

Disinfectants Effect Of Fresh Cut Carrot (*Daucus carota* L) During Cold Storage In Modified Atmosphere Packaging (MAP)

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ABSTRACT

Many discoveries of instant food products so easily processed by the consumer, fresh cut carrot is a product developed in this study with Modified Atmosphere Packaging (MAP) with 1%O₂, 10%CO₂, 89%N₂ in cold storage (5°C). This research aims to study the changes of fresh cut carrots quality factor for storage of low temperature and room temperature, and the effect of disinfectants and inhibitor of browning reaction. The study results shows that cold storage 5°C can retain visual quality of fresh cut carrot can maintained maximum of 12 days. Safety food of fresh cut carrots tolerated during 6 days of storage giving a chemical treatment, that soaked into chlorine 100ppm and ascorbic acid 100 ppm is able to maintain the brightness of the colors, and inhibit the growth of microorganism, but adverse impact on flavor of fresh cut carrot.

Keywords:

Fresh cut, carrot,
quality, Modified
Atmosphere
Packaging

INTRODUCTION

Carrots are an important vegetable component in a balanced diet for a healthy lifestyle. Carrots are identified as carotenoids that maintain immunity, healthy skin, lungs, intestinal organs, and help the growth of new cells. The development of the times and the science of food handling, many inventions of food products are semi-finished so that they are easily processed by consumers, this is based on the lifestyle of modern people who do not have much time to prepare a balanced whole menu. Departing from that explanation, fresh cut carrot is a product developed in this research by identified effect of disinfectant on the quality of fresh cut carrots. The characteristics to determine quality of

fresh cut products for consumers are external appearance, texture, taste, and nutritional value of the product [1] [3].

Modified Atmosphere Packaging (MAP) is the manipulation of composition atmosphere in the packaging by reducing oxygen (O₂) concentration, and increasing concentration of carbon dioxide (CO₂) and nitrogen (N₂) is one of the ideal methods of preserving fresh fruits/vegetables. Based on the explanation, fresh cut carrot product in this research can apply the MAP method. This research aims to determine the effect of disinfectant (browning reaction inhibitors) on the quality of fresh cut carrots during low temperature (5°C) storage with MAP method.

METHOD

The treatment parameters consisted of chemical treatment (disinfectant and prevention of browning reaction) and non-chemical treatment on MAP packaging with composition O₂:CO₂:N₂ (1% :10% : 89%) stored at cold temperature (5°C), as follows:

C = Chemical treatment (100ppm chlorine and 100 ppm ascorbic acid)

N = Non-chemical treatment

Parameters observed were the color quality of fresh cut carrots in the form of measurement of color degree, °hue, browning index, and food safety in the form of analysis of total microorganisms.

RESULT AND DISCUSSION

This research shows that cold storage at 5°C can extend the shelf life of fresh cut carrots for a maximum of 12 days based on the quality parameters of fresh cut carrots show in Figure 1. The modified atmosphere packaging method was able to maintain the freshness of sliced fresh cut carrots. Chemical treatment (disinfectant and prevention of browning reaction) can maintain several quality parameters of fresh cut carrots based on commercial standards and consumer acceptance is better than non-chemical treatment.

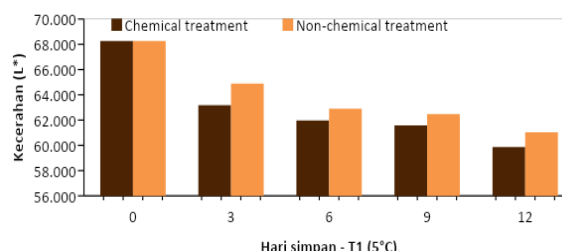
Table 1. The results of further test analysis of variance of physical parameters (color) of fresh carrot slices stored T1 (5°C)

Perlakuan	Parameter Fisik (Warna)				
	Nilai (L*)	Nilai (a*)	Nilai (b*)	Derajat (°hue)	Browning Index
Komposisi Gas (O₂:CO₂:N₂)					
Udara sekitar (P0)	62.081 ^a	25.847 ^a	35.827 ^a	53.673 ^a	5.696 ^{ab}
1% : 10% : 89 (P2)	63.915 ^b	26.987 ^b	37.776 ^b	53.165 ^a	5.696 ^{ab}
Uji F	**	tn	**	tn	*
Desinfektan					
Chemical treatment (C)	62.968 ^a	28.995 ^a	39.269 ^a	53.133 ^a	5.695 ^a
Non chemical treatment(N)	63.907 ^b	24.4501 ^a	35.147 ^a	54.027 ^a	5.697 ^b
Uji F	*	**	**	tn	**
Hari Simpan T1 5°C					
0	68.262 ^d	34.613 ^d	48.974 ^d	56.018 ^b	5.693 ^a
3	64.023 ^c	28.913 ^c	41.146 ^d	54.642 ^b	5.694 ^b
6	62.433 ^b	24.996 ^b	37.401 ^c	54.109 ^b	5.695 ^b
9	62.025 ^b	23.386 ^{ab}	31.938 ^b	53.077 ^b	5.697 ^c
12	60.446 ^a	21.707 ^a	26.583 ^a	50.055 ^a	5.698 ^d
Uji F	**	**	**	**	**

Description: (*) has a significant effect, (**) has a very significant effect, (tn) is not significant, (abc) Duncan's value is 5% level if it has the same magnitude there is no significant difference and if it is different there is a significant difference

1.1. The result of measurement color change (°hue) of fresh cut carrot

The interaction of non-chemical treatment and chemical treatment of fresh cut carrots on the level of color brightness L* indicated significant effect, contrast to the values level's of a* and b* which had not significant effect.



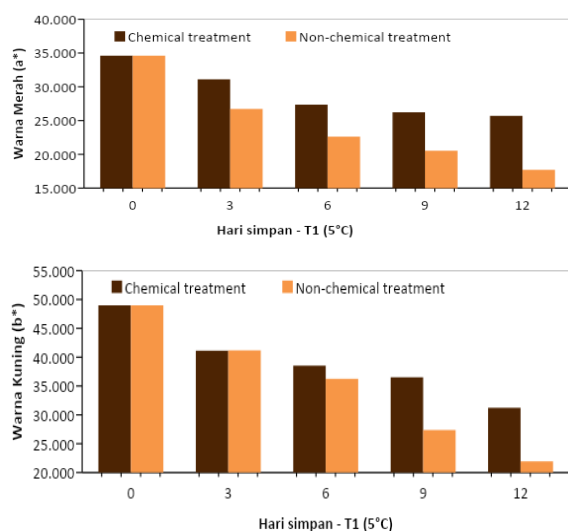


Figure 1. Effect of disinfectant on *Lab value of fresh cut carrot during storage

Carrots have high carotenoid and oxidative so that the change in color brightness level (L^*) will decrease along with the oxidation reaction that occurs. O_2 can trigger fat oxidation reactions, browning reactions, and oxidation of carotenoid pigments in carrots [2]. The effect of giving ascorbic acid as an anti-oxidant is able to maintain the color saturation of fresh sliced carrots longer, so the values of a^* and b^* in chemical treatment is brighter

1.2. The results of the browning index analysis of fresh cut carrot

Based on the analysis of the interaction variance of non-chemical treatment and chemical treatment, it showed a significant effect on the browning index with a significance ($0.00 < 0.05$) at both storage temperatures.

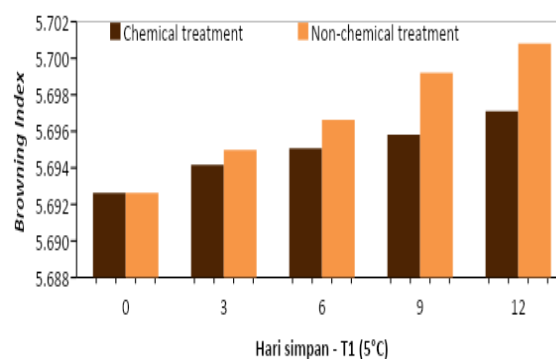


Figure 2. Effect of disinfectant and storage days on the browning index of fresh cut carrot

Browning index increased based on the concentration of O_2 in the packaging. The polyphenol enzymes (PPO) caused browning when reacted with oxygen. The browning index value in non-chemical treatment increased more than chemical treatment on the 3rd day of storage. Soaking fresh cut carrots with ascorbic acid can prevent browning of carrots [7].

1.3. Microorganism analysis results (log cfu/ml) of fresh cut carrot

Microorganism growth is related to the pH value of fresh cut carrots during storage. Microorganisms cannot be removed from eating but can be tolerated in number. Regarding the application of the maximum limit of microbial contamination in food is 1×10^4 colonies/g. In cold storage, fresh cut carrots after the 6th day of storage have passed the tolerance for consumption and in room conditions [4]. The high concentration of CO_2 in the end can slow down the growth rate of spoilage microorganisms [5]. The total microbes of chemical treatment and non-chemical treatment are not much different. However, chemical

treatment with 100 ppm chlorine immersion [3] minimizes microbial growth during storage. Chlorine is generally added to control microorganisms in foodstuffs, destroying fungi, [4] bacteria, and viruses [6].

CONCLUSION

Modified atmosphere packaging with cold storage can maintain the visual quality and taste of fresh cut carrot for maximum 12 days. Food safety of fresh cut carrot is tolerated for 6 days. Chemical treatment in the form of soaking in 100 ppm chlorine and 100 ppm ascorbic acid was able to maintain colour brightness, and suppress the growth of microorganisms, but affected to taste of fresh cut carrot.

ACKNOWLEDGMENTS

Further research about size of carrot slices to suit consumer preferences. The use of natural preservatives can maintain quality and a longer shelf life.

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