
41.	Guava	Psidium guajava	Hot	-	-	-	P	-	-	-
42.	Guava	Psidium guajava	Cold	-	-	-	-	-	-	-
43.	Hibiscus	Hibiscus rosa-sinensis	Hot	P	P	P	PP	-	PP	PP
44.	Hibiscus	Hibiscus rosa-sinensis	Cold	P	-	P	PP	-	-	PP
45.	Pomegranate	Punica granatum	Hot	-	-	-	PP	P	P	P
46.	Pomegranate	Punica granatum	Cold	-	-	-	P	P	-	-
47.	Lablab bean	Lablab purpureus	Hot	P	-	-	-	-	-	-
48.	Lablab bean	Lablab purpureus	Cold	-	-	-	-	-	P	-
49.	Neem	Azadirachta indica	Hot	-	-	-	-	P	P	-
50.	Neem	Azadirachta indica	Cold	-	-	-	PP	PP	-	-
51.	Money plant	Epipremnum aureum	Hot	-	-	P	-	-	P	-
52.	Money plant	Epipremnum aureum	Cold	-	-	P	-	-	P	-
53.	Soap nut	Sapindus Mukorossi	Hot	-	-	-	-	-	-	-
54.	Soap nut	Sapindus Mukorossi	Cold	PP	PP	PP	PP	-	PP	-
55.	Rudraksha	Elaeocarpus ganitrus	Hot	-	-	P	P	-	PP	-
56.	Rudraksha	Elaeocarpus ganitrus	Cold	P	P	-	-	P	P	P
57.	Jackfruit	Artocarpus heterophyllus	Hot	PP	-	-	PP	PP	-	P
58.	Canon ball	Couroupita guianensis	Hot	-	-	-	P	-	P	-

59.	Canon ball	Couroupita guianensis	Cold	-	-	-	-	-	P	P
60.	Canon ball flower	Couroupita guianensis	Hot	-	-	-	-	-	P	P
61.	Canon ball flower	Couroupita guianensis	Cold	-	-	PP	PP	-	-	-
62.	Black plum	Syzygium cumini	Hot	-	-	P	P	-	-	P
63.	Black plum	Syzygium cumini	Cold	-	P	P	PP	P	P	P
64.	Mango	Mangifera indica	Hot	-	-	-	-	-	-	P
65.	Mango	Mangifera indica	Cold	-	-	P	-	P	-	P
66.	Custard apple	Annona squamosa	Hot	-	-	-	-	-	-	-
67.	Custard apple	Annona squamosa	Cold	-	-	-	-	-	-	-
68.	Butterfly pea	Clitoria ternatea	Hot	-	-	-	P	-	-	-
69.	Indian plum	Ziziphus mauritiana	Hot	-	-	P	-	-	PP	-
70.	Indian plum	Ziziphus mauritiana	Cold	-	-	-	-	-	-	-

Figure 1

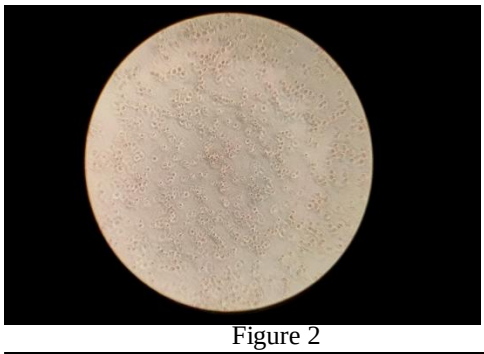

Figure 2

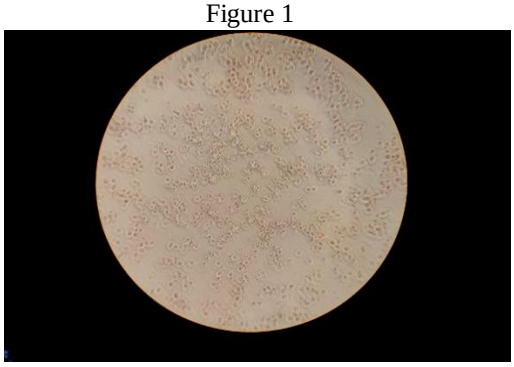

Figure 3

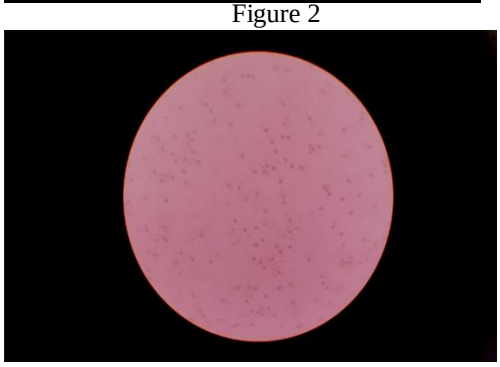

Figure 4

Blood cross-matching was done to verify our results fig. 1 shows, Henna (Lawsonia inermis) for B+ve blood sample with cold water sample and O+ve serum sample, they are compatible. Fig. 2 shows, Neem (Azadirachta indica) for AB-ve blood samplewith cold water sampleand O+ve serum sample, they are compatible. Fig. 3 shows, Soapnut (Sapindus trifoliatus) for A-ve blood sample with cold water sampleand O+ve serum sample, they are incompatible. Fig. 4 shows, Cannonball flower (Couroupita guianensis) for B+ve blood sampleand O+ve serum sample, they are compatible.

Conclusion;-

It is concluded that most of the plant varieties has shown positive result for the B+ blood group (31 positive results). Followed by AB+ blood group (27 positive results), 0+ and 0- blood groups (26 positive results), AB-

blood group (23 positive results), A- blood group (20 positive results) and A+ blood group (16 positive results).

Conflict of interest

The authors declare that there are no conflicts of interest exist among them regarding the publication of this paper.

References:-

1. Gorakshakar AC, Ghosh K. Use of lectins in immunohematology. Asian J Transfus Sci. 2016;10(1):12.
2. Judd WJ, Issitt PD. The role of lectins in blood group serology. Crit Rev Clin Lab Sci. 1980;12(3):171-214.
3. Sharon N, Lis H. Lectins: cell-agglutinating and sugar-specific proteins. Science. 1972;177(4053):949-59.
4. Hashim OH, Jayapalan JJ, Lee CS. Lectins: an effective tool for screening of potential cancer biomarkers. PeerJ. 2017;5:e3784.
5. Tuan RC. Membrane-Mediated Regulation of Embryonic Development: Highlights. Birth Defects Res C Embryo Today. 2016;108(1):4-5.
6. Berczi I, Bertók L, Chow DA. Natural immunity and neuroimmune host defense. Ann N Y Acad Sci. 2000;917:248-57.
7. Ebere U, Godswill AC. Effect of some processing methods on hemagglutinin activity of lectin extracts from selected grains (cereals and legumes). Int. J. Adv. Acad. Res.. 2016;2:24-59.
8. Vemuri PK, Talluri B, Sharma A, Akkala G, Bodiga VL. Isolation and Characterization of a Lactose-Binding Lectin from Ocimum sanctum. J App Pharm Sci. 2015;5(10):113-7.
9. Kumar VP, Prasanthi S, Reddy AC, Raj ND, Anudeep L. Characterization studies of thermostable alkaline phosphatase from various plant seeds. J App Biosci. 2010;36:2403-8.
10. Jarujamrus P, Tian J, Li X, Siripinyanond A, Shiowatana J, Shen W. Mechanisms of red blood cells agglutination in antibody-treated paper. Analyst. 2012;137(9):2205-10.