Influence of medicinal plants – *Mentha arvensis* and *Catharanthus roseus* on somatic and reproductive organ weight in Swiss albino male mice.

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Abstract :

The current study examines how two medicinal plants, *Catharanthus roseus* (Madagascar periwinkle) and *Mentha arvensis* (field mint), affect the somatic and reproductive characteristics of male albino mice (*Mus musculus*). Aqueous extracts of these plants were given orally to adult male mice for 14, 28 and 35 days of time interval. Alongside the reproductive parameter, somatic factors such as body weight and organ (liver) were noted. The findings showed that the plant extracts had varied effects as it is dose-dependent influence on somatic growth and reproductive indices. These results imply that *C. roseus* may have increases body weight and decreases reproductive organ weight but still require more research for therapeutic uses or the creation of contraceptives, but *M. arvensis* slightly reduce body weight, good for digestion and enhanced rate of metabolic but may have potential as a fertility enhancer as it decreases reproductive organ weight.

Keywords :

Mentha arvensis, *Catharanthus roseus*, infertility, somatic and reproductive parameter, metabolic rate.

1. Introduction

There are many such plants which are used in the medicinal world. Numerous weeds in our surrounding are quite potent therapeutic plants that can aid with a number of serious health conditions[1,2,3]. But still now there is need to investigate the plants effect on somatic and reproductive organ weight. Among ancient cultures, India has long been recognized as a vast repository of natural treatments [4,5,6]. Numerous studies have found and assessed a variety of plants for their ability to regulate male fertility [7,8,9,10,11,12,13,14,15,16.] Originally from Japan, *M. arvensis* Linn. family Lamiaceae is a menthol plant that is widely grown throughout temperate Europe, western and central Asia, east to the Himalaya, and eastern Siberia. It is used in industry, as a household cure, and as a seasoning for food. It has been said to have a variety of

therapeutic qualities. In cases of dysentery and diarrhea, leaf juice is administered[17]. In addition to being used medicinally for allergies and gastrointestinal issues, the leaves are mostly utilized in salads[18]. Additionally, it is used to treat jaundice, asthma, and diseases of the liver and spleen. These leaves' decoction is used to treat rheumatism, dyspepsia, as a treatment for inflammatory joints and arthritis. It has long been used to treat ischemic heart disease and hypertension[19].

2. Materials and methods

2.1. Animals

For the present investigation, adult male albino mice (*Mus musculus*) weighed between 25-30 g were kept for observation. Animals were kept in cages made of polypropylene that are cleaned every day. They were kept at the department's animal house in accordance with the ethical guidelines.

2.2. Collection of the plant

The plant of *C. roseus* and *M. arvensis* were brought from the local market and planted in the University Dept. of Zoology, Bhagalpur.

2.3. Preparation of plant extracts

The leaves of *C. roseus* and *M. arvensis* were washed properly with distilled water to remove dust particles and decayed materials. Then the leaves were left for about 30 minutes to remove the water droplets due to washing.

- ***C. roseus***: The ratio of leaves and water was 1:2, it means 10 gm of leaves paste was mixed with 20 ml of water. In a motor pestle leaves were crushed as much as possible and a paste was made. Then added the water in the paste and mix thoroughly by crushing again and again. After that the mixture was filtered using filter paper and collected in a glass tube (Shaw et al.,2017).
- ***M. arvensis***: The aqueous extract was prepared by macerating 10 gm of leaves in 100 ml sterilized distilled water. Subsequently the extract was filtered twice with whatman filter paper 1 (Panda et al.,2014).

2.4. Experimental Design:

Animals were equally distributed into five treatment groups. Control group were received only water and food, there is no any doses are provided. High dose of *C. roseus* was treated with 500 mg/kg body weight (Avila et al., 2012) and low dose of *C. roseus* was treated with 250 mg/kg body weight (Avila et al., 2012). High dose of *M. arvensis* was provided with 200 mg/kg body wt. (Tian et al., 2018) and low dose of *M. arvensis* was provided with 100 mg/kg body wt. (Tian et al., 2018). The aqueous extract of this plant was administered orally for 14, 28 and 35 days.

2.5. Body weight:

Body weight of control and experimental males were weighed initially and finally after the treatment.

2.6. Reproductive organ weight:

Males were sacrificed by cervical dislocation. All the reproductive organ were operated out and kept in clean watch glass and then measure their weight.

2.7. Statistical Analysis:

Mean ± S.E. is used to express the data. One-way ANOVA followed by Post Hoc Tukey HSD (beta) were used for statistical comparison. The values were statistically significant at $P<0.05$.

3. Result:

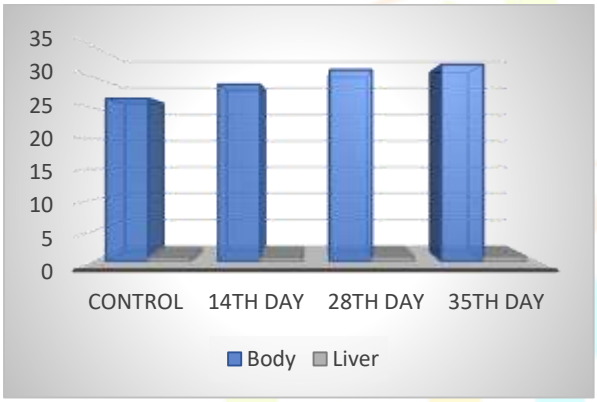
3.1 Body weight: Effects of aqueous leaf extract of *C. roseus* on body weight of male albino mice after 14, 28 and 35 days of treatment is shown in Table 1(High Dose) and Table 2(Low Dose). The data shows that there was improvement in the body weight of the experimental animals when compared prior and post administration of the aqueous leaf extract as well as relative weight of organ (liver) were also showed positive effect. But it also depends on dose and duration and extract preparation. Low dose shows safety time period for weight of liver while high doses may be harmful as it depends on metabolic rate. Changes in body weight may be result of mild toxicity at higher doses, reduced adipogenesis, suppression of appetite and reason behind liver weight changes due to effect against steatotic, hepatoprotective

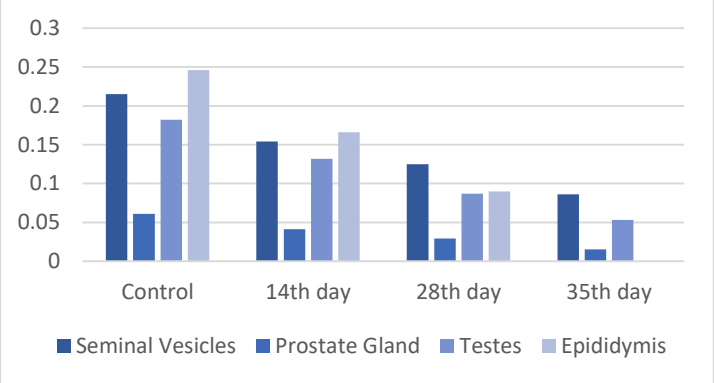
properties. The effects of different doses of ethanolic leaf extracts of *C. roseus* on the body weight of the animals in the treatment groups as compared with that in the control group. After 21 days of treatment, the body weights of the treated animals were observed to increase significantly ($p < 0.05$) in comparison with the controls. Among the treated groups, higher body weight was recorded in group (A), which received 400 mg/kg B.W. of the extract followed by group (B) receiving 300 mg/kg B.W., and then group (C) receiving 200 mg/kg B.W. Thus the administration of the ethanolic leaf extract of *C. roseus* increased the body weight of the treated animals in a dose-dependent pattern (Damilare A. Adekomi, 2010)[30]. While effects of aqueous leaf extract of *M. arvensis* on the body weight of male albino mice after 14, 28 and 35 days of treatment is shown in Table 3(High Dose) and Table 4(Low Dose). The treated group′s average body weight was almost the same as the control groups. This plant′s extract slightly cause inhibitory effects on body weight. It shows slightly increased or decreased while it depends on food consumption and metabolic rate of mice. Both doses are safe when treated with *M. arvensis*.

3.2 Reproductive organ weight: Dosages of *C. roseus* leaf extract can cause a wide range of adverse consequences on reproductive system. In Table 1. (High Dose) and Table 2. (Low Dose) shows reproductive organ weight. Result showed negative effect as it slows down the weight. Most research on the effects of Sadabahar (*C. roseus*) on the weight of reproductive organs has been conducted on animals, particularly rats. The weight of reproductive organs like the testes, epididymis, seminal vesicles and prostate gland has been examined in these studies in relation to various plant extracts (such as methanolic, ethanolic, and aqueous). Possible causes of the weight loss include: decreased testosterone levels, injury or apoptosis of germ cells, and inhibition of spermatogenesis. In Table 3. (High Dose) and Table 4. (Low Dose) *M. arvensis* leaf extract shows decreases in reproductive system after 35th day of treatment. Reproductive organ weights in both male and female animals may decrease as a result of high dosages or prolonged administration of pudina (mint) extracts. The consequences are probably caused by oxidative stress in gonadal tissues and hormonal alterations, particularly a reduction in testosterone or estrogen.

Table 1: Effects of aqueous leaf extract of *C. roseus* on the body weight and reproductive organ weight of male albino mice after 14, 28 and 35 days of treatment.

S.no	Parameter	Control	*C. roseus* (High dose = 500 mg/kg B.W.) Time interval		
			14th	28th	35th
1.	Body weight	26.49±0.46	28.78±0.30	31.13±0.19	32.01±0.25
2.	Liver	0.748±0.015	0.794±0.017	0.870±0.021	0.889±0.022
3.	Seminal vesicles	0.215±0.006	0.154±0.010	0.125±0.008	0.086±0.007
4.	Prostate gland	0.061±0.003	0.041±0.003	0.029±0.002	0.015±0.002
5.	Testes	0.182±0.005	0.132±0.007	0.087±0.006	0.053±0.006
6.	Epididymis	0.246±0.008	0.166±0.008	0.090±0.006	0.054±0.005



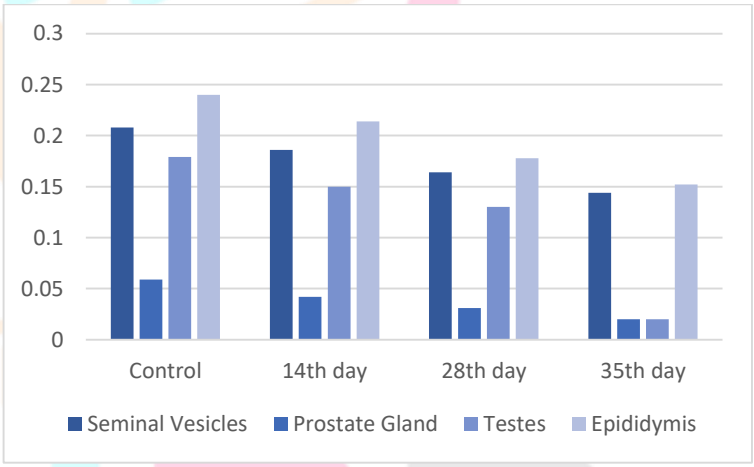


Graph 1: Represent somatic organ weight. Graph 2: Represent reproductive organ weight.

Table 2: Effects of aqueous leaf extract of *C. roseus* on the body weight and reproductive organ weight of male albino mice after 14, 28 and 35 days of treatment.

S.no	Parameter	Control	*C. roseus* (Low dose = 250 mg/kg B.W.) Time interval		
			14th	28th	35th

1.	Body weight	25.44±0.829	27.03±0.826	28.92±0.900	30.26±0.792
2.	Liver	0.796±0.020	0.838±0.019	0.883±0.018	0.912±0.014
3.	Seminal vesicles	0.208±0.009	0.186±0.007	0.164±0.004	0.144±0.004
4.	Prostate gland	0.059±0.003	0.042±0.003	0.031±0.003	0.020±0.002
5.	Testes	0.179±0.006	0.150±0.011	0.130±0.011	0.104±0.011
6.	Epididymis	0.240±0.010	0.214±0.005	0.178±0.005	0.152±0.007

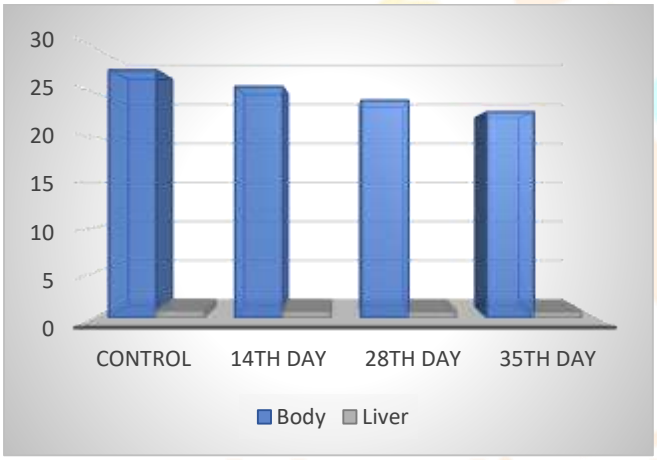


Graph 3: Represent somatic organ weight. Graph 4: Represent reproductive organ weight.

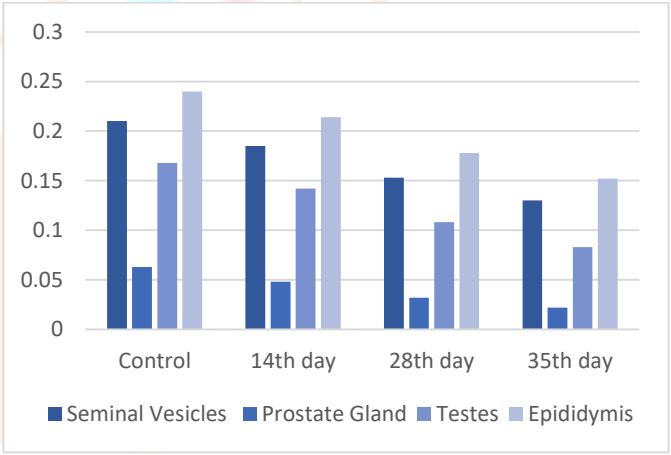
Table 3: Effects of aqueous leaf extract of *M. arvensis* on the body weight and reproductive organ weight of male albino mice after 14, 28 and 35 days of treatment.

S.no	Parameter	Control	*M. arvensis* (High dose = 200 mg/kg B.W.) Time interval		
			14^{th}	28^{th}	35^{th}
1.	Body weight	27.45±0.677	25.63±0.752	24.08±0.814	22.80±0.694

2.	Liver	0.796±0.020	0.772±0.019	0.740±0.015	0.717±0.015
3.	Seminal vesicles	0.210±0.009	0.185±0.007	0.153±0.007	0.130±0.008
4.	Prostate gland	0.063±0.003	0.048±0.004	0.032±0.002	0.022±0.002
5.	Testes	0.168±0.007	0.142±0.005	0.108±0.007	0.083±0.005
6.	Epididymis	0.240±0.009	0.214±0.005	0.178±0.005	0.152±0.007



Graph 5: Represent somatic organ weight.



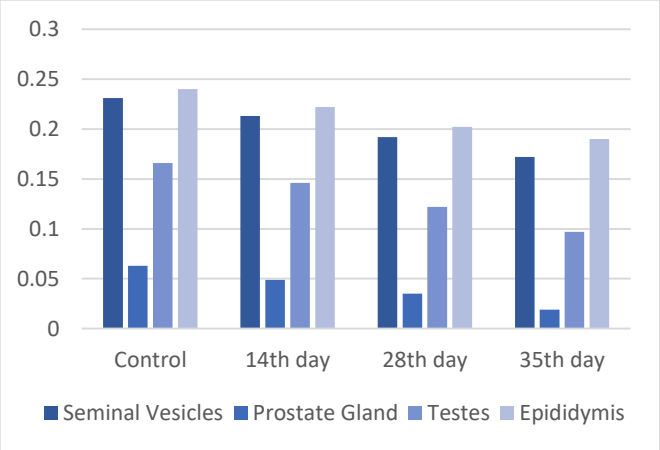
Graph 6: Represent reproductive organ weight.

Table 4: Effects of aqueous leaf extract of *M. arvensis* on the body weight and reproductive organ weight of male albino mice after 14, 28 and 35 days of treatment.

S.no	Parameter	Control	*M. arvensis* (Low dose = 100 mg/kg B.W.) Time interval		
			14^{th}	28^{th}	35^{th}
1.	Body weight	26.75±0.370	25.31±0.280	23.73±0.345	22.34±0.379

2.	Liver	0.748±0.015	0.731±0.013	0.705±0.013	0.694±0.013
3.	Seminal vesicles	0.231±0.009	0.213±0.007	0.192±0.007	0.172±0.005
4.	Prostate gland	0.063±0.003	0.049±0.002	0.035±0.001	0.019±0.002
5.	Testes	0.166±0.007	0.146±0.010	0.122±0.009	0.097±0.008
6.	Epididymis	0.240±0.009	0.222±0.007	0.202±0.007	0.190±0.006

Graph 7: Represent somatic organ weight.



Graph 8: Represent reproductive organ weight.

Discussion

Medicinal plants have been employed for centuries in the treatment and prevention of numerous ailments, serving as the foundation for many traditional healing practices. Since ancient times, herbal remedies derived from medicinal plants have played a significant role in the management of human health and disease. Their pharmacological effects are modulated by dose and time, reflecting the importance of controlled administration in therapeutic use. *C. roseus* cytotoxic alkaloids may be the cause of its possible reproductive harm. Our reproductive system is susceptible to a wide range of adverse effects from *C. roseus* leaf extract[20,21]. In the current work, the male mice's fertility and the inhibitory organs of *M. arvensis* leaves are demonstrated using a crude methanolic extract. The inherent estrogenicity of *M. arvensis*, which essentially mimics other estrogens or estrogenic substances and suppresses the testicular and/or epididymal functional integrity, may be the cause of the

inhibitory effects in the male mouse at the tried dose regimen fertility. This may be accomplished by inhibiting local androgen and/or gonadotrophin secretions[22, 23]. The results of this investigation align with the recommendations made by other authors as well[24, 25]. The albino mice's testis and accessory sex organ weights decreased statistically significantly after ingesting the extract, which suggests that there was insufficient testosterone present to sustain the weight of the gonads and accessories. However, the treated animals' libido or potency might not change[26,27,28,29]. Weight profile is an important factor for research field as it suggest the safe zone and effect on health.

Conclusion

In traditional systems, medicinal herbs have long been used to control fertility and promote general health. The anti-inflammatory and antioxidant qualities of *M. arvensis* are well-known, however *C. roseus* contains alkaloids that are employed in cancer treatment, such as vincristine and vinblastine, which may have cytotoxic effects. The effects these plants have on male reproductive processes and somatic growth are examined in this study. The current study's finding demonstrated that high dosages of *C. roseus* aqueous leaf extract taken orally may cause hepatocellular problems and reproductive organ disorders. While *M. arvensis* is safe for use at low and medium doses.

Recommendation

It's important to use *C. roseus* under professional supervision, especially in higher doses. Dosage should be carefully controlled to avoid toxicity. High doses are usually not recommended for self-medication. While if we talk about *M. arvensis*, this plant is non-toxic and also show reversible effect after a time interval of one month. For temporary antifertility effect pudina is best for this. Male reproductive function may be hampered. To investigate long-term impacts and molecular pathways, more research is required.

References

1. Chaudhary K, Parihar S, Sharma D., 2021. A Critical Review on Nanoscience Advancement: In Treatment of Viral Infection. *Journal. of Drug and Therapeutics.* Nov.11(6):225-237.

2. Parihar S, Sharma D., 2021. Cynodondactylon: A Review of Pharmacological Activities. *Sch Acad. J Pharm*. 11:183-189.

3. Telrandhe UB, Lokhande RR, Lodhe VN, Kosalge SB, Parihar S, Sharma D., 2021. Review on Herbal Drugs used in Dental Care Management. *Asian Journal of Pharmaceutical Research and Development*. 9(6):71-79.

4. Parihar S, Sharma D., 2021. Navagraha (nine planets) plants: the traditional uses and the therapeutic potential of nine sacred plants of India that symbolises nine planets. *IJRAR*. 8(4):96-108.

5. Parihar S, Sharma D., 2021. A brief overview on *Asparagus racemous*. *IJRAR*. 8(4):96-108.

6. Parihar S, Sharma D., 2021. A brief overview on *Crinum latifolium*. *International Journal of Science and Research (IJSR)*. 10(12):725-728.

7. Deshpande, V.Y., Mendulkar, K.N., Sadre, N.L., 1980. Antifertility activity of *Azadirachta indica* in mice. *Journal of Postgraduate Medicine* (Bombay). 26:77-81.

8. Qian, S.Z., Hu, J.H., Ho, L.X., Sun, M.X., Huang, Y.Z., Fong, J.H.,1980. The first clinical trial of gossypol on male antifertility. In: Turnei, P. (Ed.), Clinical Pharmacology & Therapeutics. McMillan, New York, p. 489.

9. Chattopadhyay, S., Chattopadhyay, U., Mathur, P.P., Saini, K.S., Ghosal, S., 1983. Effects of hippadine and Amryllidaceae alkaloid on testicular function in rats. *Planta Medica*. 49:252–254.

10. Choudhary, D.N., Singh, V.N., Verma, S.K., Singh, B.P., 1990. Antifertility effects of leaf extracts of some plants in male rats. Indian *Journal of Experimental Biology*. 28:714–716.

11. Jacob, D., Yadava, L., Vyas, D.K., 1991. Inhibition of fertility and alterations in the reproductive structures of the male rat after administration of carrot seed extract. *Proceedings of the National Academy of Science India.* 61(B) (I):29-34.

12. Upadhyay, S.N., Dhawan, S., Talwar, G.P., 1993. Antifertility effects of Neem (*Azadirachta indica*) oil in male rats single intravas administration. An alternate approach to vasectomy. *Journal of Andrology.* 14:275–281.

13. Lohiya, N.K., Ansari, A.S., 1999. Male contraceptive agents. In: Joy, K.R., Krishna, A., Haldar, C. (Eds.), Comparative Endocrinology and Reproduction. Narosa Publishing House, New Delhi, pp. 260–277.

14. Zhen, Q.S., Ye, X., Wei, Z.J., 1995. Recent progress in research on *Tripterigium*: a male antifertility plant. Contraception. 51:121–130.

15. Melis, M.S., 1999. Effects of chronic administration of *Stevia rebaudiana* on fertility in rats. *Journal of Ethnopharmacology*. 67:157–161.

16. Naseem, M.Z., Patil, S.R., Patil, S.R., Patil, R.S.B., 1998. Antispermatogenic and androgenic activities of *Momordica charantia* (Karela) in albino rats. *Journal of Ethnopharmacology*. 61:9–16.

17. Trease GE, Evans WC., 1983. Pharmacognosy. 12th ed. London: Balliere Tindal.

18. Khan SW, Khatoon S., 2008. Ethano botanical studies on some useful herbs of Haramosh and Bugrote Valleys in Gilgit, Northern areas of Pakistan. *Pak J Bot*. 40:43-58.

19. Jagetia GC, Baliga MS., 2002. Influence of the leaf extract of *Mentha arvensis* Linn. (mint) on the survival of mice exposed to different doses of gamma radiation. Strahlenther Onkol. 178:91-8.

20. Shaw Kartik, Nandi Krishna, Ganguly Ramjyoti and Roy Chandan, 2017. ROLE OF *CATHARANTHUS ROSEUS* LINN. (NAYANTARA) ON SPERM COUNT AND SERUM TESTOSTERONE LEVEL OF ADULT MALE ALBINO RAT. *World Journal of Pharmaceutical Research*. Volume 6:1087-1096.

21. Singh Alka and Teotia U. V. S., 2017. Evaluation of effect of *Catharanthus roseus, Solanum xanthocarpum* and *Momordica charantia* extract on reproductive system of male rat. *World Journal of Pharmaceutical Research*. Volume 7:706:715.

22. Kanjanapothi, D., Smitasiri, Y., Panthong, A., Taesotikul, T., Rathnapanone, V., 1981. Postcoital antifertility effect of *Mentha arvensis.* Contraception. 24:559–567.

23. Garg, P., Jacob, D., 1994. *Mentha arvensis* leaf: an effective antinidational substance in laboratory mouse. *Journal of Advanced Zoology.* 15:32–36.

24. Jacob, D., Yadava, L., Vyas, D.K., 1991. Inhibition of fertility and alterations in the reproductive structures of the male rat after administration of carrot seed extract. *Proceedings of the National Academy of Science India.* 61(B) (I):29–34.

25. Wu, J.T., Lau, I.F., Chang, M.C., 1973. Effects of estriol treatment of male rats and mice on the fertility of mated females. Fertility Sterility. 24:687–691.

26. Vanithakumari, G., Manonayagi, S., Padma, S., Malini, T., 1989. Antifertility effect of Bambusa arundinacea shoot extracts in male rats. *Journal of Ethnopharmacology.* 2 (5):173–180.

27. Gill-Sharma, M.K., Gopalkrishnan, K., Balasinor, N., Parte, P., Jayaraman, S., Juneja, H.S., 1993. Effects of tamoxifen on the fertility of male rats. *Journal of Reproduction Fertility.* 99:395–402.

28. Sharma, N., Jacob, D., 2001. Antifertility investigation and toxicological screening of the petroleum ether extract of the leaves of *Mentha arvensis* L. in male albino mice. *Journal of Ethnopharmacology.* 75:5–12.

29. Rao, M.V., Shah, K.D., 1988. Endocrine approach to male fertility control by steroid hormone combination in rat *Rattus norvegicus* L. *Indian Journal of Experimental Biology.* 36:775–779.

30. Damilare A. Adekomi, 2010. Madagascar periwinkle (Catharanthus roseus) enhances kidney and liver functions in Wistar rats. Eur J Anat, 14 (3): 111-119.

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