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(RESEARCH ARTICLE)

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The effect of Moringa leaves on sperm cell maturation level in rat testis metabolic syndrome model

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Abstract

Metabolic syndrome is a combination of several metabolic diseases such as diabetes mellitus, cardiovascular disease and stroke. The ethanolic extract of *Moringa Oleifera* leaves showed an antioxidant effect in the form of a significant reduction in the production of intracellular ROS (Reactive Oxygen Species) in sperm. This study aims to determine the effect of the ethanolic extract of Moringa leaves (*Moringa Oleifera*, Lam.) on the level of sperm cell maturation in the testes of wistar rats (*Rattus norvegicus*) using the Johnson score. And the result, an increase in sperm maturation scores was obtained using the Johnson score. After being given the ethanolic extract of *Moringa Oleifera* (*Moringa Oleifera*, Lam). We can concluded that Giving ethanolic extract of Moringa leaves (*Moringa Oleifera*, Lam) to white rats (Rattus norvegicus) induced by metabolic syndrome was significant to the sperm maturation level of white rats, in the form of increasing sperm maturation scores using the Johnson score.

Keywords: Metabolic syndrome; Sperm maturation; Johson score; Moringa leaves

1. Introduction

Metabolic syndrome or MetS, is a complex series of metabolic diseases and triggers of various other chronic diseases such as stroke, cardiovascular disease and diabetes mellitus, (1)(8) Based on obesity, a global pandemic that has reached Indonesia, this metabolic syndrome has dramatically increased. Asian races are more likely to acquire metabolic syndrome than other races, especially those who are fat, according to various research that have been done. (2) The rapid socioeconomic development that affects modern society's lifestyle changes, such as sedentary behavior and the proliferation of fast food, is one of the factors that raises the prevalence of metabolic syndrome. (3). These days, the prevalence of this metabolic syndrome is worrisomely on the rise, necessitating immediate treatment and preventive actions. For patients with metabolic syndrome, extracts from the leaves of the *Moringa Oleifera* tree have shown promise in a number of earlier investigations (4)(7). Ingredients in moringa leaf extract include antioxidant and anti-diabetic properties (5)(6). According to research done by Moichela et al. in 2021, administering *Moringa Oleifera* leaf extract to sperm resulted in a considerable drop in the formation of intracellular ROS (Reactive Oxygen Species). The effect of *Moringa Oleifera* leaves on the degree of sperm cell maturation in wistar rats with induced metabolic syndrome has not yet been studied, yet.

2. Material and methods

This study is a *True Experimental control group design* study, 30 subjects of wistar rats (*Rattus norvegicus*) were divided into 5 groups, namely K1; control group without treatment, K2: rats induced metabolic syndrome, K3: rats were induced with metabolic syndrome and given ethanolic extract of Moringa leaves 150 mg/kg, K4: rats were induced with

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metabolic syndrome and given ethanolic extract of Moringa leaves 250 mg/kg, K5: rats were induced with metabolic syndrome and given ethanolic extract of Moringa leaves 350 mg/kg.

3. Results

3.1. Sperm Maturation

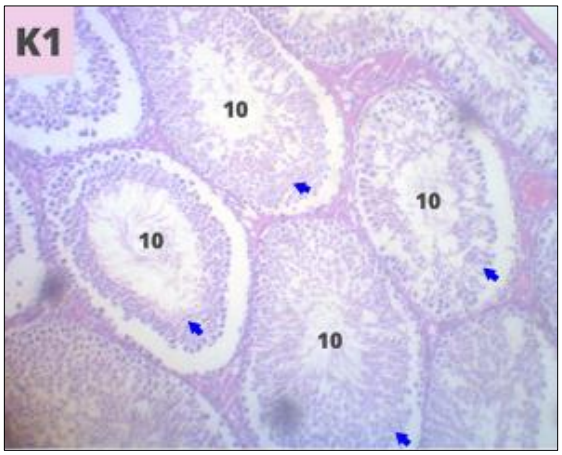

Figure 1 Describes the K1 rat histopathology

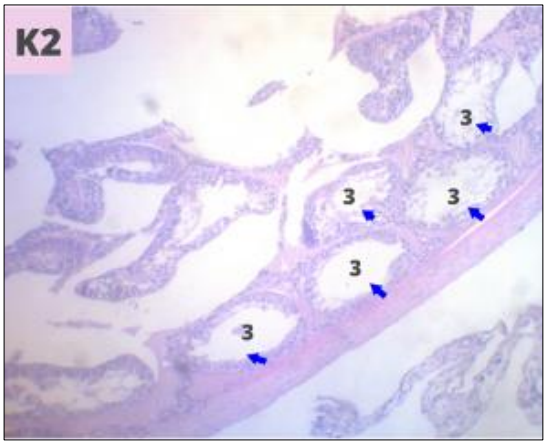

Figure 2 Describes the K2 rat histopathology

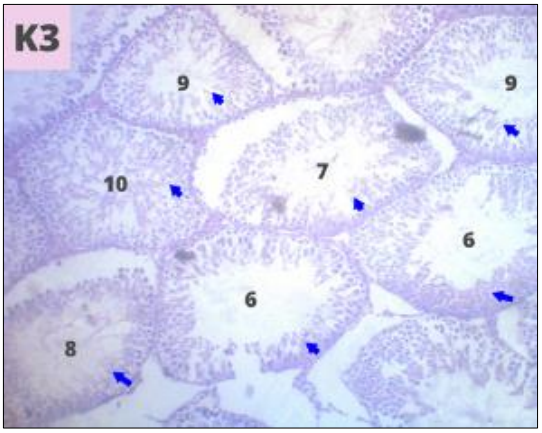

Figure 3 Describes the K3 rat histopathology

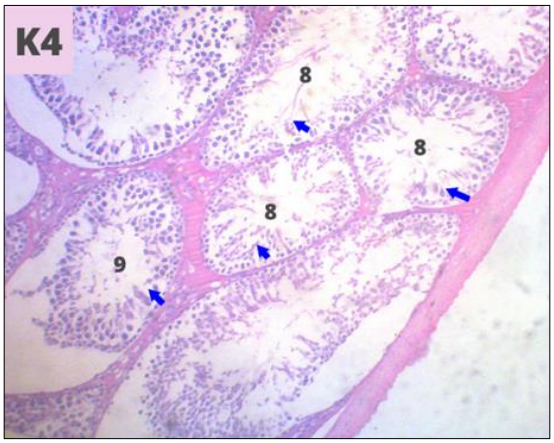

Figure 4 Describes the K4 rat histopathology

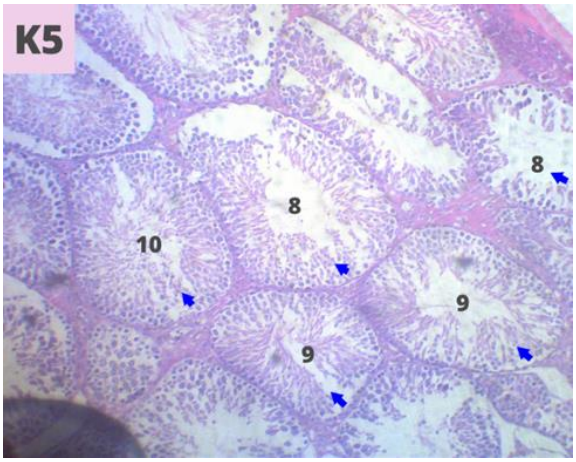

Figure 5 Describes the K5 rat histopathology

In comparison to the K2 group, which did not receive any Moringa leaf ethanolic extract, the 150 mg/KgBW (K3 group), 250 mg/kgBW (K4), and 350 mg/KgBW (K5 group) doses of the extract were able to speed up sperm maturation.

Table 1 Score Sperm Maturation

Group	**N**	**Mean ± Standard Deviation**
K1	6	9.60±0.17
K2	6	4.50±1.95
K3	6	7.90±0.85
K4	6	8.00±0.45
K5	6	8.60±0.10

Table 2 Jonhson Score

Score	Histoligical Criteria
10	Full spermatogenesis
9	Slightly impaired spermatogenesis, many late spermatids, disorganized ephitelium
8	Less than five spermatozoa per tubule, few late spermatids
7	No spermatozoa, no late spermatids, many early spermatids
6	No spermatozoa, no late spermatids, few early spermatids
5	No spermatozoa, no late spermatids, many spermatocytes
4	No spermatozoa, no late spermatids, few spermatocytes
3	Spermatogonia only
2	No germinal cells, Sertoli cells only
1	No seminiferous epithelium

4. Discussion

In the results of scoring the sperm maturation level in the testes of experimental animals, the results in group K1 were 9,60 ± 0.17, group K2 was 4,50 ± 1,95, group K3 was 7,90 ± 0.85, group K4 was 8,00 ± 0.45and group K5 was 8,60 ± 0.10. The level of sperm maturation in the K2 group decreased significantly in quality when compared to the K1 group (p = 0.000). Administration of ethanolic extract of Moringa leaves at a dose of 150 mg/KgBW (group K3), 250 mg/kgBW (group K4) and 350 mg/KgBW (group K5) can increase the level of sperm maturation when compared to group K2 which was not given ethanolic extract of Moringa leaves. The increase in the level of sperm maturation that occurred in the K3, K4 and K5 groups was close to normal as in the K1 group.

5. Conclusion

White rats (*Rattus norvegicus*) with metabolic syndrome considerably had their sperm maturation levels influenced by the injection of ethanolic extract of Moringa leaves (*Moringa Oleifera, Lam*), as measured by rising Johnson scores for sperm maturation.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

This study has no conflicts of interest.

Statement of ethical approval

The Research Ethics Commite at Dr. Moewardi Hospital Surakarta issued the ethical clearance approval letter, No, 664/V/HREC/2022.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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