Effect of oncom extract on the level of estrogen hormone of productive white rats

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ABSTRACT

Introduction: Oncom is a processed soybean that contains isoflavone compounds. The types of isoflavones found in soybeans and their dairy products are daidzein and genistein which have an estrogenic effect on animals' reproductive performance. This study aimed to determine the effect of oncom extract on productive age white rats (Rattus norvegicus) estrogen levels.

Methods: This research is an experimental study with a randomized posttest control group design. We used 21 samples divided into three groups. First group was control without being given oncom extract. The second group was given a black oncom extract dose of 0.005 g/g BB. The third group was given red oncom extract of dose 0.005 g/g body weight. Serum collection for estrogen hormone level measurement was collected on day 14 after administration of oncom extract. Data then analyzed to determine the normality and homogeneity. ANOVA test was used to compare the means between groups. P<0.05 was significant.

Result: We found in the control group with the lowest estrogen level mean (16.70±0.581) than the experimental groups. The ANOVA analysis results showed that oncom extract significantly increase estrogen levels of productive age white rats (p<0.05).

Conclusion: Oncom extract can increase the estrogen level in productive age white rats. However, the estrogen levels between red oncom and black oncom showed an insignificant difference.

Keywords: oncom, isoflavones, estrogen levels, white rats.

INTRODUCTION

Soybean (Glycine max) is a seasonal crop included in class Magnoliopsida, order Fabales, family Fabaceae, and genus Glycine. The nutrient content of soybean seed is relatively high, especially its protein, which reached ±34%, and carbohydrates with 34.8%. Meanwhile, a prior study stated that protein content in soybean is 34.9% and carbohydrate is 34.8%, where soybean is an efficient vegetable protein source. So, a small amount of soybean is needed to obtain enough protein. In a dry state, raw soybean contains 2-4 mg of isoflavone/gram. Soybean contains isoflavones and phytochemistry that can protect the body from damage caused by free radicals, improve the immune system, and fight against diseases such as diabetes, kidney, anemia, rheumatic, diarrhea, hepatitis, and hypertension. The type of isoflavones found in soybean and its processed products are daidzein 10.5-85 and genistein 26.8-120.5 mg/100g dry weight, which have an estrogenic effect on humans and animals in their reproductive performance.

The estrogenic activity of isoflavone is related to its chemical structure, similar to diethylstilbestrol, commonly used as a drug with the estrogenic property. Estrogen is a hormone in women that regulates the menstrual cycle, fertility, menopause and has a significant contribution to the human body. The form of estrogen in female animals is estradiol 17-β, estrone, and estriol. However, the most potent and found in quite a high amount in the body is estradiol 17-β. The amount of estrogen in the body gives a far-reaching effect to the organs and tissues, especially to the reproductive organs, i.e., ovarium, uterus, cervix, vulva, and vagina.

One of the processed soybean products is tofu, which waste can be processed into fermented food called oncom. Oncom is a daily Indonesian food that is popular and widely consumed in West Java. There are two types of oncom, i.e., red oncom and black oncom. Black oncom is made from peanuts, while red oncom is made from tofu waste. One study concluded that the total estrous cycle period in a group of rats given both black oncom and red oncom was longer. The estrus phase went through a more extended period than the control rats group.

The reproductive hormone profile during the estrous cycle can describe the function of the female ovarium. Therefore, analyzing the hormone profile can indicate the condition of the aforementioned female reproduction. The estrous cycle is one of the reproductive aspects that describes changes in hormone content caused by ovarian activity under the gonadotropin hormone. The changes in reproductive hormone content will cause structural changes in tissues forming the reproductive tract.
Knowledge regarding reproduction is critical to regulating fertility. Because of that, a study investigating the role of oncom extract to estrogen level needs to be conducted to determine the effect of reproductive optimization on productive age female rats.

**METHODS**

**Research Design**

This study is an experimental study with a randomized posttest control group design. Twenty-one white rats used in this study were divided into three groups, and each group consisted of 7 rats, i.e., the control group, black oncom treatment group, and red oncom treatment group.

**Animal Model**

The animal model used in this study were 4-month-old females, white Wistar rats (*Rattus norvegicus*) weighing ± 300 gram. We got the white rats from Balai Besar Veteriner (BBVet). The rats were previously acclimated for 14 days. The acclimation was in a cage with a wire lid, and the base was covered in husks. Food and drink were given ad libitum. After the adaptation process for 14 days, the study was conducted according to the research design. This study was performed in the Department of Veterinary Reproduction, Faculty of Veterinary Medicine, Universitas Udayana and Balai Besar Veteriner (BBVet).

**Production of Oncom Extract**

The black oncom were obtained from Pasir Reungit oncom factory, Sumedang, meanwhile red oncom were obtained from Pasar Anyar, Bogor. Each oncom were air-dried. Afterward, black oncom were smoothened using the blender. Oncom in flour form then macerated using ethanol for 48 hours. The results of ethanol maceration were then filtered using Whatman no. 42 filter paper to obtain ethanol extract. These extracts were dried using a rotary vacuum evaporator at 45°C until all solvent evaporates.

**Experimental Procedure**

The white rats in this study were given black oncom extract for 0.005 g/g body weight and red oncom extract for 0.005 g/g body weight. Oncom extract administration was performed using a feeding tube for 14 days consecutively. On day 14, blood serum samples were taken through the orbital vein. Blood was also collected in a tube without EDTA. The estrogen levels were then measured using the ELISA Elabscience method.

**Data collecting and analysis**

Data normality and homogeneity test were performed first. Afterward, ANOVA and least significant difference (LSD) tests were performed to determine which groups showed a significant difference. P-value <0.05 showed significant value.

**RESULTS**

The control group had the lowest mean estrogen level (16.70±0.581); meanwhile the experimental group red oncom and black oncom had similar mean 24.51±1.255 and 24.51±1.198, respectively. This study showed that the group treated with oncom could increase estrogen level significantly compared to the control group. Meanwhile, the estrogen level between the red oncom group and black oncom group showed an insignificant difference (p<0.05) (Table 1).

The numbers followed by different letters in the same row showed a significant difference (p<0.05). Meanwhile, numbers followed by the same letters in the same row showed an insignificant difference (p>0.05).

**DISCUSSION**

The content of Estradiol 17-β along the estrous cycle showed changes along with phase changes in the estrous cycle. A follicular phase is the proestrus phase with a 38.4 pg/mL hormone level, estrus phase with 26.5 pg/mL. Meanwhile, the Gotu Kola and Indian camphorweed extract administration showed an estrogen level mean value of 238.17 ng/mL in rats.

Hormone sample collection in this study was performed after observing vaginal smear results when the animals reached the late estrus phase. Thus, measured hormone is confirmed to have decreased. As in theory, the early estrus phase is a phase with the highest Estradiol 17-β content. This condition may occur because the determination of the phase that constitutes the estrous cycle was performed by observing the results of the vaginal smear. The differences in vaginal smear results are due to hormonal regulation, which cause the changes to occur after changes in hormonal content.

Estrogenic material is expected to increase the estrogen level in the blood. Increased estrogen in the blood causes the pituitary to reduce the production of follicle-stimulating hormone (FSH) and increase the release of luteinizing hormones (LH) and luteotropic hormone (LTH). FSH production that peaked and was accompanied by increased LH caused the follicle to reach the final phase of its growth and rupture. The primary function of estrogen is to induce cell proliferation and the growth of sex organ tissues and other tissues related to reproduction. The concentration of estrogen nearing ovulation reached the highest level in the body and acts to suppress the production of follicle-stimulating hormone (FSH) and induce the release of luteinizing hormone (LH); thus, ovulation occurs.

However, high estrogen content in the blood can inhibit hypophysis in secreting gonadotropin hormone (FSH) through negative feedback; thus, FSH level decreased and cause delayed follicle growth in the ovarium. A previous study showed that administration of oncom extract for 14 days caused the absence of follicle growth where the follicle stayed in the primary stage and did not develop further. Therefore, the number of follicles with follicular antrum did not increase. This study has not determined the impact of reproductive function on oncom administration. In the future, further research is needed regarding the

**Table 1. The mean value of white rats estrogen level and ANOVA test between control and experimental groups.**

<table>
<thead>
<tr>
<th>Observation type</th>
<th>Control</th>
<th>Red Oncom</th>
<th>Black Oncom</th>
</tr>
</thead>
<tbody>
<tr>
<td>RE±SE (pg/mL)</td>
<td>16.70±0.581&lt;sup&gt;a&lt;/sup&gt;</td>
<td>24.51±1.255&lt;sup&gt;b&lt;/sup&gt;</td>
<td>24.51±1.198&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

RE = Mean estrogen; SE = Standard error.
effect of oncom extract on reproductive performance in ovariectomized rats.

**CONCLUSION**

Oncom extract can increase the estrogen level in productive age white rats. However, the estrogen levels between red oncom and black oncom showed an insignificant difference.

**DISCLOSURES**

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The authors declared this research without grant or third-party support.

**Conflict of Interest**
All authors declared no conflict of interests between authors and any organizations or persons that could influence the objectivity during the study, interpreting the result and writing of the manuscript.

**Author Contribution**
All authors distributed equally in concepiting, designing, supervising the manuscript, preparing the manuscript and agreeing to submit this final version to this journal. DNDIL and NLES specifically performed the data and statistical analysis.

**REFERENCES**