

Comparative biochemical, anti-oxidative and sensory attributes of freeze-dried and air-dried ‘Chandler’ strawberry fruit

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Background and Objectives

- Strawberry fruit is praised for refreshing taste and rich nutritive value but with high perishable fruit quality after harvest.
- Fruit processing techniques like drying reduces the post harvest quality and nutrition losses in strawberry after harvest
- Various drying techniques such as freeze drying and hot air drying techniques affect the produce quality and nutrition of strawberry fruit.
- Therefore, an integrated study was executed to compare the freeze dried and hot air dried strawberry cv. Chandler fruit to check overall effectiveness and suitability of each drying method in maintaining the nutritional and fruit quality.

Methodology

‘Chandler’ strawberry fruit were harvested at commercial maturity and subjected to fruit drying

Drying Method I Hot air drying (60 °C by electric de-humidified dryer for 24 hours).

Drying Method II Freeze drying (-60 °C for 24 hours)

Types of fruit-cut (Pic 1)

T3: Fruit pedicle+cortex removed

T1: Whole Fruit

T4: Pedicle + cortex removed+ fruit cut into half.

T2: Fruit without Pedicle

Fruit quality, proximate and sensory attributes were quantified as per protocols of AOAC

Results

- Freeze dried strawberry exhibited better fruit quality.
- Freeze dried Strawberry retained higher anti-oxidative attributes including ascorbic acid contents, TPC, total anti-oxidative acidity (Table 1) and exhibited better fruit sensory characteristics, fruit texture, flavor and overall consumer acceptability (Table 3) as compared to air dried strawberry.
- The fruit cut method T4 improved drying efficacy both for freeze drying and air drying methods.

Conclusions

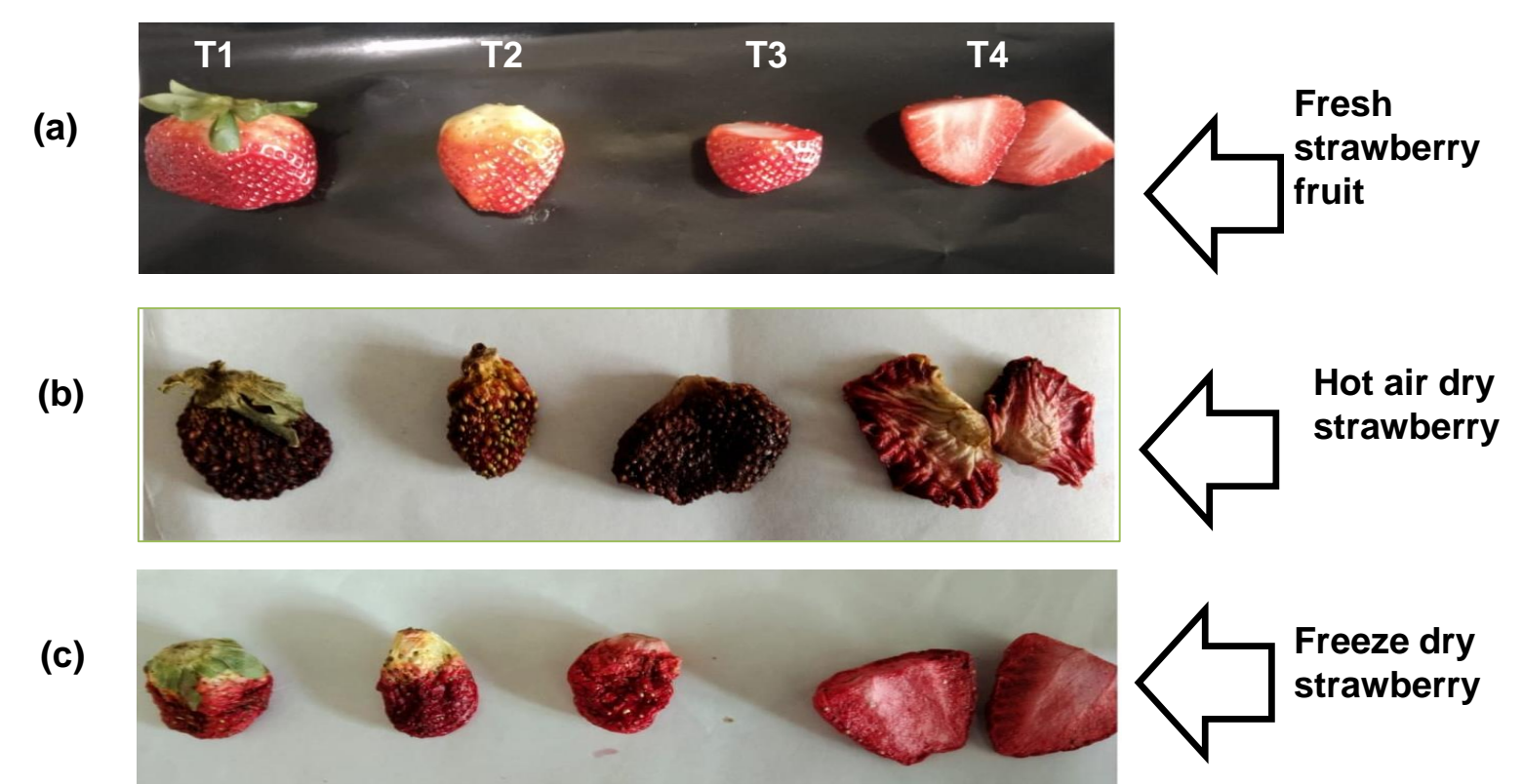
Conclusively, Freeze-dried strawberry retained significant better fruit quality attributes as compared to air dried strawberry.

Recommendations

By comparing these methods it supports better product development, quality control, and informed decision-making in production and marketing.

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Pic 1: Effect of drying method and type of fruit cut on visual shape of strawberry fruit (a) fresh strawberry fruit with various cut types (b) after hot air drying and (c) freeze drying.

Table 1: Effect of drying methods and type of fruit cut on biochemical and anti-oxidative attributes of dried ‘Chandler’ strawberry fruit

Drying Method	TSS (°Brix)	TA (%)	Juice pH	Vitamin C mg 100g ⁻¹	TPC (mg GAE 100g ⁻¹)	Anti-oxidative activity (%DPPH)
Hot air drying	6.58±0.650	0.24±0.018	3.85±0.037	101.1±1.451	259.77±1.471	19.98±0.355
Freeze drying	9.06±0.222	0.31±0.016	3.50±0.031	387.3±5.011	153.2±1.419	44.34±0.247
Type of fruit cut						
T ₁	6.15± 0.997	0.273 ±0.034	3.68±0.115	269.04 ±0.029	168.1±0.231	48.1±0.201
T ₂	9.08± 0.43	0.266 ±0.014	3.63± 0.082	180.83 ±7.034	141.5±0.501	39.3±0.071
T ₃	9.08± 0.104	0.296 ±0.031	3.77± 0.105	202.42 ±8.89	147.1±0.310	48.1±0.221
T ₄	6.97± 0.89	0.269 ±0.029	3.636± 0.027	195.68 ±8.36	161.4±0.201	37.8±0.341

T₁=whole fruit of strawberry, T₂= strawberry fruit without pedicle, T₃= fruit pedicle + cortex removed, T₄= fruit pedicle + cortex removed & fruit cut into half

TSS= total soluble solids, TA= Titratable acidity, TPC= total phenolic contents

Table 2: Effect of drying methods and type of fruit cut on proximate attributes of dried ‘Chandler’ strawberry fruit

Drying Method	Moisture contents (%)	Crude Protein (%)	Ash contents (%)	Fruit N (%)	Fruit P (%)	Fruit K (%)
Hot air drying	38.68±0.937	9.307±0.272	15.566±2.482	1.489±0.043	0.353±0.016	1.92±0.034
Freeze drying	16.9±0.52	9.57±0.2455	11.33±0.33	1.5325±0.0391	0.3658±0.0144	1.967±0.031
Type of fruit cut						
T ₁	28.71±1.438	8.583 ±0.180	16.90±3.435	1.37±0.466847	0.31±0.019149	1.86±0.047
T ₂	27.96±1.373	10.453 ±0.108253	13.60±2.18	1.673±0.538	0.40±0.0142	2.01±0.027
T ₃	28.94±1.38	8.833 ±0.024	10.61±0.752	1.47±0.435	0.33±0.017	1.85±0.03
T ₄	25.62±1.01	10.165 ±0.155	12.67±3.148	1.58±0.482	0.395±0.009	2.03±0.017

T₁=whole fruit of strawberry, T₂= strawberry fruit without pedicle, T₃= fruit pedicle + cortex removed, T₄= fruit pedicle + cortex removed & fruit cut into half

Table 3: Effect of drying methods and type of fruit cut on sensory attributes of dried ‘Chandler’ strawberry fruit

Drying Method	Taste (Score)	Colour (Score)	Appearance (Score)	Texture (Score)	Mouthfeel (Score)	Overall acceptability (Score)
Hot air drying	4.0±0.0170	1.1±1.117	4.0±0.081	4.0±0.005	4.5±0.124	5.1±0.148
Freeze drying	5.33±0.117	6.5±0.214	5.5±0.174	5.0±0.107	5.3±0.271	7.7±0.027
Type of fruit cut						
T ₁	4.0±0.117	3.5±0.114	4.0±0.007	4.6±0.007	4.1±0.007	3.9±0.007
T ₂	4.2±0.574	4.5±0.307	3.8±0.871	3.8±0.871	3.6±0.871	4.1±0.871
T ₃	5.5±0.167	5.5±0.617	4.5±0.217	4.4±0.217	4.5±0.217	4.8±0.217
T ₄	5.5±0.171	6.3±0.417	4.5±0.170	5.5±0.170	4.5±0.170	4.9±0.170

T₁=whole fruit of strawberry, T₂= strawberry fruit without pedicle, T₃= fruit pedicle + cortex removed, T₄= fruit pedicle + cortex removed & fruit cut into half

