THESIS

THE EFFECT OF OKRA *(Abelmoschus esculentus)* PODS ETHANOL EXTRACT ON MICE *(Mus musculus)* PREANTRAL AND ANTRAL FOLLICLE NUMBERS EXPOSED BY CARBON BLACK

By:

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FACULTY OF VETERINARY MEDICINE
UNIVERSITAS AIRLANGGA
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Thesis

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Approval of
Supervising Committee,

(Prof. Dr. Widjiati, drh., M.Si)	(Dr. Yeni Dhamayanti drh., M.Kes.,)
Supervisor	Co-Supervisor

DECLARATION

I hereby declare that in the thesis entitled:

The Effect of Okra (*Abelmoschus esculentus*) Pods Ethanol Extract on Mice (*Mus musculus*) Preantral and Antral Follicle Numbers Exposed by Carbon Black

There are no works that have ever been submitted to obtain a degree of scholarship in a college and to the best of my knowledge, no work or opinion has ever been written or published by anyone else, except those written in this manuscript and mentioned in the references.

Surabaya, 16th August 2022

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Surabaya, September 29th 2022

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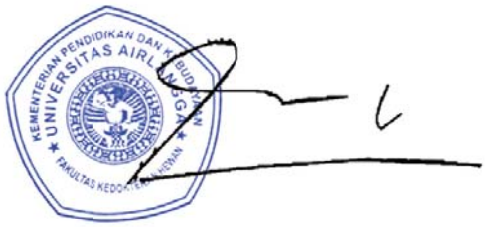
Dean,



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SUMMARY

One of the health problems in the urban area is air pollution. Air pollution comes from industrial waste products, vehicles, housing, and others. One component of air pollutants is particulate matter in the form of carbon. These carbon particles can enter and settle in the lungs which causes increased secretion of inflammatory mediators such as the production of free radicals in the body.

Prolonged exposure is known to have adverse effects on body health, one of which is reproductive health. This negative effect stems from an imbalance between the body's antioxidant production against the increase in free radicals, which results in oxidative stress. Oxidative stress that occurs continuously is known to cause disturbances in the balance of reproductive hormones, the process of body follicle formation (folliculogenesis), and infertility.

Okra (*Abelmoschus esculentus*) is known to have various benefits, including as an antioxidant. Quercetin is one of the flavonoids contained in okra fruit and has anti-inflammatory and antioxidant effects. Quercetin inhibits the formation of free radicals in the body by binding directly or by inducing the formation of antioxidant enzymes in the body. Quercetin contained in okra pods is also known to have similar effect with estrogen and was known to have beneficial effect.

This study used 25 female mice (Mus musculus) which were divided into 5 treatment groups. Each group consisted of five mice. The negative control group (C-) was given Na-CMC 0.5% solution orally without exposure to carbon black. The positive control group (C+) was given Na-CMC 0.5% solution orally with carbon black exposure of 1064 mg/m^3 according to Juliprihanto (2012) for six hours. Treatment group 1 (T1), treatment group 2 (T2), and treatment group 3 (T3) were each given okra fruit extract at 4 mg/20gBW, 8 mg/20gBW, and 16

mg/20gBW orally, then exposed using carbon black dose of 1064 mg/m^3 for six hours.

The results showed the calculation of pre-antral follicles and antral follicles. One-way ANOVA analysis of the number of preantral and antral follicles showed a significant difference ($p<0.05$). Duncan's analysis showed significantly different results ($p<0.05$) between groups C- ($18.20^{c} \pm 2.28$ and $11.20^{d} \pm 0.83$), C+ ($8.60^{a} \pm 1.14$ and $5.00^{a} \pm 1.00$), T1 ($12.60^{b} \pm 2.70$ and $8.00^{b} \pm 1.22$), and T2 ($15.20^{bc} \pm 4.76$ and $8.80^{bc} \pm 2.04$) on the number of preantral and antral follicles, but showed no significant difference ($p>0.05$) between groups T3 ($17.80^{c} \pm 2.77$ and $9.80^{cd} \pm 0.83$) and C- ($18.20^{c} \pm 2.28$ and $11.20^{d} \pm 0.83$). The best preventive dose in maintaining the number of preantral and antral follicles as a result of exposure to carbon black was a dose of 16 mg/20gBW in the T3 group which showed a not too significant difference from the negative control group.

This study concludes that giving okra (*Abelmoschus esculentus*) fruit extract can maintain the number of preantral and antral follicles in the ovaries of mice (*Mus musculus*) exposed to carbon black.

THE EFFECT OF OKRA *(Abelmoschus esculentus)* PODS ETHANOL EXTRACT ON MICE *(Mus musculus)* PREANTRAL AND ANTRAL FOLLICLE NUMBERS EXPOSED BY CARBON BLACK

Mohamad Raviansyah Jawindra

ABSTRACT

This study aims to determine the preventive effect of okra (*Abelmoschus esculentus)* pods ethanol extract on the mice (*Mus* musculus) ovarian preantral and antral follicle numbers exposed to carbon black. This study used 25 mice which were divided into 5 groups. The negative control group (C-) and the positive control group (C+) were given Na-CMC 0.5% solution orally, while the treatments groups T1, T2, and T3 were pretreated with okra pods ethanol extract orally with a dose of 4 mg/20gBW, 8mg/20gBW and 16 mg/20gBW. Later the C+, T1, T2, and T3 were exposed to 1064 mg/m^3 Carbon Black for 6 hours/day for 30 days. The results of the study showed that there was a significant difference between control group C- ($18.20^{c}\pm2.28$; $11.20^{d}\pm0.83$), C+ ($8.60^{a}\pm1.14$; $5.00^{a}\pm1.00$) and treatment group T1 ($12.60^{b}\pm2.70$; $8.00^{b}\pm1.22$), T2 ($15.20^{bc}\pm4.76$; $8.80^{bc}\pm2.04$) and T3 ($17.80^{c}\pm2.77$; $9.80^{cd}\pm0.83$) ($p<0.05$) in ovarian preantral and antral follicle numbers. The result showed no significant difference ($p>0.05$) between the T3 and C- groups on the preantral and antral follicle numbers. It can be concluded that okra pods (*Abelmoschus esculentus*) ethanol extract can maintain the preantral and antral follicle numbers in mice exposed by carbon black.

Keywords: Okra pods (*Abelmoschus esculentus*) ethanol extract, Carbon black, Ovarian preantral follicles, Ovarian antral follicle

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science and may give a contribution to the veterinary medicine field and all people in need.

Surabaya, August 16th 2022

Author

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ABBREVIATION AND SYMBOLS

Apaf-1	= Apoptotic Protease Activating Factor-1
ARE	= Antioxidant Response Element
μm	= Micrometer
AMP	= Adenosine Monophospat
BW	= Body Weight
CAT	= Catalase
COX	= Cyclooxygenase
CRP	= C-Reactive Protein
DEP	= Diesel Exhaust Particle
DNA	= Deoxiribo Nuclear Acid
FSH	= Follicle Stimulating Hormone
GSCs	= Germline Stem Cells
GPx	= Glutathione Peroxidase
GSH	= Glutathione
GSSG	= Oxidized Glutathione Disulfide
GST	= Glutathione S-Transferase
H^+	= Hydrogen Ion
H_2O	= Dihydrogen Monoxide / Water
H_2O_2	= Hydrogen Peroxide
HE	= Hematoxylin Eosin
HO-1	= Heme Oxygenase-1
IGF-1	= Insulin Growth Factor - 1
IL	= Interleukin
Keap1	= Kelch-like ECH-associated protein 1
LH	= Luteinizing Hormone
LOX	= Lipooxygenase
m^3	= Meter Cubic
MCP-1	= Monocyte Chemoattractant Protein-1
mg	= Milligram
Na-CMC	= Carboxymethyl Cellulose Sodium
NaCl	= Natrium Chloride
NADPH	= Nicotinamide Adenine Dinucleotide Phospate
NQO1	= NAD(P)H: Quinone Oxireductase
Nrf2	=Nuclear Factor (erythroid-derived 2)-like 2
RNS	= Reactive Nitrogen Species
nm	= Nanometer
OH^-	= Hydroxyl Ion
PM	= Particulate Matter
ROS	= Reactive Oxygen Species
SOD	= Superoxide dismutase
SPSS	= Statistical Product and Service Solution
TGF-β	= Transforming Growth Factor β
TNF-α	= Tumor Necrosis Factor-α
Trx	= Thioredoxin
TxNIP	= Thioredoxin-Interacting Protein

TrxR = Thioredoxin Reductase
UFP = Ultrafine Particle
VEGF = Vascular Endothelial Growth Factor