

## REDUCING SUNBURN INCIDENCE IN MD2 PINEAPPLE USING MECHANICAL PRE-HARVEST TREATMENT TO OVERCOME POST-HARVEST LOSSES IN MALAYSIA

Norsyuhaida Ahmad Shafawi

Horticulture Research Centre, MARDI Kluang, Beg Berkunci No. 525, 86009 Kluang, Johor, Malaysia

Email: syuhaida@mardi.gov.my

Azaini Azmi

Horticulture Research Centre, MARDI Kluang, Beg Berkunci No. 525, 86009 Kluang, Johor, Malaysia

Email: azaini@mardi.gov.my

Zatul-Iffah Zain

Horticulture Research Centre, MARDI Kluang, Beg Berkunci No. 525, 86009 Kluang, Johor, Malaysia

Email: iffah@mardi.gov.my

Salwani Ab Azid

Horticulture Research Centre, MARDI Kluang, Beg Berkunci No. 525, 86009 Kluang, Johor, Malaysia

Email: salwaniabazid@mardi.gov.my

Mohd Fareez Abu

Livestock Science Centre, MARDI Kluang, Beg Berkunci No. 525, 86009 Kluang, Johor, Malaysia

Email: ayies@mardi.gov.my

Noor Syahira Nasarudin

Horticulture Research Centre, MARDI Headquarters, Persiaran MARDI-UPM, 43400 Serdang, Selangor, Malaysia

Email: syahira@mardi.gov.my

Razali Mustaffa

Horticulture Research Centre, MARDI Headquarters, Persiaran MARDI-UPM, 43400 Serdang, Selangor, Malaysia

Email: razally@mardi.gov.my

Joanna Cho Lee Ying

Horticulture Research Centre, MARDI Headquarters, Persiaran MARDI-UPM, 43400 Serdang, Selangor, Malaysia

Email: joanna@mardi.gov.my

Noorashikin Isahak

Horticulture Research Centre, MARDI Kluang, Beg Berkunci No. 525, 86009 Kluang, Johor, Malaysia

Email: noorashikinisahak@gmail.com

Riyadhthusollehin Khairulfuaad

Horticulture Research Centre, MARDI Kluang, Beg Berkunci No. 525, 86009 Kluang, Johor, Malaysia

Email: sollehinfuaad@gmail.com

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### ABSTRACT

Pineapple has been identified as a new source of wealth and occupies third place in the world tropical fruits production after bananas and mangos respectively. Pineapple variety MD2 now is the most popular variety where it is being traded globally and occupied 50%-55% of world market mainly due to its excellent taste, sweetness, attractive golden flesh, golden skin color, lifespan, ripeness and its perfect cylindrical shape. While the pineapple industry is growing rapidly, post-harvest losses seems to be one of factors slowing it down and sunburn incidence are one of them. In Malaysia, during strong sunlight time often leads to severe fruit sunburn incidence rate up to 50%. An experiment has been conducted at Seri Menanti, Negeri Sembilan (2nd Agro-climatic zone) which is pre-harvest treatment using mechanical; T1 (no shading), T2 (fruit wrap), T3 (fruit cap) and T4 (50% black shade net). Results show that, T4 is the best treatment which only 0% sunburn incidence rate with only 2-4 seconds time need to cover a single fruit followed by T2, T3 and T1 with the results 5% sunburn incidence with 10-15 seconds, 15% sunburn incidence with 25-30 seconds and 50% sunburn incidence respectively. Therefore, chemical pre-harvest treatment using 50% black shade netting are suggested but further research have to be conducted at different agro-climatic zone to confirm that this treatment can be apply to every agro-climatic zone in Malaysia.

Key words: MD2 pineapple, pre-harvest treatment, sunburn, mechanical, agro-climatic zone

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## INTRODUCTION

Pineapple has been identified as a new source of wealth and occupies third place in the world tropical fruits production after bananas and mangos respectively. Pineapple variety MD2 now is the most popular variety where it is being traded globally and occupied 50%-55% of world market mainly due to its excellent taste, sweetness, attractive golden flesh, golden skin color, lifespan, ripeness and its perfect cylindrical shape. While the pineapple industry is growing rapidly, post-harvest losses seems to be one of factors slowing it down and sunburn incidence are one of them. In Malaysia, during strong sunlight time often leads to severe fruit sunburn incidence rate up to 50%.

MD2 pineapple is the highest demand pineapple in the world and even in Malaysia alone, 20 tonnes of fresh MD2 pineapple is needed for export every week. However, the main constraints faced are the quality of the fruit and the aesthetic value of the fruit which is damaged due to injuries such as sunburn and mechanical injuries during transportation from the farm to the factory and packaging area as well as during storage. This is due to the physiological characteristics of MD2 pineapple which is thin and less dense. Beside using chemical pre-harvest treatment, mechanical treatment usually used by farmers such as fruit cap, fruit wrap, netting and many other practices to give shade to MD2 pineapple fruits. The main consent must be the cost and also work load that comes together with it.

Pineapple industries development in Malaysia can rapidly develop by solving the post-harvest losses of pineapple fruits because it will increase export numbers for pineapple especially MD2 variety. Because of sudden changes in climate, sunburn incidence on MD2 pineapple fruit increase to more than 50% and if we can solve this problem our country income could increase dramatically.

## MATERIALS AND METHODS

1. Pineapple plants that have even growth and even flowering were chosen to avoid errors of different sizes and maturity of fruit because fruit injury due to sunburn is affected by surface area and fruit ripening maturity.
2. Pre-harvest treatment application was carried out on 100 days after flowering induction pineapple plant or more precisely at the stage of the complete flowering phase.
3. Pre-harvest treatment was done in the early morning before 9 am to prevent the fruit from damage by the sunlight.
4. Meteorological data such as rainfall distribution, sunlight distribution, wind speed, temperature, and humidity during the study period were taken to see the influence of weather to the study.

## RESULTS AND DISCUSSION

Hypothesis of this experiment is to reduce sunburn incidence on MD2 pineapple fruit.

From the table below, treatment that showed the lowest sunburn incidence is pre-harvest treatment T4 using 50% black shade net. The result shows sunburn incidence for T4 is 0% compared to control (T1) with 50% sunburn incidence (Table 1). Followed by treatment T2 (fruit wrap) and T3 (fruit cap) with the results 5% and 15% sunburn incidence respectively. From this result we confirm that shading using 50% black shade net can reduce the sunburn incidence from 50% to 0% because the fruit are totally protected from heavy sunlight. Only 50% of sunlight can penetrate the black netting.

Table 1. Effect of different mechanical pre-harvest treatment to sunburn incidence on MD2 pineapple

Treatment	Flowering (%)	Fruiting (%)	Sunburn incidence (%)
T1 = No shading (control)	100	100	50
T2 = Fruit wrap	100	100	5
T3 = Fruit cap	100	100	15
<b>T4 = 50% black shade net</b>	<b>100</b>	<b>100</b>	<b>0</b>

Apart from the sunburn incidence assessment of MD2 pineapple fruit, to determine the best treatment, comparison of time consumption and costing is also very important to ensure that the application of pre-harvest treatment worth it. This can be assessed from the results of the study in table 2. Four types of mechanical pre-harvest treatments were examined to obtain the best time consumption and the lowest cost among them. Based on Table 2, T4 significantly showed the fastest time consumed only 2-4 seconds per fruit with the lowest cost of RM0.10-RM0.20 per fruit. Followed by T2 and T3 with the results 10-15 seconds per fruit with the cost of RM0.30-RM0.40, and 25-30 seconds per fruit with cost RM0.50-RM0.60 per fruit respectively. From the survey conducted among workers and farmers, T4 is an easy workload.

Table 2. Comparison of time consumption and costing for different mechanical pre-harvest treatment for MD2 pineapple

Treatment	Time per fruit (second)	Cost per fruit (RM)	Difficulty rate
T1 = No shading (control)	0	0	Easy
T2 = Fruit wrap	10-15	0.30-0.40	Medium
T3 = Fruit cap	25-30	0.50-0.60	Medium
<b>T4 = 50% black shade net</b>	<b>2-4</b>	<b>0.10-0.20</b>	<b>Easy</b>

Fruit quality is the most important observation to ensure that the best treatment will give us the best quality of fruit. The result in table 3 shows that there are no significant differences between treatment in all parameters. This means that all treatment not affected the quality of MD2 pineapple fruits compare to control.

Table 3. Effect of different mechanical pre-harvest treatment to fruit quality of MD2 pineapple

Treatment	TTA (%)	TSS (°Brix)	Fruit weight (g)	Crown weight (g)	Total weight (g)	Ascorbic acid (mg/100g)
T1 = No shading (control)	0.43	17	1556	354	1910	40.78
T2 = Fruit wrap	0.40	18	1625	360	1985	40.52
T3 = Fruit cap	0.42	18	1616	349	1965	41.06
<b>T4 = 50% black shade net</b>	<b>0.42</b>	<b>19</b>	<b>1652</b>	<b>366</b>	<b>2018</b>	<b>42.29</b>

## CONCLUSION

From this experiment, we can conclude that treatment T4 using 50% black shade net are the best mechanical pre-harvest treatment to reduce sunburn incidence and all at once overcome post-harvest losses in MD2 pineapple industries. Results show that, T4 is the best treatment which only 0% sunburn incidence rate with only 2-4 seconds time need to cover a single fruit followed by T2, T3 and T1 with the results 5% sunburn incidence with 10-15 seconds, 15% sunburn incidence with 25-30 seconds and 50% sunburn incidence respectively. Therefore, chemical pre-harvest treatment using 50% black shade netting are suggested but further research have to be conducted at different agro-climatic zone to confirm that this treatment can be apply to every agro-climatic zone in Malaysia. By reducing the sunburn incidence will help pineapple industry to develop rapidly and increase country income higher because of low rate of post-harvest losses. The need of this knowledge or finding is really crucial because of climate change nowadays.

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