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DESCRIPTION OF ETHICAL APPROVAL
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Protokol penelitian yang diusulkan oleh : Dr. Luh Putu Widiastini, S.Si.T., M.Kes
The Research Protocol Proposed By

Peneliti utama : Dr. Luh Putu Widiastini, S.Si.T., M.Kes

Nama institusi : STIKES Bina Usaha Bali
Name of the institution

Dengan judul : Pengaruh Pemberian Ekstrak Etanol Daun Kelor (*Moringa Oleivera*) Terhadap Sel Spermatogenik (Sel Spermatogonia, Spermatisit, Spermatisid) Serta Jumlah Sel Leydig Tikus Putih (*Rattus Norvegicus*) Galur Wistar Usia Tua

Title : *Effect of Ethanol Extract of Moringa Leaves (Moringa Oleivera) on Spermatogenic Cells (Spermatogonia Cells, Spermatoocytes, Spermatisids) and Leydig Cell Number of White Rats (Rattus Norvegicus) Wistar Strains Old Age*

Dinyatakan layak etik sesuai 7 (tujuh) standar WHO 2011, yaitu :

1. Nilai sosial, 2. Nilai ilmiah, 3. Pemerataan beban dan manfaat, 4. Risiko, 5. Rujukan/eksploitasi, 6. Kerahasiaan dan privacy, 7. Persetujuan setelah penjelasan, yang merujuk pada pedoman CIOMS 2016.

Hal ini seperti yang ditunjukkan oleh terpenuhinya indikator setiap standar

Declared to be ethically appropriate in accordance to 7 (seven) WHO 2011 Standards:

1. Social values, 2. Scientific values, 3. Equitable assessment and benefits, 4. Risks, 5. Persuasion/exploitation, 6. Confidentiality and privacy, and 7. Informed consent, referring to the 2016 CIOMS Guidelines.

This is as indicated by the fulfillment indicators of each standard.

Pernyataan Laik Etik ini berlaku selama kurun waktu tanggal 18 Maret 2022 sampai 18 Maret 2023

This declaration of ethics applies during the period March 18th 2022 until March 18th 2023

Badung, 18 Maret 2022

Ketua



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Antioxidant effect of ethanol extract of Moringa leaves (*Moringa oleifera*) on spermatogenesis in old wistar strain rats (*Rattus Norvegicus*)

ABSTRACT

Infertility is the failure of pregnancy after regular sexual intercourse for 6-12 months without the use of contraceptives. The causes of infertility in men are caused by damaged sperm production, for example, disturbances in the process of spermatogenesis, low spermatozoa concentrations, morphology and abnormal sperm motility. The purpose of this study was to determine the Antioxidant Effect of Ethanol Extract of Moringa Leaves (*Moringa oleifera*) on Spermatogenesis (Spermatogonia, Spermatocytes, and Spermatids) in Rats (*Rattus Norvegicus*) Old Wistar Strains. This study used elderly rats aged 18-19 months with a body weight of 200-250 g, healthy conditions and no physical disabilities a total of 36 was divided into 2 groups, namely the treatment group (Moringa leaf ethanol extract 50 mg / kgBW / 0.5 mL Carboxymethyl cellulose (CMC) 0.5% per day) and the control group (CMC 0.5% 0.5 mL every day) for 30 days. The results showed that there was a significant difference in the number of spermatogonia, spermatocytes, and spermatids between the group given Moringa leaf ethanol extract and the control group that was not given with a p-value of 0.000, so it can conclude that moringa leaf ethanol extract can have a significant influence on the number of Spermatogonia, Spermatocytes, and Spermatids in Rats (*Rattus Norvegicus*) Old Wistar Strain.

Keywords: Moringa Leaf, Ethanol Extract, spermatogenesis, White Rats, Old

ABSTRAK

Infertilitas adalah gagalnya suatu kehamilan setelah melakukan hubungan seksual secara teratur selama 6-12 bulan tanpa menggunakan kontrasepsi. Penyebab infertilitas pada pria disebabkan karena produksi sperma yang rusak misalnya, gangguan pada proses spermatogenesis, konsentrasi Spermatozoa rendah, morfologi serta motilitas sperma yang abnormal. Tujuan dari penelitian ini adalah untuk mengetahui efek antioksidan ekstrak etanol daun kelor (*Moringa oleifera*) terhadap Spermatogenesis (Spermatogonia, Spermatisit, dan Spermatid) pada Tikus (*Rattus Norvegicus*) Galur Wistar Tua. Penelitian ini menggunakan Tikus usia tua yang berusia 18-19 bulan dengan berat badan 200-250 g, kondisi sehat dan tidak cacat fisik sejumlah 36 dibagi menjadi 2 kelompok, yaitu kelompok perlakuan (ekstrak etanol daun kelor 50 mg/kgBW/0,5 mL Carboxymethyl cellulose (CMC) 0.5% per hari) dan kelompok kontrol (CMC 0.5% 0.5 mL per hari) selama 30 hari. Hasil penelitian menunjukkan terdapat perbedaan jumlah spermatogonia, Spermatisit, dan spermatid yang signifikan antara kelompok yang diberikan ekstrak etanol daun kelor dengan kelompok kontrol yang tidak diberikan dengan nilai p 0,000, sehingga dapat disimpulkan ekstrak

etanol daun kelor dapat memberikan pengaruh signifikan terhadap Jumlah Spermatogonia, Spermatosit, dan Spermatozoa pada Tikus (*Rattus Norvegicus*) Galur Wistar Tua.

Kata Kunci: Daun Kelor, Ekstrak Etanol, spermatogenesis, Tikus Putih, Tua

INTRODUCTION

Fertility disorders or infertility are a scourge for married couples who want the presence of children. The incidence of infertility can cause disharmony in the household, not infrequently this condition causes polygamy events, medical problems, and psychological, social, and economic problems to the point that it can result in divorce. Infertility is the failure of pregnancy after regular sexual intercourse for 6-12 months without the use of contraceptives (El Adlani et al. 2021; Zhu et al. 2022). About half of the causes of infertility in men are caused due to damaged sperm production, for example, disturbances in the process of spermatogenesis, low spermatozoa concentrations, morphology as well as abnormal sperm motility. According to (Dimitriadis et al. 2017), the causes of male infertility are grouped into 3 factors namely *Pre-testicular*, *Testicular*, and *Post-testicular*. *Pre-testicular* is conditions outside the *Testicle* and affect the process of *spermatogenesis*.

Spermatogenesis is a process of formation of *Spermatozoa* (male gamete cells) that occurs in seminiferous tubules (Baptissart et al. 2013). *Spermatogonium* in mice requires four cycles to finally form Spermatozoa, the time required is relatively consistent, which is 48 -52 days. The duration of the spermatogenic cycle (*Spermatogonia*, *Spermatocytes*, and *Spermatids*) in rats is 12 days. *Spermatogonium* in mice requires four cycles to produce *Spermatozoa* in the lumen of the tubules, from the lumen of the seminiferous tubules, *Spermatozoa* heading to the caput epididymis takes about eight days to cross the cauda epididymis. Temperature can affect the duration of *spermatogenesis* (Lara et al. 2016). *Spermatogenesis* in humans begins at the age of 14, then decreases along with the aging process.

The results of a study conducted by Luceri et al. , (2018) showed that an increase in systemic ROS during aging already occurs in mice of middle age of 15 months, resulting in systemic oxidative stress, as indicated by an increase in the amount of carbonyl protein in the plasma of 15-month-old animals.

According to (Henkel et al. 2018), Oxidative stress is closely related to various pathologies such as aging and male infertility. Oxidative stress is defined as an imbalance between reactive oxygen species (ROS) and antioxidant production (Luceri et al. 2018). Physiological levels of ROS are necessary to regulate sperm capacities processes, acrosome reactions, hyperactivation, and sperm-oocyte fusion (Lee et al. 2017; Fatima 2018). Supraphysiological levels of ROS can affect spermatogenesis, decrease the motility of spermatozoa, and damage mitochondria and DNA integrity (Lucio et al. 2013; Morielli and O'Flaherty 2015; Fatima 2018).

Antioxidants or reductions serve to prevent oxidation or neutralize compounds that have been oxidized, by donating hydrogen and or electrons (Henkel et al. 2018; Martin-Hidalgo et al. 2019). The body

has several antioxidant mechanisms that can protect itself from cell damage caused by free radicals. The antioxidant enzymes glutathione peroxidase, catalase and superoxide dismutase (SOD) are enzymes that have the activity of counteracting free radicals. To be able to work perfectly requires cofactor micronutrients such as selenium, iron, copper, zinc, and manganese. All these micronutrients are contained in Moringa leaves (Krisnadi 2015; Ighodaro and Akinloye 2018)

Moringa contains 46 powerful antioxidants, this compound can protect the body against the adverse effects of free radicals, which consists of vitamin A, vitamin C, vitamin E, vitamin K, vitamin B (Choline), vitamin B1 (thiamin), vitamin B2 (riboflavin), vitamin B3 (niacin), vitamin B6, alanine, beta-carotene, alpha-carotene, arginine, beta-cystoterol, caffeoylquinic acid, campesterol, carotenoids, chlorophyll, chromium, delta-5-avenasterol, Delta-7-Avenasterol, glutathione, histidine, indol acetic acid, indoleacetonitrile, kaempferol, leucine, lutein, methionine, myristic acid, palmitic acid, prolamine, proline, quercetin, rutin, selenium, threonine, tryptophan, xanthine, xanthophyll, zeatin, zeaxanthin, zinc (Krisnadi 2015).

The results of the analysis of Moringa leaf content in the South Denpasar area of Bali have the antioxidant capacity, including the content of Phenolics, Flavonoids, Tannins, Ascorbic acid, Alkaloids, and Saponins (Widiastini, Karuniadi and Tangkas, 2021). Based on this background, the purpose of this study was to determine the effect of moringa leaf ethanol extract (*moringa oleifera*) against spermatogenic cells (spermatogonia cells, spermatocytes, spermatid) white rats (*rattus norvegicus*) old age wistar strains.

MATERIALS AND METHODS

Place and time of research

This research was carried out in January-March 2021 at the Integrated Biomedical Laboratory, Faculty of Medicine, Udayana University.

Material

Male rats (*Hundred Norvegicus*) strain *Wistar* body weight 200-250 g aged 18-19 months, ethanol extract of Moringa leaves 50 mg/kgBW per day for 30 days, CMC 0.5%, ketamine: xylazine, 1 set of surgical tools, surgical board, 0.9% NaCl solution, 1% Eosin dye and 10% Nigrosin, pipette drops, petri dish, glass object, light microscope (Olympus brand)

Method

This study used an experimental research design, namely a randomized post-test only control group design. The sample in this study was Rat (*Rattus Norvegicus*) Strain *Wistar* male old age according to inclusion criteria including weight 200-250 g, rat age 18-19 months. While the exclusion criterion is that the mouse appears to be sick, and does not move actively. Samples that entered the drop-out criteria were mice that died during the study and did not get a weight loss of more than 10% after the acclimatization period in the laboratory. The sample size in this study was 36 rats which were divided into two groups, namely 18 for the treatment group and 18 for the control group. To determine the sample, the researcher used the *Random Sampling* technique.

Production Moringa Leaf Ethanol Extract

Moringa leaf extract is made by maceration of 50 g of dried Moringa leaves, crushed using a blender, 96% ethanol solvent is added, put in a container, closed, and left for two days protected from sunlight. This mixture is filtered so that it is obtained maserate. The pulp is macerated with 96% ethanol using the same procedure. Maceration is carried out until a clear maserate is obtained. Maserate was evaporated using a rotary vacuum evaporator at a temperature of 40 °C (Cahyani and Sukadana 2017; Putra et al. 2017; Wasonowati et al. 2019; Widiastini et al. 2021).

Research procedure

This research started from weighing the body weight of all experimental animals. The dose of Moringa leaf ethanol extract was given to the treatment group as much as 50 mg/kgBW dissolved with 0.5% CMC as much as 0.5 mL per day. The control group was given a CMC of 0.5% as much as 0.5 mL per day. The giving is done through sonde, at 08.00-09.00 WITA and given for 30 days.

After passing the treatment period, namely on the 30th day, rats (*R. Norvegicus*) Wistar strains of old age were carried out *Euthanasia*, rats were terminated by anesthesia first using *ketamine: xylazine* dose 100 mg/kg, 10 mg / kg (ratio 10: 1) *intra-muscularly* (IM), then *euthanasia* with the *cervical dislocation* method. The testicles are separated from the *cauda epididymis* then put into a petri dish containing 5 mL NaCl 0.9%, the *cauda epididymis* is cut as smoothly as possible in a petri dish and stirred until homogeneous. The body of the mouse was buried.

Spermatogenic Cell Examination: Spermatogonia cells, Spermatoocytes, Spermatis

The manufacture of histological preparations begins with the fixation of the *Testicular* organs in a 10% formalin buffer solution for 24 hours and continued Bouin solution for 3 hours. Next the *Testicles* are washed several times with a 70% alcohol solution, the dehydration process is carried out with an alcohol solution of stratified concentration, and to purify the preparation is introduced into the solution of toluene for 24 hours. Infiltration of *paraffin* into the tissues is carried out by soaking the *Testicles* using a mixture of toluene and paraffin solutions for 30 minutes, as well as the embedding stage for planting the *Testicles* into solid paraffins. Paraffin blocks containing the *Testicles* are slashed using microtoms with a thickness of 3-5 µm. The resulting slice is pasted on the glass of the object that has been smeared with Mayers albumin and left for 24 hours to be strong enough. Ended staining of histological preparations using haematoxylin-eosin reagents, closed, and glued together with permount. Quantitative data in the form of *spermatogonium* A cell count, *pakhiten* primary *spermatoocyte* cells, *spermatisd* cells from both sample groups. Observations using an Olympus® light microscope and an OptiLab® camera with a magnification of 40x10. The observation technique is carried out by sweeping the *histological preparation* starting from the upper left-left corner of the preparation, then moving spirally towards the right-down to get the five best viewing fields on the right and left testicles.

The data analysis carried out is a descriptive analysis, namely by displaying the frequency and average distribution of *Spermatogenic Cells: Spermatogonia, Spermatoocyte, and Spermatoid* cells. Data normality analysis was carried out using the *Shapiro Wilk* test, the data were distributed normally if the $p > 0.05$ value after obtaining data before and after treatment in both the treatment and control groups. After obtaining the results of the data normality test, a comparative analysis was carried out. If the data are distributed normally, the analysis test used is an *independent sample t-test* at a meaningfulness level of $\alpha = 0.05$ to determine the difference between the treatment and control groups. Data analysis using a 95% confidence level (95% CI/*Confidence Interval* is one of the other parameters to measure how accurately a *sample's Mean* represents (includes) the actual Population Mean value) or is expressed when $p < 0.05$. Meanwhile, if the data is not distributed normally, the analysis test used is the *Mann Whitney* test, to determine the differences between the treatment and control groups, analysis of the data using a 95% confidence level or declared different when $p < 0.05$.

RESULTS AND DISCUSSION

RESULT

Table 1. Descriptive analysis of body weight of rats (*Rattus Norvegicus*) Strain Wistar male in the treatment and control groups

Group	Minimum	Maximum	Mean
Treatment and control	202	250	39.83 ± 4,17

The average body weight of the mice used was 229.35 g ± 11.4%, with the minimum 202 g and maximum values 250 g. Randomization was carried out on all mice using the simple random allocation method.

Table 2. Number of Spermatogonia in Rats (*Rattus Norvegicus*) Male Wistar Strain After Giving Moringa Leaf Ethanol Extract

Group	Mean	95% CI	Minimum	Maximum	Normality Test	Independent Sample T Test
Treatment	39.83 ± 4,17	37.76 – 41.91	31	48	0,669	0,000
Control	25.72 ± 5.33	23.07 – 28.37	19	35	0,096	

Description: $p < 0.05$, there is a significant effect using the independent sample t test

From the table above, it can be seen that in the treat has the largest average number (mean) which is 39.83, 95% CI 37.76 – 41.91, the largest minimum number is 31, the highest maximum number is 48. Data on spermatogonia count in both the treatment and control groups were normally distributed with a p value of 0.669 for the treatment group and 0.096 for the control group. Because the data were distributed normally, an independent t-test analysis was carried out and a p value of 0.000 was obtained (p value < 0.05), which means that there is a significant difference in spermatogonia count between the group given Moringa leaf ethanol extract and the control group that is not given, so it can be said that Moringa leaf ethanol extract can have a significant influence on the number of spermatogonia.

Table 3. Spermatoocyte Count in Rats (*Rattus Norvegicus*) Male Wistar Strain After Being Given Moringa Leaf Ethanol Extract

Group	Mean ± SD	95% CI	Minimum	Maximum	Normality Test	Mann Whitney test
Treatment	61.39 ± 4.47	59.16-63.61	54	69	0,612	0,000
Control	49.33 ± 8.26	45.22-53.44	38	62	0,032	

Description: $p < 0.05$, there is a significant effect using the Mann Whitney test

From the table above, it can be seen that in the group it is necessary to have a good Spermatoocyte with the largest average (mean) of 61,39. 95% CI 59,16-63,61, the largest minimum number is 54, the highest maximum number is 69. Spermatoocyte count data in both the treatment and control groups were not normally distributed with a p value of 0.612 for the treatment group and 0.032 for the control group. Because the data did not distribute normally, the Mann Whitney test analysis was carried out and the results of the p value of 0.000 (p value < 0.05), which means that there is a significant difference in sperm morphology between the group given Moringa leaf ethanol extract and the control group that is not given, so it can be said that Moringa leaf extract can have a significant influence on spermatoocyte count.

Table 4. Spermatid Count in Rats (*Rattus Norvegicus*) Male Wistar Strain After Being Given Moringa Leaf Ethanol Extract

Group	Mean ± SD	95% CI	Minimum	Maximum	Normality Test	Independent sample T Test
Treatment	89.94 ± 5.84	87.04-92.85	79	99	0,789	0,000
Control	68.89 ± 7.20	65.31-72.47	56	83	0,640	

Description: $p < 0.05$, there is a significant effect using the independent sample t test

From the table above, it can be seen that the required group has a good Spermatid Count with the largest average (mean) of 89.94. 95% CI 87.04-92.85, the largest minimum number is 79, the highest maximum number is 99. Data on the number of spermatids in both the treatment and control groups were normally distributed with a p value of 0.789 for the treatment group and 0.640 for the control group. Because the data were distributed normally, an Independent sample T Test analysis was carried out and a p value of 0.000 was obtained (p value < 0.05), which means that there is a significant difference in spermatid amount between the group given Moringa leaf ethanol extract and the control group that is not given, so it can be said that Moringa leaf extract can have a significant influence on the Number of Spermatids

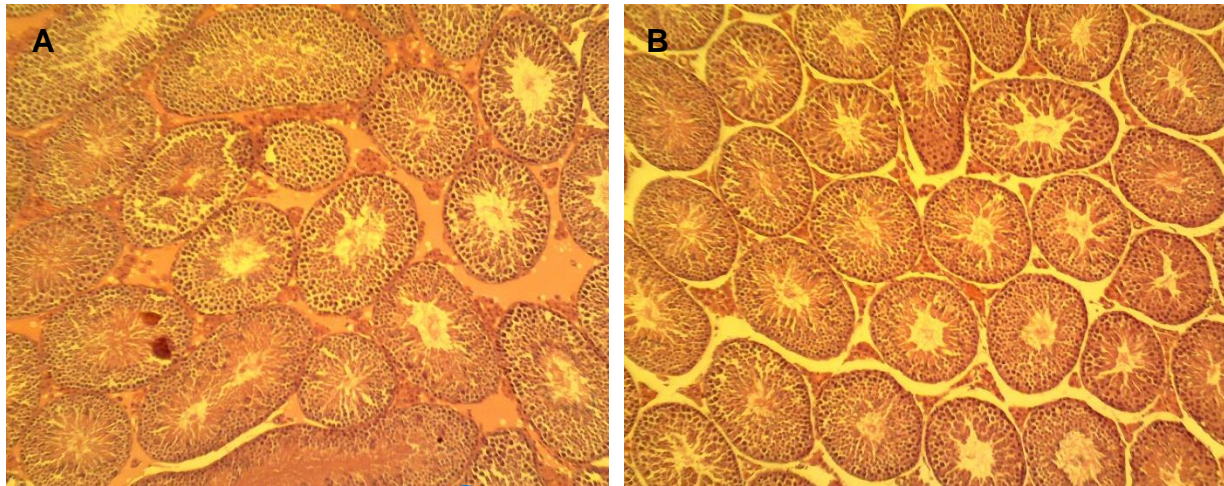


Figure 1. A. Picture of the testes in the control group. B. Picture of the testes in the treatment group

Figure 1 shows that the seminiferous tubules in the treatment group are more normal in shape than in the control group, which are mostly oval in shape.

Spermatogenesis occurs in the seminiferous tubules in the testes of mice consisting of three main phases, including mitosis spermatogonia, meiosis spermatocytes, and spermiogenesis in which spherical spermatids turn into elongated spermatozoa. The seminiferous tubules consist of three main cell types, namely peritubular myoid cells, Sertoli cells, and male germ cells. The testicular stroma is the connective tissue between the seminiferous tubules, including Leydig cells (Zhou et al. 2019). Aging is characterized by a progressive decrease in physiological integrity that provokes impaired functioning, caused by free radicals as a result of oxidative stress plus genetic and environmental modifications. Interventions that limit or inhibit free radical reactions will reduce the rate of change due to aging, so it is expected to reduce the rate of aging and pathogenesis of the disease (Balin and Allen 2018). Spermatogenesis is a lifelong process that also occurs in elderly men; However, the productive capacity of spermatogenic tissue seems to decrease with age. The reproductive capacity of males decreases with age. Testicular morphology is one of the effects of aging on the male reproductive system. Age changes affect testicular changes (Gunes et al. 2016).

In this study, it was shown that the number of spermatogonia, spermatocytes, spermatozoa in the group given moringa leaf ethanol extract as much as 50 mg / kg BB was higher than in the control group, with a p value of 0.000 (p value < 0.05), which means that moringa leaf ethanol extract can increase the number of spermatogonia, spermatocytes, spermatozoa.

Moringa is known to contain more than 90 types of nutrients in the form of essential vitamins, minerals, amino acids, anti-aging, and anti-inflammatory. Moringa contains 539 compounds known in traditional African and Indian medicine and have been used in traditional medicine to prevent more than 300 diseases (Toripah et al. 2014).

The results of the analysis of Moringa leaf content in the South Denpasar area of Bali have antioxidant capacity, including the content of Phenolics, Flavonoids, Tannins, Ascorbic acid, Alkaloids and Saponins (Widiastini et al. 2021). Antioxidants contained in Moringa leaves work to neutralize free radicals so as to prevent oxidative damage to most biomolecules and produce protection against oxidative damage significantly (Ceci et al. 2022; Ezz El-Din Ibrahim et al. 2022)

Flavonoid content in Moringa leaves can affect the process of spermatogenesis which is indicated by changes in the diameter of the seminiferous tubules followed by the thickness of the tubule epithelium. Flavonoids have the ability as antioxidants that can inhibit OS (Oxidative Stress), fight the dangers of free radicals and improve the process of spermatogenesis. The influence of Flavonoids can also improve the regeneration process of cells, by substructing free radicals, providing a competitive substrate for unsaturated lipids in membranes and or accelerating the repair mechanism of damaged cell (Dasgupta and Klein 2014).

Ascorbic acid or Vitamin C contained in Moringa leaves is one of the water-soluble vitamins that acts as a key cofactor in various hydroxylation and amidase processes (Wibawa et al. 2020). Vitamin C plays a role in chemical reactions in the body as an electron carrier. The mechanism of action of vitamin C in counteracting free radicals is by donating one electron, so that it becomes a semidehydro of ascorbic acid or ascorbic radical. This radical is more stable and can interact with other free radicals so that it becomes a non-reactive free radical called scavenging or squenching free radical (Padayatty and Levine 2016). The results of the study (Zhang et al. 2022), vitamin C provides a protective effect on male reproduction such as reducing testicular damage, sperm abnormalities and malondialdehyde. Based on the results of a literature study conducted by (Widiastini et al. 2022), it was found that Moringa /moringa has a positive effect on sexual behavior, especially increased libido. In addition, it has a positive effect on spermatogenesis, the quality of spermatozoa mainly increases sperm motility, sperm count/volume, germ cell count, renews the activity of endogenous antioxidant enzymes, reduces ROS levels, and provides protection for testicular damage and Leydig cells.

CONCLUSION

This study showed the results that the treatment group given Moringa Leaf Ethanol extract (*Moringa oleifera*) as much as 50 mg / kg BB for 30 days produced a higher number of spermatogonia, spermatocytes, and spermatids in White Rats (*Rattus Norvegicus*) Old Age Wistar Strain compared to the control group that was only given CMC 0.5%, 0.5 mL, with a p value of 0.000 (p value < 0.05), which means that there is a significant difference in the number of Spermatogonia, Spermatocytes, and Spermatides between the group given moringa leaf ethanol extract and the control group that is not given, so it can be said that moringa leaf ethanol extract can have a significant influence on the amount of Spermatogonia, Spermatocytes, and Spermatids.

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Bibliography

- Balin AK, Allen RG (2018) Oxidative stress and aging. *Encycl Endocr Dis* 2014:659–663 .
<https://doi.org/10.1016/B978-0-12-801238-3.03872-1>
- Baptissart M, Vega A, Martinot E, Volle DH (2013) Male fertility: Is spermiogenesis the critical step for answering biomedical issues? *Spermatogenesis* 3:e24114 . <https://doi.org/10.4161/spmg.24114>
- Cahyani SL, Sukadana IM (2017) Skrining Fitokimia dan Aktivitas Penangkapan Radikal Bebas DPPH Ekstrak Etanol Daun Kelor (*Moringa oleifera*) di Ende. *J poltekkes kupang* 410–416
- Ceci R, Maldini M, Olson ME, Crognale D, Horner K, Dimauro I, Sabatini S, Duranti G (2022) *Moringa oleifera* Leaf Extract Protects C2C12 Myotubes against H₂O₂-Induced Oxidative Stress. *Antioxidants* 11:1435 . <https://doi.org/10.3390/antiox11081435>
- Dasgupta A, Klein K (2014) *Antioxidants in Food, Vitamins and Supplements*. Elsevier Inc., United States of America. <https://doi.org/10.1016/B978-0-12-405872-9.00002-1>
- Dimitriadis F, Adonakis G, Kaponis A, Mamoulakis C, Takenaka A, Sofikitis N (2017) Pre-Testicular, Testicular, and Post- Testicular Causes of Male Infertility, I. Springer International Publishing AG 2017, Greece. https://doi.org/10.1007/978-3-319-29456-8_33-2
- El Adlani S, Benksim A, Kaddour YA Ben, Soummani A, Cherkaoui M (2021) Infertility: knowledge and attitudes of Moroccan young people—gender approach. *Middle East Fertil Soc J* 26:4–8 .
<https://doi.org/10.1186/s43043-021-00060-9>
- Ezz El-Din Ibrahim M, Alqurashi RM, Alfaraj FY (2022) Antioxidant Activity of *Moringa oleifera* and Olive *Olea europaea* L. Leaf Powders and Extracts on Quality and Oxidation Stability of Chicken Burgers. *Antioxidants* 11: . <https://doi.org/10.3390/antiox11030496>
- Fatima S (2018) Role of Reactive Oxygen Species in Male Reproduction. *Nov Prospect Oxidative Nitrosative Stress*. <https://doi.org/10.5772/intechopen.74763>
- Gunes S, Hekim GNT, Arslan MA, Asci R (2016) Effects of aging on the male reproductive system. *J Assist Reprod Genet* 33:441–454 . <https://doi.org/10.1007/s10815-016-0663-y>
- Henkel R, Sandhu IS, Agarwal A (2018) The excessive use of antioxidant therapy: A possible cause of male infertility? *Andrologia* 51:1–8 . <https://doi.org/10.1111/and.13162>
- Ighodaro OM, Akinloye OA (2018) First line defence antioxidants-superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPX): Their fundamental role in the entire antioxidant defence grid. *Alexandria J Med* 54:287–293 . <https://doi.org/10.1016/j.ajme.2017.09.001>
- Krisnadi AD (2015) Kelor Super Nutrisi. Pusat Informasi dan Pengembangan Tanaman Kelor Indonesia,

Blora

- Lara NLM, Santos IC, Costa GMJ, Cordeiro-Junior DA, Almeida ACG, Madureira AP, Zanini MS, França LR (2016) Duration of spermatogenesis and daily sperm production in the rodent *Proechimys guyannensis*. *Zygote* 24:783–793 . <https://doi.org/10.1017/S0967199416000137>
- Lee D, Moawad AR, Morielli T, Fernandez MC, O'Flaherty C (2017) Peroxiredoxins prevent oxidative stress during human sperm capacitation. *Mol Hum Reprod* 23:106–115 . <https://doi.org/10.1093/molehr/gaw081>
- Luceri C, Bigagli E, Femia A Pietro, Caderni G, Giovannelli L, Lodovici M (2018) Aging related changes in circulating reactive oxygen species (ROS) and protein carbonyls are indicative of liver oxidative injury. *Toxicol Reports* 5:141–145 . <https://doi.org/10.1016/j.toxrep.2017.12.017>
- Lucio RA, Tlachi-López JL, Eguibar JR, Ágmo A (2013) Sperm count and sperm motility decrease in old rats. *Physiol Behav* 110–111:73–79 . <https://doi.org/10.1016/j.physbeh.2012.12.015>
- Martin-Hidalgo D, Bragado MJ, Batista AR, Oliveira PF, Alves MG (2019) Antioxidants and male fertility: From molecular studies to clinical evidence. *MDPI* 8: . <https://doi.org/10.3390/antiox8040089>
- Morielli T, O'Flaherty C (2015) Oxidative stress impairs function and increases redox protein modifications in human spermatozoa. *Reproduction* 149:113–123 . <https://doi.org/10.1530/REP-14-0240>
- Padayatty SJ, Levine M (2016) Vitamin C: the known and the unknown and Goldilocks. *Oral Dis* 22:463–493 . <https://doi.org/10.1111/odi.12446>
- Putra DP, Dharmayudha O, Sudimartini (2017) Identifikasi Senyawa Kimia Ekstrak Etanol Daun Kelor (*Moringa oleifera* L) di Bali. *Indones Med Veterinus* 5:464–473
- Toripah SS, Abidjulu J, Frenly Wehantouw (2014) Aktivitas Antioksidan dan Kandungan Total Fenolik Ekstrak Daun Kelor (*Moringa oleifera* Lam). 3:37–43
- Wasonowati C, Sulistyarningsih E, Indradewa D, Kurniasih B (2019) Analisis Fitokimia Ekstrak Daun Kelor (*Moringa oleifera*Lamk) di Madura. *Pros SEMNASDAL (Seminar Nas Sumber daya Lokal* 2:421–427
- Wibawa JC, Wati LH, Arifin MZ (2020) Mekanisme Vitamin C Menurunkan Stres Oksidatif Setelah Aktivitas Fisik. *JOSSAE J Sport Sci Educ* 5:57 . <https://doi.org/10.26740/jossae.v5n1.p57-63>
- Widiastini LP, Karuniadi IGAM, Karmaya INM, Widhiantara IG (2022) The Potential of A Balinese Traditional Medicine Kelor Leaves (*Moringa oleifera*) For Male Infertility Treatment : A Mini Review. *Indian J Forensic Med Toxicol* 16:734–742 . <https://doi.org/10.37506/ijfmt.v16i1.17579>
- Widiastini LP, Karuniadi IGAM, Tangkas M (2021) Senyawa Antioksidan Ekstrak Etanol Daun Kelor (*Moringa oleifera*) di Denpasar Selatan Bali. *Media Kesehat Politek Kesehat Makassar XVI*:135–139 . <https://doi.org/https://doi.org/10.32382/medkes.v16i1.2038>
- Zhou R, Wu J, Liu B, Jiang Y, Chen W, Li J, He Q, He Z (2019) The roles and mechanisms of Leydig cells and myoid cells in regulating spermatogenesis. *Cell Mol Life Sci* 76:2681–2695 . <https://doi.org/10.1007/s00018-019-03101-9>
- Zhu C, Yan L, He C, Wang Y, Wu J, Chen L, Zhang J (2022) Incidence and risk factors of infertility among

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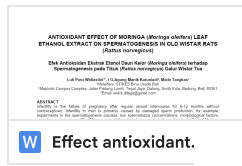
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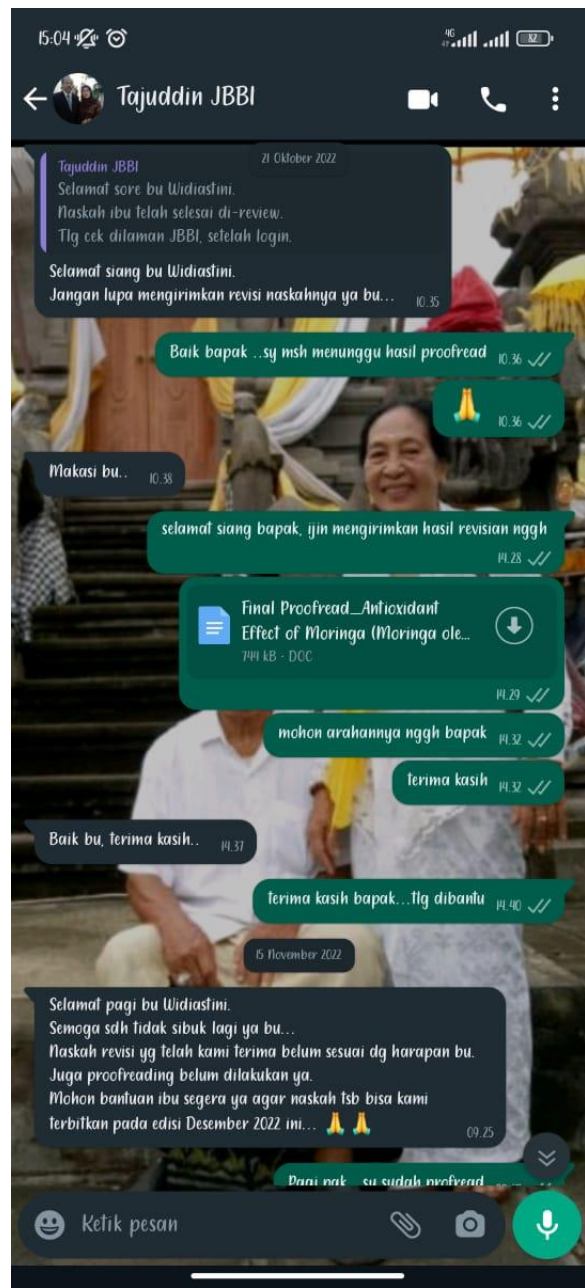
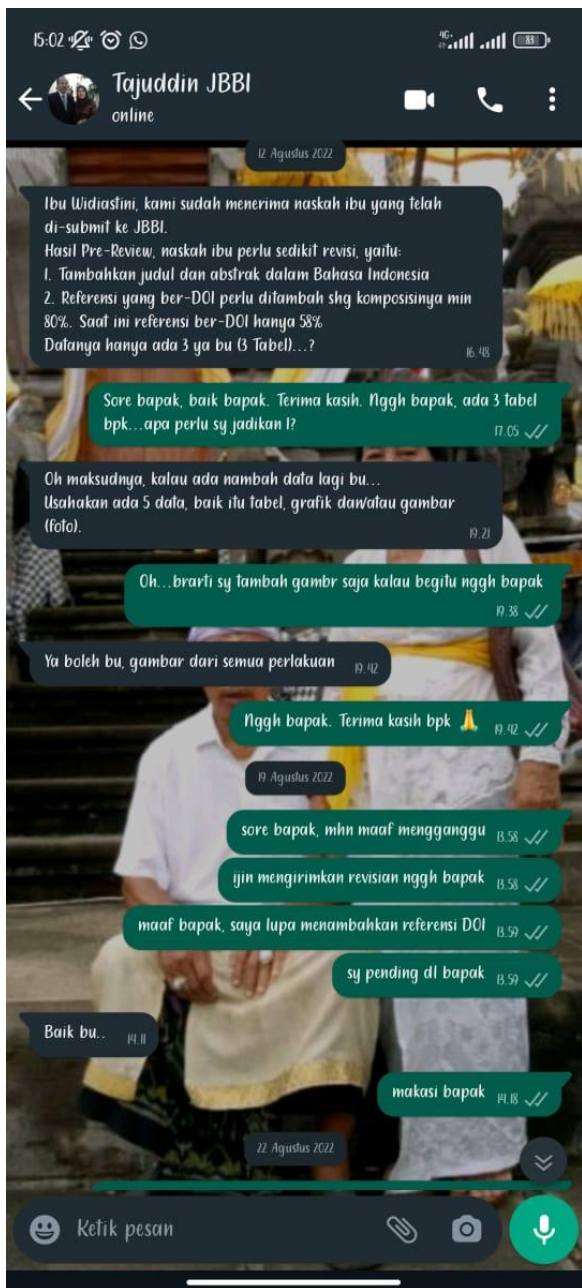
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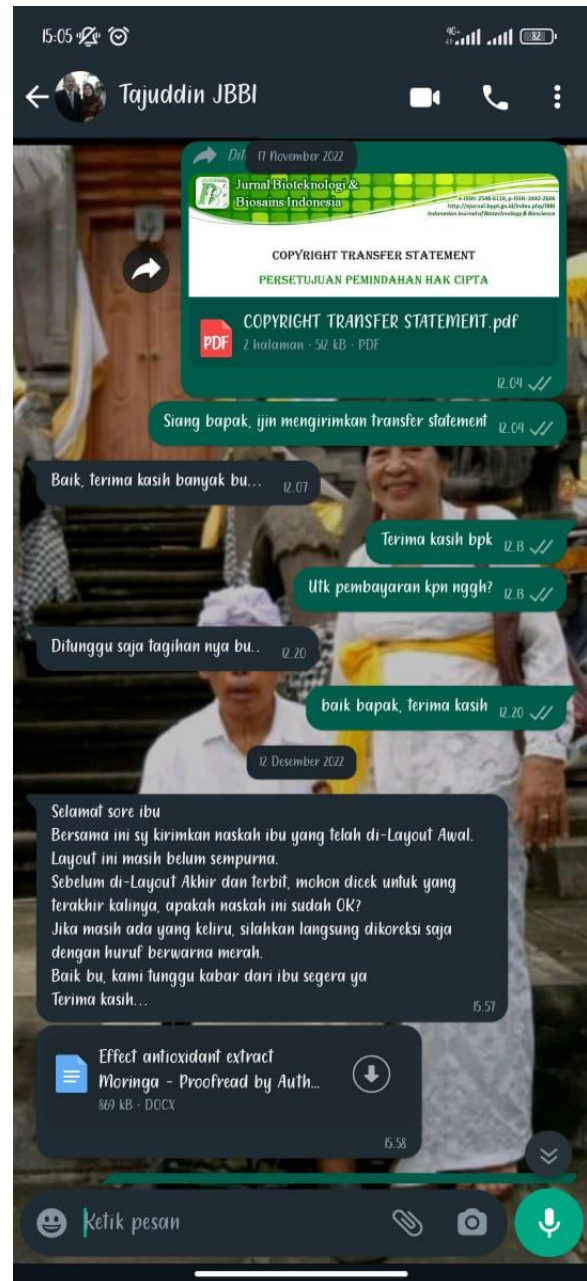
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