Physico-Chemical Qualities of Stored Fresh Cut EVIARC Sweet Jackfruit (*Artocarpus heterophyllus* Lam.) Pulp As Influenced By Deseeding, Packaging Method And Storage Condition

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Rationale

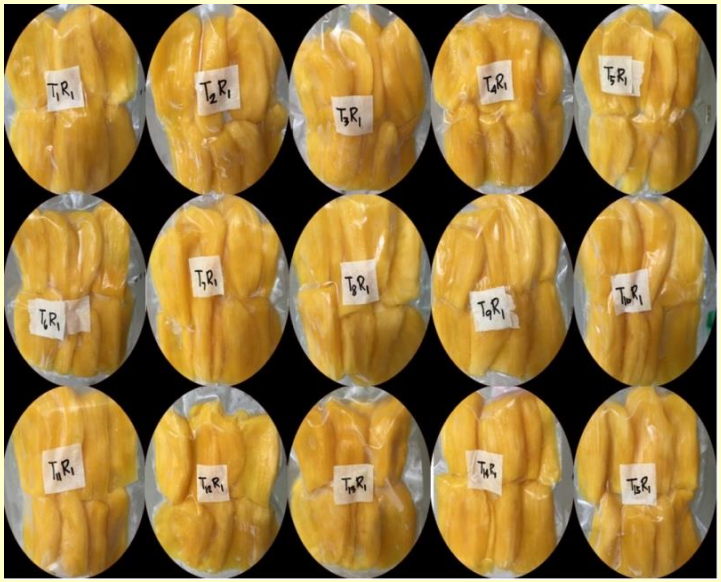
- Region 8 (Eastern Visayas) is developed as the Jackfruit Capital of the Philippines
- It has one of the sweetest jackfruit variety in the Philippines (EVIARC Sweet)
- Jackfruit is very nutritious
- Unique flavor and aroma
- Huge fruit (weighs as much as 30 kgs)
- 65-70% of the fruit constitutes the co-products
- 35-30% constitutes the pulp

Rationale

- Very perishable
- Processing is a must
- We developed already highly commerciable food products from pulp like the vacuum fried jackfruit and dehydrated jackfruit

Rationale

- Another processing option is the minimal processing of jackfruit pulps
- Especially for those who want to taste the natural flavors of fresh cut jackfruits
- Good strategy to reduce transportation cost since only the 35% of the fruit is being used



Optimum formulation: 0.004375%w/v NaOCl, 0.74%CaCl2 and 0.65%w/v ascorbic acid.

Rationale

- For the processors, additional income for the remaining 65% since they can still be processed into high valued food products

- However minimal processing conditions should be consider to assure higher quality product

Objective

To investigate the relationship of deseeding, packaging method and storage condition on the physico-chemical properties of minimally processed jackfruit.

Methodology

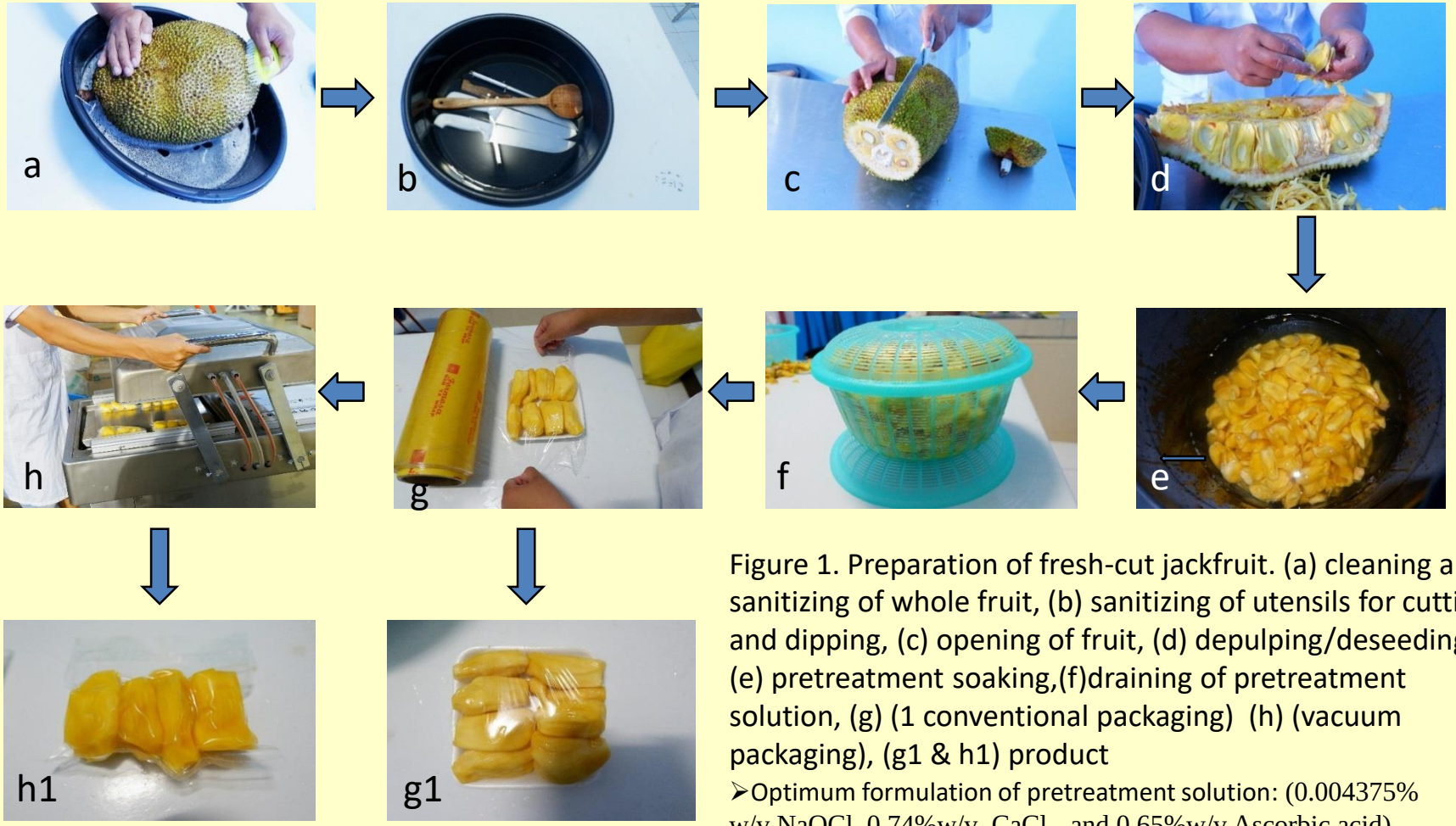


Figure 1. Preparation of fresh-cut jackfruit. (a) cleaning and sanitizing of whole fruit, (b) sanitizing of utensils for cutting and dipping, (c) opening of fruit, (d) depulping/deseeding, (e) pretreatment soaking,(f)draining of pretreatment solution, (g) (1 conventional packaging) (h) (vacuum packaging), (g1 & h1) product

- Optimum formulation of pretreatment solution: (0.004375% w/v NaOCl, 0.74%w/v $CaCl_2$, and 0.65%w/v Ascorbic acid).

Methodology

Table 1. Experimental combinations of jackfruit pulp preparation, packaging method and storage condition in preparation of the treatments

TREATMENTS	JACKFRUIT PULP PREPARATION	PACKAGING METHOD	STORAGE CONDITION
T1	With seed	Vacuum	Chilled
T2			Ambient
T3		Without vacuum	Chilled
T4			Ambient
T5	Without seed	Vacuum	Chilled
T6			Ambient
T7		Without vacuum	Chilled
T8			Ambient

Methodology

- Physico-chemical analysis-
  TSS,TA,pH (AOAC,1980)
  hunter b* (Lovibond colorimeter)
  Browning index (Absorbance, Baloch et al (1973)
  Firmness (Fruit penetrometer,kg/m2)
- Statistical analysis (ANOVA, Minitab Express Software.)

T1 (with seed, chilled and vacuum packed

T3 (with seed, chilled and plastic wrap)

T7 (seedless, chilled, plastic wrapped)

T5 (seedless,chilled,vacuum)

Figure 2. Sample images of different treatments

RESULTS

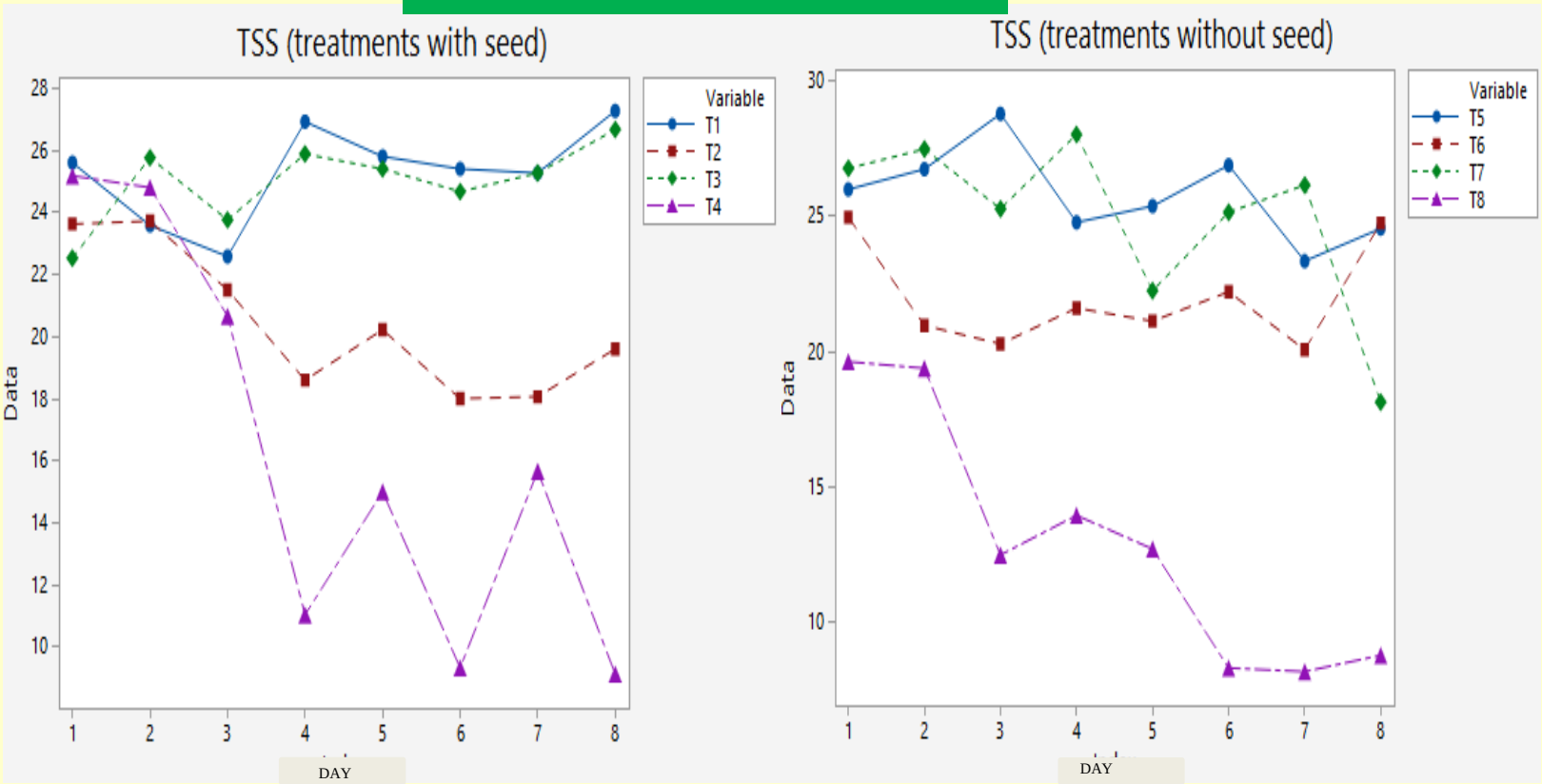
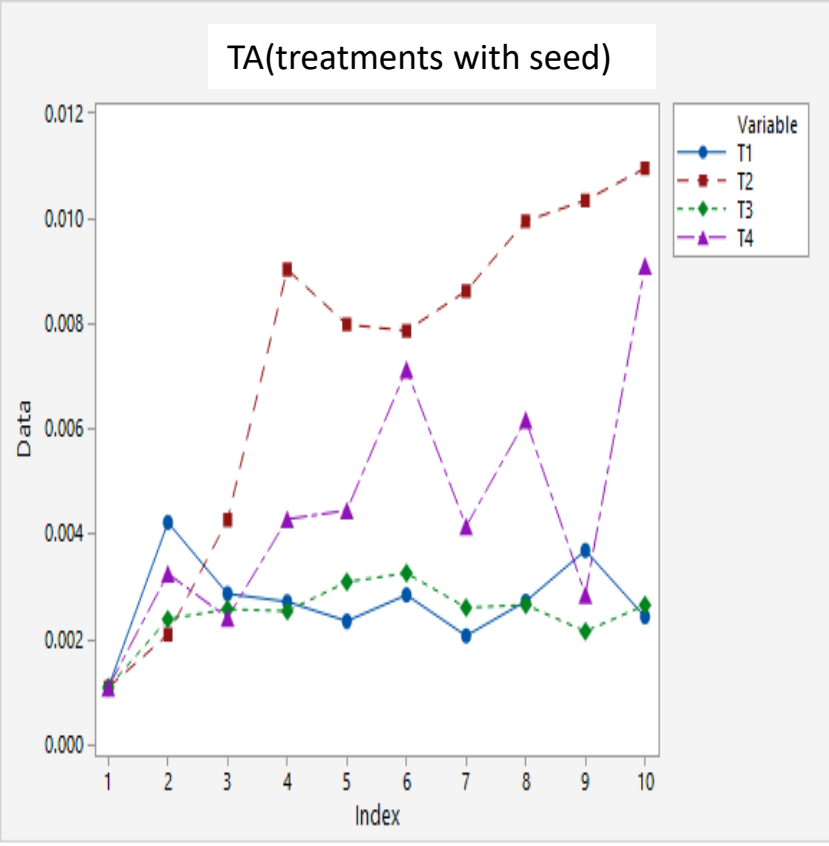


Figure 3. TSS of different treatments at different storage period *T1-vacuum and chilled, T2-vacuum and ambient, T3- without vacuum and chilled, T4- without vacuum and ambient, T5-vacuum and chilled, T6-vacuum and ambient, T7- without vacuum and chilled, T8- without vacuum and ambient

Table 2. Analysis of variance of TSS of fresh-cut jackfruit stored for 8 days

	STORAGE PERIOD (DAY)							
Main Effects	1	2	3	4	5	6	7	8
A:preparation	0.00	0.11	0.01	0.07	0.10	0.04	0.09	0.09
B:packaging method	0.73	0.06	0.49	0.34	1.19	29.75**	0.28	0.19
C:storage condition	1.11	4.32	5.95*	61.04**	54.64**	92.99***	22.48**	11.04*
Interaction								
A x B	0.72	0.17	0.55	0.04	0.14	0.06	0.09	0.28
A x C	1.91	18.91**	3.89	0.28	0.05	0.01	0.13	0.47
B x C	0.04	0.24	0.37	11.35*	6.30	19.17*	4.53	3.53

NS: not significant. *,**,***Significant to $P \leq 0.05$, 0.01 and 0.001, respectively.



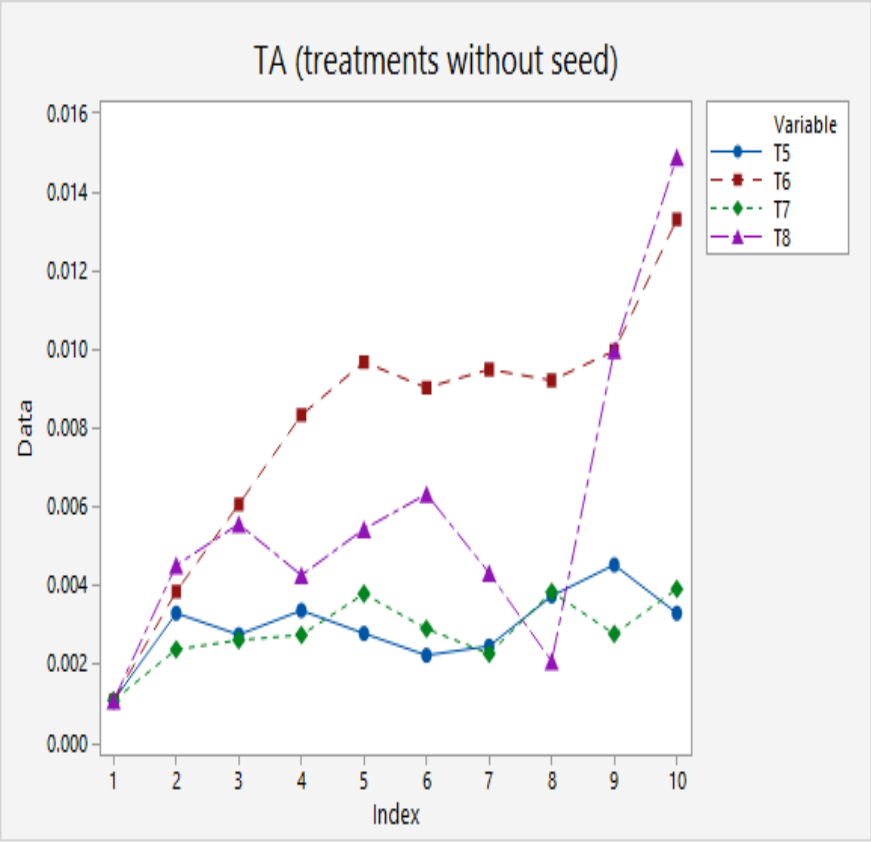


Figure 4. TA of different treatments for 8-day storage period (T1-vacuum and chilled, T2-vacuum and ambient, T3- without vacuum and chilled, T4- without vacuum and ambient, T5-vacuum and chilled, T6-vacuum and ambient, T7-without vacuum and chilled, T8- without vacuum and ambient)

Table 3. Analysis of variance of TA of fresh-cut jackfruit stored for 8 days

	STORAGE PERIOD (DAY)							
Main Effects	1	2	3	4	5	6	7	8
A:preparation^{ns}	0.44	1.10	0.00	0.17	2.21	0.01	0.07	0.06
B:packaging method	0.08	0.36	95.84***	8.01*	0.06	81.86***	1.21	3.42
C:storage condition	0.36	14.80	219.39***	53.20**	146.43***	279.08***	10.60*	2.51
Interaction								
A x B^{ns}	0.02	0..11	0.00	0.00	0.03	0.02	0.10	2.15
A x C	2.62	6.62*	0.06	0.07	0.21	0.02	0.76	1.10
B x C	3.77	0.28	66.59***	20.02*	8.20*	94.39***	6.08	0.04

NS: not significant. *,**,***Significant to $P \leq 0.05$, 0.01 and 0.001, respectively.

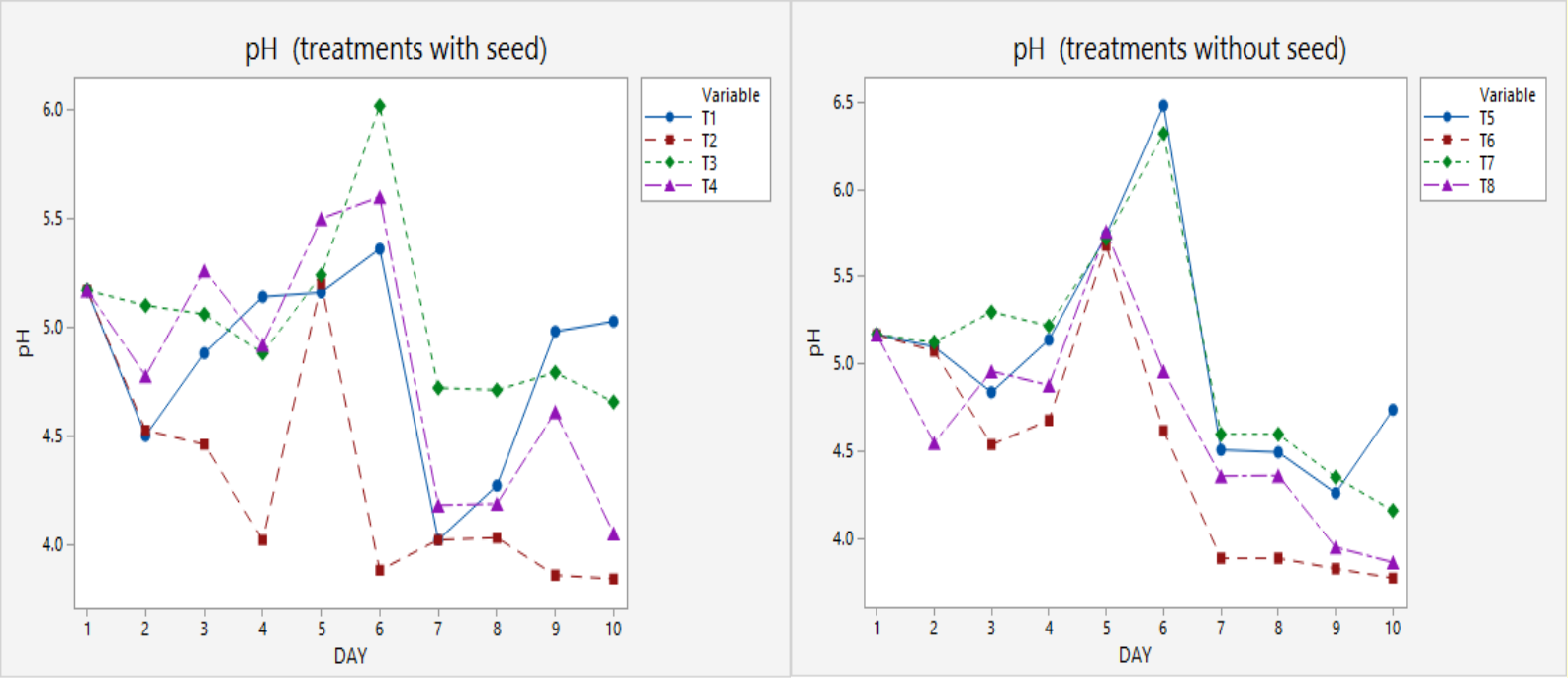


Figure 5. pH of different treatments for 8-day storage period (T1-vacuum and chilled, T2-vacuum and ambient, T3- without vacuum and chilled, T4- without vacuum and ambient, T5-vacuum and chilled, T6-vacuum and ambient, T7-without vacuum and chilled, T8- without vacuum and ambient)

Table 4. Analysis of variance of pH of fresh-cut jackfruit stored for 8 days

	STORAGE PERIOD (DAY)							
Main Effects	1	2	3	4	5	6	7	8
A:preparation	2.06	0.00	0.58	**43.55****	0.30	0.24	0.03	2.05
B:packaging	0.28	**22.23****	0.53	2.60	0.85	2.75	**12.05***	0.37
C:storage condition	1.13	0.70	6.39	0.09	**11.39***	6.45	**22.59****	4.02
Interaction								
A x B	4.17	0.02	0.08	1.38	0.63	0.12	0.00	0.07
A x C	0.13	0.17	0.08	0.99	0.49	0.14	00.91	0.54
B x C	1.13	2.16	2.96	0.12	1.06	0.08	0.07	0.84

NS: not significant. *,**,***Significant to $P \leq 0.05$, 0.01 and 0.001, respectively.

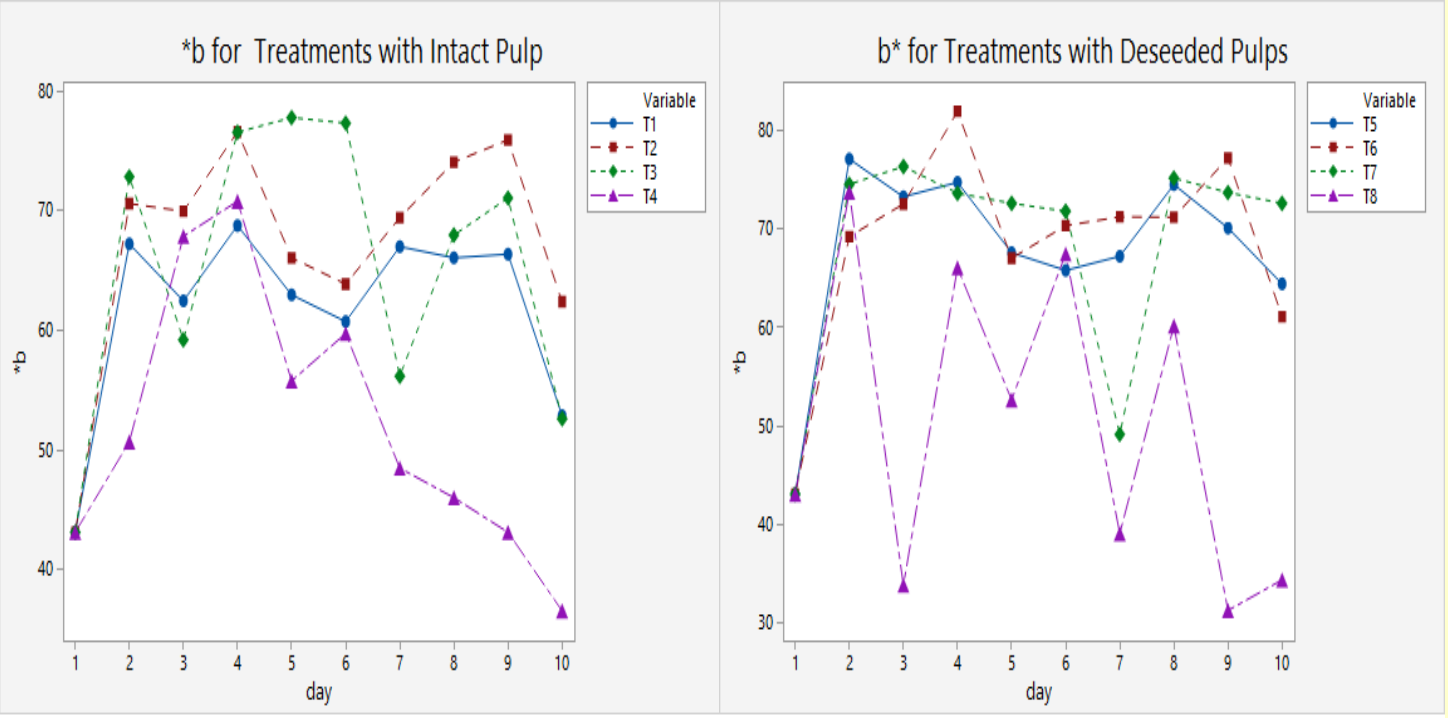


Figure 6. Hunter b* (T1-vacuum and chilled, T2-vacuum and ambient, T3- without vacuum and chilled, T4- without vacuum and ambient, T5-vacuum and chilled, T6-vacuum and ambient, T7- without vacuum and chilled, T8- without vacuum and ambient)

Table 5. Analysis of variance for color parameter (b*) of fresh-cut jackfruit

Main Effects	STORAGE PERIOD (DAY)							
	1	2	3	4	5	6	7	8
A:preparation	1.95	0.04	0.05	0.05	0.37	0.05	0.00	0.03
B:packaging method	0.27	1.78	0.04	1.35	1.12	**10.27***	5.77	1.42
C:storage condition	1.19	3.30	1.45	1.88	2.84	3.65	0.06	**19.45***
Interaction								
A x B	0.47	0.80	0.23	2.03	0.08	0.02	0.15	0.02
A x C	0.66	1.17	1.52	0.17	0.33	0.38	0.30	0.22
B x C	0.54	4.37	6.29	8.85	6.19	6.34	0.39	**35.38****

NS: not significant. *,**,***Significant to $P \leq 0.05$, 0.01 and 0.001, respectively.

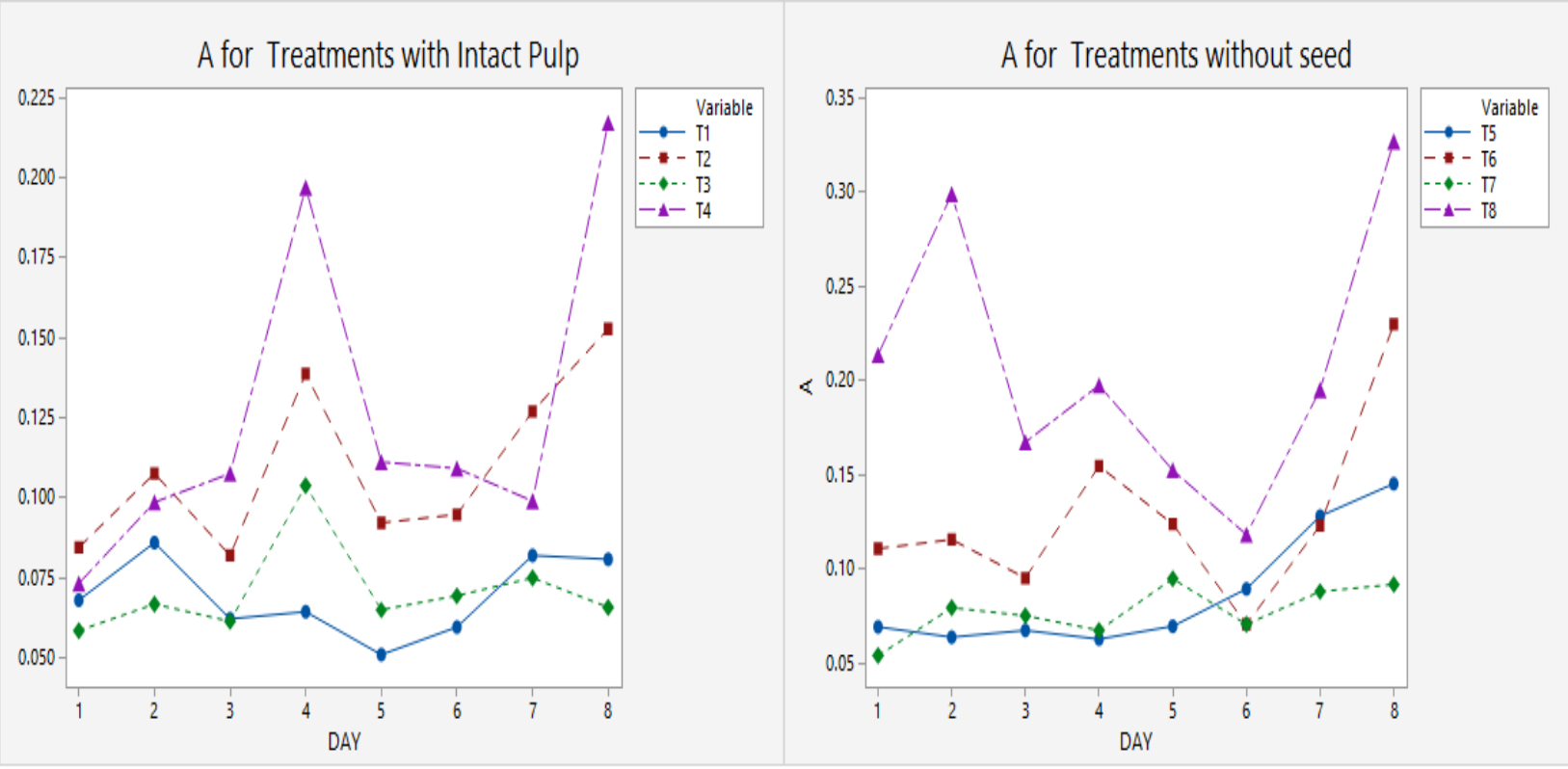


Figure 7. Absorbance (Browning Index) of different treatments at different storage period *T1- vacuum and chilled, T2-vacuum and ambient, T3- without vacuum and chilled, T4- without vacuum and ambient, T5-vacuum and chilled, T6-vacuum and ambient, T7- without vacuum and chilled, T8- without vacuum and ambient

Table 6. Analysis of variance for absorbance parameter of fresh-cut jackfruit

	STORAGE PERIOD (DAY)							
Main Effects	1	2	3	4	5	6	7	8
A:preparation	0.96	0.60	0.72	0.01	1.46	0.05	1.62	0.85
B:packaging method	0.16	0.43	0.93	**13.33***	0.75	0.52	0.00	0.10
C:storage condition	2.65	2.17	**8.75***	**96.13*** ***	**10.10***	6.92	2.54	**12.95***
Interaction								
A x B	0.42	1.19	0.26	0.06	0.04	0.00	0.32	0.0
A x C	2.62	1.61	0.49	0.43	0.30	0.73	0.14	0.56
B x C	0.66	0.94	2.08	2.06	0.02	3.24	0.72	2.32

NS: not significant. *,**,***Significant to $P \leq 0.05$, 0.01 and 0.001, respectively.

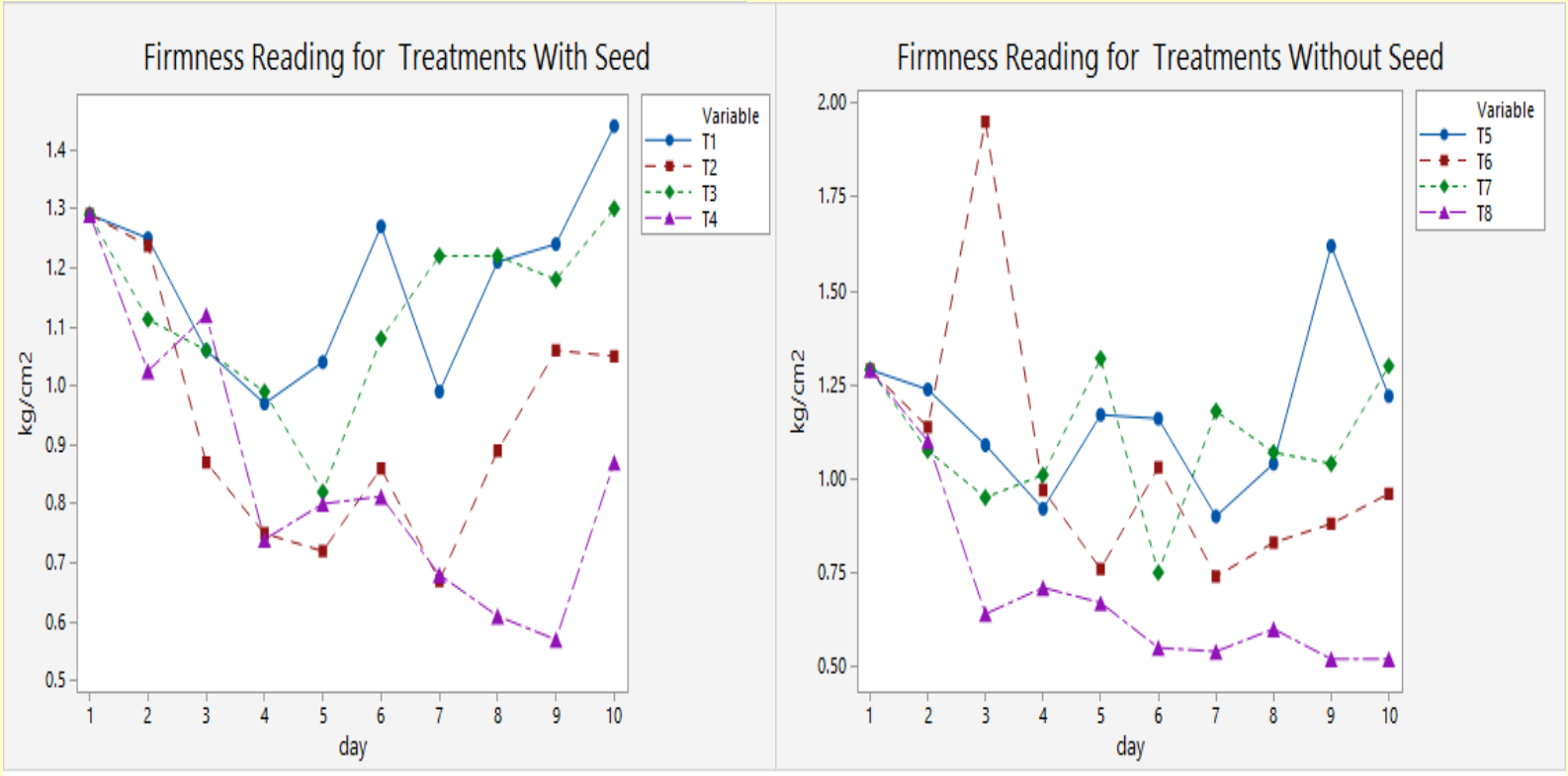


Figure 8. Firmness of different treatments at different storage period (T1-vacuum and chilled, T2-vacuum and ambient, T3- without vacuum and chilled, T4- without vacuum and ambient, T5-vacuum and chilled, T6-vacuum and ambient, T7- without vacuum and chilled, T8-without vacuum and ambient)

Table 7. Analysis of variance for firmness parameter (kg/cm^2) of fresh-cut jackfruit

	STORAGE PERIOD (DAY)							
Main Effects	1	2	3	4	5	6	7	8
A:preparation	0.31	0.31	0.13	0.42	0.96	0.05	0.21	0.00
B:packaging method	**16.41***	1.64	0.13	0.01	4.29	0.12	0.30	**11.16***
C:storage condition	1.78	0.13	**9.93***	**22.95****	4.64	**80.57*****	**47.04****	**21.13***
Interaction								
A x B	1.22	3.30	0.13	0.06	1.44	0.03	0.01	0.12
A x C	0.01	0.26	0.64	6.07	0.28	0.02	0.47	0.31
B x C	0.15	0.60	2.77	0.01	0.02	**14.33***	5.49	0.22

NS: not significant. *,**,***Significant to $P \leq 0.05$, 0.01 and 0.001, respectively.

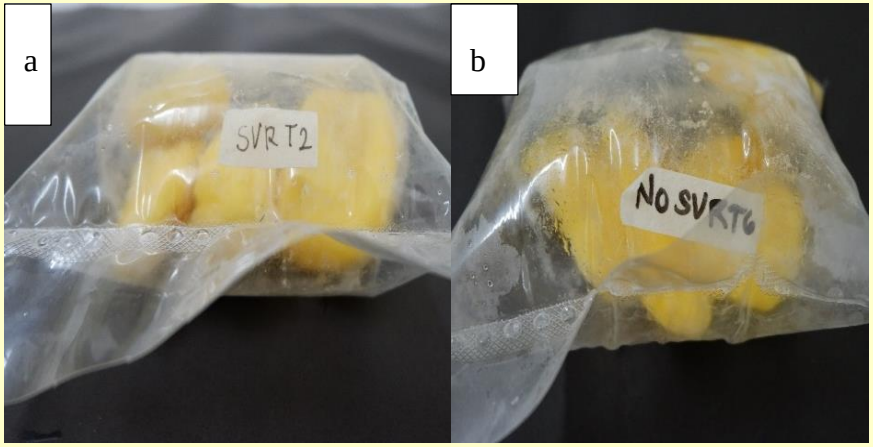


Figure 9 . Bloating of vacuum packed fresh-cut jackfruit stored at room temperature (day 1), (a) with seed and (b) without seed

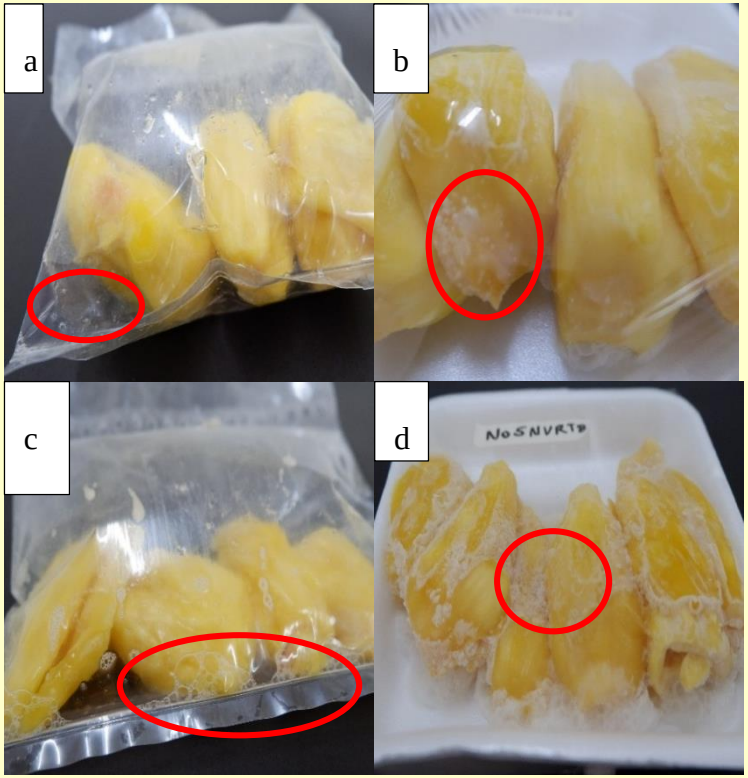


Figure 10 . Presence of white scum in treatments stored at ambient condition during day 1 (a and b) with seed (c and d) without seed

Conclusion

- Deseeded jackfruit have much faster deterioration compared to intact treatments.
- Treatments stored in chilling (4-6^{o}C) condition exhibited lesser variation in TSS, pH, browning index, firmness.
- Treatments packed in vacuum have slower deterioration compared to treatments which are packed without vacuum .
- Established protocols for fresh cut jackfruit. Jackfruit pulp with seed, vacuum-packed and chilled has longer shelf life and better sensory attributes and physico-chemical properties

Thank You!