Spermatogenic arrest in guinea pig (*Cavia porcellus*) after administration of *Abrus precatourius* seeds

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Abstract- *Abrus precatorius* seeds are said to possess fertility regulating activity. Hence, the50% alcoholic extract of seeds at doses of 50, 100 and 200 mg/kg b.w. administered orally for 60 days to 03 groups (does wise) each includes 05 male Guniea pigs. First group served as control (vehicle treated). After 60 days of feeding of doses the body and genital organ weight were noted histopathological changes were observed in genital organs such as testes, epididymes and vasa deferentia and compared with control animals. The body and genital organ weight were not much affected. A significant weight reduction of genital organ was noted. At higher doses, an arrest of spermatogenesis was observed at various stages in sominiferous tubules. No mature spermatozoa could be seen in somniferous tubular lumen. The epididymes and vasa deferentia were also devoid of spermatozoa. It is concluded that at higher doses, the treated male G. pigs became a zoospermic. It is clearly indicated that the seeds of this plant has potentiality to arrest spermatogenesis in male and thus regulate the fertility of male animals.

Key words: Spermatogenesis, Anti-Spermatogenic activity, Male reproduction, Reproductive Biology, contraception, Herbal Drug, *Abrus precatorius* seeds.

Introduction

Worldwide search is going on fertility regulating agents to curb the problem of 'Population Explosion'. Hormonal drugs and other surgical methods are available for the purpose but they are not free from side effects. Hence, the search for suitable product from herbal plants is proposed which could be effectively used in place of the 'Pill'.

Herbal plants associated with fertility regulating activity are found abundantly in India. They have been listed by Chaudhury (1966). Saxena (1973). Farnsworth *et.al.* (1975) Kamboj & Dhawan (1982) and Chaudhary et.al (1990) as antifertility plants. It is interesting to note that these plants belong to different genera & species. Thus, they exhibit diversity in nature and activity. Some plants have shown antifertility activity in male while

others have shown activity in female and even some have shown their effect on both male and female animals.

Abrus precatorius Linn. (family – Leguminoceae) is one of them. The plant, a climber, is known as Gumchi or Ratti. It is also known as "Blacksmith's weight". The seeds of this plant are considered as a local contraceptive by tribals of India. Desai & Rupawala (1967). Agarwal et.al (1970) and Jain & Khan (1996) reported its antifertility activity in female albino rats. Baijal et.al 1981) and Sinha & Mathur (1990) carried out fertility regulating activity in male albino rats. Authors had conducted the experimental work with alcoholic seed extract of this plant on male Guinea pigs (Cavia porcellus) to explore the fertility regulating activity through spermatogenic arrest.

Material and Methods

The seeds of A. precatorius were purchased from local medicinal plant stores, Dehradun and powdered after removing the hard seed coat. The 50% alcoholic extract of powdered seeds was obtained using "Soxhlet apparatus". It was dried under reduced pressure and low temperature.

The three doses (50, 100 and 200 mg) of dried extract powder were prepared with 0.5mg./dose of gum acacia powder as vehicle. All the doses were dissolved in distilled water in such a way that each dose comprises 01ml of solution.

Adult & healthy, male Guinea pigs weighing between 400-450 gms. were purchased from I.V.R.I. Izzatnagar, Bareilly (UP) and acclimatized in the laboratory for one week prior to experimentation. The 05 male G. pigs were used in each group, control as well as a treated and were housed in large animal cages. Standard animal feed (Hindustan Lever Ltd.), Leafy vegetables and water was given them twice daily.

The three doses 50, 100 and 200 mg/kg b.w./day were administered orally separately into 01ml solution through knobbed needle fitted into a syringe for 60 days to different groups (2^{nd}, 3^{rd} and 4^{th}) of male Guinea pigs. The first group was served as control in which the vehicle (01ml (0.5mg) G.pig administered orally for 60 days. After 60 days of feeding of doses, the G. pigs were killed under either anaesthesia. Before killing, the body weight of each G.pig was noted. These G. Pigs were quickly dissected and their genital organs (testes, epididymies & vasa deferentia) were taken out. These organs were processed for histopathological examination. The weight of organs were also noted, and presented in tabular form Guinea pigs were maintained as per the protocol outlined in publication of the committee for the purpose of control and supervision of experiments on animals. Standard guidelines and approval obtained from college animal ethical committee appointed by the then Principal for laboratory animals.

The data were statistically analysed by fisher's test (1950). $P<0.05$ was considered as significant in comparison of control.

Results and Discussions

The oral administration of doses did not reduce the body weight at any dose, but at higher doses, the significant reduction in genital organ weight was noted (**Table-I**).

The dose 50mg/kg/day 60 days did not cause any histopathological change in

genital organs. These organs resembled genital organs of control G.pigs.

The higher doses (100 and 200 mg/kg/day) for 60 days of administration caused arrest of spermatogenesis. The *sominiferous* tubules became disfigure and reduced in size with distorted germinal epithelium. The leakage of germ cells, Karyolysis, Karyorrhexis, vacuolization and atrophy of Leydig's cells in the interstitium of the testes were noted. (Figure 1 & 2) The lumen of epididymal tubules were devoid of spermatozoa. Reduction of tubuler size and lack of stereocilia were other changes (Figure 3 & 4). The vasa deferentia were also devoid of spermatozoa. Stereocilia were deteriorated in reduced lumen. (Figure 5 & 6). In control male G.pigs, histopathological changes in genital organs were not noted in this study.

The observations / Results of the present study clearly indicate that *Abrus percatorius* seed's 50% alcoholic extract at doses of 100 and 200 mg/kg/day for 60 days of administration to male G.pigs caused histopathological changes in genital organs (Testes, epididymes and vasa deferentia) which made them azoosermic. No effect on body weight but significant reduction in genital organ weight was noted at higher doses (Table-I) The arrest of spermatogenesis in testes at higher doses within 60 days (one spermatogenic cycle) and reduction of genital organ weight are androgen dependent (Jackson, 1966).

Conclusion

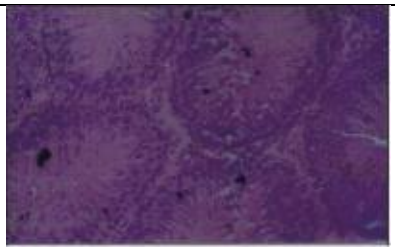
It appears that the infertility was due to absence of spermatozoa in the genital organs (epididymes and vasa deferentia) which is evident from histological preparation. The study on A. precatorius seeds also support the studies made by Baijal et.al. (1981) and Sinha and Mathur (1990) on arrest of spermatogenesis in testes of male albino rats and effect on epididymies and vasa deferentia had shown by Sinha (1991). Similar studies were also carried out by Singh (1985) and Das (1986) on semicarpus anacardium (seed kernel) and carica papaya seeds respectively in male albino rats with suppression of spermatogenesis. No toxic effects were noted at any given doses in this study. The Results of the present study suggest that A. precatorius seed's 50% alcoholic extract may be a good fertility regulating agent from plant origin for male animals.

Table-1 Effect of A precatorius alcoholic seed extract on body (gm) and genital organ weight (mg) of male Guniea pigs administered at different doses for 60 days. Five animals used in each group.

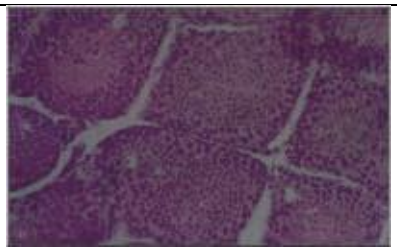
Group	Doses (mg/kg)	Body weight (gm)		Genital organ weight (mg)	
		Initial	Final	Tests	Epididymes (pig)
1	Central	502.10 ± 01.17	540.20±07.95	02.70±01.90	800.20±05.10
2	50 mg	490.20±04.70	520.35±05.15	02.50±01.75	798.30±02.15
3	100mg	498.05±02.10	518.15±02.35	02.60±02.20	789.10±02.75
4	200mg	491.75±01.20	480.10±02.78	01.15±01.20*	610.10±06.15*

Values are mean ±_S.E.

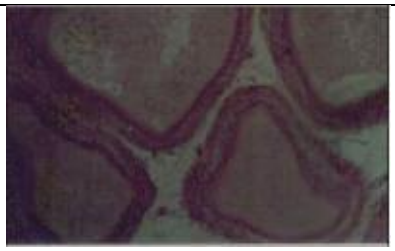
*p values < 0.05



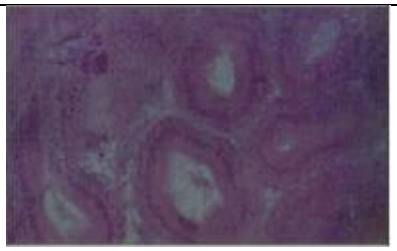
(Figure.1)
T.S. of testis of G.pig of control group. Note the normal supermatogenesis with all all spermatogenic elements in *sominiferous* tubules including spermatozoa in lumen and Leydig's cells in the interstituim. X400.



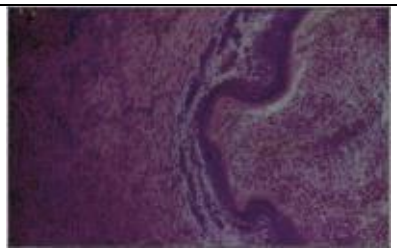
(Figure.2)
T.S. of testis of G.pig of treated group with 100 and 200 mg/kg. doses of *Abrus Precatorius* for 60 days. Note the arrest of spermatogenesis, disFigureured *sominiferous* tubules, distorted germinal epithelium, vacuolization, leakage of germ cells and atrophied Leydig's cells in interstitum. X400.



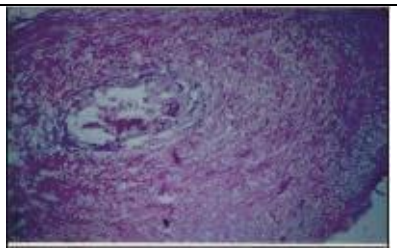
(Figure.3)
T.S. of caput epididymis of G.pig of control group. Note the normal histological structure of cells of epididym al tubules, stereocilia and lumen packed with spermatozoa. X400.



(Figure.4)
T.S. of caput, epididymis of G.pig of treated group with100 and 200 mg/kg doses A. precatorius for 60 days. Note the reduced epithelial cell height and lumen of tubules, deteriorated stereocilia and lack of spermatozoa. X 400.



(Figure.5)
T.S. of vas deferens of G.pig of control group. Note the normal musculature, mucosal lining, folds, stereocilia and lamina propria. Lumen packed with spermatozoa. X400.



(Figure.6)
T.S. of vas deferens of G.pig of treated group with 100 and 200 mg/kg doses of A. precatorius for 60 days. Note the distorted mucosal lining, epithelial cells and stereocilia, Empty lumen without spermatozoa. X400.

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Disclaimer Statement

Authors declare that no competing interest exists. The products used for this research are commonly used products in research. There is no conflict of interest between authors and producers of the products.

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