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18. BIODIVERSITY TOOLS FOR BOOSTING IMMUNE SYSTEM OF HOMOSAPIENS: AN IN VITRO STUDY OF ABUTILON INDICIUM LEAVES

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ABSTRACT

Climate change is attributed directly or indirectly to human activity that alters the compositions of the global atmosphere. Human beings are both agents and victims of environmental change. Therefore, climate change is the main reason for the environmental challenge that the world faces today. To overcome these negative impact on human health, biodiversity has given powerful tools and healing powers in the form of plants and herbs for boosting human body's immune system which keeps homosapiens finally strong, hale and healthy. Many complex diseases including heart problems require long and expensive treatment which common man in developing countries cannot afford. India has a long history for the treatment of various diseases using traditional medicinal plants. In contrast to synthetic compounds, herbal products are safer with minimum side effects and preferred largely for the treatment of various ailments. Thromboembolism involving the arterial or venous circulation or arising from the heart is a common cause of morbidity and mortality. India with its numerous plants variety offers costless method and inexpensive treatment to a number of disorders such as thromboembolism. The present study explores how to find out the in vitro anticoagulant activities of abutilon indicium leaves extracts, in addition to comparing and contrasting the findings with other similar studies authored by a number of medical practitioners.

INTRODUCTION

Climate change has affected human beings all over the world irrespective of their level of economic attainment. However, developing countries in Asia, Africa and Latin America have suffered a lot and felt the climate change catastrophes to a larger extent since poor people in these countries do not possess sufficient income and wealth to protect themselves in terms of mitigation and adaptation measures against the vagaries of climate change such as heat waves, tidal waves and tsunami. Extreme disasters have led to human sufferings, diseases and impairment of immune system.

IMMUNE SYSTEM

Immune system is an interactive network of

organs, cells and proteins that protect the body from viruses and bacteria or any foreign substances. The immune system works to neutralize and remove pathogens like bacteria, viruses, parasites or fungi that enters the body, recognize and neutralize harmful substances from the environment, and fight against the body's own cells that have undergone changes due to an illness. The cells of the immune system originate in the bone marrow, then migrate to guard the peripheral tissues, circulating in the blood and in the specialized system of vessels called the lymphatic system.

Human beings face illness when the performance of the immune system is compromised. Sub-normal activity of the immune system leads to severe infections and tumors of immunodeficiency while hyper-normal activity of immune system results in allergic and auto-immune diseases. Immune System has been categorized into two parts. They are as follows.

1. **Innate Immune System:** Innate immune system works as a general defense against pathogens.

2. **Adaptive Immune System:** Adaptive immune system targets specific pathogens.

These two immune systems complement each other to protect the body as well as in any reaction to a pathogen or harmful substance. Healthy immune function begins with good diet. Generally, obesity arises as a result of impaired immune response, so a plant based diet can support immune system in double ways; boosting immune system as well as keeping the body healthy. Following are some of the plant products available commonly, which will boost body's immune system

1. Garlic: Garlic is full of powerful molecules that can disinfect wounds besides preventing and fighting infections.

2. Onion: Onions enhance digestive system and immune system.

3. Cabbage: It has more antioxidant capacity.

4. Ginger: Ginger is a well known antibacterial food that has been shown to be more effective against bacterial staph infections than antibiotics. In addition, it kills cancer cells and resolves brain inflammations.

5. Green Tea: Green tea is a potent source of

antioxidants called polyphenols which can destroy influenza and common cold viruses.

6. Aloe Vera: Aloe Vera plant and its gel have the healing powers.

7. Citrus Fruits: Oranges and grape fruits packed with C vitamin, raise the body's resistance to infections.

8. Mushrooms: Mushrooms increase the production and activity of white blood cells, making them more aggressive and keeps immune system healthy.

METHODOLOGY

Climate catastrophes witnessed in the last few decades have culminated in a number of human disorders reducing the performance of immune system, besides increasing heart problems. Primary data and secondary data have been used to analyze the objectives and the related research question. The present study through a number of laboratory tests on human blood, tries to find out how Indian medicinal plants could be used as a costless method in the treatment of heart disorders instead of expensive allopathic treatment.

Thromboembolic diseases such as myocardial infarction, stroke, deep vein thrombosis, pulmonary embolism are the main causes of death worldwide. As thrombosis results from increased blood clotting, anticoagulant therapy is administered to counteract thrombosis. Chronic anti thrombotic therapy involves the use of anticoagulants, antiplatelets that are given either as mono-therapy or in combination for prevention of thrombotic complications. Rapidly acting parental anticoagulant such as heparin are used for prevention and treatment of thromboembolism and during revascularization procedures and the slow acting vitamin K antagonists are used for long term therapy. Heparin has been the mainstay of anticoagulant treatment for acute thrombotic disorders but has several side effects such as inefficiency in anti thrombin deficient patients, bleeding complications, heparin induced thrombocytopenia, immune-suppression and osteoporotic complications with long term effects. But these anticoagulants have certain serious side effects such as hemorrhage and also have a narrow therapeutic window. Limitations of these existing anticoagulants have led to the search for novel agents of natural origin.

REVIEW OF LITERATURE

The use of plants with medicinal properties for the prevention and treatment of diseases is one of the most ancient forms of health care. Plants contain several secondary metabolites that present many biological activities. Studies have been conducted which had shown the antiplatelet, anticoagulant and fibrinolytic

activity in fruits and vegetables. Kee et al in his study on medicinal plants in South Africa found that the plant *Leonotis leonurus* root extract had anticoagulant activity. Ki Min et al found that algal fucoidan had thrombolytic activity and a stimulatory effect on the thrombolytic activity of Tissue-Plasminogen activator in a dose dependent manner in a murine arterial thrombosis model.

Studies in algae done by Shanmugam et al in South India found out sulfated polysaccharides presence which has the potential anti thrombin mediated anticoagulant activity. *Abutilon indicum* is an erect, velvety tomentose under shrub, ranchlets with short stellate pubescent. Leaves are crenate-dentate and acute-acuminate. Flowers are golden yellow, solitary, schizocarps globose, densely stellate-hairy, black when ripe. In Ayurveda, it is called *atila* and in Siddha, it is called *thuthi*. The plant root, leaf, flower are used as cure for piles, ulcers, haematemesis, cough, leprosy, dysuria, leucorrhoea, jaundice and for other drug reactions. The leaves of the *abutilon indicum* are used as diuretic and demulcent.

AIM

The aim of the study is to find out the in vitro anticoagulant activities in leaves of *abutilon indicum* extracts.

MATERIALS AND METHODS

Leaves of *abutilon indicum* were identified, collected, shade dried, powdered and aqueous extracts are prepared from the plant. They are then lyophilised into powdered form. Plant extract accounting for 0.1 gram were weighed in an electronic weighing balance and mixed with 1000 micro-litre of distilled water.

Blood samples were taken from volunteers and their blood grouping have been carried out. Then platelets were removed from the plasma and were separated based on the following blood groups A, B and O. Platelet poor plasma samples of 1 ml. each of A blood group of ten volunteers were pooled in a test tube. The same procedure has been repeated for B and O blood groups also.

Pooled plasma weighing 1000 micro-litres of A, B and O blood groups were mixed with 50 micro-litres of extract. For the control, another 1000 micro-litres of pooled plasma of A, B & O blood groups were mixed with 50 micro-litres of distilled water. The following tests carried out were prothrombin time, Activated partial thromboplastin time and Thrombin time in a semi automated coagulometer. The coagulometer was calibrated using the quality control standard reagent given for all the three tests. The following tests were run again with a higher concentration (0.2 grams) of the plant

extract in cases where the extract exhibited anticoagulant properties.

Results

ABUTILON INDICIUM (0.1 gm in 1000 µl)

Prothrombin time

BLOOD GROUP	CONTROL (in sec)	TEST (in sec)
A	12.4	12.6
B	12.5	12.6
O	10.1	10.0

Thrombin time

BLOOD GROUP	CONTROL (in sec)	TEST (in sec)
A	4.6	5.4
B	5.0	6.2
O	5.1	6.1

Activated partial thromboplastin time (0.1 gm in 1000 µl & 0.2 gm in 1000 µl)

BLOOD GROUP	CONTROL (in sec)	TEST (0.1gm)	TEST (0.2gm)
A	34.0	54.0	59.6
B	33.0	65.7	72.4
O	44.0	67.8	79.2

DISCUSSION

An ideal anticoagulant should have the following features such as effectiveness, safety and lack of serious toxicity, a wide therapeutic window, no need for monitoring, oral bio-availability, safety during pregnancy and low cost. It has been observed that heparin; the widely used anticoagulant has its own side effects and adverse reactions. This has led many researchers to search for the 'perfect' anticoagulant which has the capability of the highest therapeutic efficacy with no adverse effects.

Tests have been carried out on the controls of all the three blood groups A, B and O separately. Analysis revealed that O blood group had prolonged APTT compared to A and B blood groups. This may be due to the O group individuals having 25% lower plasma levels of Factor VIII and Von Willie brand factor compared to the other blood groups.. Factor VIII level play an important role in the intrinsic pathway and lower levels prolong the activated PTT.

The study has found out that the extract resulted in prolonged activated partial thromboplastin time (APTT) but not in thrombin time (TT) as well as in prothromin time (PT). The findings were comparable to another similar study by Rita et al. In their study on the same plant abutilon indicium, they have found out that aqueous extract of the leaves prolonged

clotting time significantly. Anticoagulant activity of *Phyllanthus niruri* linn was seen in the aerial and roots aqueous extracts which affected the intrinsic and common pathway of coagulation. This prolongation of APTT occurred in all the three blood groups A, B and O respectively.. Juliana et al in their study on leaves of *Jatropha gossypifolia* showed significant activity in APTT but not in PT suggesting an action towards intrinsic and common pathway of coagulation. Similar study by Woo Jung et al revealed that fucoidan extracted from the plant *Undaria pinnatifida* prolonged the activated PTT significantly.

Tests have been carried out on the samples for APTT by doubling the concentrations from 0.1 to 0.2 gm per ml. of the extract. Findings have established that there was significant increase in the APTT on increasing the concentration of the dose level. This was again confirmed in all the three blood groups. Similarly, Caroline et al in their study on in vitro anticoagulant activity of the plant *Melastoma malabathricum* linn. have observed that the plant affects the intrinsic pathway of coagulation cascade (APTT) and markedly prolonged, depending on the level of concentration but not in PT and TT. However, Karim et al in their study on evaluation of anticoagulant property of *Morinda citrifolia* extract have observed that it prolonged both the prothrombin and activated partial thromboplastin time to time.

There was however, no significant increase in blood PT in all the three blood groups. Manjappa et al in their study have established that the seeds of the plant *Momordica charantia* exhibited strong anticoagulant property in intrinsic pathway of blood coagulation and not in extrinsic pathway (PT).

There was no significant change in Thromin time(TT) in the present study which reflects the conversion of fibrinogen to fibrin but Wonhwa Lee et al in their study of plant *Cyclopia subternata* have revealed that the active compound present vicenin- 2 prolonged PT, activated PTT and inhibited production of thrombin and factor X. Moreover, another study done in vivo of citrus lemon and punica granatum on rabbits by Azra et al suggested that they possessed anti- thrombin activity. However, caution should always be exercised when introducing new anticoagulants as therapeutic excesses can lead to bleeding risk and therapeutic limitations can increase thrombotic risk as well.

CONCLUSION

The leaf extract of abutilon indicium showed prolongation of activated partial thromboplastin time and normal levels in prothromin time and

time and normal levels in prothrombin time and thrombin time. This confirms the anticoagulant activity of the plant in vitro by affecting the intrinsic pathway of the coagulation cascade. Therefore, the study establishes the value of plants as a tool of biodiversity in preventing health complications at a cheaper cost, suitable to the socio-economic conditions of common man in less developed countries. In the context of the above, the governments both at the centre and states should evince keen interest in promoting and propagating the use of medicinal plants through extensive research grants and permission to carry out both in vitro and in vivo test trials for establishing and authenticating the credentials of medicinal plants for the sustainable benefit and use of mankind.

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