

SPERMICIDAL ACTIVITY IN AQUEOUS EXTRACT OF *ABRUS*
PRECATORIUS (L.) IN MALE ALBINO RATS

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Summary

The present study was conducted to evaluate the spermicidal activity of aqueous extract of seed powder of *Abrus precatorius* in male albino rats. The aqueous extract of seed powder of *Abrus precatorius* have shown some changes in Serum glutamic oxaloacetic transaminase (SGOT), Serum glutamic pyruvic transaminase (SGPT), Alkaline phosphatase (Alk.PO₄), Serum total protein (TP) in group 1 (aqueous – control), 2 (1g / kg bw), 3 (2g / kg bw) and 4 (3g / kg bw).

Key words: *Abrus precatorius*, spermicidal activity, liver function enzymes.

Introduction

Plants are being used by human beings since ancient times when these were considered as the only available means to cure every type of ailment. In the field of fertility regulation, large number of plants have been reported to possess antifertility constituents. *Achyranthes*, *Aeschynonene*, *Albizzia*, *Alysicarpus*, *Amnona*, *Anthocephals*, *Azadirachta*, *Bauhinia*, *Betula*, *Calotropis*, *Cassia*, *Curcuma*, *Cynodon*, *Snithia* *Mallotus*, *Solanum*, *Solena*, *Vandal*, *Viscum*, *Hibiscus*, *Gardenia* etc. are all well known genera which are used by forest dwellers as a fertility regulator in different parts of India¹. From the inception of human civilization men used to live in sylvan jungle. The degree of his association with forest determines his status as ‘Tribal’ in rural urban continuums. Through the ages, the relationship of man with forest has been described as symbiotic as their life and culture is centered on the forests. In numerous pockets, within some inaccessible or less accessible forests, hills, deserts and other habitats, man still lives in the primitive style in seclusion from modern civilization upholding the ancient traditions of his ancestors. These tribal pockets are found in various parts of India, in which Maharashtra shares utmost. In conclusion the aqueous extract of *Abrus precatorius* can show good spermicidal activity with some changes in liver function enzymes.

Materials and Methods

Plant material

The plant material used in this study is collected from Western Ghats of Maharashtra and authenticated from Department of Botanical Survey of India, Pune (India).

Preparation of the extracts

The seeds of herbal drug are collected from forest area. Then the seeds were dried, powdered for the preparation of drug. The seed powder was mixed with distilled water and shake well. In this way we prepared the aqueous extract of the seed powder of *Abrus precatorius*. These drugs are stored in airtight bottles. We prepared the fresh extracts.

Animals

Albino rats (Male sex) of Sprague dawley strain weighing between 240-260 Gms. The animals were acclimatized to laboratory conditions and given pelleted animal feed (Amrut feed) and drinking water. Diagnostic reagent kits were used for the estimation of liver function enzymes².

Toxicity studies

The acute toxicity study was performed for aqueous extract according to the acute toxic classic method as per guidelines³; male rats were used for acute toxicity study. In animals the extract was administered orally at the dose of 1gm, 2gm and 3 gm / kg body weight. If mortality was observed in 2 out of 3 animals, than the dose administered was assumed as toxic dose. If the mortality was assumed in only 1 animal than the same dose was repeated again to confirm the toxic dose if mortality was not observed the procedure was repeated for further high dose.

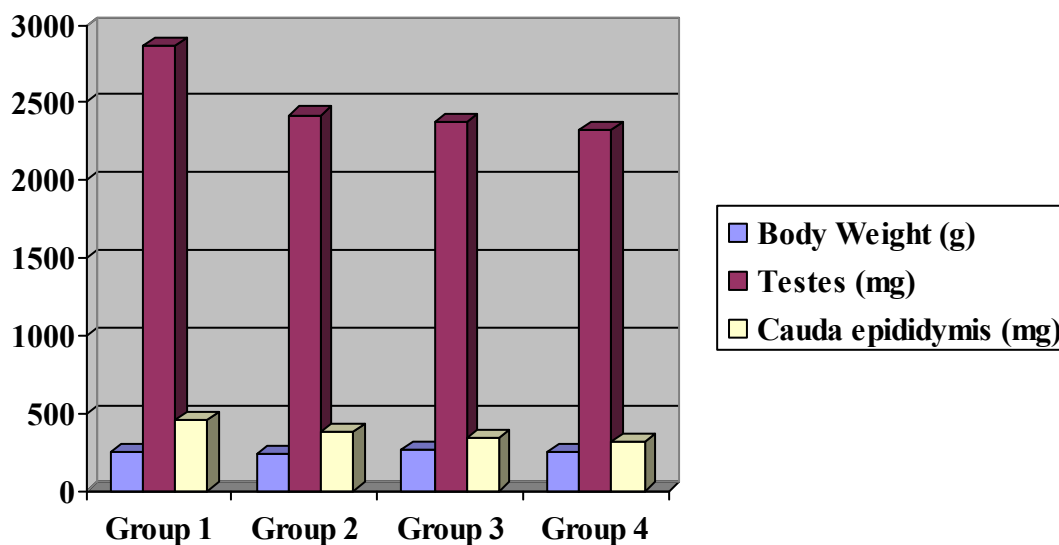
Spermicidal activity

The animals were divided in to four groups comprising of six animals in each group using randomization technique and treated with the aqueous extract of *Abrus precatorius* for 45 days to assess the spermicidal activity. The first group (vehicle control) received vehicle for all the days. The second group received 1gm/kg body weight aqueous extract of *Abrus precatorius*. The third and fourth group received 2gm/kg, 3gm/kg body weight aqueous extract of *Abrus precatorius* simultaneously for 45 days. The blood samples were collected by cardiac puncture in heparinized microfuge tubes. The blood samples thus collected were immediately centrifuged. When serum clearly separated out, the serum was analyzed. The result thus obtained was subjected to statistical analysis using student t-test and analysis of variance.

Table 1- Comparison of mean body weight, mean absolute weight of testes, cauda-epididymis, mean serum testosterone level and mean sperm count in group 1 (aqueous –control), 2 (1g / kg bw), 3 (2g / kg bw) and 4 (3g / kg bw)-*Abrus precatorius*-

Groups	Group 1	Group 2	Group 3	Group 4
Variables	(X ± S.D.)	(X ± S.D.)	(X ± S.D.)	(X ± S.D.)
Body Weight (gm)	251.83 ± 7.38	238.00 ± 6.32	259.00 ± 4.51	254.83 ± 6.94
Testes (mg)	2862.16± 9.34	2422.33± 7.20	2375.66 ± 5.71	2322.66 ± 6.53
Cauda-epididymis (mg)	460.00 ± 6.81	381.00 ± 9.01	338.33 ± 7.81	319.66 ± 4.84
Testosterone (n g/ml)	2.20 ± 0.04	1.28 ± 0.05	1.06 ± 0.07	0.86 ± 0.10
Sperm count (million / ml)	90.00 ± 5.21	24.33 ± 2.33	12.66 ± 3.26	9.66 ± 2.33

Values are mean ± SD of six rats in each group.

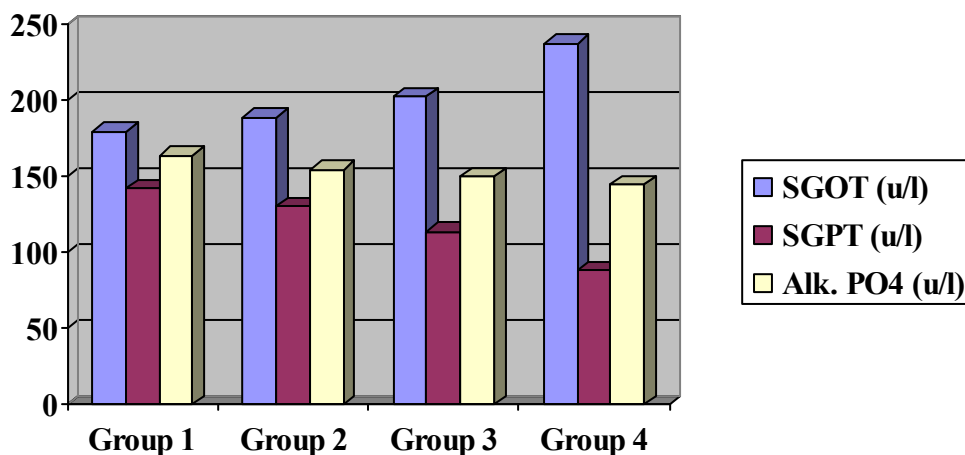


Graph No. 1 - Histogram showing the changes in Body weight, Testes and Cauda-epididymis weight changes of group 1,2,3,4 - following treatment with aqueous extract of *Abrus precatorius*.

Table 2- Values of Liver function enzymes - Serum glutamic oxaloacetic transaminase (SGOT), Serum glutamic pyruvic transaminase (SGPT), Alkaline phosphatase (Alk.PO₄), Serum total protein (TP) in group 1(aqueous –control), 2 (1g / kg bw), 3 (2g / kg bw) and 4 (3g / kg bw)-*Abrus precatorius*

Groups	Group 1	Group 2	Group 3	Group 4
Variables	X ± S.D.	X ± S.D.	X ± S.D.	X ± S.D
SGOT (u /l)	179.5 ± 7.79	188.83 ± 3.92	203.00 ± 4.96	237.66 ± 5.12
SGPT (u /l)	142.0 ± 3.74	130.66 ± 5.46	113.83 ± 4.99	88.00 ± 4.89
Alk. PO ₄ (u /l)	163.83 ± 4.91	154.5 ± 3.08	150.33 ± 2.94	145.00 ± 3.74
TP (g /dl)	8.25 ± 0.26	7.23 ± 0.43	7.38 ± 0.33	7.75 ± 0.28

Values are mean ± SD of six rats in each group.



Graph No. 2 - Histogram showing the changes in SGOT, SGPT and Alk. PO₄ values of group 1, 2, 3, 4- following treatment with aqueous extract of *Abrus precatorius*.

Results and discussion

The different parameters which are given in tables are discussed in the following points-

Body weight (g)-

The body weight in control group 1 (aqueous) was 251.83 ± 7.38 respectively. The body weight in animals treated with aqueous extract of *Abrus precatorius* were 238.00 ± 6.32 , 259.00 ± 4.51 , 254.83 ± 6.94 for 1g, 2g, and 3g / kg body weight respectively. It means that by the treatment of aqueous extract of *Abrus precatorius*, the body weight increases and in 1 g dose it slightly decreases, but this is not major change.

Weight of Testes (mg)-

A testis is a main part of reproductive system of male. The weight of testes decreased in all groups. The weight of testes in control group 1 (aqueous) was 2862.16 ± 9.34 . The testes weight in animals treated with aqueous extract of *Abrus precatorius* the values were 2422.33 ± 7.20 , 2375.66 ± 5.71 , 2322.66 ± 6.53 for 1g, 2g, 3g / kg body weight respectively. It means that the *Abrus precatorius* has less weight in all groups from control group, so it affects the reproductive system of the male. In the absence of any known pathology, testis weight is highly related to daily sperm production⁴.

Weight of Cauda-epididymis (mg)

Cauda-epididymis is the main part of epididymis, because in this part the sperm maturation process takes place. The weight of cauda epididymis in control group 1 (aqueous) was 460.00 ± 6.81 . The cauda epididymis weight in animals treated with aqueous extract of *Abrus precatorius* the values were 381.00 ± 9.01 , 338.33 ± 7.81 , 319.66 ± 4.84 for 1g, 2g, 3g / kg body weight respectively. Like the weight of testes the weight of cauda epididymis also decreases, which shows that the less number of sperm maturation takes place in cauda epididymis.

Testosterone (ng. / ml.) Level

Serum testosterone level was estimated by radioimmunoassay. The testosterone value in animals treated with aqueous extract of *Abrus precatorius* were 1.28 ± 0.05 , 1.06 ± 0.07 , 0.86 ± 0.10 for 1g, 2g, and 3g / kg body weight respectively. The testosterone level decreases in all 3 groups, which are treated with 3 different doses of aqueous extract of *Abrus precatorius*. Because the testosterone level is more significant character for spermicidal activity so if it decreases, means the sperm count is also decreased. It means that the *Abrus precatorius* has got spermicidal activity as the testosterone level decreased. In the case of aqueous extract the testosterone level decreases with dose for 1g, it decreases to 1.28 ± 0.05 , for 2 g 1.06 ± 0.07 and for 3 g it is 0.86 ± 0.10 from 2.20 ± 0.04 in control (aqueous extract) group.

Sperm count (million / ml.)

The sperm count was determined from the cauda-epididymis using a Hematocytometer Neubauer chamber. The sperm count in control group1 (aqueous)

was 90.00 ± 5.21 . The sperm count values in animals treated with aqueous extract the values were 24.33 ± 2.33 , 12.6 ± 3.26 , 9.66 ± 2.33 for 1g, 2g, and 3g / kg body weight respectively. It means that the *Abrus precatorius* has got spermicidal activity as the sperm count decreases with dose for 1g it decreases to 24.33 ± 2.33 , for 2g 12.6 ± 3.26 and for 3g it is 9.66 ± 2.33 from 90.00 ± 5.21 in control (aqueous) group. This shows that the *Abrus precatorius* aqueous extract have got considerable spermicidal activity. The decreased values of sperm count shows that the rats are becoming oligospermic and on mating the average pups delivered are 2-3 at one time in place of 12-16 pups. The survival rate is also very low.

Liver function enzymes-

Antifertility drugs are known to cause a variety of perturbations in the isoenzymology of male reproductive organs. Many plant based drugs are known to be not only cytotoxic but also cytostatic⁵ and causes spermatogenic effect. Protein synthesis may be hampered due to antitranslational effect of these test drugs. Serum glutamate oxaloacetate transaminase and serum glutamate of pyruvate transaminase activity are known toxicity markers in the study of hepatotoxicity of chemicals.

SGOT (u/l)-Serum glutamate oxaloacetate transaminase (aspartate aminotransferase)

The mean value for SGOT count in control group 1 (aqueous) was 179.50 ± 7.79 . The mean value for SGOT count in animals treated with aqueous extract of *Abrus precatorius* the values were 188.83 ± 3.92 , 203.00 ± 5.76 , 273.66 ± 5.12 for 1g, 2g, 3g/kg body weight respectively. It means that the *Abrus precatorius* has more count in all groups from control group.

SGPT (u/l)-serum glutamate of pyruvate transaminase (alanin aminotransferences)

The mean value for SGPT count in control group 1 was 142.00 ± 3.74 . The mean value for SGPT count in animals treated with aqueous extract of *Abrus precatorius* the values were 130.66 ± 5.46 , 113.83 ± 4.99 , and 88.00 ± 4.89 for 1g, 2g, and 3g / kg body weight respectively. It means that the *Abrus precatorius* has less count in all groups from control group.

Alk.PO₄ (u / l)-Alkaline phosphatase

The mean value for Alk.PO₄ in control group (aqueous) is 163.83 ± 4.91 . The mean value for Alk.PO₄ in animals treated with aqueous extract of *Abrus precatorius* the values are 154.50 ± 3.08 , 150.33 ± 2.94 , 145.00 ± 3.74 for 1g, 2g, 3g / kg body weight respectively. It means that the *Abrus precatorius* has less value in all groups from control group.

In the present study a decline in the quantity of Alkpase was observed after treatment of extract of herbal drugs. This may relate to some separative process (es) in the seminiferous epithelium and in the interstitial cells. Alkpase is a lysosomal enzyme which is believed to be androgen-dependent and is often used to determine fluctuations in the circulatory titre of this hormone. A significant reduction in the enzyme was observed by Mathur⁶ in mice treated with neem seed oil.

Total protein (g/dl)

The mean value for total protein in control group 1 (aqueous) was 8.25 ± 0.26 . The mean value for total protein in animals treated with aqueous extract of *Abrus precatorius* the values were 7.23 ± 0.43 , 7.38 ± 0.33 , 7.75 ± 0.28 for 1g, 2g, 3g / kg body weight respectively. It means that the *Abrus precatorius* has value in all groups from control group.

In the present study, the reduced testicular and accessory sex organ weights indicate a wide spread damage⁷ which could be due to reduced protein contents in these organs. Similar results have been observed with *Semecarpus anacardium* fruit⁸ and *Mimosa pudica*⁹. The epididymal maturation process is essential for sperm function¹⁰.

The present study was performed to assess the antifertility activity in male rats. The aqueous extract of seeds of *Abrus precatorius* shows the spermicidal activity. In conclusion the aqueous extract of seeds of *Abrus precatorius* could be an important source of spermicidal compounds.

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