COMPARATIVE ANALYSIS OF DRYING PERFORMANCE BETWEEN

UTC TOMATO VARIETY AND DIVA F1 TOMATO VARIETY USING A CONTROLLED DEHYDRATOR AND PARABOLIC UV DRYER

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2026

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1.0 INTRODUCTION

This research study was conducted at the Lutam farms processing Facility. Tomato processing and preservation remain important strategies for reducing post-harvest losses, extending shelf life, and improving market value. Drying is one of the most effective preservation methods used to reduce moisture content in tomatoes while maintaining nutritional quality and usability for further processing.

This comparative study evaluated the drying characteristics of two tomato varieties:

1. UTC Tomato Variety
2. Diva F1 Tomato Variety from East-West Seed Company.

The study compared the drying efficiency, dry matter recovery, color retention, texture, and visual quality of both varieties using two drying methods:

- Controlled electric dehydrator
- Parabolic UV/Solar dryer

The objective of the study was to determine which tomato variety demonstrated better suitability for drying and value-added tomato processing.

2.0 BRIEF DESCRIPTION OF TOMATO VARIETIES

2.1 UTC Tomato Variety

The UTC tomato variety is a commonly cultivated open-pollinated tomato variety widely available within Northern Nigerian tomato markets and production systems. The variety is frequently traded among local farmers and seed distributors due to its adaptability, affordability, and availability. Unlike hybrid varieties, UTC tomatoes are generally farmer-reproducible and are commonly circulated through informal seed systems and local agricultural supply channels.

The variety is commonly used for fresh consumption and local tomato processing. UTC tomatoes are characterized by moderate fruit firmness, acceptable color development, relatively high moisture content, and moderate drying performance. Because it is not strongly tied to a single branded breeding company, available technical documentation on the UTC variety is limited compared to commercial hybrid varieties.

Field observations during this experiment showed that the UTC variety demonstrated acceptable drying potential, although dry matter retention and color stability were lower when compared with Diva F1.

[Picture: UTC Tomato Variety]

2.2 Diva F1 Tomato Variety

Diva F1 is a hybrid tomato variety developed by East-West Seed Company. The variety is recognized for its strong vigor, high yield potential, attractive deep red fruit coloration, and firm fruit texture. Diva F1 tomatoes are suitable for both fresh market use and industrial processing due to their good firmness and high solids content. The variety also demonstrates tolerance to environmental stress and several tomato diseases.

Diva F1 is considered suitable for value-added processing because of its rich color, dense pulp, and improved shelf stability. These characteristics make it potentially advantageous for tomato drying and powder production.

Source references:

- East-West Seed Company official website
- East-West Seed product and technical descriptions
- Farmer seed distributors and tomato production networks

[Picture: Diva F1 Tomato Variety]

3.0 MATERIALS AND METHODS

3.1 Materials Used

The following materials and equipment were used during the experiment:

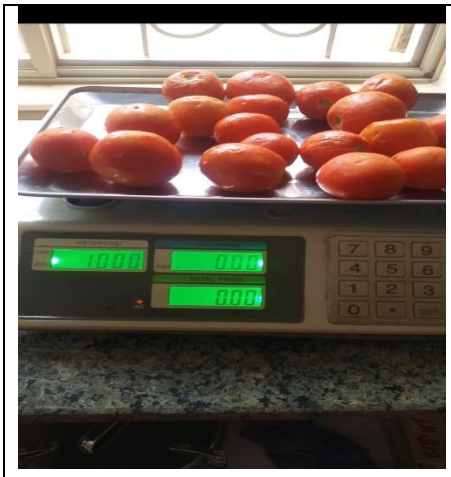
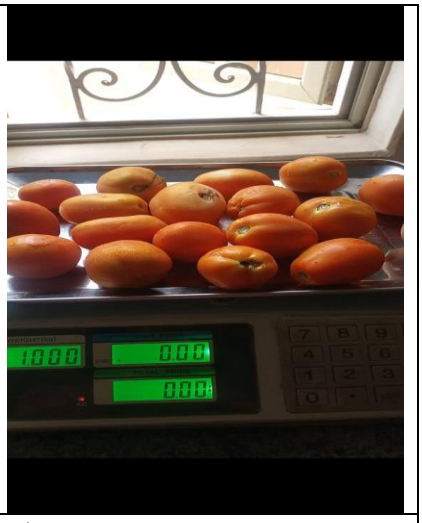
- UTC tomato variety
- Diva F1 tomato variety
- Controlled electric dehydrator
- Parabolic UV/Solar dryer
- Weighing scale
- Stainless knives
- Washing bowls
- Drying trays
- Packaging materials

4.0 EXPERIMENT ONE: CONTROLLED DEHYDRATOR DRYING

4.1 Experimental Procedure

Fresh tomatoes from both UTC and Diva F1 varieties were weighed at 1 kg each.

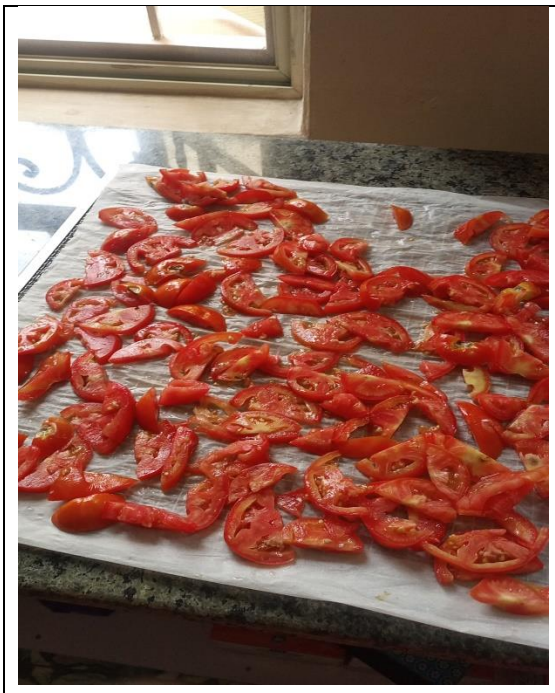
[Picture: Fresh tomatoes weighed at 1 kg each]

	
1 kg Diva f1 Tomatoes	1kg UTC Tomatoes

The tomatoes were thoroughly washed with clean water to remove dirt and impurities.

The washed tomatoes were thinly sliced uniformly to promote efficient drying.

[Picture 3: Sliced tomato samples]

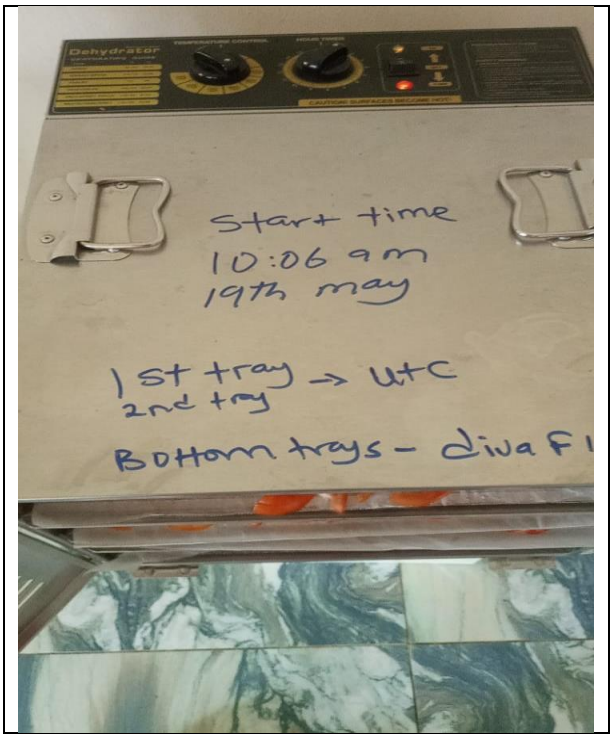
	
SLICED DIVA F1 TOMATOES	Sliced UTC TOMATOES

The sliced tomatoes were spread evenly on dehydrator trays. Two trays were used for each variety.

The trays were inserted into the controlled dehydrator at exactly **10:06 AM on 19th May 2026**.

The dehydrator temperature was maintained at 60°C throughout the drying period.

[Picture 4: Dehydrator setup showing date and time]



Drying continued until **8:29 AM on 21st May 2026**.

After removal from the dehydrator, both tomato varieties were assessed physically for dryness.

The dried samples were observed to be:

- **Completely dry**
- **Crispy and crunchy**
- **Easily snapped when broken**
- **Free from visible moisture**

These observations confirmed effective moisture removal.

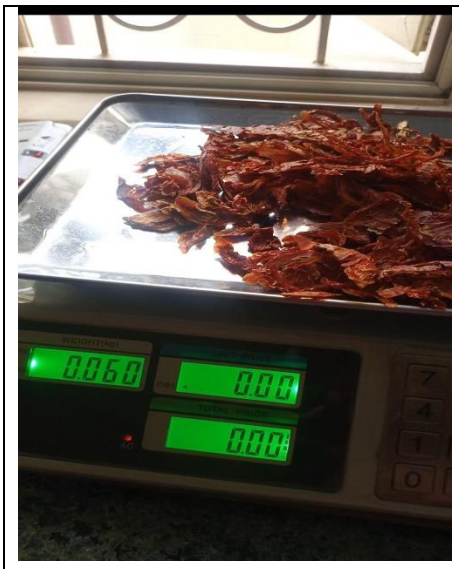
[Picture 5: Final dried tomato samples from dehydrator]

	
DRIED TOMATO SAMPLES	DRIED TOMATO SAMPLES

4.2 Final Dry Weight Measurement

After drying, the final dry weights obtained were:

Tomato Variety	Fresh Weight	Final Dry Weight
UTC	1 kg	55 g
Diva F1	1 kg	60 g

	
DIVA F1 DRY OUTPUT	UTC DRY OUTPUT

Picture 6: Final dry weight measurements on weighing scale]

4.3 Physical and Visual Assessment

Diva F1 Variety

The Diva F1 dried tomato exhibited:

- Deep dark red coloration
- More attractive appearance
- Better visual appeal
- Richer tomato hue
- Improved aesthetic quality

The variety showed strong potential for premium dried tomato processing.

UTC Variety

The UTC dried tomato exhibited:

- Slight muddy dark coloration
- Acceptable appearance
- Moderate visual quality

- Lower color intensity compared to Diva F1

Although acceptable, the UTC variety showed lower color retention when compared with Diva F1.

5.0 EXPERIMENT TWO: PARABOLIC UV/SOLAR DRYER

5.1 Experimental Procedure

Fresh tomato samples from both varieties were prepared for drying using the parabolic UV/solar dryer.

The fresh weights recorded were:

Tomato Variety	Fresh Weight
UTC	17.55 kg
Diva F1	34.50 kg

[Picture: Fresh tomato samples prepared for solar drying]

UTC TOMATOES

DIVA F1 TOMATOES

The tomatoes were washed thoroughly, sliced thinly, and spread evenly on drying trays within the parabolic UV dryer.

Drying was carried out for approximately 48 hours.

[Picture: Parabolic UV dryer during drying process]

TOMATO SAMPLES DRYING IN UV/SOLAR DRYER

After drying, the tomato samples were observed to be adequately dried and stable for storage.

5.2 Final Dry Weight Measurement

The final dry weights obtained were:

Tomato Variety	Fresh Weight	Final Dry Weight
UTC	17.55 kg	0.80 kg
Diva F1	34.50 kg	1.90 kg

[Picture: Final dried output from parabolic UV dryer]

	
FINAL OUTPUT OF UTC TOMATOES	**FINAL OUTPUT DIVA F1 TOMATOES**

6.0 STANDARDIZED DRY MATTER ANALYSIS

Because the fresh quantities used during solar drying were unequal, a standardized dry matter recovery analysis was conducted to allow fair comparison between the two varieties.

The dry yield per 1 kg of fresh tomato was calculated.

6.1 Dry Matter Recovery Formula

Dry Matter Recovery (%) = (Dry Weight / Fresh Weight) × 100

6.2 UTC Dry Matter Recovery

Fresh weight = 17.55 kg

Dry weight = 0.80 kg

Dry matter recovery:

0.80 ÷ 17.55 × 100 = 4.56%

This means that:

- 1 kg of fresh UTC tomato produced approximately 45.6 g of dried tomato.

6.3 DivaF1 Dry Matter Recovery

Fresh weight = 34.50 kg

Dry weight = 1.90 kg

Dry matter recovery:

1.90 ÷ 34.50 × 100 = 5.51%

This means that:

- 1 kg of fresh Diva F1 tomato produced approximately 55.1 g of dried tomato.

7.0 ECONOMIC AND MARKET OBSERVATIONS

Tomato pricing within Northern Nigerian markets was observed to be highly volatile and seasonal during the period of this study.

Interviews conducted with tomato farmers and distributors in Shika, Zaria indicated that tomato prices fluctuate significantly depending on:

- Seasonality
- Market supply
- Disease outbreaks
- Transportation costs
- Weather conditions
- Regional market demand

According to market observations and interviews with a major tomato farmer and distributor, Rabi Kabiru CEO Rusraz Nig limited, tomato prices during peak harvest periods between December 2025 and January 2026 dropped significantly.

During this period:

- Tomato crates sold for approximately ₦6,000 to ₦10,000 depending on market conditions.
- Pricing was largely determined by prevailing open-market rates.
- Hybrid tomato varieties such as Diva F1 were generally sold at slightly higher prices because of their higher seed costs and improved fruit quality.

Despite the higher production cost associated with hybrid seeds, observations from this experiment suggest that Diva F1 may provide better economic value due to:

- Higher dry matter recovery
- Better color retention
- Improved visual quality
- Better suitability for value-added processing
- Higher potential processing efficiency

These characteristics may improve profitability for processors involved in tomato drying and powder production.

However, farmer preference, seed accessibility, and production objectives remain important considerations when selecting tomato varieties for commercial cultivation and processing.

8.0 COMPARATIVE ANALYSIS

Parameter	UTC Variety	Diva F1 Variety
Color Retention	Moderate	Excellent
Visual Appeal	Acceptable	Highly Attractive
Dry Matter Recovery	4.56%	5.51%
Dry Yield per 1 kg Fresh Tomato	45.6 g	55.1 g
Texture After Drying	Crispy	Crispy
Drying Stability	Good	Very Good
Industrial Processing Potential	Moderate	High

Parameter	UTC Variety	Diva F1 Variety
Color Retention	Moderate	Excellent

Visual Appeal	Acceptable	Highly Attractive
Dry Matter Recovery	4.56%	5.51%
Dry Yield per 1 kg Fresh Tomato	45.6 g	55.1 g
Texture After Drying	Crispy	Crispy
Drying Stability	Very Good	Very Good
Industrial Processing Potential	Moderate	High
Moisture content	7.0	6.5

8.0 COST IMPLICATION ANALYSIS

8.1 Procurement Costs

The tomato varieties used for this study were procured at prevailing market prices during the study period.

Variety Quantity Purchased Procurement Cost

Diva F1 One Crate ₦25,000

UTC Half Crate ₦17,000

Tomato prices within Northern Nigeria are highly seasonal and subject to significant fluctuations depending on supply, demand, weather conditions, and market availability.

Interviews conducted with tomato farmers and distributors in Shika, Zaria indicated that during peak glut periods, tomato prices may decline substantially, with crates reportedly selling for as low as ₦2,000–₦4,000. Conversely, prices increase significantly during periods of scarcity.

The prices recorded during this experiment therefore reflect market conditions at the time of procurement and should not be considered fixed benchmark prices.

8.2 Processing and Logistics Costs

The following costs were incurred during the drying experiment:

Item	Cost
Transportation to drying facility	₦5,000
Parabolic dryer processing charge (52.05 kg × ₦150/kg)	₦7,800
Transportation of dried samples to Kaduna	₦10,000
Electricity cost for dehydrator drying	₦2,000

Total Processing and Logistics Cost = ₦24,800

8.3 Allocation of Shared Costs

The shared transportation and processing costs were allocated according to the proportion of fresh tomato weight processed.

Fresh tomato processed:

- UTC: 17.55 kg
- Diva F1: 34.50 kg

Total fresh tomato processed:

- 52.05 kg

Cost allocation:

Variety	Allocated Shared Cost
UTC	₦8,358
Diva F1	₦16,442

8.4 Total Cost Incurred by Variety

UTC Variety

Cost Component	Amount
Procurement Cost	₦17,000
Allocated Shared Costs	₦8,358
Total Cost	**₦25,358**

Diva F1 Variety

Cost Component	Amount
Procurement Cost	₦25,000
Allocated Shared Costs	₦16,442
Total Cost	**₦41,442**

8.5 Production Cost of Dried Tomato

Using the total costs incurred and the dried outputs obtained during the experiment, the estimated production cost of dried tomato was calculated.

Variety	Total Cost	Dried Output	Production Cost per kg of Dried Tomato
UTC	₦25,358	0.80 kg	₦31,698/kg
Diva F1	₦41,442	1.90 kg	₦21,812/kg

8.6 Economic Assessment

The economic analysis revealed that although Diva F1 tomatoes required a higher initial procurement cost, the variety achieved a substantially lower production cost per kilogram of dried tomato.

The estimated production cost of dried tomato from UTC was ₦31,698 per kilogram, while Diva F1 achieved a production cost of ₦21,812 per kilogram.

This represents a cost advantage of approximately ₦9,886 per kilogram of dried product in favour of Diva F1.

The findings indicate that the higher acquisition cost associated with Diva F1 can be offset by improved processing efficiency and greater dried product output. Consequently, Diva F1 demonstrated stronger economic potential for commercial dried tomato production under the conditions of this study.

Furthermore, the economics of tomato drying are expected to improve significantly during glut periods when tomatoes can be purchased at substantially reduced market prices. This highlights the importance of strategic procurement and seasonal processing as a means of increasing profitability and reducing post-harvest losses.

9.0 DISCUSSION

The experiment demonstrated noticeable differences between the two tomato varieties in terms of drying performance and dry matter recovery.

Under controlled dehydrator conditions, both tomato varieties dried successfully and achieved stable moisture reduction. However, Diva F1 produced slightly higher dry matter yield and superior color retention compared to UTC.

Under the parabolic UV drying system, Diva F1 again demonstrated higher dry matter recovery and better processing efficiency. The darker red coloration and richer visual quality observed in Diva F1 indicate a stronger suitability for industrial tomato drying and powder production.

The higher dry matter recovery observed in Diva F1 suggests that the variety may possess higher solids concentration and lower relative moisture content when compared to UTC.

Although UTC showed acceptable drying characteristics, Diva F1 consistently outperformed UTC in:

- Dry matter recovery
- Color quality
- Visual appeal
- Processing suitability

10.0 CONCLUSION

The comparative drying study revealed that both UTC and Diva F1 tomato varieties can be successfully processed using controlled dehydration and parabolic UV drying systems.

However, Diva F1 demonstrated superior overall performance in terms of:

- Dry matter recovery
- Color retention
- Visual quality
- Processing efficiency

The variety produced a higher quantity of dry product per kilogram of fresh tomato and maintained a more desirable deep red coloration after drying.

Based on the observations and results obtained during this study, Diva F1 appears more suitable for commercial dried tomato production and value-added tomato processing applications.

11.0 RECOMMENDATIONS

Based on the findings from this experiment, the following recommendations are proposed:

1. Diva F1 should be considered for commercial dried tomato processing due to its superior dry matter recovery and color retention.
2. Controlled dehydrator drying at 60°C proved effective for achieving stable and crispy dried tomato products.
3. Parabolic UV drying can serve as a viable low-energy alternative for bulk tomato drying operations.
4. Further studies should evaluate:

- Nutritional retention
- Shelf-life stability
- Rehydration properties
- Tomato powder quality
- Economic cost-benefit analysis

5. Standardized equal-weight drying experiments should be repeated at larger scales for additional statistical validation.

12.0 ACKNOWLEDGEMENT

Special appreciation is extended to Eugene of OSOMOBEGBE GLOBAL VENTURES(OGV) for his technical assistance and support during the parabolic UV drying process.

This research and report was prepared by Okoli Uchechukwu, CEO of LUTAM Farms, for FHSA.

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