Effect of *Abrus precatorius* and *Amaranthus spinosus* combination treatment on fertility in male rats

Sir,

Curiously, it has long been known that hormonal suppression of gamete production was as feasible for men as it was for women. Studies conducted by World Health Organization (WHO) have shown that hormonal suppression of sperm output in the ejaculate to less than 3 million sperm per millilitre provided highly effective, reversible, and well-tolerated male contraception.[1] In spite of great advances observed in modern medicine in recent decades, plants still make an important contribution to healthcare. This study is an intention to identify the suitability of two plant extracts as male contraceptives independently and in combination.

Abrus precatorius (Family: Fabaceae) seeds soxhlated in 70% methanol, to prevent charring caused by absolute methanol and *Amaranthus spinosus* (Family: Amaranthaceae) leaves were macerated in absolute methanol for 72 h. Preliminary phytochemical investigation of the extract of *A. precatorius* revealed that the extracts contain alkaloids, amino acids, carbohydrates, flavonoids, proteins, steroids, and tannins. The extract of *A. spinosus* contains alkaloids, amino acids, carbohydrates, glycosides, flavonoids, proteins, and steroids. The extracts of *A. precatorius* and *A. spinosus* were given to male rats in doses of 20 mg/kg and 55 mg/kg for 55 days, respectively, while the two groups of which one received both treatments, i.e. *A. precatorius* for 55 days to complete one spermatogenic cycle and *A. spinosus* later for 20 days. The animals were evaluated for changes in body weight, gonado-somatic index (GSI), calculation of daily sperm production (DSP), calculation of epididymal sperm reserve (ESR), sperm motility, sperm abnormality, and the number of implants found after mating the animals with undosed female rats of equal age for 10 days.[2,3,4] [Tables 1 and 2].

The other group was tested for *A. precatorius* withdrawal and kept undosed for later 20 days [Table 1]. The duration of 20 days withdrawal was selected since the earlier results indicated that the drugs affected the sperm motility and abnormality and not the DSP or the ESR.

In the methanolic extract of *A. precatorius*, the sperm count in both the testis and the epididymis were decreased; however, the DSP and the ESR were unchanged indicating that the drugs neither affected the production of sperm in the testis nor the epididymal transit time. *A. precatorius* caused a marked decrease in the sperm motility, while *A. spinosus* increased the sperm motility significantly. The motility action may result from a rise in change generation of a reactive oxygen species.[5] The increase in spermatozoa abnormality following *A. precatorius* as recorded in this experiment indicated that *A. precatorius* could produce a suppressive

Table 1: Effect of *Abrus precatorius* and *Amaranthus spinosus* dosing on fertility in male rats

	Control	*Abrus precatorius*	*Amaranthus spinosus*
Body weight variation	83.13 ± 2.52	68.63 ± 3.73**	97.38 ± 1.47**
GSI ($\times10^{-2}$)	1.0 ± 0.04	1.05 ± 0.08	0.9 ± 0.07
DSP ($\times10^{6}$) per ml	0.395 ± 0.01	0.327 ± 0.02	0.30 ± 0.02
ESR ($\times10^{6}$) per ml	38.02 ± 1.05	36.04 ± 4.41	35.86 ± 121
Sperm viability (%)	61.25 ± 1.70	46.00 ± 1.41***	65.75 ± 1.25
Sperm motility[a] (%)	40	35**	45**
Sperm abnormality (%)	17.25 ± 2.39	36.25 ± 2.01***	18.25 ± 0.47
Average number of implantations	13.50 ± 1.04	9.00 ± 0.57*	12.25 ± 0.9
SGPT	53.25 ± 1.49	71.75 ± 1.93***	53.00 ± 1.22
SGOT	135.8 ± 2.49	179 ± 14.62*	139.5 ± 4.59
Total cholesterol	97.03 ± 1.98	53.40 ± 6.95**	138.80 ± 7.75**
Total proteins	6.37 ± 0.50	6.15 ± 0.37	6.80 ± 0.65

[a]Adjusted to next fifth integer; Results are expressed as mean ± SEM, $n = 4$, analyzed by one-way ANOVA followed by Dunett's test. ***$P < 0.001$, **$P < 0.01$, *$P < 0.05$ when compared with the control.

Table 2: Effect of *Abrus precatorius* withdrawal and *Amaranthus spinosus* combination on male rats

	Control	Combination	*Abrus precatorius* withdrawal
Body weight variation	11.0 ± 3.67	26.00 ± 1.29**	10.13 ± 2.83
GSI (×10^{-2})	1.07 ± 0.06	1.15 ± 0.09	1.07 ± 0.08
DSP (×10]^{6}) per ml	0.41 ± 0.01	0.40 ± 0.01	0.36 ± 0.02
ESR (×10^{6}) per ml	42.16 ± 4.31	41.02 ± 3.66	40.24 ± 2.79
Sperm viability (%)	65.50 ± 1.75	63.00 ± 1.35	61.25 ± 0.94
Sperm motility[a] (%)	40	40	35**
Sperm abnormality (%)	17.25 ± 1.31	17.50 ± 0.06	19.50 ± 0.04
Average number of implantations	13.75 ± 0.87	12.50 ± 0.64	11.74 ± 0.47
SGPT	51.75 ± 2.17	53.25 ± 1.54	61.50 ± 2.78*
SGOT	131.5 ± 2.17	53.25 ± 1.54	61.50 ± 2.78**
Total cholesterol	99.23 ± 2.57	87.30 ± 1.57**	79.70 ± 1.37***
Total proteins	6.27 ± 0.50	6.85 ± 0.20	6.30 ± 0.56

[a]Adjusted to next fifth integer; Results are expressed as mean ± SEM, $n = 4$, analyzed by one-way ANOVA followed by Dunett's test. **$P < 0.01$ when compared with the control.

effect on the maturation of sperm cells resulting in increased sperm abnormality. Such abnormality was not observed with *A. spinosus* administration. The absence of such abnormality in combination dosing implicates the sperm protective activity of *A. spinosus*. An average number of implantation sites in the *A. precatorius* treated group after mating with the treated male rats markedly were declined, which is consistent with the effects of ethanolic extract of *A. precatorius*,[6] it is more plausible that the sperm were unable to reach and fertilize the released ova due to compromised sperm motility, viability, and/or morphology. Although the study was planned to study the effect of combination on fertility, however the results contradict the assumptions.

Elevation of SGPT and SGOT levels are indicative of liver toxicity, the normalization of which, in *A. precatorius* treatment by *A. spinosus*, indicates its protective activity. This study suggests that *A. precatorius* has sperm toxic effects while *A. spinosus* prevents the cell death, it could improve sperm performance, even at a low dose. *A. spinosus* was observed to have no negative effect on fertility of male rats; however, it normalized the infertility caused due to *A. precatorius* and also the alteration of the biochemical parameters induced by *A. precatorius* treatment, indicating its role in minimizing toxicity. The possibility of adverse effects cannot be eliminated since *Abrus* has not been applicable as a drug except being reported for usefulness in reducing male fertility. Although the results are preliminary, the normalization of biochemical parameters by *Amaranthus* indicates usefulness of combination during toxicity of *A. precatorius*. This apparent reinforcement of action may be a possible means of avoiding undesirable side effects produced by *A. precatorius* which induces male infertility.

Yaseen Gigani, Amit Vekaria[1], Syed Amir Ali[2]

School of Biosciences and Clinical Research, Apeejay Stya University,Gurgaon, Haryana. [1]Department of Pharmacology, Zydus Research Centre, Ahmadabad, [2]Department of Pharmacy Practice, Bharat Institute of Pharmacy, Hyderabad, India

Address for correspondence:
Yaseen Gigani, School of Biosciences and Clinical Research, Apeejay Stya University, Gurgaon, Haryana, India.
E-mail giganiyaseen@rediffmail.com

REFERENCES

1. Shu YZ. Recent natural products based drug development: A pharmaceutical industry perspective. J Nat Prod 1998;61:1053-71.
2. Robb GW, Amann RP, Killian GJ. Daily sperm production and epididymal sperm reserves of pubertal and adult rats. J Reprod Fertil 1978;54:103-7.
3. Oze R, Nwanjo G, Oze H. Reproductive Impairment Associated with the Ethanolic Extract of Alstonia Boonei (De-Wild) Stem Bark in Male Rats. Internet J Lab Med 2008;3:1.
4. Björndahl L, Söderlund I, Kvist U. Evaluation of the one-step eosin-nigrosin staining technique for human sperm vitality assessment. Hum Reprod 2003;18:813-6.
5. Ratnasooriya WD, Amarasekera AS, Perera NS, Premakumara GA. Sperm antimotility properties of a seed extract of *Abrus precatorius*. J Ethnopharmacol 1991;33:85-90.
6. Rao MV. Antifertility effects of alcoholic seed extract of *Abrus precatorius* Linn. in male albino rats. Acta Eur Fertil 1987;18:217-20.

Access this article online

Quick Response Code:

Website: www.jpharmacol.com

DOI: 10.4103/0976-500X.99441