Influence of Postharvest Treatments and Storage Conditions on the Quality of Hass Avocado

Soe Sandar Aung

Deputy Assistant Staff Officer

Post Harvest Training Center (PHTTC), Htonebo

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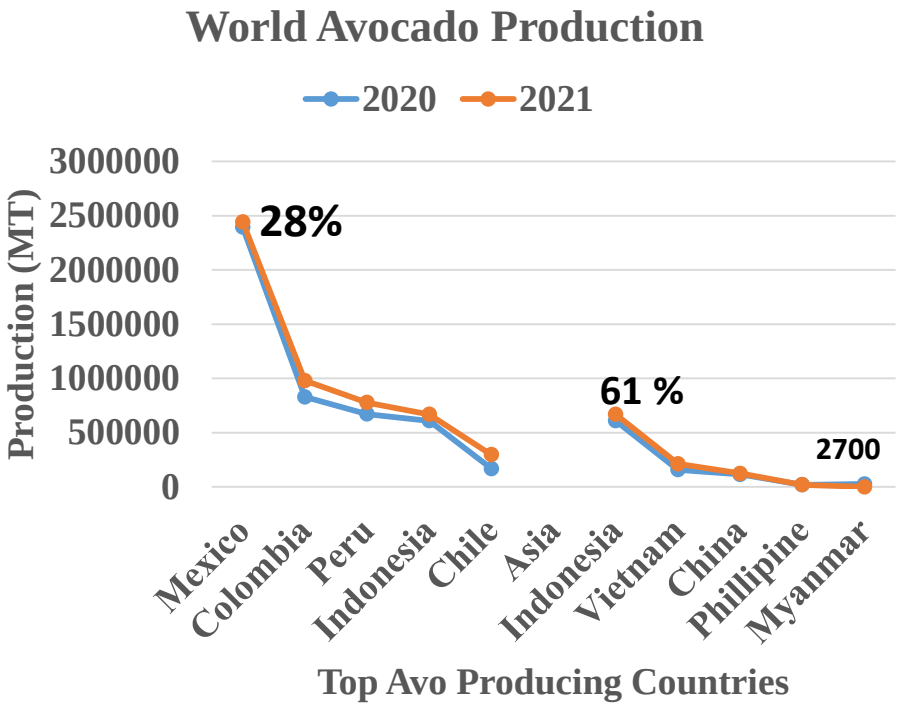
Introduction

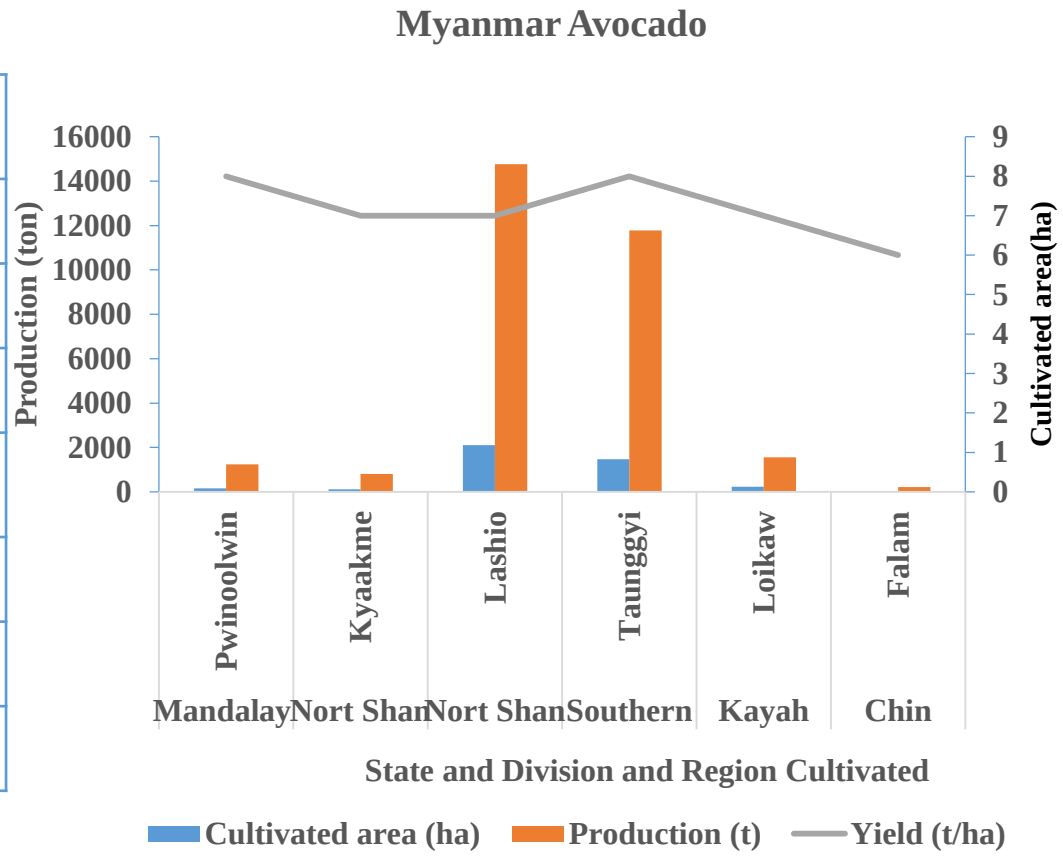
- Globalization - led to marked improvement in commercial exchanges-relating to the fruit and vegetable world.
- Consumption of a tropical fruits - avocado - increasing (esp: Hass Var.)
- Top production countries in the World and Asia



Reference: FAO (2021) Statistical Database

Myanmar Avocado (cultivated area, production, and yield)

State and division	District	Cultivated area (ha)	Production (t)	Yield (t/ha)
Mandalay	Pwinoolwin	155	1240	8
Nort Shan	Kyaakme	115	805	7
Nort Shan	Lashio	2110	14770	7
South Shan	Taunggyi/ Heho	1472	11776	8
Kayah	Loikaw	223	1561	7
Chin	Falam	35	210	6
		4110	30362	



Heho- Shan Avo Orchard – GLOBALG.A.P. (MAPEA)
Myanmar Avocado Producer and Exporter Association

https://www.fao.org/

Post Harvest Technology on Quality of Fruits

- Avocado fruits - hot water treatment, which involves immersing them in warm water for a specific duration.
- HWT - studied to minimize chilling injury and fruit quality.
- Many researchers - the hot water as minimum **38 ℃ to maximum 50 ℃** as min **10 to 60 min** (**Allan B et al 1997**) followed by cold storage at **4.5 ℃ to 5.5 ℃ for 2, 6, 20, 28 days** promote the quality of fruit in avocado (**Alaika Kassim 2020**).

Challenges in Avocado Production

- Myanmar Avo production - challenges as **the lack of** research, limited technical expertise, poor harvesting practices, and low investment in post-harvest capabilities.
- Particularly impacts smallholder farmers - **up to 80 percent** of their harvests - often damaged or unsold.
- As production volume increase and export market expand, avocados endure lengthy storage and transportation periods, often subjected to **temperature fluctuation.**

Objectives

- **To investigate the influence of postharvest treatments on the marketable life span of Hass avocado.**
- **To know the avocado quality after cold disinfestation (cold storage) using hot water treatment (HWT).**
- **To share the simple postharvest technology to Avo communities.**

Materials and Methods

5 Treatments with 3 Replications in RCB Design

T1 - 42 ˚C for 25 min and cold store at 4 ˚C

T2 - 41 ˚C for 30 min and cold store at 4 ˚C

T3 - 42 ˚C for 25 min and store at room temperature

T4 - 41 ˚C for 30 min and store at room temperature

T5 - Control (Kept naturally)

Location_ PHTTC, Htonebo, Mandalay Region

Duration _During 2023 Avocado Season

Materials Used

Initial Hass Avo Fruits

Digital Balance

Hot water machine

Cold Chamber

Cold Storage at 4 ˚C

Sensory Assessment

Procedures

Total of 225 fruits used

For T5 - 45 fruits kept at Room Temperature (30 ℃)

3 Replication

180 fruits for T1, T2, T3 and T4 pass though 2 different HW Temp and Time

T1 and T2 _ 90 fruits cold stored at 4 ℃

3 Replication

T3 and T4 _ 90 fruits Kept at Room Temperature (30 ℃)

3 Replication

Data Collection

- Fruit weight (g)
- Marketable life span
- Sensory attributes
  - Skin color
  - Firmness
  - Flavor (taste, texture, aroma)

Treat -1
Treat -2
Treat -3
Treat -4
Treat -5

Day 1 and Day 15, 25, 35, 45, and 55 as 10 days interval

Day 1 and Day 3, 6,9, 12, 15 as 3 days interval

15 Fruits as weight and quality

3-5 days removal from CC

3-5 Fruits as sensory assessment

Assessor were trained by discussing the definition of quality parameters selected for sensory evaluation, explaining the score sheet and method of scoring.

For over all linking score, it is only focus on skin color, taste, texture and aroma. Evaluation were done after removing the fruit from cold storage in 5 days.

Skin Color Change Score

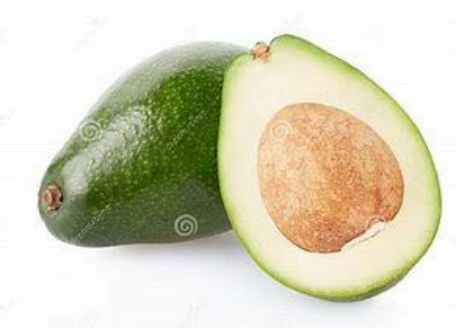
Rating score	Color
1	Emerald green
2	Forest green
3	Olive green
4	Purple green
5	Black

Fruit skin colorimeter

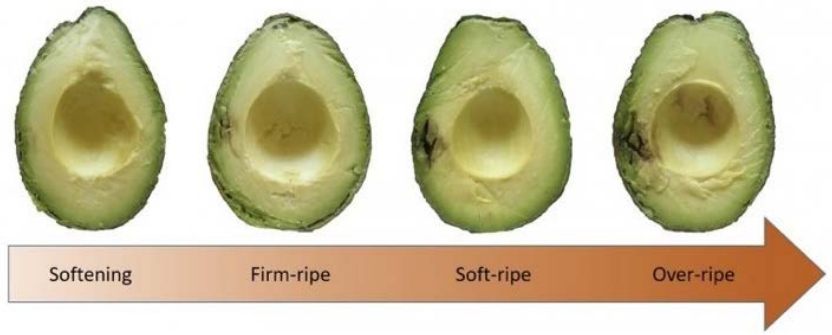
Reference; Scott Ledger et al (2011)

Firmness In Hand Feel Score

Rating score	Firmness	Hand feel
1	Hard	No give with strong thumb pressure
2	Rubbery	Slight give with strong thumb pressure
3	Softening	Deforms 2-3 mm with moderate thumb pressure
4	Firm ripe	Deforms 2-3 mm with slight thumb pressure
5	Medium soft ripe	Deforms with moderate hand pressure



Reference; Scott Ledger et al (2011)



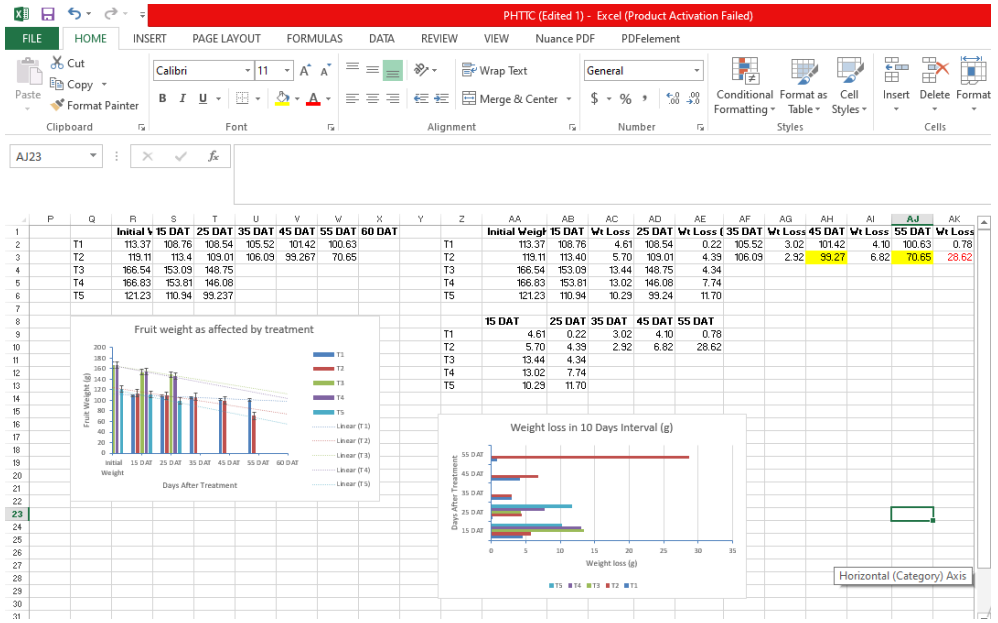
Firmino meter

Perception of Flavor score as 1- Like extremely, 2- Like slightly, 3- Neither like nor dislike, 4- Dislike slightly, 5- Dislike extremely

Over all linking score (Skin color, Firmness, Flavor, Freshness, Aroma, Hardness) as 1- Excellent, 2- Good, 3- OK, 4- Scarce were used (Thais Mendes et al (2019).

Data Analysis

- Data were analyzed by Excel Program and Statistix 8.
- Sensory analysis was done by 3 well trained staff as assessors



Results

A typical Hass avocado weighs is around 200 gram when it is ripe and ready to eat.

Table.1 Effect of treatment on weight of fruit as days record

Treat	First (Day 1, 1)	Second (Day 3, 15)	Third (Day 6, 25)	Fourth (Day 9, 35)	Fifth (Day 12, 45)
T1	131.03 ab	142.27 a	136.90 a	131.90 a	116.80 ab
T2	116.67 bc	139.73 a	135.70 a	131.7 a	101.90 bc
T3	145.80 a	104.67 c	101.87 c	131.7 a	-
T4	142.53 a	126.80 ab	123.37 ab	98.53 b	125.17 a
T5	106.83 c	111.87 bc	111.70 bc	98.53 b	92.73 c

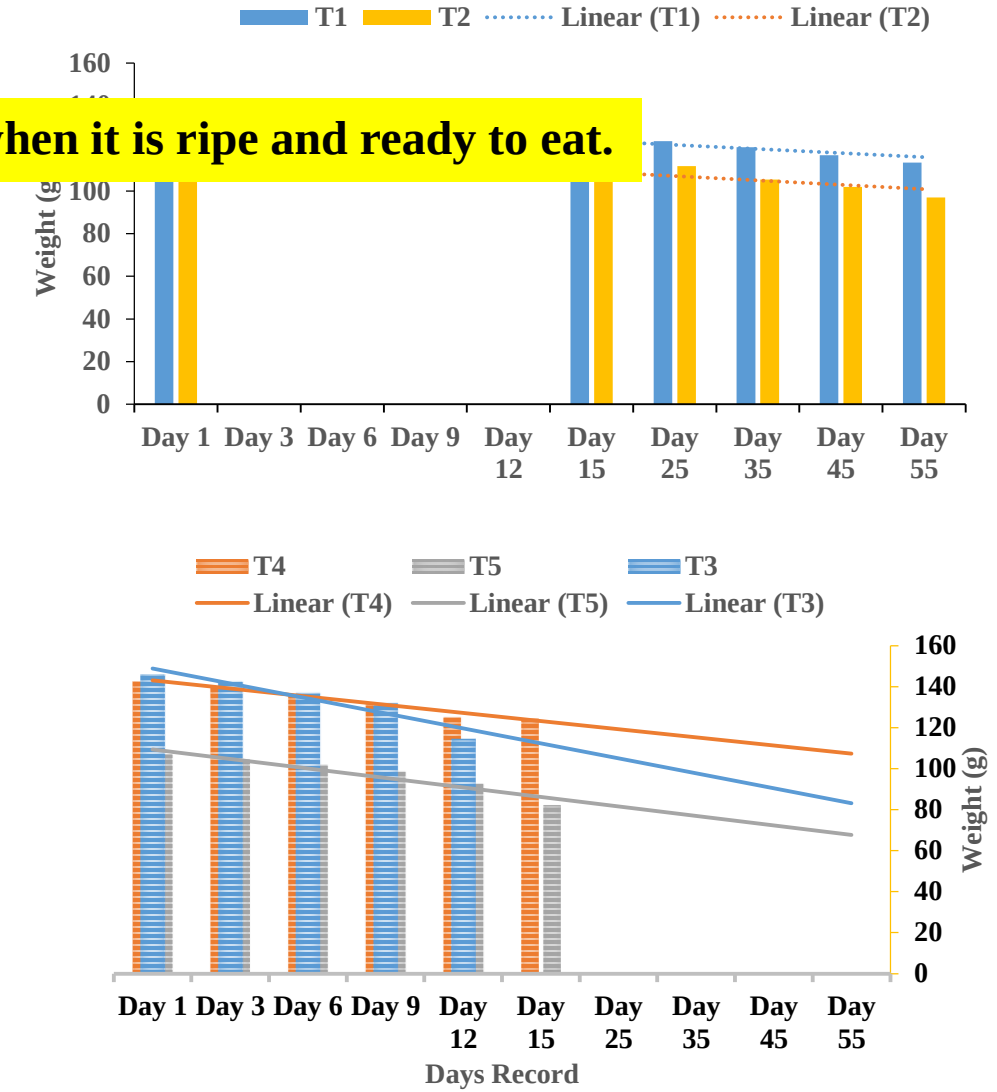
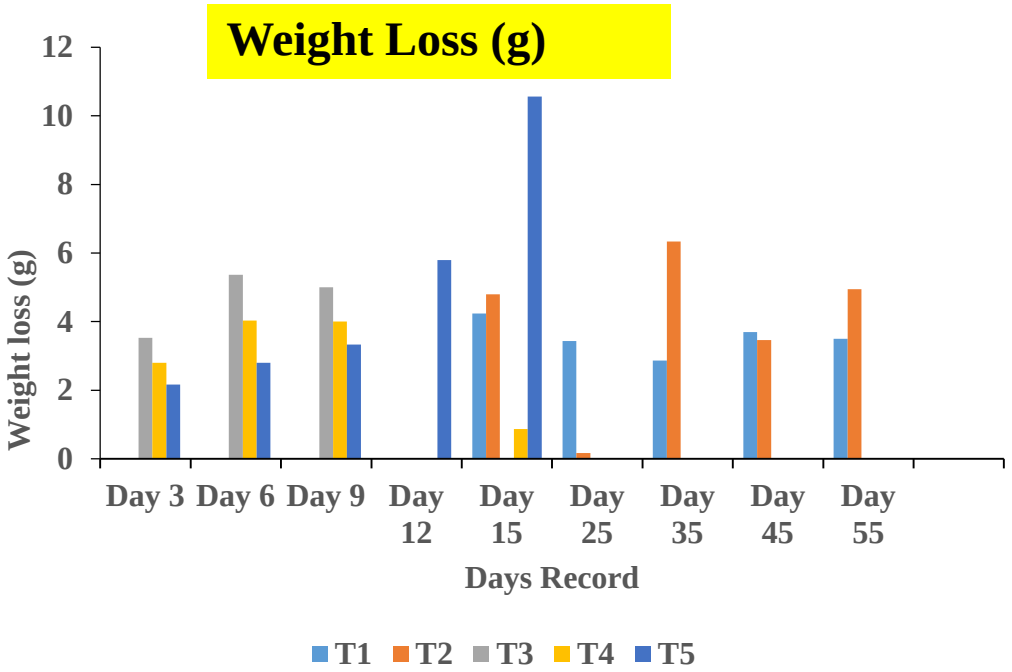
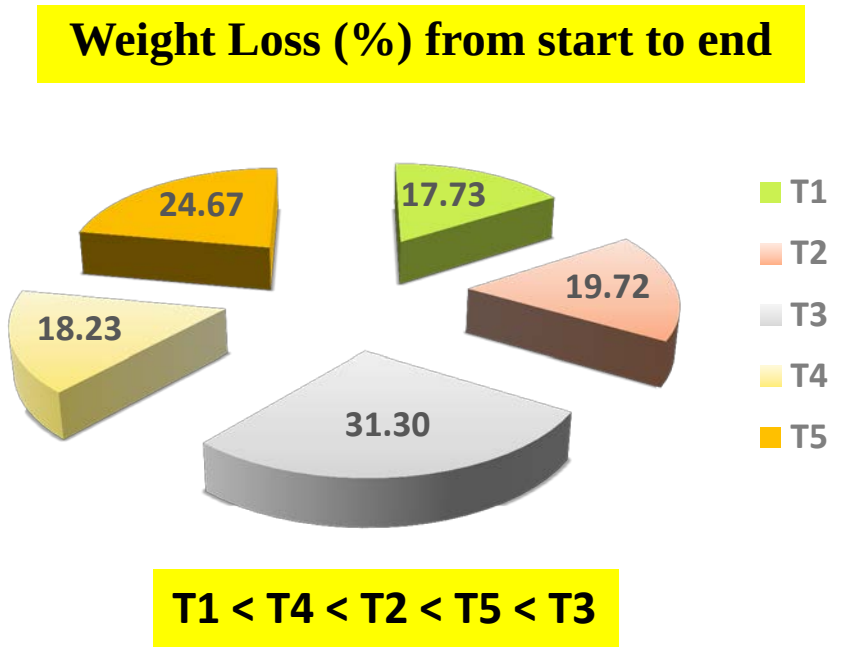


Figure 1. Weight of fruit at days of record

Weight loss due to moisture evaporation of typical Hass avocado at room temperature is between 5-10 % (Alaika Kassim et al. 2020).





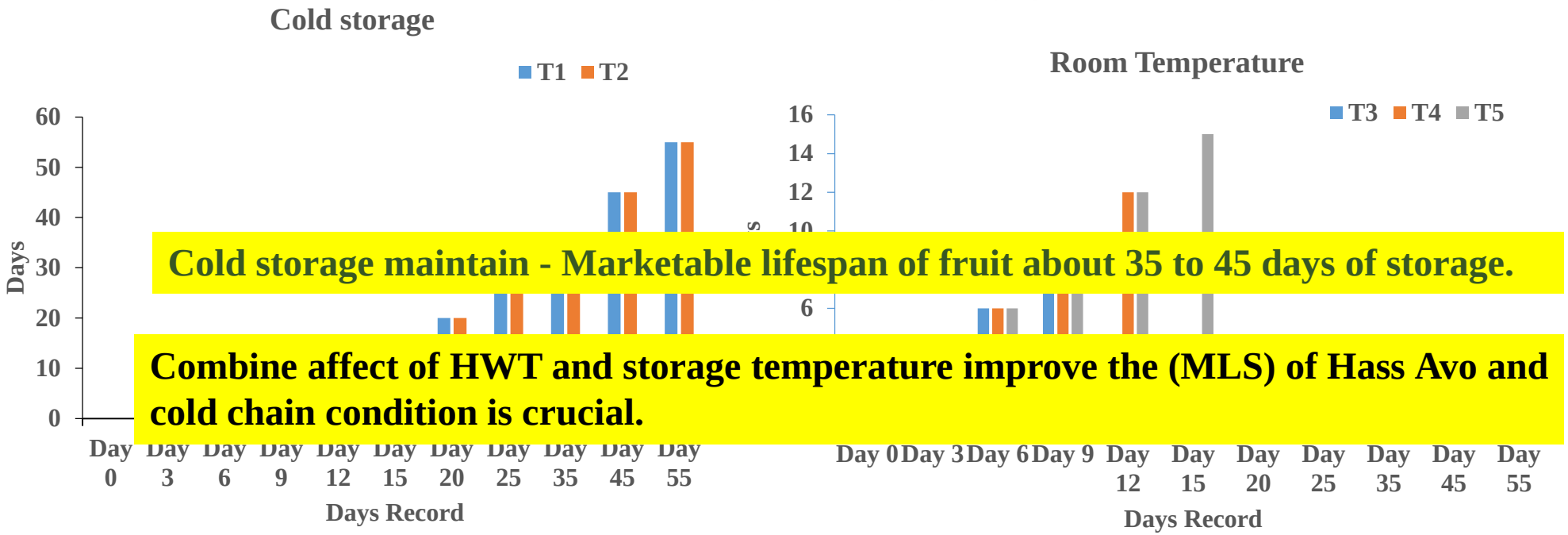
T1 < T4 < T2 < T5 < T3

Figure 2. Weight loss among treatments

weight loss between 0.17 to 10.57 g or (0.14-5.0 %)

Cold storage showed the lowest weight loss and T3 express highest weight loss, observed that cold temperature conserved moisture of fresh fruits.

Effect of Treatments on Marketable Life Span (MLS) of Hass Avocado



Cold storage maintain - Marketable lifespan of fruit about 35 to 45 days of storage.

Combine affect of HWT and storage temperature improve the (MLS) of Hass Avo and cold chain condition is crucial.

Figure 3. Comparison of MLS under treatment

MLS of T1 = T2 showed that cold storage increased marketable life span to days 45-55 not much affected by HW temperature and time of immerse.

MLS of T3 < T4 showed that 1 C increased in water temp; suffer more heat stroke in fruits and rotten easily (in 3 days between treatments)
T5 > T3 (6 days more life span)

Days Record at Different Stages

Treatment 1

D 15

D 25

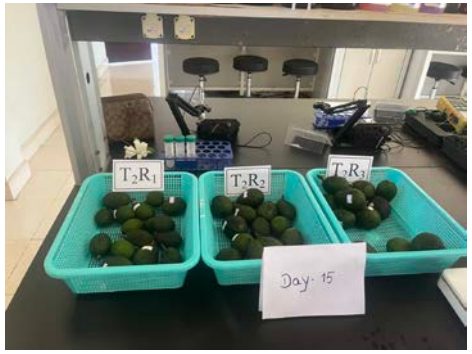
D 35

D 45

D 55

Treatment 2

D 15



D 25

D 35

D 45

D 55

Days Record at Different Stages

Treatment 3

D 1

D 3

D 6

D 9

D 12

D 15

Treatment 4

Treatment 5

Assessment of Fruit Quality Attributes by Scoring

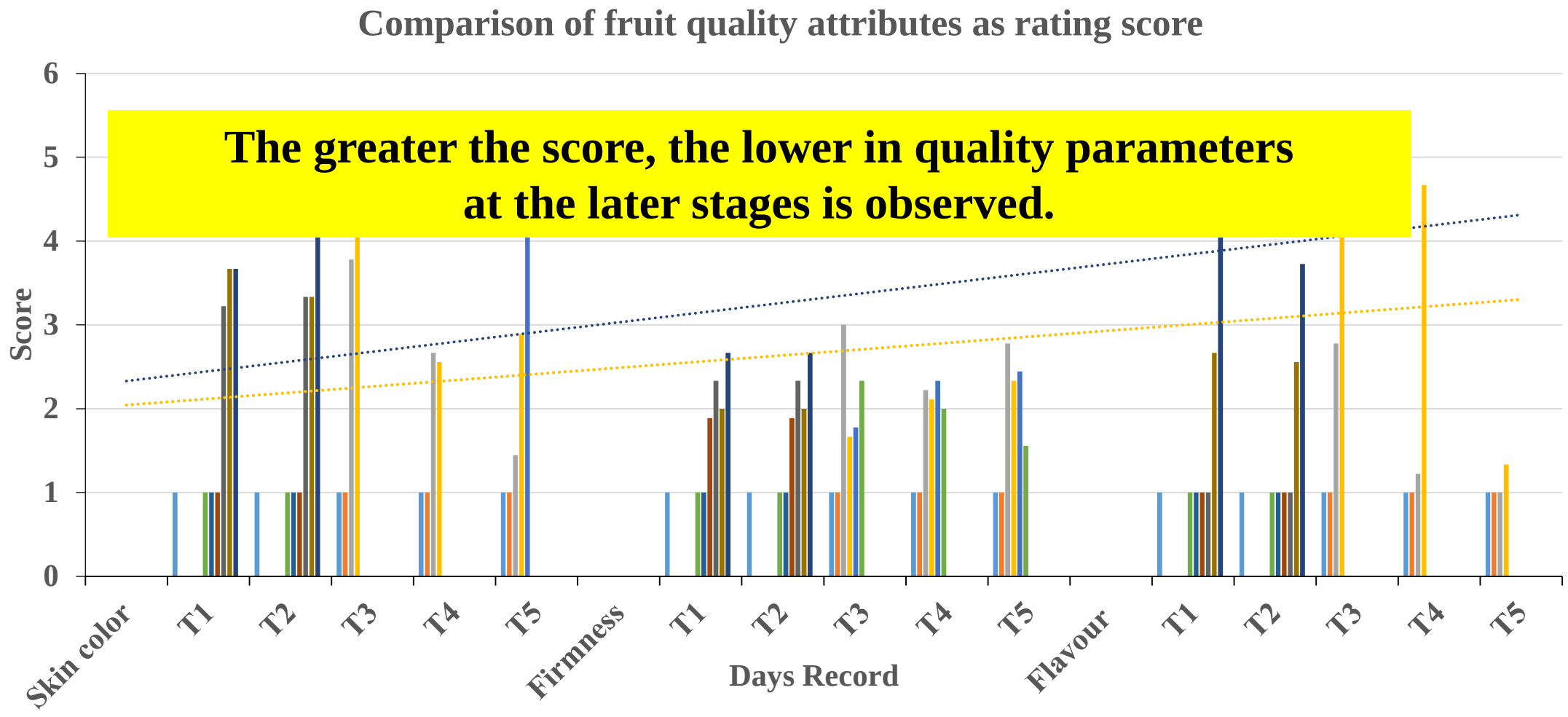


Figure 4. Assessment of fruit quality attributes

Fruit Quality as Affected by HWT and Cold Storage

Similar results were observed by Peter J. Hofman et al (2002) pointed out that f HWTs of about 41 °C for 25–30 min, or 42 °C for 25 min to improve avocado external and internal fruit quality following cold disinfestation.

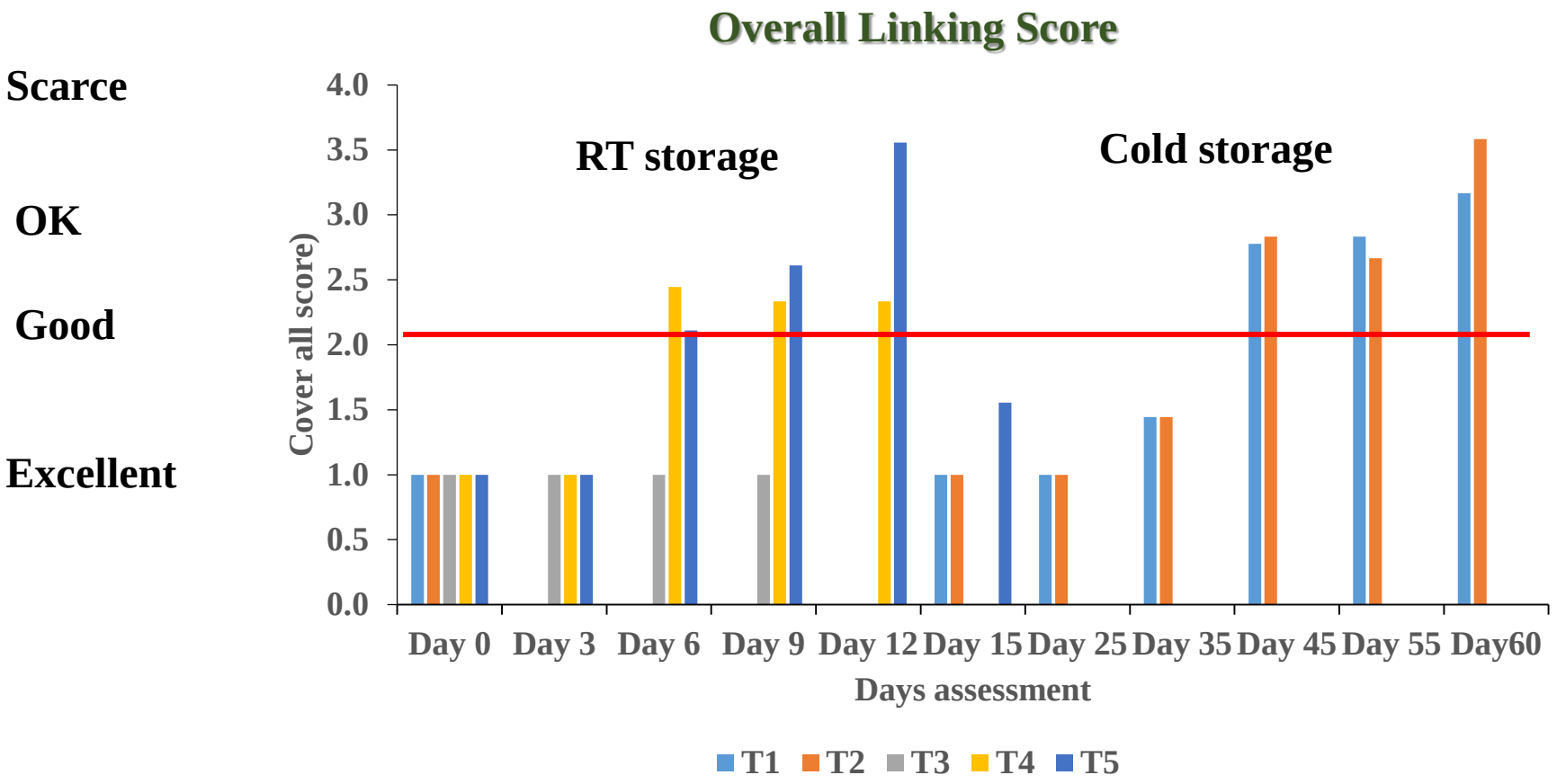


Figure 5. Fruit quality as affected by treatments

Sensory Test Photo

The effective treatments as (T1 and T2) at Day 45 and T4 at Day 9

Discussion

- Combine effect of HW and cold storage **maintain** not only the fruit weight and weight loss but also lengthen the MLS up to 3 weeks more, compare to storage at RT.
- HWT of 42 ˚C for 25 min or 41 ˚C for 30 min immersion following cold disinfestation condition **delays the fruit life span** up to 35 to 45 days.
- **1 ˚C change** in water temperature affects the fruit quality and **reduced life span** nearly 3-5 days without cold chain.
- Keeping the fruit as **natural condition is more effective than only hot water** treated ones.

Conclusion

- Cold chain conditions - beneficial in preserving the postharvest quality of avocados, by delaying the ripening process and consequently extending the shelf life of avocados by up to 3-4 weeks more, compared to storage at ambient conditions.
- Confirm that the maintaining low temperature during storage is crucial and may facilitate the improvements in the local, and export avocado supply chain.

Recommendation and The Way Forward

- Hass avocado - a good future for development in Myanmar.
- For this purpose, superior varieties of quality fruit - made available for the consumers and producers.
- Need to forward the updated and simple way of post harvest techniques of Avo fruits to communities.

A study as pre-packaging, packaging, and storage temperatures - for the way forward.

Reference

Aung Soe. (1997). Avocado Production in Myanmar

Alaika Kassim, Tilahun Seyoum Workneh (2020). Influence of postharvest treatments and storage conditions on the quality of Hass avocados

Allan B. Woolf and Michael Lay-Yee (1997). Pretreatments at 38°C of 'Hass' Avocado Confer Thermo tolerance to 50 °C Hot Water Treatments.

FAO (2022). Statistical Data.

Peter J. Hofman a, Barbara A. Stubbings a , Matthew F. Adkins a , Geraldine F. Meiburg b , Allan B. Woolf (2002). Hot water treatments improve ‘Hass’ avocado fruit quality after cold disinfestation

Scott Ledger et al (2011). Avocado ripening manual.

Thais Mendes et al (2019). A novel statistical approach to assess the quality and commercial viability of a retail branded perishable fruit.

Thank You For Kind Attention !