

**ABSORPTION OF RED COLOR EXTRACT FROM
THE ROYAL TOMATO ONTO TALC**

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ABSTRACT

The objective of this study were to obtain red color extracted from the Royal tomato using 95% ethanol as solvent and to prepare into powder form with talc and methicone treated talc. The mass ratio of red color extract per talc and methicone treated talc were 1:1 and 1:1.5, respectively. The results showed that talc and methicone treated talc were light pink color powder. The stability of the color in the different powders were tested on 6 storage conditions that are ambient temperature, 45°C, 4°C, sunlight exposure, dark, and under fluorescent light for 28 days. The color of talc with tomato color extracted powder change from pink to light pink that show the increase of lightness (L^* value). The a^* and b^* value show slightly change in all conditions. Methicone treated talc with tomato extracted change from light pink to dark pink. The L^* value and b^* value tend to increase, but a^* value is quite stable.

Keywords: Tomato/ Lycopene/ Color extract/ Color stability

INTRODUCTION

Consumers have been focusing on natural cosmetic products or natural ingredients which considering to the quality of products, the skin safety and environmentally friendly products. Royal project tomato is one of the local plants and is a product in the Royal Project foundation of king's Rama 9 that is considered a popular economic crop with nutritional value and essence in tomatoes. The royal project tomatoes are big in size and have a bright red color, therefore popularly consumed both fresh and processed into various products such as beverages, and drying products to add value of the crops in the season where the yield is high. There have been many researches that have studied about tomato extraction in the parts of skin benefits, such as skin moisturizer, antioxidant, and skin nourishing on skin care products. Another important feature of tomatoes is the bright red color that makes the royal tomato project different from other tomatoes. The objective of this work is to study the method of color extracting from tomatoes and preparing into the powder form to make it easy to apply in the cosmetic powder formulation.

The Royal project tomato (*Lycopersicon esculentum*)

The Royal tomato is an edible plant, often red, berry of the plant (*Lycopersicon esculentum*) commonly known as a Table tomato (Highland Research., 2016). The species originated in western South America. The tomato is consumed in diverse ways, raw or cooked, in many dishes, sauces, salads, and drinks. While tomatoes are the fruit which botanically classified as berries who are commonly used as a vegetable ingredient or side dish (Grace Y., 2018)

Lycopene is a red plant pigment found in tomatoes, guavas, watermelons, papayas and grapefruits. Meanwhile tomatoes being the largest contributor to the dietary intake of humans than others. The advantages of tomato lycopene used as an excellent natural food colorant and it is stable to heat and extreme pH values (Effat et al, 2014) encountered in food processing, effective in low concentrations, has no off-flavors, and covers the full range of colors from yellow through orange to deep red. Addition of lycopene as a food colorant depends on the formulation, method of food preparation, and the manufacturing techniques involved. The nutraceuticals status of lycopene has accelerated research activities to improve processing factors. Lycopene exhibits higher singlet oxygen quenching ability. Due to its strong color and non-toxicity, lycopene is a useful food coloring. Lycopene extract from tomato peel is intended for use as a food colorant. It provides the similar color shades,

ranging from yellow to red, as do the natural and synthetic lycopenes. Lycopene extract from tomato is also used as a food/dietary supplement in products where the presence of lycopene provides a specific value (e.g., antioxidant or other claimed health benefits). The lycopene may also be used as an antioxidant in food supplements. Lycopene is a bright red carotene and carotenoid pigment and phytochemical. It is a symmetrical tetraterpene assembled from eight isoprene units. The molecular weight is 536.89. The Molecular Formula is $C_{40}H_{56}$. It is a member of the carotenoid family of compounds, and because it consists entirely of carbon and hydrogen, is also a carotene. In its natural, all-trans form, the molecule is long and straight, constrained by its system of 11 conjugated double bonds (U.S. National library of medicine, 2016). Each extension in this conjugated system reduces the energy required for electrons to transition to higher energy states, allowing the molecule to absorb visible light of progressively longer wavelengths. Lycopene absorbs all but the longest wavelengths of visible light, so it appears red.

Traditionally, organic solvents are used to extract lycopene. Although the method is reliable, it is laborious, cumbersome, and requires the use and disposal of organic solvents (Colle et al., 2010; Haroon, 2014). Carotenoids present in the tomato are fat soluble; common organic solvents used for extraction of lycopene are dichloromethane, hexane, ethanol, acetone, ethyl acetate, petroleum ether, and mixtures of polar or nonpolar solvents in different ratios, such as acetone:chloroform (1:2) and hexane-acetone-ethanol (2:1:1) (Barba et al., 2006). The amount of lycopene extracted using hexane/acetone or hexane/ethanol is higher than when using methanol, dichloromethane, or chloroform. Organic solvents used for extraction of lycopene are toxic in nature and traceless, which can make it unsuitable for human consumption.

METHODOLOGY

Preparation of plant material

Royal project tomato (*Lycopersicon esculentum*) was collected from Royal Project Foundation, Mae Hia, Mueang, Chiang Mai, Thailand, on July 2017. *L. esculentum* was dried at 60°C in hot air oven for 4 hours. After that, *L. esculentum* were squeezed to homogenize for color extraction.

Extraction of *L. esculentum*.

Dried *L. esculentum* was accurately weighted 1,500 grams, then soaked in 95% ethanol. The ratios of mixture between tomato to solvent was 10:1 by weight. Then, the mixture was sonicated at 45°C for 30 minutes. Next, the mixture was filtered through filter paper (Whatman NO.1). After that, 70% of solvent was evaporated by using the rotary evaporator at 40°C.

Preparation of red color powders

The red tomato extract was mixed with talc or methicone treated talc. Each powder (2 grams) was added in mortar, and then red tomato extract was added into the powder. The mixture was mixed to get paste form. After that, tomato paste was spread onto the aluminum tray, dried at 60°C for 4 hours. The dried red tomato extract was ground well to powder form.

Accelerated stability test of red tomato color powders

Accelerated stability test was performed under 6 storage conditions which are ambient temperature, 45°C, 4°C, sunlight exposure, dark and under fluorescent light. The color was visually observed and also measured by a chromameter. Moreover the appearance and odor was performed at day 0, 7, 14, 21 and 28.

RESULTS AND DISCUSSION

Extraction of red color from tomato

The Royal project tomato extract has red-orange color. The L^* , a^* , b^* value of red tomato concentrated extract measured by using Minolta CR-400 colorimeter was $L^*= 32.99$, $a^*= 25.14$, and $b^* = 24.80$. It has tomato characteristic odor with the pH of the extract was 4.3.

Preparations of red color extract powder

The red tomato concentrated extract was prepared into colored powder by mixing with talc or methicone treated talc. The optimal ratio of red color tomato extract with talc and methicone treated talc were 1:1 and 1:1.5 by mass, respectively. The color of powders was measured by Minolta CR-400 colorimeter. The L^* defines lightness (100 = lighter, 0 =

darker), a^* denotes the red/green value (+ = red, - = green) and b^* was the yellow/blue value (+ = yellow, - = blue). The L^* value of tomato extract with methicone treated talc (83.82 ± 0.01) are lighter than red color tomato extract with talc (81.06 ± 0.03). The red color tomato extract with talc showed more yellow shade (22.00 ± 0.02) than red color tomato extract with methicone treated talc (16.39 ± 0.01) as can be seen the higher b^* value from Table 1. The visually observed of talc and methicone treated talc with red color extract are light pink shade as can be seen in Figure 1.

Table 1 The physical characteristics of tomato colored powders

Tomato colored powder	Color characteristics			
	Shade	L^*	a^*	b^*
Talc	Light pink	81.06 ± 0.03	4.48 ± 0.01	22.00 ± 0.02
Methicone treated talc	Light pink	83.82 ± 0.01	4.40 ± 0.01	16.39 ± 0.01



Figure 1 The appearance of different powders with red color extract from tomato

Talc with red color extract has moderate covering, slip, adherence, and smoothness properties. Methicone treated talc with red color extract is good in covering, adherence, smooth, and fluffiness. The properties of red-tomato extract powders are summarized in Table 2.

Table 2 The sensorial properties of the colored powders

Properties	Powders types	
	Talc	Methicone treated talc
Covering	+++	++++
Slip	+++	+++
Adherence	+++	+++++
Smoothness	+++	++++
Fluffiness	++	++++
Color	++	++++

Remark: +++++ = completely satisfied, ++++ = very satisfied, +++ = somewhat satisfied, ++ = slightly satisfied, and + = not at all satisfied

Accelerated stability test of red tomato color powder

The stability of the colored powders was tested under 6 storage conditions that are ambient temperature, 4°C, 45°C, dark room, fluorescent exposure, and sunlight exposure for 28 days. The L*, a*, and b* values of talc with tomato color are shown in Table 3. The L* value tends to increase from day 0 to day 14 (1.27-1.52), indicating that the color tends to lighter. The a* value slightly increased at day 28 in all conditions but can't observe by eyes. The b* value was quite stable in ambient temperature, dark room, fluorescent exposure and 4°C conditions and showed more increase at 45°C (1.79) and sunlight exposure (1.48). The visually observed of talc with tomato extracted powder change from light pink at day 0 to yellowish pink at day 28 as can be seen in Figure 2.

Table 3 L, a*, b* values of talc with red color extract powder on Day0 – Day28

Conditions	Day	L*	a*	b*
Ambient	0	81.08±0.03	4.49±0.01	22.00±0.02
	7	81.38±0.03	4.41±0.00	21.27±0.02
	14	82.43±0.04	4.13±0.01	21.49±0.01
	21	80.79±0.02	4.38±0.01	21.48±0.33
	28	79.76±0.10	4.53±0.01	21.73±0.10
Dark	0	81.05±0.00	4.49±0.00	21.95±0.02
	7	82.56±0.01	4.37±0.01	21.93±0.01
	14	82.42±0.01	4.20±0.08	22.60±0.33
	21	80.81±0.01	4.38±0.01	22.21±0.01
	28	79.96±0.30	4.57±0.04	22.88±0.21
Fluorescent light	0	81.05±0.02	4.48±0.01	21.91±0.02
	7	81.94±0.01	4.30±0.01	21.79±0.03
	14	82.57±0.29	4.28±0.08	22.43±0.28
	21	82.99±0.01	4.66±0.23	22.88±0.02
	28	79.76±0.11	4.51±0.01	22.71±0.02
4°C	0	81.07±0.01	4.48±0.01	21.88±0.01
	7	81.86±0.03	4.32±0.01	21.71±0.02
	14	82.34±0.02	4.15±0.09	22.53±0.21
	21	80.08±0.02	4.62±0.02	23.57±0.24
	28	79.68±0.19	4.65±0.22	22.63±0.01
45°C	0	81.08±0.01	4.48±0.01	21.87±0.00
	7	81.86±0.00	4.33±0.01	21.69±0.01
	14	82.40±0.01	4.15±0.01	22.53±0.11
	21	79.07±0.01	4.83±0.01	23.17±0.03
	28	78.70±0.03	4.93±0.02	23.66±0.15
Sunlight	0	81.09±0.00	4.48±0.01	21.85±0.01
	7	83.04±0.01	4.33±0.00	21.69±0.01
	14	82.40±0.01	4.15±0.01	22.53±0.11
	21	80.81±0.02	4.38±0.02	22.22±0.04
	28	76.82±0.03	5.31±0.02	23.33±0.28

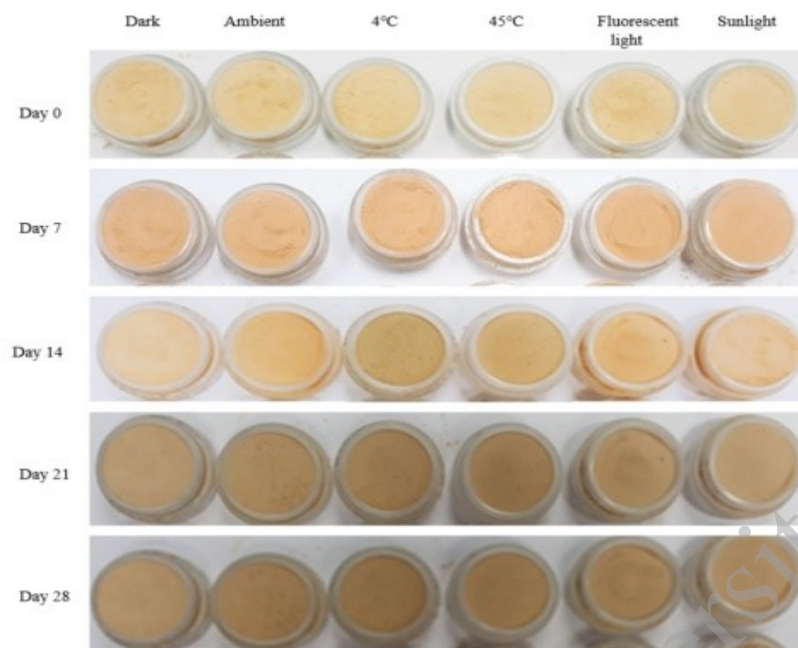


Figure 2 Stability test of talc with red color extract

The L^* , a^* , and b^* values of methicone treated talc with tomato color extracted powder are shown in Table 4. The L^* value tends to increase in all conditions at day 28 (0.03-2.05). The a^* value slightly changed or quite stable (0.62-1.21). The b^* value increased at all conditions (1.32-3.18), so the powder tends to yellow. The visually observed of methicone treated talc with tomato extracted powder change from light pink at day 0 to dark pink at day 28 (Figure 3).

Table 4 L^* , a^* , b^* values of methicone treated talc with red color extract powder on Day0 – Day28

Conditions	Day	L^*	a^*	b^*
Ambient	0	83.82±0.01	4.40±0.01	16.39±0.02
	7	85.00±0.01	3.76±0.01	17.85±0.02
	14	85.96±0.22	3.14±0.42	16.96±0.01
	21	85.15±0.01	3.29±0.01	17.70±0.01
	28	84.72±0.12	3.78±0.01	18.09±0.02
Dark	0	83.79±0.00	4.42±0.01	16.34±0.01
	7	84.68±0.03	3.77±0.01	16.29±0.46
	14	85.97±0.01	3.14±0.01	16.9±0.01
	21	85.15±0.01	3.27±0.05	17.67±0.02
	28	85.37±0.01	3.21±0.01	17.66±0.01

Fluorescent light	0	83.87±0.01	4.42±0.01	16.30±0.02
	7	86.43±0.34	3.17±0.01	15.68±0.01
	14	85.96±0.02	3.12±0.45	17.00±0.01
	21	85.16±0.06	3.27±0.01	17.73±0.02
	28	84.78±0.19	3.76±0.01	18.14±0.03
4°C	0	83.66±0.05	4.42±0.01	16.20±0.05
	7	84.84±0.03	3.67±0.01	16.70±0.02
	14	85.96±0.01	3.13±0.01	16.99±0.01
	21	85.77±0.12	3.37±0.01	18.01±0.01
	28	85.38±0.07	3.23±0.01	17.68±0.02
45°C	0	83.65±0.04	4.43±0.01	16.19±0.01
	7	84.83±0.04	3.68±0.01	16.69±0.06
	14	85.97±0.49	3.10±0.01	17.04±0.02
	21	85.61±0.22	3.20±0.09	19.33±0.02
	28	84.48±0.02	3.44±0.01	19.37±0.02
Sunlight	0	83.64±0.01	4.46±0.00	16.20±0.01
	7	85.39±0.46	3.75±0.01	17.90±0.02
	14	86.20±0.46	2.95±0.43	16.04±0.01
	21	83.90±0.02	3.35±0.01	18.02±0.01
	28	83.53±0.06	3.35±0.01	18.08±0.05

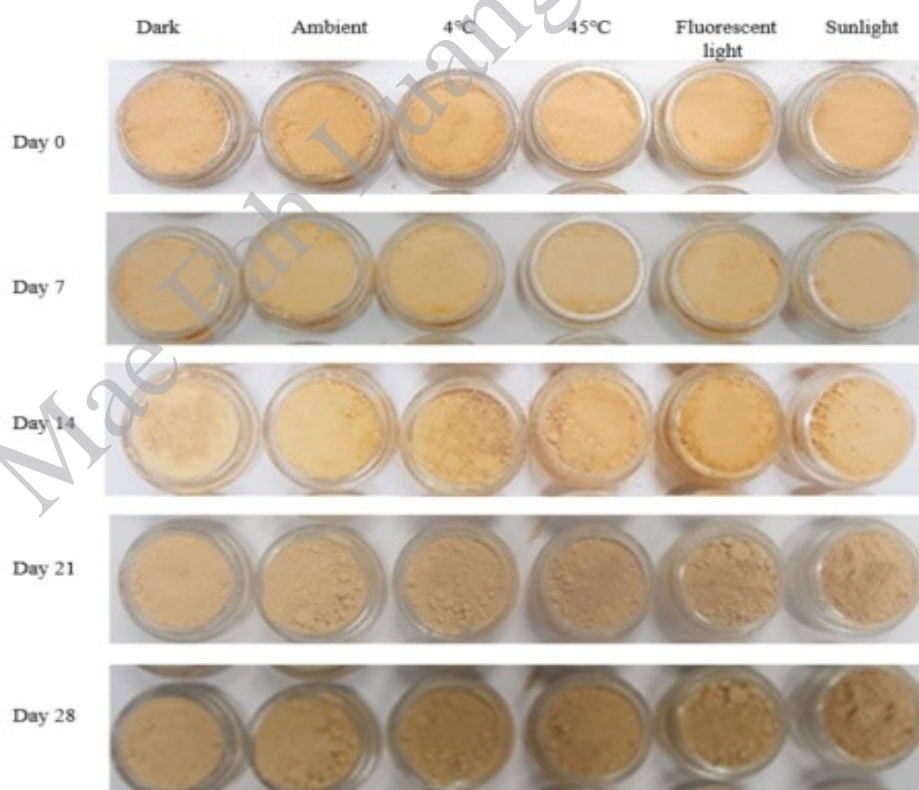


Figure 3 Stability test of methicone treated talc with red color extracts

CONCLUSION

The red color of Royal tomato was extracted by 95% ethanol. The red color extract was prepared into powder form with talc and methicone treated talc with ratio of red color extract per talc and methicone treated talc as 1:1 and 1:1.5, respectively. The powder of talc and methicone treated talc were light pink color powder. The color stability of talc with tomato color extracted powder change from pink to light pink that show the increase of lightness (L^* value) and slightly changed in a^* and b^* value in all conditions. Methicone treated talc with tomato extracted change from light pink to dark pink. The sensorial properties evaluation, methicone treated talc are more effective for covering, adherence, smooth, and fluffiness than red color extracted on talc. It suggests that methicone treated talc with red color extract may be an alternative color for use in powder cosmetic products.

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