

# **Studies on Lectin mediated agglutination reaction on RBC surface antigens using hot and cold water plant extracts**

## **ABSTRACT**

Previous research studies on lectins drew a lot of attention because of their various physiological roles in cell agglutination. Based on their carbohydrate-binding properties, plant lectins are widely used for the detection, segregation, and characterization of glycoconjugates. Rhesus (Rh) factor is a protein that is inherited and found on the surface of red blood cells. If the surface protein is present, the RBC is Rh positive; otherwise, it is Rh-negative in nature. In this paper, we use agglutination reactions to investigate the effect of different cold and hot water extracted plants on RBC antigens as an alternative to commercial monoclonal antibodies. Extensive research on the sequence homology and 3-D structure of various plant lectins suggests that they have been conserved throughout evolution and may play important physiological roles that are still unknown.

**Keywords:** Rh factor, Agglutination reaction, RBC antigen, Plant Lectins, Antigen, Monoclonal antibody.

## **INTRODUCTION**

Plant extracts contain lectins, which are carbohydrate-binding proteins found in the seeds of many plants, particularly corals and beans, as well as fungi, bacteria, and animals [1]. Aside from their hemagglutinating ability, they have been assigned a variety of functions and significance in immunohematology is enormous [2]. They are used to detect specific red cell antigens, to activate various types of lymphocytes, and to resolve poly agglutination issues [3]. Lectins are powerful tools for recognizing a diverse range of oligosaccharides, and they have been widely used in many fields of cell biology, biochemistry, and food technology [4-8]. These are glycoprotein domains with highly specific pockets for their counter sugar moieties of polysaccharides, glycolipids, glycoproteins, proteoglycans, and peptidoglycans found on the exterior walls or membranes of both vertebrate and invertebrate cells and microorganisms [9]. Lectins participate in biological recognition phenomena in cell-to-cell contact of all living organisms, such as binding of microorganisms to target tissues, protein sorting, control of morphogenesis, cellular differentiation, fertilisation, adhesion and

trafficking of leukocytes, metastasis, and inhibition of natural killer cell activity against healthy cells [10-12]. To determine their suitability for consumption, different plant lectins were individually tested for lectin binding activity on the ABO blood group system [13]. 45 percent of the plants tested positive for blood group agglutination against the A, B, AB, and O groups. Blood samples from blood types A+, A-, B+, O+, O-, AB+, and AB- were collected and tested for the effect of different cold and hot water extracted plants on RBC antigens using agglutination reactions as an alternative to commercial monoclonal antibodies [14].

## **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- from volunteers.

### **Preparation of extracts**

Leaf samples of 35 different plants were collected and made into smoothies [15]. 50 ug of leaf sample, 1ml of hot and 1ml of cold water were 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 to the ELISA plates. The ELISA plates were placed in the mixer for 10 minutes and the results were tabulated.

## **RESULTS AND DISCUSSIONS:**

### **Statistical Analysis**

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

**Table 1:**

S.No	Blood type	A+	A-	B+	AB+	AB-	O+	O-
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	Original Name	CE	HE	CE	HE	CE	HE	CE	HE	CE	HE	CE	HE	CE	HE
1	Banana	N	P	P	N	P	N	P	P	N	N	N	P	P	N
2	Drumstick	P	P	N	N	P	N	P	P	N	P	P	N	N	N
3	black gram	N	P	P	N	P	N	N	P	P	N	N	P	P	N
4	Henna	P	P	P	N	N	P	P	N	P	P	N	P	N	P
5	Night flowering	P	P	N	N	P	N	P	P	N	N	P	P	P	N
6	jasmine	N	P	N	N	P	P	N	N	N	P	P	N	P	N
7	Bottle guard	P	N	P	P	N	N	P	N	N	N	P	P	N	P
8	Holy basil	P	N	P	P	P	N	P	P	P	N	N	P	N	P
9	Basil	P	P	N	N	P	P	N	P	N	P	P	N	P	N
10	Yellow cucumber	N	P	P	P	P	N	N	P	N	P	N	P	P	N
11	Madonna lily	P	N	N	N	N	P	P	N	N	P	P	P	N	P
12	Marigold leaf	N	P	P	P	P	N	P	P	N	P	N	N	P	P
13	Tomato	P	P	N	N	P	P	N	P	P	N	P	N	P	N
14	Snake gourd	P	N	P	P	N	N	P	P	N	P	P	N	P	P
15	Lesser mallow	N	P	P	N	N	P	P	P	P	P	P	N	N	P
16	Ridge gourd	P	P	N	P	N	P	P	N	P	P	N	P	P	N
17	Brinjal	P	P	N	P	N	P	N	N	N	P	P	N	P	N
18	Bitter gourd	P	N	N	P	P	N	P	P	P	N	N	P	P	P
19	Periwinkle	P	P	P	P	N	P	N	N	P	P	N	P	N	P
20	winter jasmine	N	P	P	P	N	N	N	P	P	N	N	P	P	N
21	Aloe Vera	P	N	N	N	P	P	P	N	P	N	N	P	N	N
22	Sodom apple	N	P	P	N	N	P	P	N	P	P	N	N	N	P
23	Guava	P	P	N	P	N	P	N	P	P	P	N	P	P	P
24	Hibiscus	N	P	P	N	N	P	P	P	P	N	P	N	P	N
25	Pomegranate	N	P	P	P	N	P	N	P	P	N	P	P	N	N
26	Neem	P	P	N	N	P	P	N	P	N	P	N	N	P	N
27	Money plant	P	P	N	P	N	P	P	P	P	P	P	N	N	P
28	Soap nut	P	N	N	P	P	N	P	P	N	N	P	P	P	P
29	Rudraksha	P	N	N	N	P	P	N	P	P	N	P	N	P	P
30	Jackfruit	N	P	P	N	N	P	P	N	P	N	P	N	P	P
31	Canon ball flower	N	P	N	P	P	N	N	P	N	N	P	N	P	N

32	Black plum	N	P	P	N	N	P	P	N	P	N	P	N	P	N
33	Mango	P	P	N	N	N	P	P	N	P	N	P	P	N	P
34	Custard apple	N	P	P	N	N	P	P	P	N	P	P	N	P	P
35	Butterfly pea	N	N	P	P	N	N	P	P	N	N	P	P	N	P



Figure 1. Henna (*Lawsonia inermis*)

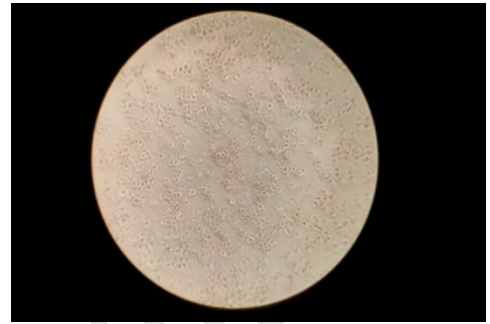


Figure 2. Neem (*Azadirachta indica*)

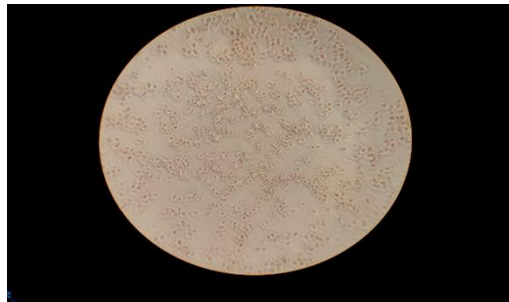


Figure 3. Soapnut (*Sapindus trifoliatus*)



Figure 4. Cannonball flower (*Couroupita guianensis*)

Blood cross-matching was done to verify our results figure 1 shows, Henna (*Lawsonia inermis*) for B+ve blood sample with a cold water sample and O+ve serum sample, are compatible. Figure 2 shows, Neem (*Azadirachta indica*) for AB-ve blood sample with a cold water sample and O+ve serum sample, they are compatible. Figure 3 shows, Soapnut (*Sapindus trifoliatus*)

for the A-ve blood sample with a cold water sample and O+ve serum sample, are incompatible. Figure 4 shows, Cannonball flower (*Couroupita guianensis*) for the B+ve blood sample and the O+ve serum sample, they are compatible.

## CONCLUSION

It is concluded that most of the plant varieties have shown a positive result for the B+ blood group (31 positive results). Followed by AB+ blood group (27 positive results), O+ and O- blood groups (26 positive results), AB- blood group (23 positive results), A- blood group (20 positive results), and A+ blood group (16 positive results).

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