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ANTISPERMATOGENIC ACTIVITY OF *SOLANUM XANTHOCARPUM* S&W ROOT (50% ETOH-EXTRACT) IN RATS

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Oral administration of 50% EtOH-Extract of *Solanum xanthocarpum* S&W root to male albino rats at the dose levels of 50, 100 and 200 mg/Kg. b.wt./rat/day for 60 days caused degenerative changes in seminiferous tubules and spermatogenic germinal elements in testes. The contents of cholesterol, ascorbic acid, fructose, protein and sialic acid in testes and sex accessories were significantly decreased. The probable androgen deprivation inhibit spermatogenesis and reflect sperm density, motility and fertility of the extract treated rats. The possible antispermatogenic activity of *S. xanthocarpum* (root) extract is discussed.

Keywords: Androgen; Rat; *Solanum xanthocarpum*; Spermatogenesis; Testis.

Introduction

Since a long plants and their products have been used for fertility control[1-3]. The alcoholic extract of the plant[4] *Solanumxanthocarpum* (Kantikari) of Solanaceae seeds[2] and berry[5] exhibit antispermatogenic effects in rats. Solasodine ($C_{27}H_{43}O_2N$) a steroidal alkaloid is the main active principle isolated from berries of the plant exerts antifertility activity in dogs[6], buffalo bull[7] and rats[8]. Although roots of the *S. xanthocarpum* are used in cough, catar fever and pain in chest, but no attention has paid on antifertility activity, therefore the present investigation was undertaken.

Materials and Methods

The roots of *Solanum xanthocarpum* collected in and around Jaipur, were shade dried, powdered and soxhletted with 50% ethanol. The extract was collected after evaporating ethanol under reduced pressure, and washed with petrolium ether, benzene, chloroform and acetone.

Proven fertile healthy, adult male albino rats (*Rattus norvegicus*) of sprague Dawley strain (weighing 150g-200g) were maintained at 25±5°C and fed with standard pelleted diet (Hindustan Lever Ltd., India) and water *ad libitum*. They were divided into 4 groups of 5 animals each. The animals of the control group received only the vehicle. The rats of other experimental groups fed 50, 100 and 200 mg/Kg. b.wt/rat/day for 60 days.

After completion of experiment on the day 61 body weights were recorded and animals were autopsied by using light ether anaethesia. The sperm motility and density were counted by the method of Prasad *et al.*[9] The blood collected, allowed to clot. Serum separated and stored at 20°C until biochemically analysed. The weight of organs were recorded after removing the adherent tissue. The fresh tissues were freezed for the cholesterol[10], glycogen[11], fructose[13], ascorbic acid[13], protein[14] and sialic acid[15] determination. Testes were fixed in Bouin's fluid, passed through alcoholic dehydration and embeded in Paraffin wax. The 6μ sections were made and stained with Harris' hematoxylin and eosin. The data were analysed statistically by using students "t" test.

Results and Discussion

The 50 percent ethanolic extract of *S. xanthocarpum* S&W (root) adiministration in male rats significantly decreased the weight of testes, epididymides, seminal vesicle and

Table 1. Effects of 50% EtOH Extract of *S. xanthocarpum* root on reproductive organs weight, sperm motility, density and fertility in treated rats.

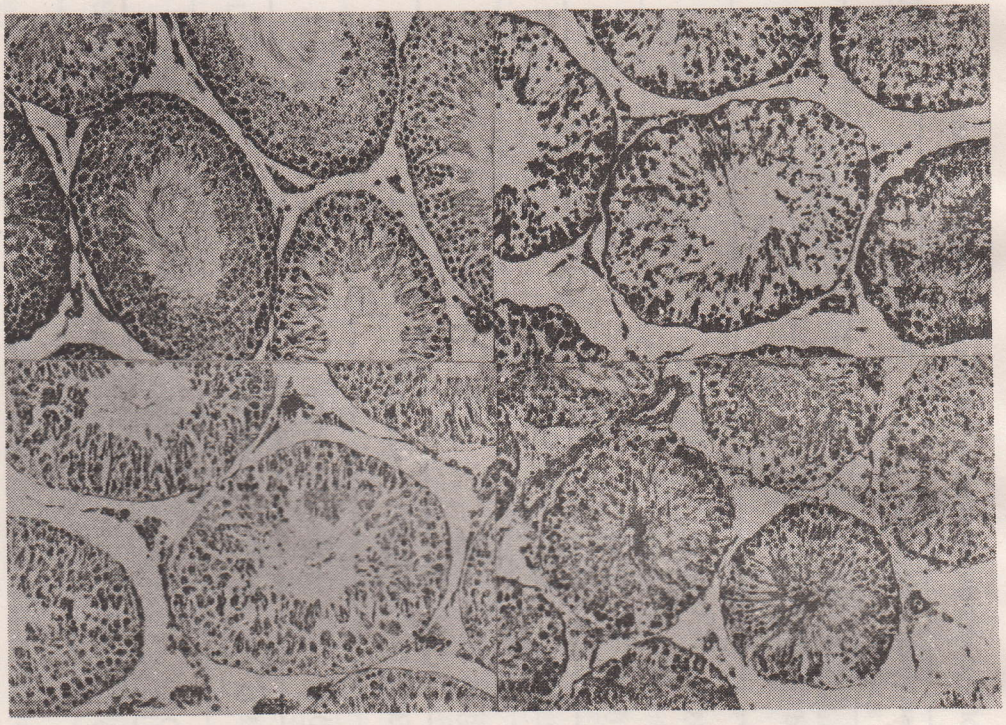
TREATMENT	FINAL Bodywt. (gm)	TESTES	EPIDIDY-MIDES mg/100gm	SEMINAL VESICLE	VENTRAL PROSTATE	SPERM MOTILITY (CAUDA%)	SPERM TESTIS	DENSITY (Million/mm^3) CAUDA	Fertility (%)
CONTROL (Group-I)	277.5 ± 5.2	1325.99 ± 19.07	454.31 ± 5.54	374.48 ± 3.74	124.23 ± 1.94	68.25 ± 1.58	5.15 ± 0.13	50.62 ± 1.02	100(+ve)
50mg/Kg. b. wt/rat/ day (Group-II)	231.0^{ns} ± 19.05	987.47** ± 63.65	256.78** ± 16.84	263.26* ± 24.53	112.18* ± 1.82	38.63** ± 4.84	3.27* ± 0.47	16.5** ± 0.7	40 (-ve)
100mg/Kg. b.wt/rat/day (Group-III)	234.0^{ns} ± 14.01	1051.47** ± 51.19	296.11** ± 2.2	257.64** ± 9.77	89.73** ± 0.6	31.47** ± 0.61	3.07** ± 00.32	19.65** ± 5.36	60 (-ve)
200mg/Kg.b. wt/rat/day (Group-IV)	249.0^{ns} ± 9.02	936.76** ± 77.41	266.76** ± 2.82	254.55** ± 3.79	102.36** ± 1.11	33.16** ± 2.41	2.6** ± 0.2	20.87** ± 0.52	80 (-ve)

MEAN + SEM; ns Non Significant; * Significant ($P \leq 0.01$); * * Highly Significant ($P \leq 0.001$); Treated groups compared with control group.

Table 2. Effects of 50% EtOH Extract of *S. xanthocarpum* root on biochemical contents in treated rats.

Treatment	Cholesterol		Ascorbic acid	Fructose	Protein		Sialic Acid	
	Testis	Adrenal Gland	Adrenal Gland (mg/gm)	Seminal Vesicle	Testis	Cauda	Testis	Cauda
Control (Group-I)	7.49 ± 0.25	24.37 ± 1.5	3.54 ± 0.28	4.82 ± 0.17	227.64 ± 8.03	267.64 ± 3.33	4.93 ± 0.11	5.67 ± 0.19
50mg/Kg. b. wt/ rat/day (Group-II)	4.99* ± 0.62	15.62** ± 0.62	2.11** ± 0.86	3.92** ± 0.08	188.65** ± 2.23	228.86** ± 2.22	4.53* ± 0.03	4.78* ± 0.19
100mg/Kg.b.wt /rat/day (Group-III)	5.2** ± 0.2	15.0** ± 1.25	2.07** ± 0.05	3.68** ± 0.16	144.62** ± 6.66	197.75** ± 6.68	4.47* ± 0.03	4.74* ± 0.14
200mg/Kg.b.wt /rat/day (Group-IV)	4.16** ± 0.41	14.06** ± 0.94	1.97** ± 0.05	3.6** ± 0.08	153.31** ± 6.66	177.75** ± 15.41	4.45* ± 0.02	4.64* ± 0.17

MEAN ± SEM; ns Non Significant; * Significant ($P \leq 0.01$); * * Highly Significant ($P \leq 0.001$); Treated groups compared with control group.



Figs. 1-4: T.S. of testis of albino rats, Hematoxylin and Eosin (X50). 1 Testis of control rat showing seminiferous tubule with normal spermatogenesis. 2, 3 and 4 Testis of rats after 60 days oral administration of the root of *S. xanthocarpum* (50% EtOH-Extract) respectively at the doses of 50, 100 and 200 mg/Kg. b.wt./rat/day, showing seminiferous tubules with degenerated spermatogenic germinal elements.

ventral prostate (Table 1), might be due to androgen reflection[16]. It has been reported that the weight of testes and sex accessories are androgen dependent[17].

Cholesterol is a precursor of steroid hormone in testis which are utilized by the developing germ cells.[18] Ascorbic acid is an essential biochemical component in reproductive process and is a potential factor in fertility.[19] Ascorbate affect hormone secretion, gamete protection and gonad tissue remodeling.[20] Fructose and seminal vesicle secretion serve as an energy source[21], and act as stimuli for sperm motility. The level of protein plays an important role in normal functioning of the genital organs in males. Its deficiency causes adverse effects on spermatogenesis.[22] Sialic acid is necessary for sperm maturations, capicitation and fertilization.[23] Since androgens are essential

for the synthesis and secretion of male accessory sex glands.[21-24] Thus androgen depletion reflect the cholesterol, ascorbic acid, fructose, protein and sialic acid (Table 2) contents of testes and other sex accessories in the treated rats.

The initiation and maintenance of spermatogenesis reported under the control of androgens.[25] The decreased Contents of cholesterol, ascorbic acid, fructose, protein and sialic acid in testes and accessory sex glands confirmed androgen deprivation, cause degenarative change in seminiferous tubules, germinal elements and decreased number of normal sperms (Fig. 1-4) reduced sperm motility and density (Table 1). The decreased sperm motility and density suggest inhibition of spermatogenesis in the extract treated rats and antispermatogenic/antiandrogenic effect.

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References

1. Kamboj V P 1988, *Ind. J. Med. Res. 87* 336.
2. Rao MV 1988, *Ind. J. Exp. Biol. 26* 95
3. Talukdar 1991, *Everymans Sci. 26* 143
4. Setty BS, Kamboj V P and Khanna N M 1977, *Ind. J. Exp. Biol. 15* 231
5. Purohit A 1992, *Ancient Sci. Life 12* 364
6. Dixit V P and Gupta R S 1982, *Int. J. Androl. 4* 1
7. Kanwar U, Batla A, Ranga A and Sanyal SN 1988, *Ind. J. Exp. Biol. 26* 941
8. Singh S P and Singh K 1994, Abstr. 47, National Symposium on Reproductive Health Care, Jaipur, 94
9. Prasad M R N, Chinoy N J and Kadam K M 1972, *Fertil. Steril. 23* 186
10. Oser B L 1979, In : *Hawk's Physiology*, 14th edition (Tata Mc Graw Hill Pub. Co. Ltd., New Delhi) 119
11. Montgomery R 1957, *Arch. Biochem. Biophys. 73* 378
12. Foreman D, Gaylor L, Evans E and Trella C 1973, *Analyt. Bichem. 56* 584
13. Roe J H and Kuether C A 1943, *J. Biol. Chem. 147* 389
14. Lowry O H, Rosenbrough N J, Farr A L and Randall R J 1951, *J. Biol. Chem. 193* 265
15. Warren L 1959, *J. Biol. Chem. 234* 1971
16. Shaikh P D, Manivannan B, Pathan K M, Kasturi M and Nazeer A R 1993, *Curr. Sci. 64* 688
17. Sidharthan V, Rajalingam R, Aruldhas M M and Govindarajulu P 1993, *Ind. J. Exp. Biol. 31* 414
18. Khan S A, Dorrington J H and Moran M F 1993, *Endocrinology 132* 109
19. Luck M R, Jeyaseelan I and Scholes R A 1995, *Biol. Reprod. 52* 262
20. Davis M B, Austin J and Partridge D A 1991, *Royal 52* 262
21. Curry P T and Arherton R W 1990, *Arch. Androl. 25* 107
22. Tripathi S S, Roy S K and Kar A B 1968, *Ind. J. Exp. Biol. 6* 195
23. Gupta G 1974, *J. Reprod. Fertil. 38* 281
24. Setty B S, Riar S S and Kar A B 1977, *Fertil. Steril. 28* 674
25. Kulkarni S A, Garde S V, and Seth A R 1992, *Arch. Androl. 29* 87