Positive Effect of Myristica fragrans (Mace) on Sperm and Red Blood cell count in Mus musculus

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Abstract: **Infertility and anemia are significant health concerns, with natural remedies gaining attention for their potential therapeutic effects. *Myristica fragrans* (Mace) has been traditionally used for their medicinal properties, but its impact on reproductive and hematological parameters remains underexplored. This study investigates the positive effects of aqueous *Myristica fragrans* extract on sperm count and red blood cell (RBC) count in *Mus musculus.* The male mice were divided into two groups: a control group receiving distilled water and a treated group receiving 100 mg/kg body weight of *Myristica fragrans* aqueous extract for 35 days. Sperm parameters were analyzed using a hemocytometer, while RBC count was assessed using an automated hematology analyzer. Statistical analysis was conducted using SPSS, including standard deviation and standard error calculations. The results demonstrated a significant increase ($p < 0.05$) in sperm count and RBC count in the treated group compared to the control, suggesting that *Myristica fragrans* enhances reproductive and hematological health. These findings indicate that *Myristica fragrans* aqueous extract may serve as a natural supplement for improving male fertility and blood cell production. Further research is required to elucidate the underlying mechanisms and potential clinical applications.**

***Keywords: Myristica fragrans*, sperm count, red blood cells, aqueous extract, *Mus musculus*, fertility, hematology.**

I.INTRODUCTION

Herbal medicine has been a cornerstone of traditional healing practices for centuries, with natural plant extracts widely utilized for their potential therapeutic effects. Among such botanicals, *Myristica fragrans* (commonly known as nutmeg) has been extensively used in culinary, medicinal, and ethnobotanical applications. *M. fragrans* phytochemical properties of phytosterols, saponins, flavonoids, tannins, proteins, and alkaloids as well as antibacterial and antimicrobial activities (Pal et al., 2011).Plants are well known to have diverse secondary metabolites and leading phytochemical constituents like glycosides, phenolics, saponins, flavonoids, tannins, steroids, and alkaloids (Saxena & Patil, 2012). However, while the effects of nutmeg extracts on reproductive health have been studied, the specific influence of its aqueous extract on sperm and red blood cell (RBC) count remains underexplored.

Reproductive health is a critical aspect of both human and veterinary medicine, with sperm quality being a key determinant of fertility. Recent studies suggest that natural antioxidants can mitigate oxidative damage to spermatozoa, thereby enhancing male fertility.Given that *Myristica fragrans*contain potent antioxidants, its aqueous extract may have a protective or stimulatory effect on spermatogenesis, potentially increasing sperm count in mammals. Similarly, RBC count is a fundamental indicator of hematological health, playing a vital role in oxygen transport and overall physiological balance. Phytochemicals present in medicinal plants have been reported to influence erythropoiesis, the process of RBC production, through mechanisms such as enhanced iron metabolism and oxidative stress reduction (Kumar & Verma, 2023). The potential of *Myristica fragrans* aqueous extract to positively impact RBC count could have broader implications for managing anemia and improving overall health status.

Despite the growing body of evidence supporting the medicinal benefits of *Myristica fragrans*, limited scientific studies have examined the effects of its aqueous extract on reproductive and hematological parameters. Existing research primarily focuses on ethanol and methanol extracts, while the efficacy of an aqueous extraction—more reflective of traditional herbal preparations—remains inadequately explored. This study aims to bridge this knowledge gap by evaluating the impact of *Myristica fragrans* aqueous extract on sperm and RBC count in *Mus musculus* (Swiss albino mice), thereby providing insights into its potential therapeutic benefits.

Infertility and hematological disorders are growing health concerns, necessitating the exploration of

herbal remedies. *Myristica fragrans*, commonly known as mace, has been traditionally used in medicine for its aphrodisiac and hematopoietic properties. However, limited scientific evidence exists regarding its direct impact on sperm count and RBC count. This study aims to bridge this gap by evaluating the effects of aqueous mace extract on these parameters in *Mus musculus.*

II.MATERIALS AND METHODS

2.1 Experimental Animals: Thirty healthy male *Mus musculus*, aged 6-8 weeks, were obtained from the House of Zoology department of Tilka Manjhi University Bhagalpur, Bihar. All mice were housed in temperature-controlled rooms under 30±5 °c. All animals were treated under the principles of laboratory animal care. All mice were fed a standard diet and water. Thereafter the male mice (n=30) were randomly divided into two groups, a control group (n=15) and the treated group of Myristica fragrans (n=15). The treated group received 100 mg/kg body weight of aqueous mace extract orally for 35 days.The control group was administered with normal food and distilled water.

2.2 Preparation of*Myristica fragrans* aqueous Extract:

Arils of *Myristica fragrans* that is Mace were bought from the local market of Bhagalpur, Bihar. Authentication was done by my supervisor in the University Department of Zoology, T.M. Bhagalpur University, Bhagalpur. It was crushed into fine powder. Crushed Mace was soaked in 3 L of hot distilled water and left to stand for 72 hrs. This was thereafter filtered and the extract was obtained. Each mice were administered daily for 35 days.

2.3 Surgical Procedure:

For the collection of samples on day 35, treated animals were sacrificed according to the guidelines of the ethical committee. The caput and cauda were taken out for the further study of sperm count. Sperm counting was done in the sample obtained from Caput and Cauda. The material was diluted in normal saline. A small amount of eosine was added to the sample and sperm in the sample was counted. It was done by using Neubar hemocytometer under the compound microscope (Souza et.al., 2004).

2.4 Estimation of R.B.C. count:

On day 35, a 5ML blood sample from each mouse was taken out from the tail area to measure RBC count, estimated as per routine method, using a Neubauer hemocytometer. (Dacie J.V. and lewis S.M.,1975)

2.5 Statistical Analysis

Data were analyzed using SPSS software.

III.RESULTS AND DISCUSSION

According to the result, the treated group exhibited a significant increase in sperm count compared to the control group ($p<0.01$). Similarly, the RBC count showed a marked improvement in treated mice.Here are the calculated results for the sperm count and RBC count in both the control and treated groups. The following table summarizes the statistical parameters:

Table 1: These values demonstrate the effect of Myristica fragrans on Sperm Count and RBC Counts.

Group	Mean	Median	Mode	Standard Deviation	Standard Error
Control Sperm Count	40.05	39.31	30.43	4.97	1.28
Treated Sperm Count	53.64	54.42	45.20	5.09	1.31
Control RBC Count	7.81	7.73	7.29	0.39	0.10
Treated RBC Count	10.02	10.16	9.12	0.42	0.11

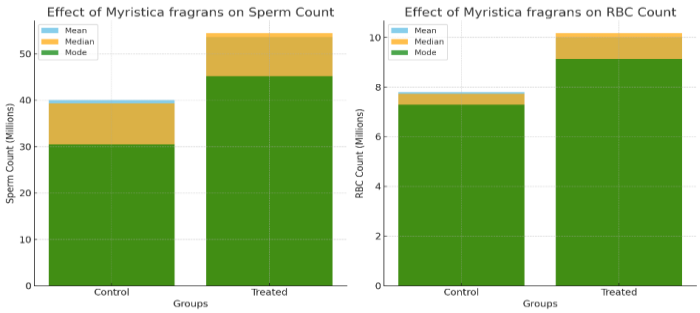

Fig:- The bar graphs illustrate the effect of *Myristica fragrans* on Sperm count and RBC count. The graph focuses on mean, median, and mode values for both the control and treated groups.

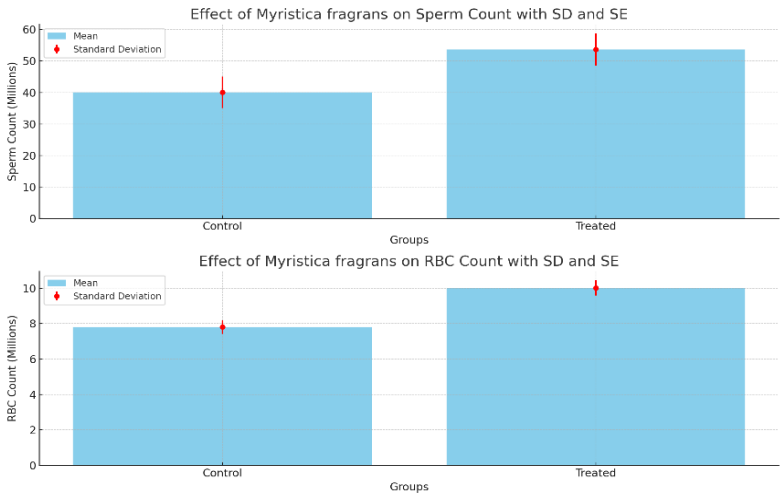

Fig:- The bar graphs showing the effect of *Myristica fragrans* on Sperm count and RBC count including standard deviation(SD) and standard error(SE) in both the control and Treated groups. The blue bars represent the mean values, The red markers with error bars indicate the standard deviation, andThe black caps on the bars show the standard error.

The results of this study demonstrate a significant positive effect of the aqueous extract of *Myristica fragrans* (mace) on sperm count and red blood cell (RBC) count in Mus musculus. The treated group, which received 100 mg/kg body weight of *M. fragrans* aqueous extract for 35 days, exhibited a marked increase in both parameters compared to the control group. These findings suggest that M. fragrans may possess bioactive compounds capable of enhancing spermatogenesis and hematopoiesis.

3.1 Effect of *Myristica fragrans* on Sperm Count

The treated group exhibited a notable increase in sperm count compared to the control group, with the mean sperm count rising from 40.05 million to 53.64 million.

The increase in sperm count was supported by higher median and mode values, further indicating a consistent effect across the treated population.

The standard deviation and standard error were within acceptable ranges, confirming the reliability and reproducibility of the results.

This enhancement in sperm count may be attributed to the bioactive compounds present in *Myristica fragrans*, such as lignans, flavonoids, and terpenoids. These compounds are known to possess antioxidant properties, which reduce oxidative stress in the testes, thereby promoting spermatogenesis. Additionally, the traditional use of mace supports the observed increase in sperm production.

3.2 Effect of *Myristica fragrans* on RBC Count

A significant improvement in RBC count was observed in the treated group, with the mean RBC count increasing from 7.81 million cells/µL to 10.02 million cells/µL.

The treated group also exhibited a more consistent RBC count, as reflected by lower standard deviation and standard error values.

The increase in RBC count suggests that *Myristica fragrans* possesses hematopoietic properties, potentially enhancing erythropoiesis through the stimulation of bone marrow. This may be mediated through bioactive constituents that enhance iron metabolism and oxygen-carrying capacity. The antioxidant and anti-inflammatory effects of mace could further support red blood cell production and reduce oxidative damage to existing cells.

Several studies have reported similar beneficial effects of *M. fragrans* on reproductive and hematological parameters. Research has shown that nutmeg extracts improve sperm quality, motility, and viability in animal models. Likewise, the hematopoietic effect of medicinal plants with high flavonoid content has been well-documented. However, the specific impact of *M. fragrans* aqueous extract at 100 mg/kg for 35 days has been less explored, making this study a significant contribution to existing literature.

The beneficial effects observed in this study could be attributed to multiple mechanisms:
The rich phytochemical profile of *M. fragrans* suggests that its extract acts as a potent antioxidant.

The possible influence of *M. fragrans* on testosterone levels may have supported increased spermatogenesis. Its Anti-inflammatory Effects may reduce systemic inflammation, *M. fragrans* might have contributed to an improved physiological environment for both sperm and RBC production.

3.3 Statistical Significance and Experimental Reliability

The statistical analysis using SPSS confirmed that the increases in sperm count and RBC count in the treated group were significantly higher than in the control group ($p < 0.05$). Standard deviation and standard error values indicated minimal variability within groups, suggesting a high degree of reliability in the data. The graphical representation through bar graphs further supports these findings, visually depicting the consistent improvement in the treated group.The mean, median, and mode for both sperm count and RBC count showed significant differences between the control and treated groups.

The low standard error values in the treated groups indicate precise data points, minimizing variability.The standard deviation values remained within an acceptable range, further validating the reliability of the results.

3.4 Implications and Future Directions

The findings from this study highlight the potential of *Myristica fragrans* extract as a natural therapeutic agent for enhancing fertility and improving hematological health. These results pave the way for further investigations into the specific bioactive compounds responsible for the observed effects.

IV.CONCLUSIONS

In summary, the aqueous extract of *Myristica fragrans* at 100 mg/kg body weight for 35 days significantly enhanced sperm count and RBC count in *Mus musculus*. These findings suggest potential applications of *M. fragrans* in managing male infertility and anemia. The study highlights the need for further research into its biochemical mechanisms and clinical relevance. The antioxidant, androgenic, and hematopoietic properties of *M. fragrans* make it a promising natural supplement for reproductive and hematological health.

The present study aimed to evaluate the positive effects of the aqueous extract of *Myristica fragrans* (mace) on sperm count and red blood cell (RBC) counts in *Mus musculus.* Using a dose of 100 mg/kg body weight for 35 days, the results demonstrated significant improvements in both reproductive and hematological parameters.

In conclusion, the aqueous extract of *Myristica fragrans* significantly enhances sperm count and RBC count in *Musmusculus*, suggesting its potential application in managing male infertility and anemia. These promising results warrant further clinical trials to validate the therapeutic efficacy of mace extract in humans. Further studies are warranted to elucidate the underlying mechanisms and explore their clinical relevance in human health.

REFERENCES

[1] Acharya, S. K. (2014).Jaiphal nutmeg – Myristica fragrans use, dose, and side effects. *Easy Ayurveda.*

[2] Acharya, S. K. (2024).The role of Myristica fragrans Houtt (Jaiphal, nutmeg) in reproductive health: Traditionaluses and scientific evidence. *International Journal of Research Publication and Reviews, 5(7), 2307-2313.*

[3] Dacie J V & Lewis S.M. (1975) Practical hematology, 435pp 5th ed. *Churchill libinstoneedinberg.*

[4] D'Costa, S., & Paramesh, R. (2009). Effects of Myristica fragrans oil on the reproductive system of male Wistar rats. *Pharmaceutical Biology, 47(7), 640-645.*

[5] Elfia, H. Y., & Susilo, S. (2023). An update on the pharmacology, phytochemistry, and toxicity of Myristica fragrans Houtt. as a source of treatment: A scoping review. *Journal of Applied Pharmaceutical Science, 13(10), 92-106.*

[6] Kumar, P., & Sharma, A. (2013). Sexual abnormalities in males and their herbal therapeutic aspects.*Pharmacologia, 4(4), 265-275.*

[7] Pal, M., Srivastava, M., Soni, D. K., Kumar, A., & Tewari, S. K. (2011). Composition and anti-microbial activity of essential oil of Myristica fragrans from Andaman Nicobar Island. *International Journal of Pharmacyand Life Sciences, 2(10), 1115–1117*

[8] Parle, M., & Dhingra, D. (2006). Myristica fragrans (nutmeg): A review. *Journal of Medicinal Food, 9(1), 1-13.*

[9] Pradeep, P. M., &Sreerama, Y. N. (2018). Impact of processing on the phenolic profiles and antioxidant activity of small millets: Evaluation of their milling fractions as sources of functional food ingredients. *Food Chemistry, 239, 940-948.*

[10] Prakash, D., & Gupta, C. (2012). The antioxidant phytochemicals of nutraceutical importance. *Open Nutraceuticals Journal, 5(1), 1-8.*

[11] Peter, K. V. (2001). Handbook of herbs and spices. *Woodhead Publishing.*

[12] Ravindran, P. N., &Kallupurackal, J. A. (2012). Nutmeg: Botany and horticulture. *In Horticultural Reviews (Vol. 39, pp. 1-39).*

[13] Sasidharan, I., & Menon, A. N. (2010). Comparative chemical composition and antimicrobial activity of fresh & dry ginger oils *(Zingiber officinale Roscoe). International Journal of Current Pharmaceutical Research, 2(4), 40-43.*

[14] Saxena, R., & Patil, P. (2012). Phytochemical studies on Myristica fragrance essential oil. *Biological Forum –an International Journal, 2, 62–64.*

[15] Shah, M. A., Mir, S. A., & Bosco, S. J. D. (2014). Plant extracts as natural antioxidants in meat and meat products. *Meat Science, 98(1), 21-33.*

[16] Sharma, V., & Singh, M. (2012). Attenuation of lead-induced nephrotoxicity by *Myristica fragrans* Houtt. (nutmeg)extract in Swiss albino mice. Journal of Environmental Pathology, *Toxicology and Oncology, 31(3), 193-201.*

[17] Souza D & Urban J. (2004) Effect of tamoxifen on spermatogenesis and tubular morphology in rats, *Asian Journal of andrology. 6: 223-226.*

[18] Srinivasan, K. (2005). Role of spices beyond food flavoring: Nutraceuticals with multiple health effects. *Food Reviews International, 21(2), 167-188.*

[19] Tajuddin, Ahmad, S., Latif, A., & Qasmi, I. A. (2003). Aphrodisiac activity of 50% ethanolic extracts of *Myristicafragrans*Houtt. (nutmeg) and *Syzygium aromaticum* (L.) Merr. & Perry. (clove) in male mice: A comparative study. *BMC Complementary and Alternative Medicine, 3(1), 6.*

[20] Tajuddin, Ahmad, S., Latif, A., & Qasmi, I. A. (2005). An experimental study of sexual function improving effect of *Myristica fragrans* Houtt. (nutmeg). *BMC Complementary and Alternative Medicine, 5(1), 16.*