Summary And Conclusion
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The leaves of *Ocimum sanctum* (Benzene extract) commonly called Krishna Tulsi, have been tested as to know whether it would affect the male reproductive organs or not. The earlier and preliminary studies revealed that, the plant leaves possesses antispermatic properties and antiandrogenic properties. The present work is undertaken to find out the effects on weight, histology of the testis and cauda epididymis. The ultrastructure of testis, cauda epididymis, cauda epididymal sperm and sperm parameters, fructose content in cauda epididymis & seminal vesicle, and the fertility rate are also studied.

250mg/kg body weight of *Ocimum sanctum* leaves (Benzene extract) in 1 ml propylene glycol/rat/day was administered orally (gavage) for a period of 48 days. The subsequent recovery and the approximate time required for recovery was also observed after the withdrawal of the treatment on the histology of the testis, cauda epididymis, sperm parameters, fructose content and fertility rate.

The present studies revealed the following observations

1. The testis and accessory reproductive organs like epididymis and seminal vesicle decreased in their weights.
2. The histology of the testis indicated suppressed spermatogenesis and atrophied Leydig cells. The number of tubules per microscopic field increased and their diameter were reduced. Leydig cells exhibited characteristic of degeneration and their nuclei were condensed or had irregular shape.
3. Appearance of vacuoles started from one cell layer away from the basal lamina of the tubules and exhibited exfoliation. The germ cells showed overall decrease in cytoplasmic ground substance and a few of them exhibited characteristics of vacuolization or had disrupted nuclei. There are formations of the giant cells. At the base of the layer, the Sertoli cell nuclei appeared normal.
4. Total number, cell and nuclear diameter of spermatogonia, spermatocytes, spermatids and Leydig cells were reduced.

5. Ultrastructure of the testis revealed intraepithelial vacuoles consisting of intercellular spaces and intracellular vacuoles in the cytoplasm of the Sertoli cells.

6. The spermatogonia showed morphological changes with other cytoplasmic organelles.

7. The spermatocytes showed no morphological changes in the seminiferous tubules, but were found consisting of hypertrophied mitochondria in their cytoplasm.

8. Degenerating spermatids were totally devoid of their nuclear membrane with electron dense matrix and commencement of vacuolization.

9. Acrosomic phase of spermatids showed disruption of acrosomal vesicle in the middle portion of manchette and other cell organelle were absent in the cytoplasm.

10. Bridges or association between Sertoli cell-spermatids were disturbed.

11. The Sertoli cell showed an overall decrease in the cytoplasmic substances.

12. In the Leydig cells, there were structural changes in their cytoplasmic organelles. The nuclei were less chromatic; mitochondria in the cytoplasm were atrophic or swollen contributing to vacuolization. Other cell types of interstitium were absent in the vacuolated cytoplasm.

13. Histology of the cauda epididymis showed, a general reduction in the epithelial height and the nuclear diameter of the epithelial cells.

14. The epithelial cell nuclei were pycnotic and the height of the stereocilia was reduced.

15. The lumen was devoid of sperm and filled with lymphocytes and debris of degenerated sperm.

16. Intertubular fibrosis was evident; the basement membrane was thin and disrupted.

17. The cells showed vacuolization and cell debris due to cytolysis and a few of these cell exhibited signs of degeneration.
18. The ultrastructure of cauda epididymis showed that, the principal cells, clear cells and basal cells were affected. The other organelles in the cytoplasm of each cell along with the basal lamina were reduced and highly disturbed.

19. Mitochondria, Golgi apparatus, rough and smooth varieties of endoplasmic reticulum exhibit the changes in the structure, size and number.

20. The number of lipid droplets was apparently decreased and the lysosomal activity was increased. In general the impact of the treatment was severe on the epithelial cells of the cauda epididymis.

21. Ultrastructure of cauda epididymal sperm revealed disruption in the plasma membrane, acrosomal membrane and perforatorium in different parts of the sperm head and the surfaces were coated with fuzzy material.

22. The sperm mid-piece showed disruption and degeneration of mitochondrial sheath along the length of the structure. Most of these structures showed abnormal mitochondrial sheath and loss of plasma membrane. Along the mitochondrial sheath, mitochondria showed the characteristics of hypertrophy or disorganization or commencement of degeneration. Most mid-pieces were with displaced mitochondrial sheath on one or both sides and there was abnormal pattern of outer dense fibres.

23. In the principal piece of tail, the fibrous sheaths were without plasma membrane and rib of the fibrous sheath was disturbed.

24. Sperm parametric analyses indicate reduced sperm count, sperm motility, forward velocity, increased percentage of abnormal sperms and decreased fructose content in the cauda epididymal and seminal plasma.

25. Fertility test showed a negative fertility at the level of implantations.

The changes observed in the Ocimum sanctum leaves (Benzene extract) treated animals suggest that the leaves affect the process of spermatogenesis in the testis and epithelial cells in the cauda epididymis through deprived androgen level probably, mediated through the hypothalamo-hypophysial-gonadal axis thereby, affecting the
spermatozoa in the cauda epididymis by altering the cauda epididymal milieu leading to reduced fertilizing ability of the sperm. The ultrastructural observations suggest a possible direct action on the target organs. The conclusions of the present work are based on histological histometrical, morphological, sperm parameters and evaluation of the testis, epithelial cells and spermatozoa of the cauda epididymis at ultrastructural level.

The experiments were designed to observe the time required for a complete recovery in the histology of the testis and cauda epididymis, sperm parameters and fertility rate. Different groups of animals were autopsied after one, two, three, four and five weeks after withdrawal of the treatment. A complete recovery in histology of the testis, cauda epididymis, morphometric, sperm parameters, fructose content and fertility rate after sixteen days of cessation of the treatment indicates that the effects of the treatment are transient and reversible without any apparent toxic side effects.