1st International Agriculture, Biosystems and Technology Conference

July 22-23, 2021

BOOK OF ABSTRACTS

"Scaling Up Innovative Solutions for Sustainable and Climate-Smart Agricultural Transformation"

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About the Conference

The 1st **International Agriculture, Biosystems and Technology Conference** (1st ABT Conference) is an international forum initiated and sponsored by the Tarlac Agricultural University, Philippines to convene researchers, young scientists, academicians, and other stakeholders and to showcase the scaling of their leading-edge agricultural innovations that will enable farmers to engage in transformational technologies as the key to farm level profitability, generation of sustainable and climate-resilient agricultural systems and technologies, and linking farmers to market through productive alliances.

The conference will be held on July 22-23, 2021 via Zoom with the theme, **"Scaling Up innovative Solutions for Sustainable and Climate-Smart Agricultural Transformation."**

The conference offers free access to registered participants on the conference's plenary and breakout sessions highlighting research trends in the fields of Agriculture, Biosciences, Biosystems, and Technology. This year also features the Young Scientist Forum which serves as a venue for young students, researchers, and scientists to present their significant research findings to the international setting.

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Physical and Chemical Characteristics on Green Grapes (*Vitis vinifera* L) Coating with Snail Shells Chitosan

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Abstract

Grape is a fruit that is very easy to damage until required handling methods during proper and safe storage. The alternative that can be used as a natural preservative for grapes at a relatively light and safe cost is coating green grapes with snail shell chitosan. The objectives of the study were to determine differences in physical properties (weight, texture and color) and differences in chemical properties (pH) in green grape coated by snail shell chitosan with various concentrations. Research method using True experimental. In this research three variations of concentration (1.25%; 1.50% and 1.75%) was carried out with dyeing for 15 minutes. The results showed that the physical properties of green grapes which had been coated with snail shell chitosan at a concentration of 1.75% lower shrinkage weight with a percentage shrinkage of 36.42% compared to the concentration of 1.25% of 40.42% and 1.50% of 39.70% so that the concentration of 1.75% had a significant effect compared to the control and organoleptic values based on the quality of green grapes with texture and color parameters at concentrations of 1.75% and 1.50% at 18th day storage experienced a decrease in scores of 1.9 and 1.8; at a concentration of 1.25% there was a decrease in scores at the 17th day storage of 1.9 compared to the control, there was a decrease in scores on the 16th day storage of 1.9 so the concentration of 1.75% had a significant effect compared to the control. Green grapes which have been coated with chitosan shells can suppress the increase in pH value compared to green grapes that are not coated with snail shells pH value obtained is rapidly increasing, at concentration 1, 75% is a concentration that has a significant effect, where at the 5th day storage the pH value is 3.56.

Keywords: chitosan snail shell, green grapes, physical properties and chemical properties

PHYSICAL AND CHEMICAL CHARACTERISTICS ON GREEN GRAPES (*Vitis vinifera* L) COATING WITH SNAIL SHELLS CHITOSAN

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Abstract
Grape is a fruit that is very easy to damage until required handling methods during proper and safe storage. The alternative that can be used as a natural preservative for grapes at a relatively light and safe cost is coating green grapes with snail shell chitosan. The objectives of the study were to determine differences in physical properties (weight, texture and color) and differences in chemical properties (pH) in green grape coated by snail shell chitosan with various concentrations. Research method using True experimental. In this research three variations of concentration (1.25%; 1.50% and 1.75%) was carried out with dyeing for 15 minutes. The results showed that the physical properties of green grapes which had been coated with snail shell chitosan at a concentration of 1.75% lower shrinkage weight with a percentage shrinkage of 36.42% compared to the concentration of 1.25% of 40.42% and 1.50% of 39.70% so that the concentration of 1.75% had a significant effect compared to the control and organoleptic values based on the quality of green grapes with texture and color parameters at concentrations of 1.75% and 1.50% at 18th day storage experienced a decrease in scores of 1.9 and 1.8; at a concentration of 1.25% there was a decrease in scores at the 17th day storage of 1.9 compared to the control, there was a decrease in scores on the 16th day storage of 1.9 so the concentration of 1.75% had a significant effect compared to the control. Green grapes which have been coated with chitosan shells can suppress the increase in pH value compared to green grapes that are not coated with snail shells pH value obtained is rapidly increasing, at concentration 1, 75% is a concentration that has a significant effect, where at the 5th day storage the pH value is 3.56.
Keywords : Chitosan snail shell, Green grapes, Physical properties and Chemical properties.

Introduction
Grapes (*Vitis vinifera*) are found worldwide and are used for winemaking (Pazos-Tomas et al., 2020).Green grapes have antioxidant properties. The content of secondary metabolites in grapes such as polyphenols (Rasines-Perea & Teissedre, 2017), flavonoids (Pazos-Tomas et al., 2020), and anthocyanins (Rasines-Perea & Teissedre, 2017). Polyphenol compounds in grapes have biological activities that act as antioxidants, anticancer, anti-inflammatory, anti-ageing, antimicrobial, cardiovascular and diabetic (Rasines-Perea & Teissedre, 2017).

Grapes (*Vitis vinifera* L.) have a water content of 70% -80% (Rebin and Mujiman). Moisture content has an essential role during the shelf life. High water content is easy to damage (Mutia et al., 2014). Fruit damage or rot can occur due to microbial activity or enzyme activity in grapes (*Vitis vinifera* L.). In addition, physical and chemical changes can affect fruit rot (Faozan and Sugiharto). The cause solution to preserve food ingredients to extend the shelf life of foodstuffs with the addition of preservatives (Cahyadi, 2012).

According to the Director General of BPOM, several preservatives are permitted to preserve food, including sorbic acid, benzoic acid, propyl p-hydroxybenzoate, methyl p-hydroxybenzoate, potassium sulfite, nisin, potassium nitrite, potassium nitrate, propionic acid, and others, as well chemicals that are prohibited for food, such as formalin, boric acid, dulsin, and others, harm health (Sarwono, 2010). Entrepreneurs often misuse chemicals to preserve food. This back to nature; natural materials that have the potential as a source of natural preservatives are snail shells. Snail shells contain chitin. Chitin is a natural polysaccharide in abundance and is a by-product of crustaceans, and its deacetylation produces chitosan. Chitosan is edible and has biodegradable, antimicrobial, antifungal properties (Wang et al., 2020), film-forming properties, non-toxic (Homez-Jara et al., 2018). Chitosan is abundant, low production costs, biodegradable, and biocompatibility (Achmad et al., 2021).

Umarudin et al. (2019) supported this research, which stated that snail shell chitosan was bactericidal in *Staphylococcus aureus*. Chitosan can be helpful as a preservative because of its properties; namely, it can inhibit the growth of destructive microorganisms, and chitosan can coat preserved products (Novita et al., 2012). Chitosan can inhibit microbial growth by forming a protective layer on tofu and chicken meat (Hastuti and Hadi, 2009). 2% snail shell chitosan can shelf life of white tofu for 4 days (Syukrianto and Umarudin, 2020).

Research by Nur'aini et al. (2015) stated that chitosan coating was able to extend the shelf life of duku fruit up to 6 days, with the best treatment using 1.5% chitosan an soaking time of 30 seconds. Trisnawati et al. (2013), utilizing chitosan from crab shell waste, showed the ability to inhibit microbial growth. Snail shell chitosan one has researched a preservative in green grapes. Snail shell chitosan has not been researched a preservative in green grapes.

Methodology

Research method using true experimental. Design used was Completely Randomized Design. Research at the Chemistry Laboratory of Academy Pharmacy of Surabaya and Research Center for Biomaterial, Indonesian Institute of Science, Cibinong Science Center, Cibinong, West Java, Indonesia, in February-April 2021. Research materials used are aquadest (SIP), snail shells, green grapes (*Vitis vinifera* L.), 1 M NaOH (SAP), 1 M HCl (Lipi), 0.315% NaOCl (Lipi), 50% NaOH (Tjiwi Kimia) and ice cubes. The tools used in this research are analytical balance (Acis), Erlenmeyer (Pyrex), measuring cup (Iwaki), stirring rod, magnetic stirrer, funnel (herma), oven, beaker glass (herma), volumetric flask (Iwaki), blender, universal pH paper (Macherey-nagel), pH meter, filter paper and reflux.This research is divided into 4 groups:

PO : without snail shell chitosan (1% acetic acid)
P I : 1.25% snail shell chitosan
P II : 1.50% snail shell chitosan
P III : 1.75% snail shell chitosan

Research procedure

1. Isolation of chitosan with 4 stages of demineralization, deproteination, depigmentation and deacetylation refers to research (Umarudin et al. (2019)
2. Chitosan analyzed by FTIR (Ramadani and Ningrum, 2019)
3. Snail shell chitosan coating on green grapes
   Green grapes cleaned with aquadest. Chitosan with concentrations of 1.25%, 1.5% and 1.75% (w/v) was placed in a 50 ml – 100 ml beaker glass. The green grapes was soaked in the chitosan solution for 15 minutes, and then the green grapes was drained and dried until the chitosan solution on the surface of the green grapes did not drip anymore. Green grapes that had been coated with chitosan was then stored at room temperature and analyzed on days 0, 5, 10, 15, and 20 days during storage.
4. Physical properties testing (organoleptic and shrinkage weight)
   Green grapes was observed for physical testing, namely organoleptic and shrinkage weight. Organoleptic testing was carried out on the colour and texture of green grapes that had been coated with chitosan with three different concentrations (1.25 %, 1.5% and 1.75%) and as a control (not covered with chitosan). The method used is a scoring method, while the overall acceptance uses a hedonic test by comparing it to a comparison control. This test was carried out by 15 panellists, with a numerical assessment score on organoleptic testing 1-4 (the higher the score given, the better the score). The shrinkage weight test on green grapes was carried out to determine the shrinkage weight on green grapes coated with chitosan with several concentrations (1.25%, 1.5% and 1.75%) and green grapes not covered with chitosan. Measurements was made using an analytical balance.The shrinkage weight result is expressed in per cent is calculated by the equation:

   $$\text{shrinkage weight} = \frac{W0-W1}{WO} \times 100\%$$

   Information :

   W0 = initial shrinkage of fruit (grams)
   W1 = fruit shrinkage on day-n (grams)
5. pH test
   Green grapes that have been coated and not coated with chitosan was tested chemically in a pH test. The pH test was carried out to determine the level of acidity in green grape samples. Measurements was made by crushing 10 grams of green grapes until smooth and adding distilled water in a measuring flask to a volume of 100 ml, then the electrode is immersed until it sinks in the green grapes sample solution and is left for approximately one minute until a stable number is obtained, then the value is recorded (Nurhayati et al., 2014).
6. Data Analysis
   To determine the effect of giving snail shell chitosan with various doses on shelf life, shrinkage weight, organoleptic test, and pH of green grapes, it was analyzed by one-way ANOVA test.

Results and Discussion

Snail shell chitosan has benefits as a natural preservative to extend the shelf life of green grapes. Isolation of snail shells was carried out in four stages: demineralization, deproteination, depigmentation, and deacetylation. Nurmala et al. (2018) deproteination with 1 M NaOH aims to remove protein. Demineralization with 1 N HCl aims to remove inorganic salts or mineral content. Depigmentation, Victor et al. (2016) with 0.315% NaOCl aims to produce white chitosan, remove pigments present in the material, and deacetylate using 50% NaOH to increase the degree of chitosan deacetylation. Following are the results of the weight of each stage of isolation of snail shell chitosan in Table 1 below:

Table 1. Stages of Isolation of Chitosan Shell Snail

No	Parameter	%Result
1	Demineralization	89,4 %
2	Deproteination	60,13 %
3	Depigmentation	44,36 %
4	Deacetylation	32,12 %

Czechowska-Biskup et al. (2012), chitosan can be identified using FTIR through absorbance of its functional group on the wavenumber 1320 cm-1, which show the N-acetylglucosamine uptake and absorbance of the carbonyl group (C=O) on the wavenumber 1750-1500 cm-1 that indicate the degree of deacetylation. Degree of deacetylation (DD) is the degree that shows how many acetyl group that changed into amine group. DD value usually used to determine the quality of chitosan, where the higher of DD value, the quality of chitosan is better. DD measurement is based on the absorbance at wavenumber 1655 cm-1 to identify amide and absorbance at wavenumber 3450 to identify hydroxyl group uptake (Antonino et al., 2017: Ramadani and Ningrum, 2019). The DD of chitosan in this study was 56.53. According to Kaczmarek et al. (2019), chitin has a DD value of less than 50%, and chitosan has a DD value of more than 50%.

Chitosan has a role as an antimicrobial (Cabrera and Cutsem, 2005). Chitosan in this study was used as a natural preservative in green grapes (*Vitis vinifera* L.), by observing the characteristics of green grapes to identify the physical and chemical properties of green grapes as the main ingredient to be studied, so that changes can be observed. Changes that occur during storage at room temperature. The test results of physical and chemical properties can be known through the percentage of shrinkage weight, organoleptic, and pH.

1. **Percentage of shrinkage weight of Green Grapes (*Vitis vinifera* L.)**

The analysis results showed that the weight loss of green grapes after storage for 21 days with various concentrations. The following average values are shown in Table 2 below:

Table 2. Percentage of shrinkage weight of Green Grapes (*Vitis vinifera* L.)

Percentage Of Shrinkage Weight Of Green Grapes				
day	Chitosan Concentration			
	control	1,25%	1,50%	1,75%
	% shrinkage	% shrinkage	% shrinkage	% shrinkage
1	3,66	2,95	3,02	2,84
2	5,67	4,65	3,85	5,77
3	8,35	6,77	7,22	6,3
4	10,51	8,81	8,59	8,65
5	12,63	10,56	10,45	10,17
6	14,72	12,39	12,27	11,91
7	17,75	14,79	14,82	14,32
8	18,24	16,72	16,68	16,11
9	21,49	18,2	18,24	17,59
10	24,73	21,17	21,08	20,43
11	27,23	23,28	23,19	22,45
12	29,5	24,9	24,3	23,49
13	31,58	27,15	26,87	26,16
14	32,23	28,38	28,53	27,74
15	35,33	31,67	30,21	29,35
16	37,39	32,81	31,59	30,68
17	38,75	33,98	32,81	31,64
18	40,1	35,16	33,82	33,36
19	41,03	36,16	35,23	34,19
20	41,51	37,69	37,84	35,49
21	46,86	40,42	39,70	36,42

Information :
Control : No chitosan coating
1.25%-1.75% : Coating with chitosan

The fig of the percentage of shrinkage weight below.

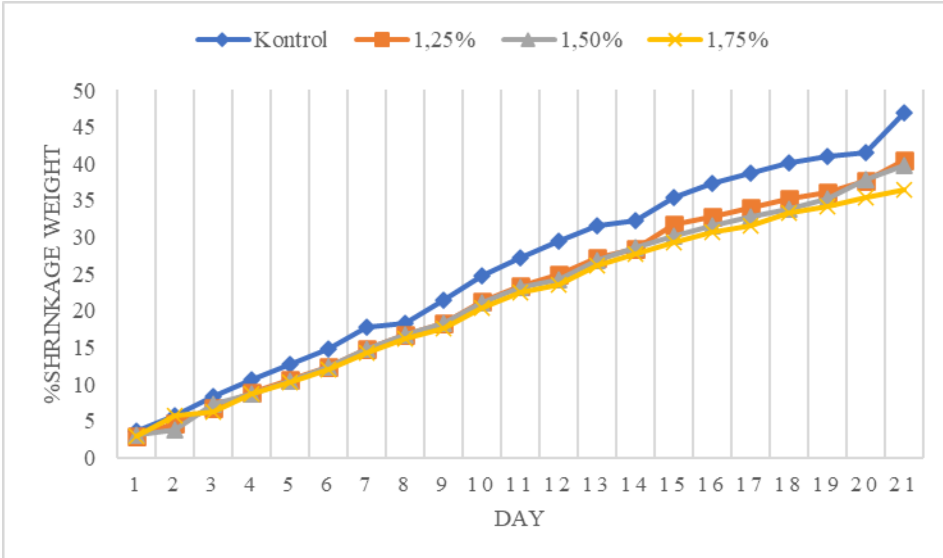

Figure 1. Graph of shrinkage weight of Green Grapes

Information :
Control : No chitosan coating
1.25%-1.75% : Coating with chitosan

Figure 1 shows the shrinkage weight of grapes for control on day 21 with an average of 46.86%. Fruit coated with chitosan various concentrations of 1.25%, 1.5%, and 1.75% affect changes in the shrinkage weight of green grapes, namely at concentrations of 1.25% at 40.42%, 1.5% at 39, 70%, and 1.75% by 36.42%.The results of statistical tests with ANOVA on shrinkage weight of green grapes can be seen in Table 3 below.

Table 3. ANOVA Test Results on shrinkage weight of Green Grapes

ANOVA					
shrinkage weight					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	554,956	3	184,985	10,461	,001
Within Groups	265,248	15	17,683		
Total	820,204	18			

Table 3 shows the value of sig < 0.05, which means the data is significant and is continued with the Tukey test contained in Table 4 below:

Table 4. Tukey's Test Results on shrinkage weight of Green Grapes

Multiple Comparisons						
Dependent Variable: shrinkage weight						
Tukey HSD						
(I) Konsentrasi	(J) Konsentrasi	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Kontrol	1.25%	-2,41300	2,82089	,827	-10,5432	5,7172
	1,5%	7,44500	2,82089	,078	-,6852	15,5752
	1,75%	10,72900*	2,82089	,008	2,5988	18,8592
1.25%	Kontrol	2,41300	2,82089	,827	-5,7172	10,5432
	1,5%	9,85800*	2,65956	,010	2,1927	17,5233
	1,75%	13,14200*	2,65956	,001	5,4767	20,8073
1,5%	Kontrol	-7,44500	2,82089	,078	-15,5752	,6852
	1.25%	-9,85800*	2,65956	,010	-17,5233	-2,1927
	1,75%	3,28400	2,65956	,615	-4,3813	10,9493
1,75%	Kontrol	-10,72900*	2,82089	,008	-18,8592	-2,5988
	1.25%	-13,14200*	2,65956	,001	-20,8073	-5,4767
	1,5%	-3,28400	2,65956	,615	-10,9493	4,3813
*. The mean difference is significant at the 0.05 level.						

Table 4 shows that shrinkage weight in control were significantly different with a concentration of 1.75%, while the concentrations of 1.25% and 1.5% were not significantly different. The concentration of 1.25% were significantly different from the concentrations of 1.5% and 1.75%. The 1.5% concentration were significantly different from the 1.25% concentration, while the 1.75% concentration were significantly different from the control and 1.25% concentration.The higher concentration of snail shell chitosan on the weight loss of green grapes affects maintaining fruit weight.

The shrinkage weight in control was higher at 46.86%. The grapes that were not coated with chitosan quickly rotted due to the transpiration process, so that the water contained in the green grapes moved to the environment, which caused shrinkage in the uncoated fruit. Higher. Compared to grapes coated with chitosan in good condition, this is because chitosan can shelf life and can inhibit the rate of respiration and transpiration reactions so that fruit damage does not occur quickly. Nur'aini et al. (2015), chitosan is known to have the ability to form gels, films and fibres, due to its high molecular weight and solubility in dilute acid solutions, so that it can inhibit the rate of physiological and microbiological reactions that cause fruit damage.

2. Organoleptic Test

Organoleptic test with hedonic quality test method, totalling 15 panellists with colour and texture parameters. The limit for consumer acceptance is 4, where each score has specifications based on SNI 2004. The following organoleptic values include:

a. Organoleptic value of green grape (*Vitis vinifera* L.) colour

Colour is one of the most critical quality attributes for processed food products. The skin colour of green grapes significantly affects consumer acceptance. The organoleptic value of green grape skin colour during storage time is presented in Table 5 below.

Table 5. Organoleptic Value of Green Grape Color

Organoleptic Value color				
day	**Chitosan Concentration**			
	control	**1,25%**	**1,50%**	**1,75%**
1	4	4	4	4
2	3,9	4	4	4
3	3,9	4	4	4
4	3,9	4	4	4
5	3,8	3,8	3,9	4
6	3,6	3,8	3,7	3,8
7	3,5	3,8	3,7	3,8
8	3,4	3,6	3,7	3,7
9	3,3	3,5	3,7	3,6
10	3,3	3,3	3,6	3,5
11	3,1	3,2	3,5	3,5
12	2,8	3,1	3,3	3,3
13	2,3	2,7	2,9	2,9
14	2,2	2,6	2,7	2,7
15	2	2,4	2,5	2,5
16	1,7	2,3	2,3	2,4
17	1,6	1,9	2,1	2,1
18	1,5	1,7	1,7	1,8
19	1,3	1,6	1,5	1,7
20	1,1	1,4	1,4	1,5
21	1	1,3	1,4	1,5

Information :
Control : No chitosan coating
1.25%-1.75% : Coating with chitosan

The hedonic quality test assessment graph is shown in Figure 2 below.

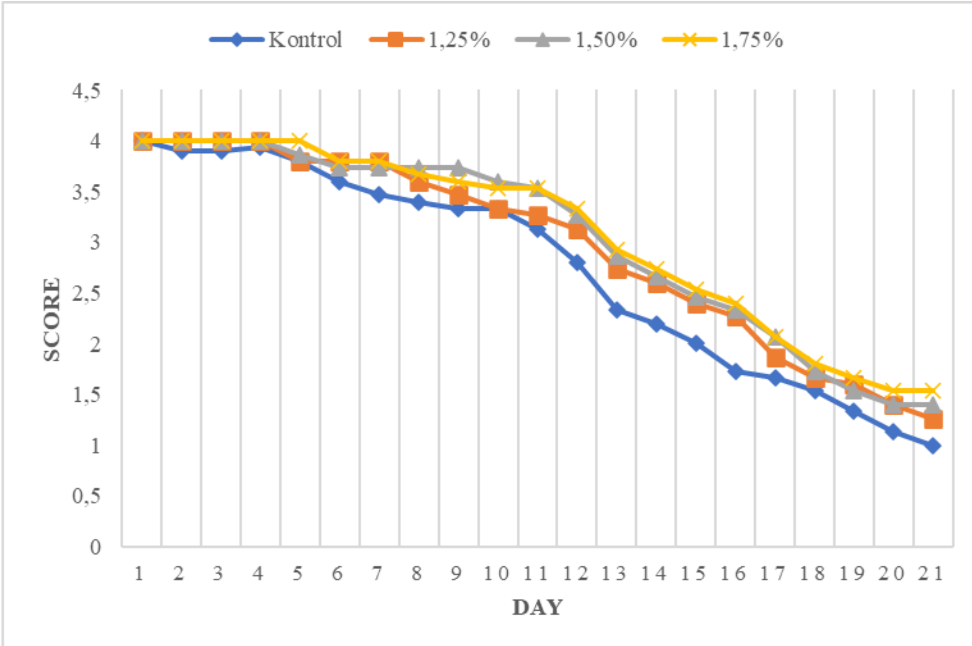

Figure 2. Graph of Color Organoleptic Values in Green Grapes

Note: Rating Scale:
1. The colour turns brown completely; 2. Deviation of almost the full bloom of the skin; 3. A slight variation in skin tone; and 4. Colour according to the type of colour;

Green grapes coated with chitosan affect consumer acceptance at a concentration of 1.25%, 1.5% and 1.75%. Figure 2 shows that all samples experienced a decrease in a score; at a concentration of 1.75%, the reduction in score was better than the control. Concentrations of 1.75% and 1.50% on the 18th day of storage decreased scores by 1.7 and 1.8; at a concentration of 1.25%, there was a decrease in score on the 17th day of storage by 1.9 compared to the control there was a decrease in the score on the 16th day of storage by 1.7. The results of statistical tests with ANOVA on the organoleptic colour of green grapes can be seen in Table 6 below:

Table 6. ANOVA Test Results on Green Grape

ANOVA					
Color					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2,333	3	,778	4,242	,009
Within Groups	10,267	56	,183		
Total	12,600	59			

Table 6 shows the value of sig <0.05, which means the data is significant and can be continued with the Tukey test contained in Table 7 below:

Table 7.Tukey's Test Results on Green Grape

Multiple Comparisons						
Dependent Variable: Color						
Tukey HSD						
(I) Konsentrasi	(J) Konsentrasi	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Kontrol	1,25%	-,26667	,15635	,330	-,6807	,1473
	1,5%	-,40000	,15635	,062	-,8140	,0140
	1,75%	-,53333*	,15635	,006	-,9473	-,1193
1,25%	Kontrol	,26667	,15635	,330	-,1473	,6807
	1,5%	-,13333	,15635	,829	-,5473	,2807
	1,75%	-,26667	,15635	,330	-,6807	,1473
1,5%	Kontrol	,40000	,15635	,062	-,0140	,8140
	1,25%	,13333	,15635	,829	-,2807	,5473
	1,75%	-,13333	,15635	,829	-,5473	,2807
1,75%	Kontrol	,53333*	,15635	,006	,1193	,9473
	1,25%	,26667	,15635	,330	-,1473	,6807
	1,5%	,13333	,15635	,829	-,2807	,5473
*. The mean difference is significant at the 0.05 level.						

Table 7 shows that the control was significantly different at a concentration of 1.75% and not significantly different at a concentration of 1.25% and 1.5%. Concentrations of 1.25% and 1.5% were not significantly different from the control and 1.75% concentration, while the concentration of 1.75% was significantly different from the control. This is because, in the control of the colour of green grapes to brown, a natural enzymatic process occurs. The longer the storage time, the process of respiration and transpiration occurs, resulting in a change in the fruit skin colour. The use of chitosan coating on grapes can inhibit the function of transpiration and respiration so that changes in fruit skin colour do not occur quickly (Nur'aini et al., 2015).

b. Texture organoleptic value of green grapes (*Vitis vinifera* L.)

The organoleptic value of green grapes texture during storage time is presented in Table 8 below.

Table 8. Organoleptic Value of Green Grape Texture.

Texture organoleptic value				
day	**Chitosan Concentration**			
	control	**1,25%**	**control**	**1,75%**
1	4	4	4	4
2	4	4	4	4
3	3	3,6	4	4
4	3,3	3,6	4	4
5	3,3	3,6	3,9	4
6	3,3	3,5	3,9	3,8
7	3,3	3,3	3,9	3,7
8	3,1	3,3	3,9	3,6
9	3	3,3	3,9	3,6
10	2,9	3,2	3,7	3,5
11	2,8	3,1	3,5	3,5
12	2,8	3	3,3	3,3
13	2,5	2,7	2,9	3
14	2,3	2,5	2,7	2,8
15	2,2	2,3	2,5	2,7
16	1,9	2,2	2,4	2,5
17	1,7	1,9	2	2,1
18	1,6	1,7	1,8	1,9
19	1,5	1,5	1,7	1,7
20	1,3	1,3	1,6	1,5
21	1	1,2	1,4	1,5

Information :
Control : No chitosan coating
1.25%-1.75% : Coating with chitosan

The hedonic quality test assessment graph is shown in Figure 3 below.

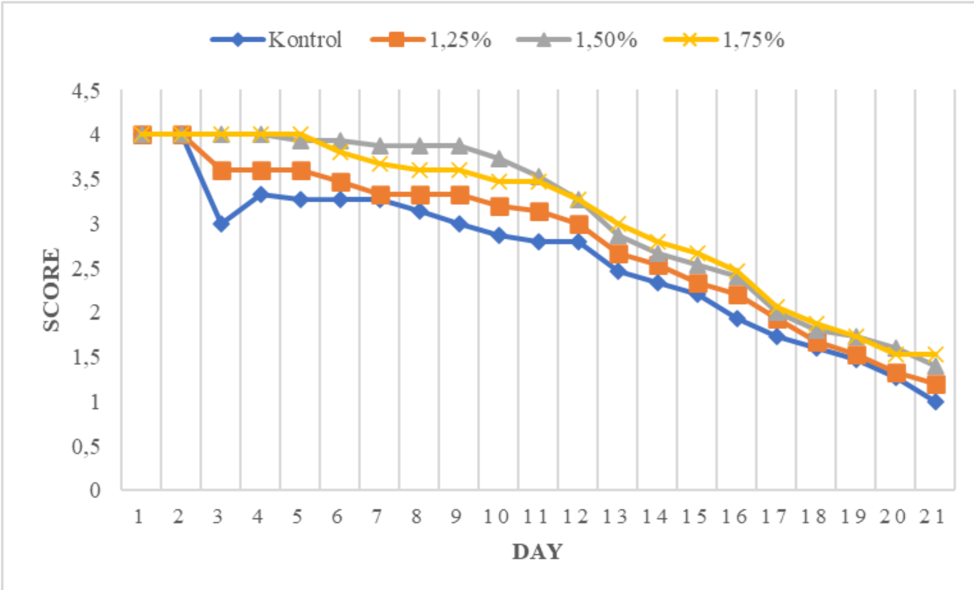

Figure 3. Graph of Texture Organoleptic Values in Green Grapes
Note: Rating Scale: 1. Wet, watery and shows wrinkles; 2. Compact, flabby and shows wrinkles; 3. Compact, solid, and shows little wrinkles; 4. Compact, reliable, and shows no wrinkles;

Green grapes coated with chitosan affect consumer acceptance at a concentration of 1.25%, 1.5% and 1.75%. Figure 3 shows that all samples experienced a decrease in a score; at a concentration of 1.75%, the reduction in score was longer than the control. Concentrations of 1.75% and 1.50% on the 18th day of storage decreased scores by 1.9 and 1.8; at a concentration of 1.25%, there was a decrease in the score on the 17th day of storage by 1.9 compared to the control there was a decrease in the score on the 16th day of storage by 1.9.

The following are the results of statistical tests using ANOVA on the organoleptic texture of green grapes in Table 9 below:

Table 9. ANOVA Test Results on the Texture of Green Grapes

ANOVA					
Texture					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2,450	3	,817	4,699	,005
Within Groups	9,733	56	,174		
Total	12,183	59			

Table 9 shows the value of sig < 0.05, which means the data is significant and can be continued with the Tukey test contained in Table 10 below:

Table 10. Tukey's Test Results on the Texture of Green Grapes

Multiple Comparisons						
Dependent Variable: Texture						
Tukey HSD						
(I) Konsentrasi	(J) Konsentrasi	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Kontrol	1,25%	-,20000	,15223	,558	-,6031	,2031
	1,5%	-,40000	,15223	,053	-,8031	,0031
	1,75%	-,53333*	,15223	,005	-,9364	-,1302
1,25%	Kontrol	,20000	,15223	,558	-,2031	,6031
	1,5%	-,20000	,15223	,558	-,6031	,2031
	1,75%	-,33333	,15223	,139	-,7364	,0698
1,5%	Kontrol	,40000	,15223	,053	-,0031	,8031
	1,25%	,20000	,15223	,558	-,2031	,6031
	1,75%	-,13333	,15223	,817	-,5364	,2698
1,75%	Kontrol	,53333*	,15223	,005	,1302	,9364
	1,25%	,33333	,15223	,139	-,0698	,7364
	1,5%	,13333	,15223	,817	-,2698	,5364
*. The mean difference is significant at the 0.05 level.						

Table 10 shows that the control was not significantly different with a concentration of 1.25% and 1.5% but significantly different with a concentration of 1.75%. Concentrations of 1.25% and 1.5% were not significantly different from the control and 1.75% concentration, while the concentration of 1.75% was significantly different from the control. The texture shows an effect, namely at a concentration of 1.75% compared to control, caused by transpiration during physiological processes resulting in reduced water content in green grapes. Changes in fruit texture and microbiological reactions can damage fruit flesh tissue resulting in a decrease in the quality of fruit flesh texture (Nur'aini et al., 2015). The longer the shelf life of grapes, the faster the rate of fruit damage. In texture, the longer the storage time, the green grape flesh becomes softer and wrinkled, which starts on the skin and penetrates the fruit flesh.

3. pH test

The following are the results of the pH test shown in Table 11 below.

Table 11. pH Value of Green Grapes

Concentration	pH value		
	Day 1	Day 3	Day 5
Control	3,28	3,78	4,14
1,25 %	3,23	3,65	3,93
1,50 %	3,17	3,56	3,76
1,75 %	3,06	3,42	3,56

Information :
Control : No chitosan coating
1.25%-1.75% : Coating with chitosan

The following pH values in green grapes are presented in Figure 4 below.

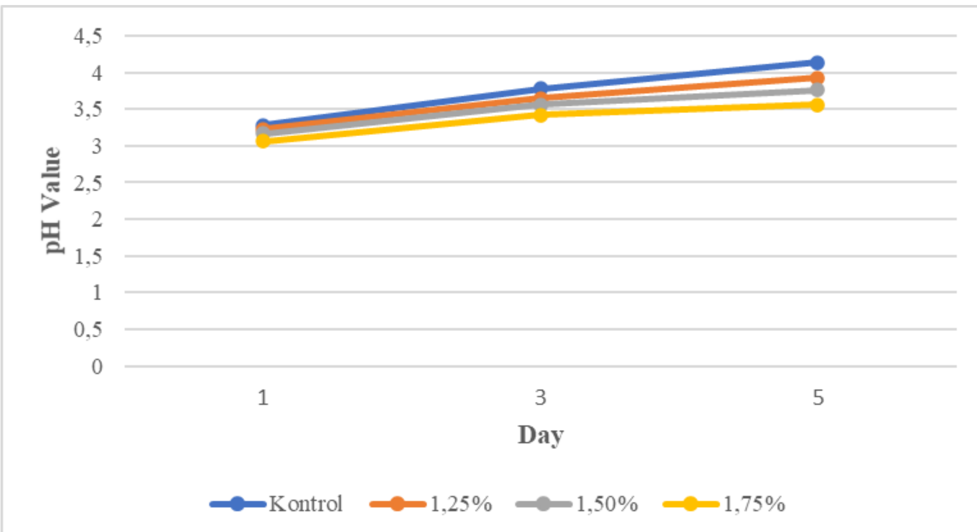

Figure 4 Graph of pH Value in Green Grapes

Figure 4 shows that the more extended storage causes the pH value of the grapes to increase. The pH values of green grapes soaked in chitosan with concentrations of 1.25%, 1.5%, and 1.75% tended to be lower than green grapes not soaked in chitosan during storage for 5 days where the pH value of green grapes that were not coated with chitosan experienced a higher increase of 4.14 on storage for 5 days. Compared with grapes coated with chitosan at a concentration of 1.25%, 3.93; 1.5% of 3.76; and 1.75% of 3.56. The following statistical test results using ANOVA on the pH of green grapes can be seen in Table 12 below:

Table 12 ANOVA Test Results on the pH of Green Grapes

ANOVA					
pH Value					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1,208	3	,403	4,827	,005
Within Groups	4,672	56	,083		
Total	5,880	59			

Table 12 shows the value of sig < 0.05, which means the data is significant and can be continued with the Tukey test contained in Table 13 below:

Table 13 Tukey's Test Results on the pH of Green Grapes

Multiple Comparisons						
Dependent Variable: pH Value						
Tukey HSD						
(I) Konsentrasi	(J) Konsentrasi	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Kontrol	1,25%	,13000	,10547	,609	-,1493	,4093
	1,5%	,23667	,10547	,124	-,0426	,5159
	1,75%	,38667*	,10547	,003	,1074	,6659
1,25%	Kontrol	-,13000	,10547	,609	-,4093	,1493
	1,5%	,10667	,10547	,744	-,1726	,3859
	1,75%	,25667	,10547	,082	-,0226	,5359
1,5%	Kontrol	-,23667	,10547	,124	-,5159	,0426
	1,25%	-,10667	,10547	,744	-,3859	,1726
	1,75%	,15000	,10547	,491	-,1293	,4293
1,75%	Kontrol	-,38667*	,10547	,003	-,6659	-,1074
	1,25%	-,25667	,10547	,082	-,5359	,0226
	1,5%	-,15000	,10547	,491	-,4293	,1293
*. The mean difference is significant at the 0.05 level.						

Table 13 shows that the control was not significantly different with a concentration of 1.25% and 1.5% but significantly different with a concentration of 1.75%. Concentrations of 1.25% and 1.5% were not significantly different from the control and 1.75% concentration, while the concentration of 1.75% was significantly different from the control.

The pH value obtained increased every day, where the chitosan-coated fruit experienced an increase in pH, which was not too high compared to the control the rise in pH value and the increase in the shelf life of green grapes. The longer the shelf life of the fruit, the more water components come out. With more water components in this fruit juice, the pH value increases. The analysis results showed that the shelf life of the fruit affected the pH value of green grape juice. According to Arumaningrum et al. (2015), the increase in pH was due to the increasing number of water components in the extracted green grapes, increasing the pH value. The longer the osmosis time, the more water from the cells extracted.

The higher the concentration of snail shell chitosan in green grapes produces a more acidic pH value and can maintain or suppress the increase in pH value. Andriasty et al. (2015), the chitosan coating can inhibit the respiratory work of increasing CO_2 production. This is because the organic acids in the fruit do not decompose quickly under aerobic conditions. In addition, using chitosan coating, which is composed of several raw materials in the form of polysaccharides which form a thin layer in the form of a film, provides semi-permeable properties to maintain the internal equilibrium of gases involved in aerobic and anaerobic respiration, thereby inhibiting senescence.

Conclusion

The physical properties of green grapes (*Vitis vinifera* L.), coated with snail shell chitosan at a concentration of 1.75% shrinkage weight, and significant effect than the control. Organoleptic values with texture and colour parameters at concentrations of 1.75% and 1.50% on the 18^{th} day of storage decreased scores by 1.9 and 1.8; at a concentration of 1.25%, there was a decrease in the score on the 17^{th} day of storage by 1.9 compared to the control, there was a decrease in score on the 16^{th} day of storage by 1.9, and the concentration of 1.75% had a significant effect compared to the control. Chemical properties (pH) of coated green grapes (*Vitis vinifera* L with snail shell chitosan at a concentration of 1.75%, pH value of 3.56; 1.50% concentration of 3.76; and a concentration of 1.25% of 3.93. The higher the concentration can suppress the increase in the pH value, and the concentration of 1.75% has a significant effect compared to the control.

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