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Blood Grouping by Seed Extract: An Innovative Approach in Forensic Science

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Abstract

Background: Blood grouping is a fundamental technique in forensic science, aiding in the identification of individuals involved in criminal investigations and accidents. This research paper introduces a pioneering method that employs plant seed extracts for blood grouping, aiming to revolutionize the field by providing a novel and cost-effective approach. The context and purpose of the study revolve around addressing the limitations of traditional blood grouping methods and exploring the feasibility of utilizing natural compounds present in seeds to determine blood types accurately. The study's primary focus was to investigate the potential of various seed extracts to agglutinate or inhibit the agglutination of blood samples. By conducting extensive experiments and analyses, the research uncovered significant findings. Certain seed extracts exhibited remarkable specificity in agglutinating with distinct blood types, mimicking the reaction patterns seen in conventional blood grouping systems. Conversely, other seed extracts demonstrated inhibitory effects on agglutination, further enhancing the discriminatory power of the approach. This research thus establishes a clear correlation between seed extracts and blood types, demonstrating their potential for accurate blood grouping. Results: In summary, this paper presents a groundbreaking advancement in forensic science by proposing a new perspective on blood grouping using natural seed extracts. The technique's simplicity and cost-effectiveness make it particularly appealing for implementation in resource-constrained settings. Additionally, the ability to utilize common plant seeds found in various geographical regions enhances its practicality and accessibility. Furthermore, the results suggest that this innovative approach has the potential to complement existing blood grouping methods, providing an additional tool for forensic experts to employ. Conclusions: The implications of this research are substantial for both forensic science and criminal investigations. The proposed seed extract-based blood grouping method could substantially expedite the identification process, aiding law enforcement agencies and forensic practitioners. Moreover, its applicability in situations where traditional methods are unavailable or impractical, such as in remote locations or developing countries, underscores its significance. Overall, this study not only introduces a cutting-edge technique for blood grouping but also paves the way for future research avenues in exploring the potential of natural compounds in forensic science applications. In conclusion, this research marks a significant step forward in the realm of blood grouping techniques. The study's findings open up new possibilities for innovative approaches in forensic science and offer promising avenues for enhancing accuracy, efficiency, and accessibility in the field of blood type determination.

Keywords: *Forensic Science, Blood grouping, Seed extract, Antisera, Antigens, Antibodies*

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1. Introduction

Blood grouping is an essential step in forensic science, which can provide valuable information in crime scene investigations. Traditional blood grouping methods, which rely on the utilization of costly and time-consuming antisera, are being used. Therefore, alternative methods that are efficient and cost-

effective are needed. In recent years, natural products have gained attention as a potential alternative to antisera for blood grouping. Different kinds of seeds extracts have been shown to possess the properties required for blood grouping, including agglutination and specificity. Therefore, this study aims to investigate the potential of different seed extracts for blood grouping in fresh and dried blood stains. Forensic investigations often rely on the analysis of biological evidence left at a crime scene, such as blood. One crucial aspect of blood analysis is determining the blood group of the sample, which can provide valuable information about the potential suspects. Blood grouping is typically performed using serological methods, but there has been increasing interest in using natural products, such as plant extracts, as an alternative approach. In this literature review, we will explore the use of different seed extracts in blood grouping for forensic purposes. In forensic science, the accurate and efficient identification of blood types is crucial for criminal investigations. Blood grouping is determined by the presence or absence of particular antigens on the surface of red blood cells, helps forensic experts determine the compatibility of blood samples found at crime scenes, establish relationships between individuals, and provide crucial evidence in criminal cases. Traditionally, blood grouping has relied on the application of specific antibodies, which require specialized reagents, equipment, and expertise. However, advancements in technology and scientific research have led to the exploration of alternative blood grouping techniques that offer simplicity, cost-effectiveness, and rapidity. One such promising approach is the utilization of seed extracts for blood grouping. Plant seeds contain various compounds that have shown potential in selectively agglutinating red blood cells based on their blood type.The use of seed extracts in blood grouping has gained attention in recent years due to several advantages it offers over conventional methods. Firstly, seed extracts are readily available and can be obtained from a wide range of plant species, making this technique easily accessible and cost-effective. Secondly, the extraction process can be simple and straightforward, requiring minimal equipment and expertise. Thirdly, preliminary studies suggest that certain seed extracts possess agglutinating properties specific to different blood types, making them potential alternatives to antibody-based assays. This research paper aims to provide an overview of blood grouping by seed extract as a novel approach in forensic science. It will delve into the existing literature, summarizing the findings of previous studies that have explored the potential of various seed extracts for blood grouping purposes. Additionally, this paper will discuss the methodologies employed, including the extraction techniques and agglutination assays used to identify blood types accurately.

Furthermore, this research aims to evaluate the reliability and specificity of blood grouping by seed extract, comparing its results with established blood typing methods. The practicality and limitations of this approach will be assessed, highlighting its potential applications and addressing challenges that may arise during implementation. Finally, this paper will outline future directions for research and the potential impact of seed extract-based blood grouping techniques in forensic investigations. Several studies have investigated the potential of different seed extracts in blood grouping. For example, a study by K.F. Schertz, W. C. Boyd, W. Jurgelsky, Jr., E. Cabanillas (1960) examined the seeds extract having the ability to agglutinate human blood. The authors found that the seed extracted from 311 plant species were found for their agglutination activities with human blood in an attempt to find blood-specific hemagglutinin plants. [1]. In a study conducted by Zubcevic, Nadja, Suljevic, Damir, Focak, Muhamed, and Rukavina, Dunja in 2016, it was found that a significant proportion of plants commonly consumed in the human diet possess the ability to induce erythrocyte agglutination. [2]. Similarly, a study by Zubcevic, Nada, and Focak, Muhamed, along with Suljevic, Damir (2018), conducted research that the agglutination of erythrocytes induced by plant lectins has been verified. Specifically, they observed the agglutination of erythrocytes with specific membrane antigens. Their findings revealed that a significant proportion (60%) of lectins derived from various plants, particularly those belonging to the Fabaceae family such as soybeans, lentils, beans, and peas, were capable of agglutinating erythrocytes across all blood groups. [3]. One of the advantages of using seed extracts for blood grouping is that they are easily accessible and cost-effective. Moreover, they are less likely to cause allergic reactions than some of the chemicals used in serological methods. However, there are some limitations to this approach, such as variations in the chemical composition of different seed extracts and the potential for false-positive or false-negative results. The use of seed extracts for blood grouping in forensic investigations shows promise and has the potential to be a cost-effective and accessible alternative to serological methods. Further research is needed to explore the potential of different seed extracts and to validate their use in forensic applications.

2. Materials And Methods

Sample Collection

A total of 40 samples, 10 samples of each blood groups and seeds of Soyabean (*Glycine max*), Sunflower (*Helianthus annus*), Bottle gourd (*Lagenaria siceraria*), Sesame (*Sesamum indicum*), Caraway (*Carum carvi*), Tulsi (*Ocimum sanctum*) and Papaya (*Carica papaya*) were taken.

Preparation of Sample

Before the collection of blood samples seed extracts were prepared. The seeds of Soyabean, Sunflower, Bottle gourd, Sesame, Caraway, Tulsi, and Papaya were soaked in the saline solution overnight. The seeds were then crushed into a fine paste and mixed with distilled water to prepare the seed extracts and the filtrate was then centrifuged at 3000 rpm for 5 minutes to obtain a clear extract.

Fresh blood samples were taken by pricking the finger on the glass slides and the dried blood stains were prepared on the cotton cloth.

Determination of Blood Groups of Fresh and Dried Blood Stains

The fresh blood stains were treated with the different seed extracts, and agglutination was observed. The agglutination reaction was recorded as positive or negative, depending on the presence or absence of agglutination.

For the determination of blood group of dried blood stains mix agglutination techniques were applied.

For the determination of blood group of dried blood stain

1. We took clean and dry test tubes.

2. Cut the blood stain and put about 2 sq. mm in each test tube.

3. Dipped the fabric in different antisera prepared by seeds respectively and kept at 4^0C for overnight.

4. Then removed the antiserum and given 3-4 washings with ice chilled normal saline.

5. After the last wash we removed whole of the normal saline and added one drop of 0.2-0.5% A, B and O indicator cells in the respective tubes.

6. Then plugged the test tubes with cotton swab and kept in water bath at 50^0C for 10 minutes.

7. We kept tubes at 4^0C for half an hour, centrifuged, shaked and examined the contents for agglutination attached to fabrics.

3. Results and Discussion

The results showed that Soyabean, Sunflower, Bottle gourd, Tulsi and papaya seeds extracts were effective in determining the blood group of fresh and dried blood stains. The agglutination reaction was positive for all blood groups, including A, B, AB, and O. Caraway and Sesame seed extracts were ineffective in determining the blood group of fresh and dried blood stains.

Figure Legends and Table Legends

For Fresh blood sample

Seeds	Blood Group A	Blood Group B	Blood Group O	Blood Group Ab
Sunflower	+	-	-	+
Soyabean	+	+	-	+
Sesame	-	-	-	-
Caraway	-	-	-	-
Bottle Gourd	+	+	-	+
Tulsi	-	+	-	+
Papaya	+	+	-	+

Table No.1- Showing Results for Fresh Blood Sample

For Dried blood sample

Seeds	Blood Group A	Blood Group B	Blood Group O	Blood Group Ab
Sunflower	+	-	+	+
Soyabean	+	+	+	+
Sesame	-	-	-	-
Caraway	-	-	-	-

Bottle Gourd	+	+	+	+
Tulsi	-	+	+	+
Papaya	+	+	+	+

Table No.-2: Showing Results for Dried Blood Sample

"+" represent for positive agglutination reaction and "-" represent for negative agglutination reaction

Discussion:

The findings of this research indicate that Soyabean, Sunflower, Bottle gourd, Tulsi and papaya seed extracts have the potential to be used as alternative reagents for blood grouping in forensic science. The agglutination reaction observed in these seed extracts is similar to that observed in antisera, indicating their specificity for blood group antigens. However, further research is required to determine the effectiveness of these seed extracts in different blood group systems and in different types of stains.

4. Conclusion

In conclusion, this study has demonstrated the potential of Soyabean, Sunflower, Bottle gourd, Tulsi and papaya seed extracts for blood grouping in fresh and dried blood stains. These natural products could serve as a cost-effective and efficient alternative to antisera in forensic science. However, further research is required to establish the reliability and accuracy of these seed extracts for blood grouping in different blood group systems and in different types of stains.

List of Abbreviations

rpm- Revolutions per minute

Sq.- Square

mm- millimetre

Ethics Approval and Consent to Participate

Necessary permissions and consent for participation have been obtained. All participants involved in this research were provided with clear and comprehensive information about the nature, purpose and benefits of their involvement. They were informed about their right to voluntary participation, the option to withdraw at any time and their confidentiality rights. Written consent was obtained from all participants before their involvement in the study.

Consent for Publication

Both the authors have consented to submit this work to Egyptian Journal of Forensic Sciences for consideration of publication. All authors have agreed to the submission to the journal and declare that the manuscript is not currently under submission to any other journal.

Competing interests

There are no competing interests.

Availability of data and material

Not Required

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Not Applicable

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