

# Antioxidant Cream of *Solanum lycopersicum* L.

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**Abstract:** *Solanum lycopersicum* L. (tomato) is the fruit that has an antioxidant activity. The fruit mainly contains lycopene,  $\beta$ -carotene, vitamin C and vitamin. These compounds are able to prevent and retain free radicals forming, which can cause aging and chronic diseases. This research is aimed to investigate antioxidant activity of tomato cream. The tomato with a different concentration of 0.5%, 1%, 2%, and 3% were formulated in creams. In the first step, the creams were examined for its physical stability and the cream was stored at three different temperatures (cool temperature 4°C, room temperature and high temperature 40±2°C), then tested through a mechanical test and a cycling test. The DPPH method was used to measure the antioxidant activity of the tomato creams that pursuant to value of DPPH retention (EC50). This research showed that the tomato cream with concentration of 0.5%, 1%, 2% and 3% had a physical stability with storage at cool temperature 4°C, room temperature and high temperature 40±2°C. The tomato cream with concentration of 1%, 2% and 3% reached a minimum value of DPPH retention (EC50) but the tomato cream 0.5% did not reach a minimum value of DPPH retention (EC50). The tomato cream 1 % had the best physical stability and the tomato cream extract 3% had the best antioxidant activity.

**Keywords:** *Solanum lycopersicum* L. (tomato), physical stability, antioxidant activity, DPPH.

## Introduction

Tomato fruit is a source of natural antioxidants. Based on previous researches, someone that consumes a lot of tomato fruits regularly can reduce the risk of cancer diseases<sup>1</sup>. In the daily life, someone who consumes a lot of tomatoes can keep their physic healthy and stay young. Tomato contains carotenoids: lycopene and  $\beta$ -carotene; as well as other natural antioxidant compounds such as: vitamin C and vitamin E<sup>2,3</sup>. Since tomatoes have several good antioxidants, it is good if tomatoes are being developed as pharmaceutical products, especially as cosmetics<sup>4,5</sup>. In this research, tomatoes (*Solanum lycopersicum* L.) were extracted and formulated in the form of semisolid as a cream. The form of semisolid as a cream was chosen due to the form of a cream that could easily be dispersed in the skin, not thickened and easily cleansed compared to the form of ointment. The test conducted in this research was to physic stability test of the cream

based on stability parameters. Besides that the research measured antioxidant activity using DPPH method. The purpose of this research was to evaluate the physic stability and the anti-oxidant activity in a dry cream of tomato extract in the different concentrations that were 0.5%, 1%, 2%, and 3%.

## Materials And Methods

### Production of Cream

Mixtures containing water phase (methyl paraben, triethanol amin, glycerin, aquadest), tomato extract powder, and oil phase (stearic acid, cethyl alcohol, isopropil myristat, propil paraben, paraffin liquidum) were stirred by using a set speed homogenizer at 3000 rpm for 10 minutes until the base was formed and the temperature was maintained at 55°C. Creams were made in 4 formulations and each cream was containing extracts of 0.5%, 1%, 2% and 3% (w/w) in the same base composition.

### Evaluation of Tomato Cream

Organoleptic tests was done by looking at changes in color, odor (rancidity), and the occurrence of phase separation. Homogeneity and consistency of the creams were observed by checking the size of particles on the object glass to determine the formation of coarse particles. The cream consistency was tested by penetrometer. pH measurements were done by using a pH meter that was calibrated using standard buffer solution of pH 4 and 7. Measurements of the average globule diameter were done by using an optical microscope and viscosity measurements were done by using a Brookfield Viscometer.

### Stability Test

Stability of the creams were evaluated by cycling test methode and mechanical test. In the cycling test methode, cream samples were stored at 4°C for 24 h and then moved into the oven with a temperature  $40 \pm 2$  °C for 24 h . The test done in 6 cycles and then observed the occurence of phase separation. In the mechanical test, cream samples were inserted into centrifuges at a speed of 3750 rpm for 5 h or 5000-10000 rpm for 30 min then observed whether a separation exist or not.

### Measurement of antioxidant activity with DPPH method

The measurement was based on the AH compound, which will donate hydrogen (H) on DPPH, thus changing the DPPH free radicals which are purple to pale yellow. Then the absorbance was measured by

UV-Vis spectrophotometer at 517 nm. The tests were done qualitatively and quantitatively.

#### a. Sample preparation

1 g cream were extracted with absolute ethanol in a separating funnel, then shaken rapidly for 5 min. The extract was filtered and the filtrate extract were collected.

#### b. Preliminary test with 0.2% DPPH solution (qualitative test).

Sample solution was spotted on the whattmann paper then sprayed with 0.2% DPPH until provide an intense yellow color.

#### c. Free Radicals Suppression Test toward DPPH (quantitative test)

2 ml sample solution was added by 1 ml of DPPH. Then the mixture solution was incubated in a closed water bath at 37 °C for 30 min. The absorbance was measured by UV-Vis spectrophotometer at 517 nm. Measurements were done every 10 min for 30 min.

Inhibition of the DPPH free radical in percent (%) was calculated as:

$$\% \text{ inhibition} = \frac{A_c - A_s}{A_c} \times 100\%$$

Where  $A_c$  is the absorbance of the control reaction (containing all reagents except the sample extract) and  $A_s$  is the absorbance of the sample extract.

Free radical suppression activity was shown by the % EC50, which was the concentration of the sample that can reduce DPPH radicals by 50%.

## Results

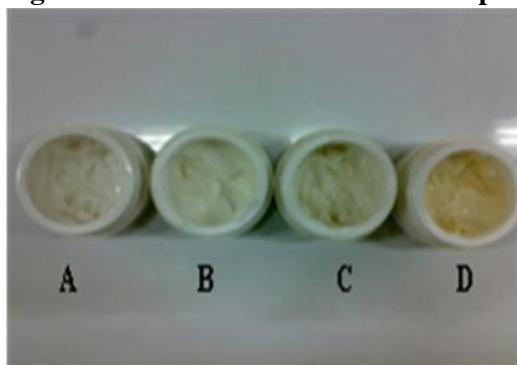
**Table 1: The results of evaluation to cream with tomato extract concentration of 0.5%, 1%, 2%, and 3%**

Cream	Colour	Homogeneity	pH	Viscosity	Diameter of globular
A.Tomato 0,5%	white+++	Homogen	6.85	140000 cps	1.6725 µm
B.Tomato 1%	white-orange++	Homogen	6.80	150000 cps	1.6121 µm
C.Tomato 2%	white-brown+++	Homogen	6.76	155000 cps	1.6576 µm
D.Tomato 3%	orange-brown++	Homogen	6.73	165000 cps	1.5509 µm

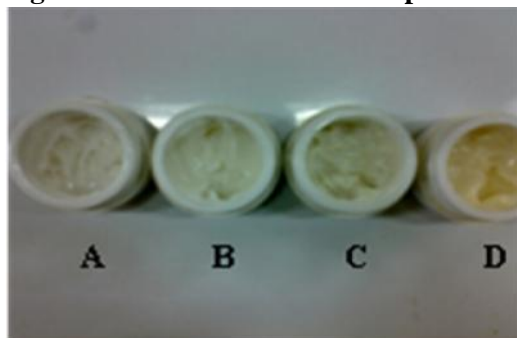
Evaluation results obtained showed that the cream was soft, easy to spread, forms half consistency and applies comfortably to the skin. Tomato cream 0.5% was white, odorless, homogeneous, pH 6.87, 140 000 cps viscosity at 2 rpm, ticsotropic plastic flow, and the size of the average globule diameter was 1.666  $\mu\text{m}$ . Tomato cream 1% was a little orange-white, odorless, homogeneous, pH 6.83, 142 500 cps viscosity at 2 rpm, ticsotropic plastic flow, and the

size of the average globule diameter was 1.645  $\mu\text{m}$ . Tomato cream 2% was orange-white, odorless, homogeneous, pH 6.79, 155 000 cps viscosities at 2 rpm, ticsotropic plastic flow, and the size of the average globule diameter was 1.612  $\mu\text{m}$ . Tomato cream 3% was a little orange brown, odorless, homogeneous, pH 6.75, viscosity of 165 000 cps, at 2 rpm, ticsotropic plastic flow, and the size of the average globule diameter of 1.558  $\mu\text{m}$ .

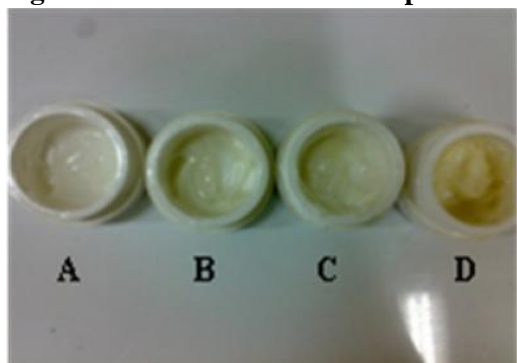
**Figure 1: Tomato Cream at room temperature and storage 8 weeks**



**Figure 2: Tomato Cream at temperature 4°C and storage 8 weeks**

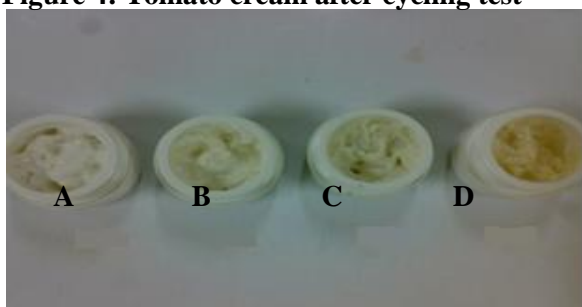
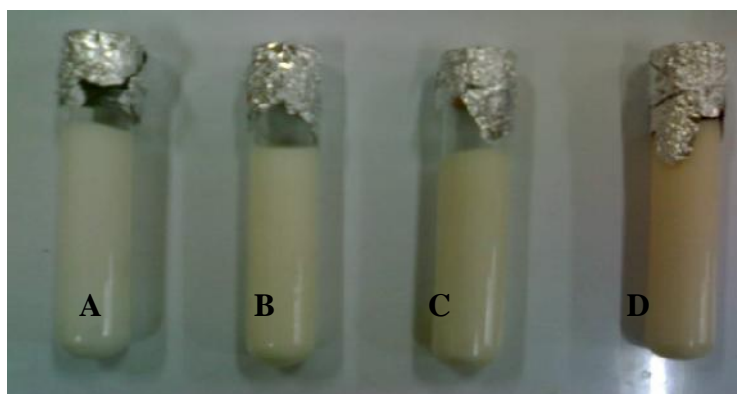
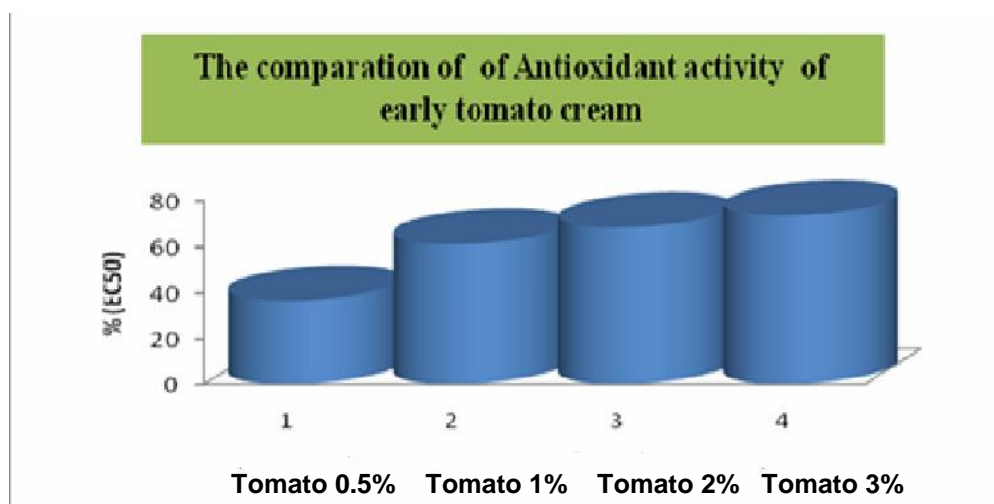


**Figure 3: Tomato Cream at temperature 40°C and storage 8 weeks**



Each cream at 4 °C storage, room temperature, and 40 °C showed that the color changes to be faded. At 4 °C and 40 °C temperature, the colors were changed, especially on the temperature of 40°C, whereas at room temperature the color did not change significantly. The results of pH

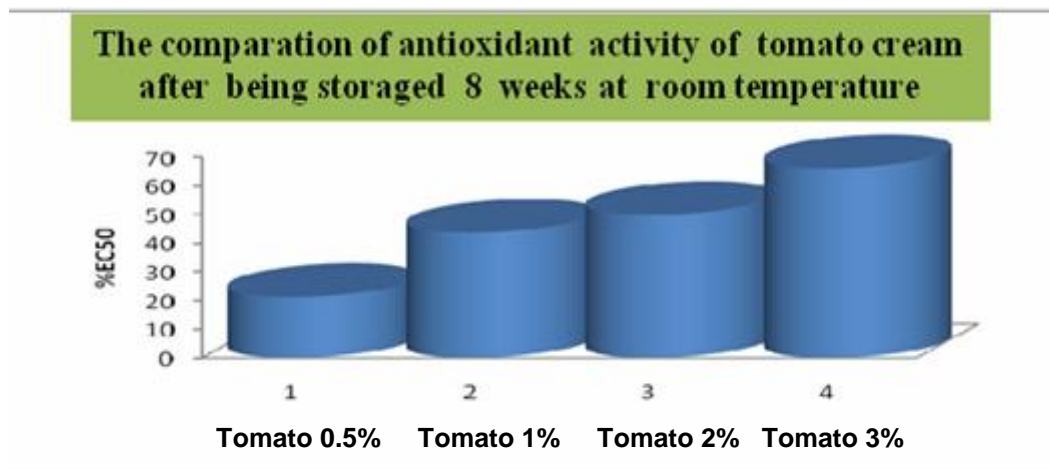
measurements of each cream at 4 °C, room temperature and 40 °C were various, at 4 °C and 40 °C temperature, the change in pH led to a neutral pH, at room temperature the pH led to acidic pH.

**Figure 4: Tomato cream after cycling test****Figure 5: Tomato cream after mechanic test****Figure 6: The Comparison of Antioxidant Activity of Early Tomato Cream**

Fourth tomato creams with different concentrations showed a stable results, because it did not indicate the presence of phase separation. Observations of cycling test were performed after 6 cycles between 4 °C and 40 ± 2 °C. Fourth creams showed no phase separation after mechanical testing (centrifuge) at 3750 rpm for 5 h.

Based on the results of DPPH suppression, tomato cream 0.5% was below the minimum value of DPPH suppression, while the tomato cream 1%, 2% and 3% meet the minimum value of DPPH suppression, as well as vitamin C cream 0.5% which was not differ significantly with tomato cream 2%.

**Figure 7: The Comparison of Antioxidant Activity of Tomato Cream After being Storage 8 weeks at room temperature**



Based on the results of DPPH suppression, the antioxidant activities of tomato cream 0.5% and 1% were decreased significantly. Tomato cream 3% decreased slightly, while the tomato cream 2% was relatively stable.

### Discussion

Prior to the quantitative measurement of antioxidant activity, a preliminary test is done first by spraying 0.2% DPPH solution in the Whatman paper that has been spotted with tomato cream 0.5% ethanol filtrate extracted. The results obtained in the paper was purple turned into orange-yellow color, that indicated that the antioxidant activity of the filtrate are from the tomato cream that contained antioxidants. The qualitative test was followed by quantitative determination of antioxidant activity by using UV-Vis Spectrophotometer.

The wavelength for the measurement of antioxidant activity by DPPH method was 517 nm, because at this wavelength the maximum absorption was characterized by a peak.

Based on the results, it can be concluded that the tomato cream 3% had the highest antioxidant activity, while 0.5% tomato cream had a lack antioxidant activity that met the minimum value of DPPH (EC50). Vitamin C cream was used as a positive blanko which was a comparison of the stocks in the market an antioxidant cream. Tomato cream and vitamin C were using the same base composition.

Based on the data, after storage for 8 weeks there was a decrease in the antioxidant activity of tomato cream 1% from 60.68% to 43.7%, so it did not meet the minimum 50% reduction DPPH (EC50). There was decreased activity of tomato cream 3% but not too high and still met the minimum value of DPPH reduction (EC50). A decrease in antioxidant activity was probably due to the cream formula that did not contain an additional antioxidant concentration in a tomato cream that act as antioxidants to protect the cream. The reason for not adding any additional antioxidants to the tomato cream was because it may interfere in the measurement of antioxidant activity.

### Conclusion

1. Cream tomato of 1%, 2% and 3% had antioxidant activity that fulfilled 50% of DPPH retention (EC50), whereas the tomato cream concentration of 0.5% was not fulfilled.
2. The tomato cream concentrations of 0.5%, 1%, 2% and 3% showed their physic stability based on parameters of physic stability test.
3. The tomato cream 1 % had the best physical stability and the tomato cream extract 3 % had the best antioxidant activity.

### Acknowledgements

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