Chalaza Journal of Animal Husbandry
Url:http://usnsj.com/index.php/Chalaza
Email: chalaza.usnsj@gmail.com

The Effectiveness of Sweet Orange Certificate in Recovering Media of Salt Duck Eggs on Fat Levels and Sensoric Quality

AUTHORS INFO

Irmawaty
Universitas Islam Negeri Alauddin Makassar
irmawaty.majid@gmail.com
+6281355747372

Astati
Universitas Islam Negeri Alauddin Makassar
astati76@gmail.com
+628124229461

Muhammad Nur Hidayat
Universitas Islam Negeri Alauddin Makassar
hidayat.peteruin@gmail.com
+6281245384448

Jumriah Syam
Universitas Islam Negeri Alauddin Makassar
jumriah.syam@uin-alauddin.ac.id
+6281342067333

Nur Azmi
Universitas Islam Negeri Alauddin Makassar
nurazmiyusuf237@gmail.com
+6282396245025

Muhammad Arsan Jamili
Universitas Islam Negeri Alauddin Makassar
arsan.jamili@uin-alauddin.ac.id
+62 852 55922877

ARTICLE INFO

p-ISSN: 2548-5504
e-ISSN: 2548-3803
Vol. 6, No. 2, December 2021
URL: http://dx.doi.org/10.31327/chalaza.v6i2.1566

Abstract

Salted eggs are livestock products that have undergone a salting process to extend shelf life, add flavor, and increase consumer tastes. The fat content in duck eggs is very high, reaching 35-34%, concentrated in egg yolks. It could be dangerous if consumed in excess; therefore, a study was conducted to determine the fat content of salted duck eggs with the addition of sweet orange juice (Citrus). sinesis L). This study used sweet orange juice (Citrus sinesis L) with different concentrations of 0% (control), 80% (P1), 90% (P2), 100% (P3), and 100% commercial Vitamin C. (Vicee) (P4). The research used a completely randomized design (CRD) consisting of 5 treatments and four replications. Each replication consisted of 2 eggs. Parameters observed were sensory quality (yolk color, Aroma, Taste, grit) and fat content of salted duck eggs. The results showed that the addition of sweet orange juice (Citrus sinesis L) on sensory quality (yolk color, aroma, taste, grit) had no significant effect ($P<0.05$). Meanwhile, the fat content in egg yolk had a significant effect ($P>0.05$).

Keywords: sweet orange (Citrus sinesis L), sensory quality, egg yolk

A. Introduction

Eggs are one of the livestock commodities that have complete nutritional content. Their high protein content makes eggs an important source of animal protein in addition to meat, fish, and milk. Duck eggs have a lower water content, while the protein and fat content is higher (Putri, 2019).

Duck egg protein is considered high quality because it has a complete and balanced composition of essential amino acids. It can be used as a benchmark in determining protein quality in food. High protein content in eggs causes rapid microbial growth and can reduce egg quality, so preservation efforts are needed.

Preservation by salting method is one way to extend shelf life in the long term, add flavor, increase economic value, increase consumer tastes, and prevent the entry of microorganisms into eggs. On the other hand, preservation by salting can increase egg fat content. The results showed that at 0 days of salting, the yolk fat was 21.4, and after nine days of salting, it increased by 37.,34 (Engelen et al., 2017).

The high fat in salted eggs causes concern for consumers. Consumers want to continue consuming salted eggs but are worried about the dangers of too high fat. For entrepreneurs, this anxiety can be an opportunity to produce a breakthrough for low-cholesterol salted eggs. Therefore, innovations need to utilize certain ingredients in salted egg ripening dough to function as antioxidants. Lowering LDL cholesterol levels can be done by giving antioxidants. Antioxidants can prevent the formation of oxidants and lipid peroxidation and repair the damage caused by the free radical attack. One of the ingredients that can be added in making salted egg dough to reduce fat and cholesterol levels of salted duck eggs is using sweet orange juice.

The main component in sweet oranges is ascorbic acid, a natural antioxidant compound that can ward off free radicals. Antioxidants can be used in food products as additives to prevent damage due to oxidation, including lipid oxidation changes in Color and Aroma in food; besides, antioxidants can also function as food preservatives. Food products that are safe for consumption are the nutritional value contained in food and can be utilized optimally and accepted sensory, so optimization and innovations are needed to produce processed products that are sensorily attractive, highly nutritious, and safe for consumption. This condition causes duck eggs to be very suitable for processing into salted eggs. Based on this, it is necessary to know about the sensory value test of food and the fat content of salted duck eggs with sweet orange juice in the ripening dough.

B. Methodology

1. Research Material

The material used in making salted eggs is duck eggs aged 1-7 days, as many as 40 eggs obtained from one of the breeders in Gowa Regency. Other ingredients such as 500g of rubbing ash, 500g of bricks, 2kg of sweet orange, 500g of table salt, and aquades were obtained from a supermarket in Makassar City. While the material used to test the fat content is diethyl ether or petroleum ether solvent.

The tools used in making salted eggs are closed plastic jars, scales, orange squeezers, measuring cups, pans, and stoves. At the same time, the tools for testing the fat content are filter paper, fat flask, and Soxhlet apparatus, electric heater, oven, scales, fat-free cotton, desiccator, and clamping pliers.

This study used a completely randomized design (CRD) with sweet orange juice. Namely (P0) without the addition of sweet orange juice, which was used as a control; (P1) addition of 80% sweet orange; (P2) the addition of 90% sweet orange juice; (P3) addition of 100% sweet orange juice; Each treatment was repeated four times so that there were 5 x 4 = 20 experimental units.

2. Research Procedure

a) Preparation of Duck Eggs and Sweet Oranges

The material used in this study was duck eggs taken from one of the breeders in the Gowa district, aged one to seven days, weighing between 60 g to 65 g and of good quality, i.e., when put into water, the eggs will sink to the touch. The bottom of the container followed Suprapti's opinion (2002) that the condition of eggs that float or float when placed in water is not good for consumption. The eggs are washed thoroughly so that no dirt is attached to the eggshells that can contaminate eggs when making salted eggs. The sweet oranges chosen are citrus fruits with a maturity level of 85%.

b) Preparation of Sweet Orange Juice
The process of preparing sweet orange juice, namely the oranges, was washed so that there was no dirt on the surface of the orange peel, then the oranges were cut into two parts to facilitate the squeeze process. Oranges are squeezed using a squeezer to get the juice from citrus fruits in optimal quantities.

c) Dough Making Process and Curing
They were weighing the ingredients according to treatment, each treatment using 500g salt, 500g rubbing ash, and 300g bricks and sweet orange juice with different concentrations according to treatment, namely 80%, 90%, 100%, and commercial vitamin C solution using Vicee 100 %. Next, mix the rubbing ash and salt first until homogeneous, add bricks, and add sweet orange juice for each treatment. Next, the duck eggs are covered with a dough thickness of 2 cm, and then the eggs are placed in a closed jar. The curing of eggs is carried out for ten days to ensure that the salt and sweet orange juice can seep into the eggs to the maximum to produce quality salted eggs.

d) cooking
After curing for ten days, the eggs are cleaned from the coating using running water and then arranged on a pan for further steaming over medium heat at a temperature of 79 - 80°C for 30 minutes. This process is carried out to ensure that the steamed eggs are perfectly cooked and that any microbes present in the eggs can be confirmed to have died. Furthermore, the sample is ready to be observed organoleptically (Color, Aroma, Taste, Ruin) and Objectively (measuring fat content).

e) Observation

1. Organoleptic Test

Organoleptic tests include Color, Aroma, Taste, and grit Tests. This study uses 25 researchers with semi-trained authors category, with an age range of ± 25 years.

2. Fat Content Test

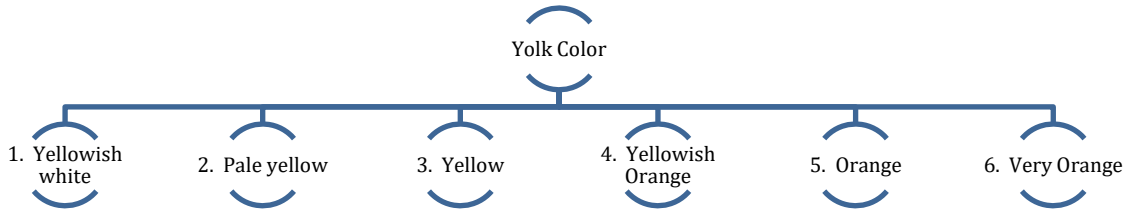
AOAC (2005), the procedure of the fat content of the Soxhlet method is as follows: The fat flask to be used was dried in an oven at 105º C for 1 hour. The fat flask was cooled in a desiccator for 15 minutes and weighed (W2). A sample of ± 5 g was mashed and then weighed (W1) and wrapped using filter paper formed by a sleeve (Thimble). Assemble extraction tools from heating mantle, fat flask, soxhlet to condenser. The sample is then put into a soxhlet added with hexane solvent for 1½ cycles. Extraction was carried out for ± 6 hours until the solvent fell back through the siphon into a clear-colored fat flask. The extract from the fat flask was separated between the hexane and the extracted fat using a rotary evaporator (rpm 50, temperature 69ºC). The fat separated with hexane is then heated in an oven at 105ºC for 1 hour. The fat flask was cooled in a desiccator for 15 minutes and weighed (W3). Reheat in the oven for 1 hour if the difference in weighing the last extraction with the previous weighing has not reached 0.0002 grams.

3. Parameters

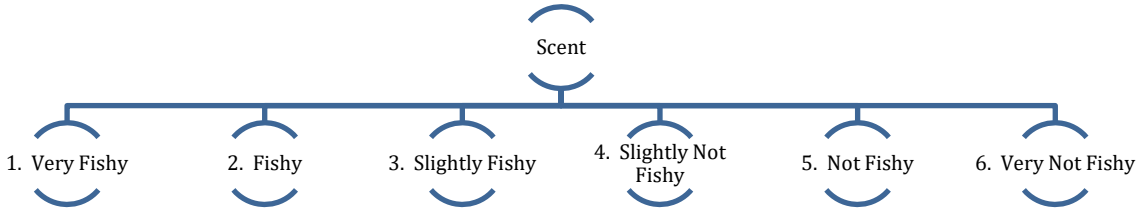
The parameters measured in this study were the sensory test of salted duck eggs and fat content.

a) Organoleptic Test
Organoleptic tests were carried out using a score range of 1-6. This test uses a panel of 25 students of Uin Alauddin Makassar in the semi-trained category consisting of male and female panelists. The sensory properties observed are as follows:

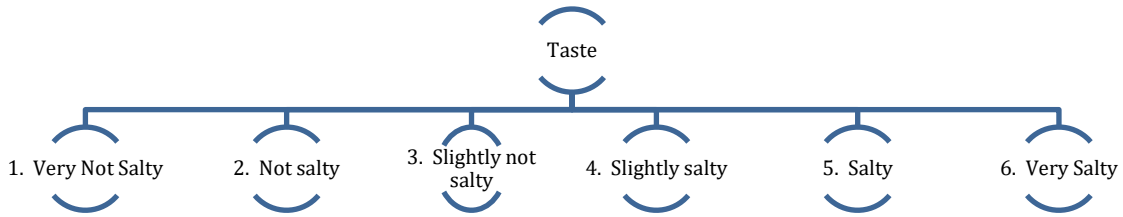
1. Yolk Color



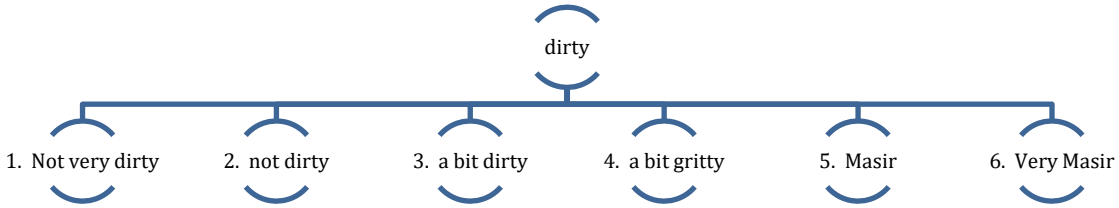
2. Scent



3. Taste



4. Dirty



b) Fat Content Test (%)

The fat content in eggs was measured using the Soxhlet method. % fat content is ready for analysis with the following formula:

$$\% \text{ Fat} = (W3-W2)/W1 \times 100$$

Information:
W1= Sample weight (g)
W2= Weight of empty fat pumpkin
W3= Weight of pumpkin fat + extracted fat

4. Data Analysis

The data from the fat content test were analyzed by ANOVA (Analysis of Variance) at a significant level of 5%. Furthermore, if the data produced were significantly different, it was continued with Duncan's double-region test

C. Result and Discussion

Organoleptic testing aims to determine the acceptance of the researchers to the salted egg products produced. The organoleptic test carried out in this study was the salted egg hedonic test. The addition of sweet orange juice (Citrus sinesis L) on sensory properties (Color, Aroma, Taste, and grit) on 25 researchers aged ± 25 -35 years with the category of researchers somewhat trained.

1. Salted Duck Egg Color Organoleptic Test

The Color of food is one of the panelists' appeals. If it has an attractive color, it will increase the appetite to consume it. The average value of the organoleptic test results of salted duck eggs with the addition of sweet orange juice (*Citrus sinesis L*) is shown in Figure 1.

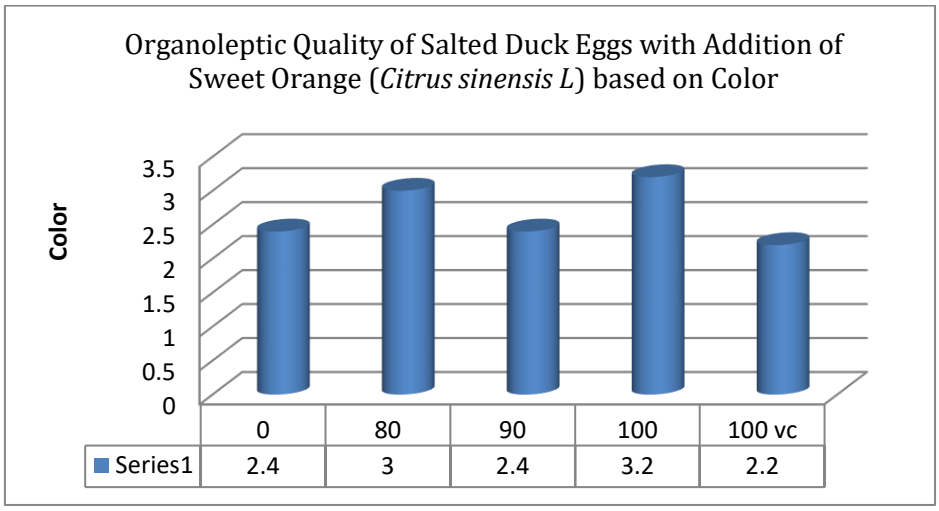


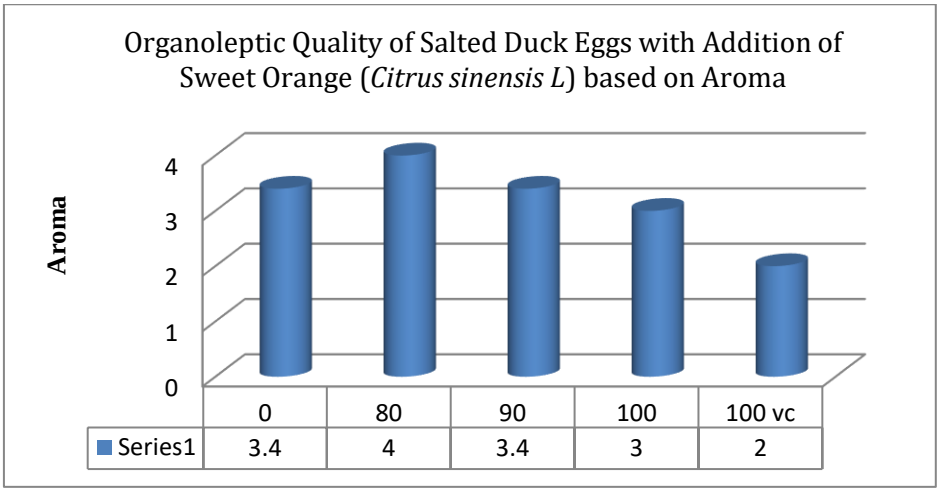
Figure 1. Organoleptic Quality of Salted Duck Eggs with Addition of Sweet Orange (*Citrus sinensis L*) based on Color

Figure 1. Showed that the lower yolk color value in treatment (P5) with the addition of commercial vitamin C (Vicee) as a negative control and higher in treatment (P4) with the addition of 100% sweet orange juice. The average salted duck egg color value obtained ranged between 2.20 and 3.20. This value indicates that the Color produced in this study is on a pale yellow to yellow, orange color scale). Analysis of variance was carried out to determine the effect of adding sweet orange juice (*Citrus sinesis L*) on the Color of salted duck egg yolk.

The analysis of variance showed that the addition of sweet orange juice in the salted egg-making media on Color did not have a significant effect ($P<0.05$). It could be seen in the Color produced from each treatment showing a range of pale yellow to yellow. It means that the researcher is not interested in the Color produced because the Color of the salted egg does not match the Color of the salted eggs, in general, orange. The low value of salted duck egg yolk color obtained in this study was caused by sweet orange juice having too high a concentration, causing inhibition of salt entering the eggs, which would cause the water content in the eggs not to decrease. Following the opinion of Nuruzzakiah et al. (2006), it was found that salted eggs with a salt concentration of 80% produced very orange egg yolks, while salted eggs with a salt concentration of 0% produced egg yolks that were not orange in Color. Because the concentration of salt in salted eggs causes the water content of the eggs to decrease, and this decrease in water content changes the Color of the egg yolks to become lighter.

2. Salted Duck Egg Aroma Organoleptic Test

Aroma is the smell of a food product that can be felt by the smell (nose) and can change the panelists' tastes from dislike to liking or vicee versa. The average organoleptic test results of salted duck eggs with the addition of sweet orange juice (*Citrus sinesis* L) are presented in Figure 2.



Gambar2. Organoleptic Quality of Salted Duck Eggs with Addition of Sweet Orange (*Citrus sinensis L*) based on Aroma

Figure 2 showed that the Aroma of salted duck eggs was on average lower in the treatment with the addition of Vicee and the highest in the addition of sweet orange juice with a concentration of 80%. The average value of the Aroma of salted duck eggs obtained ranged from 2.00 to 4.00 (fishy to slightly fishy). This value illustrates that the Aroma produced in each treatment ranges from slightly fishy to slightly fishy. Analysis of variance was conducted to determine the effect of sweet orange juice (Citrus sinesis L) on the Aroma of salted duck eggs.

The analysis of variance showed that the addition of sweet orange juice to the Aroma had no significant effect (P<0.05). This value illustrates that the Aroma produced by adding sweet orange juice (Citrus sinesis L) was fishy to slightly fishy Aroma. It means that the sweet orange juice used in the dough has not removed the fishy smell of eggs. The concentration of sweet orange juice can cause the fishy to slightly fishy Aroma in salted duck eggs was too high, causing the salt diffusion rate to be slow, which causes the salt content in the eggs to be below. It followed Koswara & Winarno (2002) opinion, which states that the salt contained in salted eggs and functioning as a taster also functions as a liberator from the fishy smell in eggs. Another factor that can cause eggs to turn fishy is the lack of antioxidants in sweet oranges absorbed by diffusion into the eggs. The antioxidants found in sweet oranges cannot inhibit eggs' oxidation process, so they cannot reduce the fishy Aroma in salted eggs. Anita & Sumantri (2019) stated that sweet orange juice contains flavonoid compounds and vitamin C. Sweet orange juice has antioxidant activity using the ABTS method with an IC50 value of 71.34 ± 0.69 ppm, which has high antioxidant activity strong.

3. Salted Duck Egg Taste Organoleptic Test

Taste is the most important thing in a portion of food to appeal to the Taste buds of the panelists. One of the factors that determine the quality of food is Taste. The average organoleptic test results of salted duck eggs with sweet orange juice (Citrus sinesis L) are presented in Figure 3.

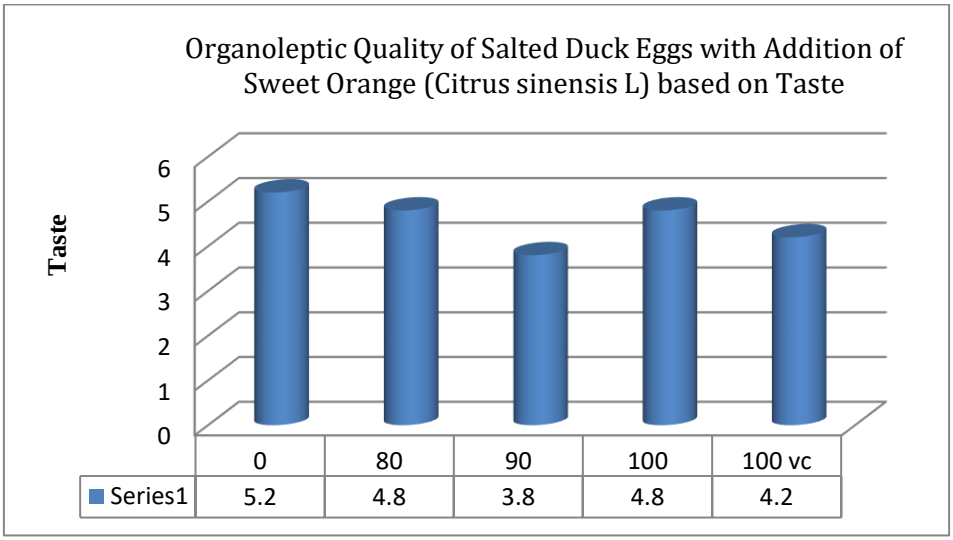


Figure 3. Organoleptic Quality of Salted Duck Eggs with Addition of Sweet Orange (*Citrus sinensis L*) based on Taste

Figure 3 showed that the Taste of salted duck eggs is on average higher in the treatment without the added sweet orange juice (*Citrus sinesis L*), and the lowest was in the treatment with the addition of 90% sweet orange juice. The average Taste of salted duck eggs obtained ranged from 3.80 to 5.20 (slightly not salty to salty). This value illustrates that the Taste produced in the treatment with the addition of sweet orange juice (*Citrus sinesis L*) and without sweet orange juice (*Citrus sinesis* L) has a variety of flavors, from slightly salty to salty. Analysis of variance was conducted to determine the effect of sweet orange juice (*Citrus sinesis L)* on the Aroma of salted duck egg yolk.

The analysis results showed that the addition of sweet orange juice to Taste had no significant effect (P<0.05). This value indicates that statistically, the Taste produced in the treatment with sweet orange juice ranges from slightly salty to salty. It means that there is a tendency for researchers to choose salted duck eggs that have a salty taste. Salty Taste in eggs is made important by the amount of NaCl salt that enters the egg after the salt ionizes Na+ and Cl-.

Thus the use of sweet orange juice illustrates that the rate of osmosis of salt into the egg tends to be slower so that the Taste obtained is not optimal.

It was following the opinion of Harry (2004), which states that salt works as a maker of salty Taste and at the same time as a preservative because it can reduce oxygen solubility, inhibit the work of proteolytic enzymes and absorb air in eggs.

4. Salted Duck Eggs Organoleptic Test

Figure 1 Margin is one of the characteristics of salted egg yolks and can increase the Taste of those who consume it. The average organoleptic test results of salted duck eggs with the addition of sweet orange juice (Citrus sinesis L) are presented in Figure 4.

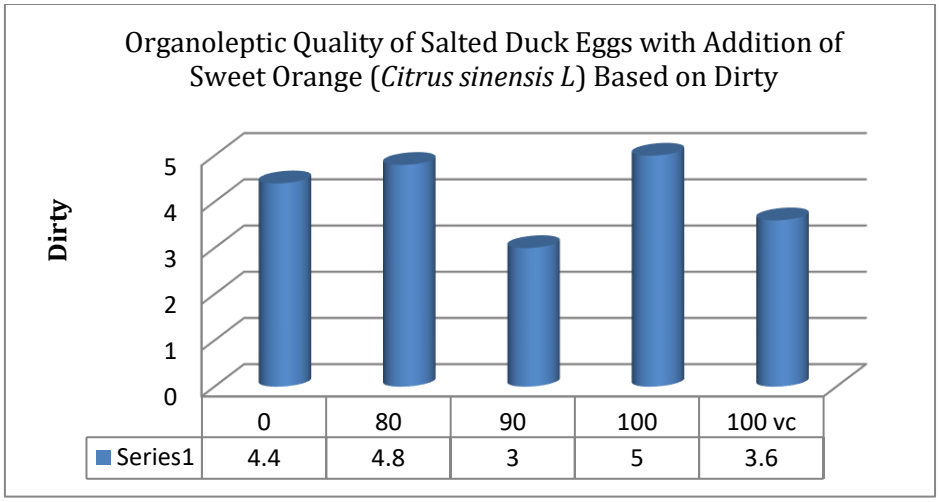


Figure 4. Organoleptic Quality of Salted Duck Eggs with Addition of Sweet Orange (*Citrus sinensis L*) Based on Dirty

Figure 4 showed that the saltiness of salted duck eggs, on average, is higher in the treatment with the addition of sweet orange juice (Citrus sinesis L) with a concentration of 100% (P1). The lowest was in the treatment with 90% sweet orange juice. The average value of the sandiness indicator is obtained in the range of 3.00 – 5.00 (somewhat unpolished to sandy). This value illustrates that the level of sandiness produced in the treatment with the addition of sweet orange juice (*Citrus sinesis L*) and without the addition of sweet orange juice (*Citrus sinesis L*) has various levels of sandiness, from slightly salty to salty. Analysis of variance was conducted to determine the effect of the addition of sweet orange juice (*Citrus sinesis L*) on the level of salted duck egg saltiness.

The analysis of variance showed that the addition of sweet orange juice had no significant effect ($P<0.05$) on sandiness. It was is due to the lack of salt particles that enter the egg so that less water content in the yolk comes out into the egg white. It was following the opinion of Windy (2008), which states that the saltiness of the egg yolk is influenced by the presence of salt that enters the egg yolk. The gritty or gritty texture of the egg yolk is a gritty texture that is very typical of salted eggs due to the reaction between the lipoproteins contained in the egg yolks with the salt that enters the egg yolks.

5. Salted Duck Fat Content

The fat content in eggs needs to be considered because, in general, the fat content in eggs is quite high, so there is a prohibition or limitation for people with high cholesterol from consuming eggs; almost all of the fat is concentrated in egg yolks. In contrast, egg whites contain very little fat.

Based on the study results, the administration of sweet orange juice on the fat content of salted eggs was higher in the P1 treatment, which was 33.88%, and the lowest was in the P3 treatment, which was 29.78%. This average value can be interpreted that the fat content of salted duck eggs obtained in the treatment with the addition of sweet orange juice varies and is thought to reduce fat. Analysis of variance was conducted to determine the effect of the addition of sweet orange juice (Citrus sinesis L) on the fat content of salted duck eggs.

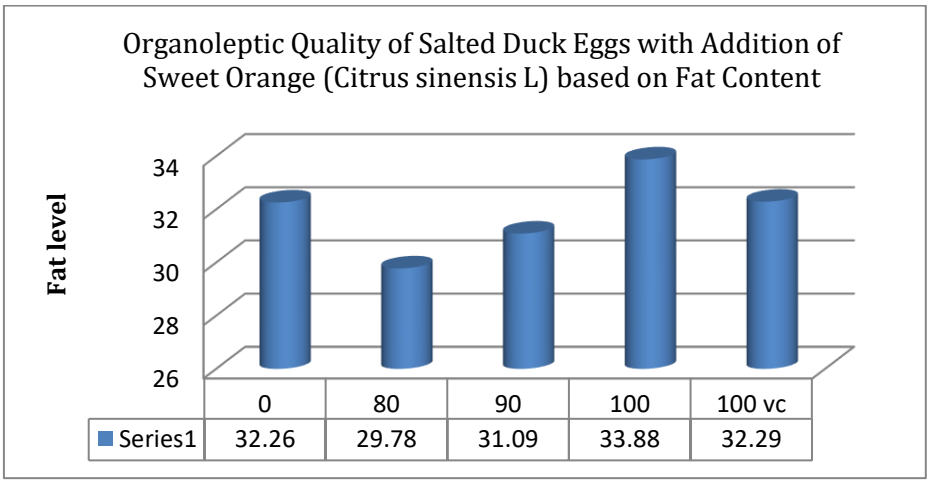


Figure 5. Organoleptic Quality of Salted Duck Eggs with Addition of Sweet Orange (*Citrus sinensis L*) based on Fat Content

The analysis of variance showed that the addition of sweet orange juice had a significant effect (P>0.05) on the fat content of salted duck eggs. The value shown statistically illustrates that the addition of sweet orange juice can reduce egg yolk fat. The bioactive content, such as flavonoids and phenols and ascorbic acid and vitamin C contained in sweet oranges, can counteract free radicals, thereby preventing damage due to the oxidation process. It followed the opinion of Winarsi (2007), which states that ascorbic acid acts as a reducing agent for various free radicals and minimizes oxidative damage. Ascorbic acid can directly scavenge oxygen free radicals, either with or without an enzyme catalyst. Indirectly, ascorbic acid can reduce free radical activity by converting tocopherol into a reduced form. The reaction to reactive oxygen compounds is faster than other liquid components. Ascorbate also protects important macromolecules from oxidative damage. The reaction to the hydroxyl radicals is limited only through the diffusion process.

According to Nangbes *et al.* (2014), plants, especially citrus fruits, are the most important and prominent ascorbic acid or vitamin C sources. The dominant citrus fruits in this world are sweet orange (Citrus sinensis), lime (Citrus aurantifolia), and lemon (Citrus lemon). A further BNT test was carried out to determine the effect between treatments.

The results of the BNT further test show that the addition of sweet orange juice with a concentration of 80% (P3) has a fat content of 29.78%, lower than the treatment with the addition of 90% and 100% sweet orange juice. It means that the high use of orange juice, namely 90% and 100%, can increase the salt work to diffuse into the egg more quickly so that the amount of salt in the egg yolk can be more. The amount of salt that enters can cause an increase in the value of the fat content with the mechanism that the fat contained in the egg yolk will react with the salt. It was following the statement of Ganesan et al. (2014) states that the process of salting eggs could increase fat levels. It occurred because of the addition of salt in the process; the fat contained in eggs is triglyceride fat (neutral fat), phospholipids (lecithin), and cholesterol; most people avoid these fatty acids. The high-fat content in salted eggs produced in the P3 and P4 treatments was directly proportional to the Color obtained in the sensory test, namely the brightest Color (Orange) followed by a high level of grit. It happened because low-density lipoprotein (LDL) egg yolk reacts with salt during salting. As a result of this reaction, the structure of low-density lipoprotein (LDL) is damaged, then the fat becomes free and comes to the surface. Chi & Tseng (1998) stated that during salting, there was a transfer of water from the yolk to the egg white; dehydration during salting would increase the release of oil. Lai et al. (1999) stated the amount of oil that comes out and the formation of sandy granules in the egg yolk.

While the addition of 80% sweet orange juice showed a decrease in the fat content of salted duck eggs. The decrease in fat in this treatment and the less amount of sweet orange juice caused the salt diffusion to take place more slowly so that at the same salting time, low-fat salted eggs were obtained. It is suspected that the small amount of orange juice can slow salt entry into the body so that the amount of salt found is less. It caused the bioactive compounds contained in oranges to react with salt so that the amount of ascorbic acid in eggs will increase their function as antioxidants. It was following the opinion of Suwarto & Octaviany (2010), which states that sweet oranges contain the enzyme pectin, which functions to reduce Low-Density Lipoprotein (LDL) or bad cholesterol. Citrus fruits also contain flavonoids which can

increase the effectiveness of vitamin C. One orange contains 16 g of carbohydrates which contains 70 calories, and fiber, equivalent to 12% of what the body needs. Vitamin C is useful as an antioxidant in the body that can prevent cell damage due to the activity of free radical molecules.

D. Conclusion

Based on the results of the research conducted, it can be concluded that The addition of sweet orange juice with different concentrations had no significant effect (P<0.05) on the sensory quality (Color, Aroma, Taste, and grit) of salted eggs. The addition of sweet orange juice with different concentrations can reduce the fat content in salted egg yolks or have a significant effect (P> 0.05).

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