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# Enhancing Postharvest Quality and Shelf-Life of Tomato (*Solanum lycopersicum* L.) Fruits Through Salicylic Acid Treatment: Implications for Agricultural Practices in Benue State, Nigeria

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***Authors' contributions***

*This work was carried out in collaboration among all authors. 'Author A' designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. 'Author B' and 'Author C' managed the analyses of the study. 'Author C' managed the literature searches. All authors read and approved the final manuscript.*

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## ABSTRACT

Tomato fruits have a high nutritional value and are beneficial to health. However, losses frequently occur after harvest, because they are perishable. Salicylic acid (SA) can be used to preserve fruit quality and maintain their nutritional contents during storage. Therefore, this study was conducted

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to investigate the effects of applications of SA at different concentration on the physicochemical properties and shelf-life of tomato fruit. For this purpose, two tomato varieties (Padma F1 and local variety) fruits received postharvest applications of salicyclic acid at 0g/l (control), 10g/l, 20g/l and 30g/l and the fruits were stored for 26 days at ambient conditions (temperature of 30.8$^0$C to 33.5$^0$C and relative humidity of 55% to 68%). The postharvest application of salicyclic acid (SA), particularly at higher concentration (30g/l), preserved and maintained fruit firmness, slowed weight loss, and higher values of pH, Total Soluble Solids (TSS), Total titratable acidity (TTA) and vitamin C of tomato fruit. Salicyclic acid (SA) application significantly reduced decay percentage of fruits thus increasing the marketability of fruits during the 26$^{th}$ day of storage. Treated Padma F1 and local variety had an extended shelf life of 26days and 23.67days while the untreated fruits had a shelf-life of 21days respectively under ambient conditions of Makurdi. Furthermore, SA treated fruits had higher overall acceptability and other sensory qualities as well as the better retention of nutrients during storage as compared to the treated fruits. Therefore, postharvest application of Salicyclic acid (SA) at 30g/l is recommended for preserving the quality and shelf-life of tomato fruits, such as Padma and local variety, and maintaining their nutritional properties for human health.

*Keywords: Physico-chemical; quality; shelf-life; tomato fruits; salicyclic acid.*

## 1. INTRODUCTION

Tomato (*Solanum lycopersicum* L.) is one of the world's most essential vegetables due to its nutritional, economic, and social importance. Its antioxidant characteristics make it particularly vital in human nutrition (Heuvelink 2018; Stoleru et al. 2020). FAOSTAT (2020) reports that more than 180 million tonnes of tomatoes are produced annually from more than 5 million ha of tomato cultivation globally (Argento et al. 2019). Nigeria is the largest tomato producer in sub-Saharan Africa and the 13th worldwide, even though she does not export tomatoes (Obekpa 2019) as demand exceeds supply, this is understandable (Ugonna et al. 2014).

Tomatoes have recently come to be seen as a vital part of a healthy diet (Felföldi et al. 2021; 2022). This is because they are rich in a variety of nutrients and healthful components that the human body needs to function normally (including vitamins, minerals, and water). Tomatoes have several beneficial chemicals, but one of the best known is carotenoids, which have been shown to reduce the amount of low-density oxidised lipoproteins in the blood, hence reducing the risk of developing diabetes, gastrointestinal, and cardiovascular disorders (Rao and Rao 2007; Felföldi et al. 2022). Tomatoes also contains ascorbic acid, a vital organic acid in fruits and vegetables (Rosales et al. 2011; Antonious et al. 2019; Ali et al. 2021). Organic acids affect plant nutrition and sugars, which affect tomato quality and customer preferences (Zhao et al. 2016).

Tomatoes' perishability makes production and consumption difficult. This threatens product sales and business profitability. Freshly picked fruits last one week at room temperature and two weeks under refrigeration (Obekpa 2019). This may be especially true under the prevalent traditional production system. In tropical developing nations with insufficient storage and transit facilities, postharvest losses of perishable commodities might surpass 50% (Ugonna et al. 2015). Generally, environmental factors, cultivation technology, genetic differences, agricultural procedures, biotic and abiotic stresses, and post-harvest storage affect the chemical composition of tomato fruit (De Sio et al. 2019; Fortis Hernandez et al. 2021; San Martín-Hernández et al. 2021). Moreover, understanding drivers of the use of improved tomato varieties and adoption of appropriate farm management practices will guide interventions seeking to promote new varieties and scale up production. Thus, the study was carried out to evaluate the effect of postharvest treatment with salicyclic acid (SA) on fruit quality and shelf life of tomato fruit varieties in Makurdi

## 2. MATERIALS AND METHODS

### 2.1 Source and Collection of Materials

Healthy tomatoes were harvested from farmers field and used for this experiment. Salicyclic acid (SA) was purchased from Rovet Nigeria Limited, Nigeria.

### 2.2 Preparation of Materials

Salicyclic acid (SA) was dissolved in distilled water at different levels for 5 minutes. Fruits were immersed 5 min into an aqueous solution of salicyclic acid containing different concentrations (10g/l, 20g/l and 30g/l) and untreated (water). All treated fruit were allowed to air-dry at room temperature.

## 2.3 Experimental Design and Treatments

The experiment was laid out in Completely Randomised Design (CRD) with a factorial arrangement and replicated three (3) times. The factors under consideration were two (2) variety of tomatoes (Padma F1 and local) and three levels of SA (10, 20 and 30g/ which is equivalent of 0.15mMol/l, 0.30mMol/l and 0.45mMol/l).

## 2.4 Experimental Procedure

The cleaned fruits were completely immersed in the medium of SA, and allowed to stay for 10mins (Win and Setha 2022). Thereafter, the fruits were removed, air dried and placed in plastic crates and stored at room temperature. Observations were taken at 5days intervals for 26days respectively.

## 2.5 Data Collection

**Fruit length and width:** Fruit length and width was determined by measuring the length and diameter of five randomly selected fruits from the treatment with a Vernier calliper.

**Weight loss:** To determine the weight loss of stored tomatoes, both the treated and control fruits were weighed at different sampling intervals. The weight loss was expressed as a percentage (%) with the formula below

$$\text{Weight loss (\%)} = \frac{\text{Initial wt. of fresh fruit} - \text{final wt. of fruit in storage}}{\text{Initial wt. of fresh fruit}} \times 100$$

**Firmness:** A penetrometer was used to determine firmness from fruits in all treatments. The probe was allowed to penetrate to a depth of 1.5cm and the corresponding force required to penetrate this depth was determined. Firmness was expressed in N/cm.

**Total soluble solid**: Total soluble solid (TSS) was measured using a hand-held digital refractometer and expressed as %brix. Total titratable acidity (TTA) was measured with a digital pocket acidity meter and expressed as percentage of citric acid.

**pH:** pH value in fruit juice were measured directly using a pH meter.

**Vitamin C** content (mg/100g) of the fruit was determined by the method described by AOAC (2005).

The percentage of decayed fruit was calculated by counting the number of infected fruits out of the total. Marketability (%) was based on descriptive quality attributes such as level of visible lesion, shriveling, smoothness and shininess of fruit, percentage of marketable fruits was calculated with the formula as follows;

$$\text{\%Marketability} = \frac{\text{Number of marketable fruits}}{\text{total number of fruits}} \times 100$$

The shelf life (days) of tomato fruits was evaluated by counting the number of days' tomatoes fruits were still acceptable for marketing and consumption from each experimental treatment.

**Sensory evaluation**. A panel of trained judges examined the tomato fruits for the sensory attributes including for texture, colour, flavour, taste and overall acceptability by using the 9-point hedonic scale described by Ihekoronye and Ngoddy (1985), where 9 for extreme like and 1 for extreme dislike.

## 2.6 Data Analysis

Data obtained from the study was subjected to analysis of variance (ANOVA) using GENSTAT statistical package in a completely randomized design (CRD). The effect of treatment on dependent variables was determined using Fishers' Least Significance Difference (P≤0.05).

# 3. RESULTS AND DISCUSSION

## 3.1 Effect of Variety on the Postharvest Quality and Shelf-life and Quality of Tomato Fruit in Benue State

The Padma F1 variety recorded the lowest percentage weight change (31.95%) at the 26th day of storage, while the local variety recorded 41.51% weight change (Fig. 1). The weight change (%) of tomatoes as significantly influenced by variety showed that the local variety had the highest weight change with increased in the days of storage. The weight of tomato varieties after storage was strongly affected by factors before harvest, the environment, and genetic differences. The results of this investigation are aligned with those of Ada et al. (2019), who demonstrated that the

Rio Grande variety consistently performed better than others in terms of fruit weight and other parameters. When Tunwari et al. (2019) and Usman (2019) worked with several tomato varieties, they observed similar results. This implies that some varieties are resistant and can tolerate circumstances that may otherwise cause weight loss to increase.

In terms of fruit firmness, the Padma F1 variety outperformed the local variety throughout the study period, the tomato fruits decreased as the number of storage days increased (Fig. 2). Tomato fruit firmness is a crucial quality attribute that is influenced by a number of factors, including the tomato variety. A natural decline in firmness was noted by Tunwari et al. (2019) as they observed that some varieties stayed firmer than others after storage. Latara and Ajala (2019) further confirmed that fruit varieties had an impact on firmness. In their investigation, the 'Tima' variety produced fruits that had a thicker pericarp than the 'Roma VF' and 'UTC' varieties, which resulted in increased firmness. This implies that growers may produce higher-quality fruit that satisfies market criteria by choosing particular kinds.

On marketability and postharvest decay, Padma F1 obtained the highest percentage (83.30%) of marketable fruits at day 26 with a reduced marketability at day 16 as compared to the local variety (73.10%) with a reduced marketability at day 11 (Fig. 3 and 4). Similarly, Padma F1 recorded lowest decay percentage of tomato and the difference was significantly as compared to local variety which recorded the highest decay percentage. The local variety began to deteriorate at day 11, whereas Padma F1 began to do so at day 16, five days ahead of the local variety (Fig. 4). The variety of tomato that is grown has a big impact on how marketable and how quickly tomatoes deteriorate after harvest in Nigeria. Because it impacts yield, quality, and market acceptability, this effect is significant for producers as well as consumers. Varietal differences in postharvest decay and the percentage marketability of horticultural products such as tomatoes, oranges, and okra have previously been observed by a number of

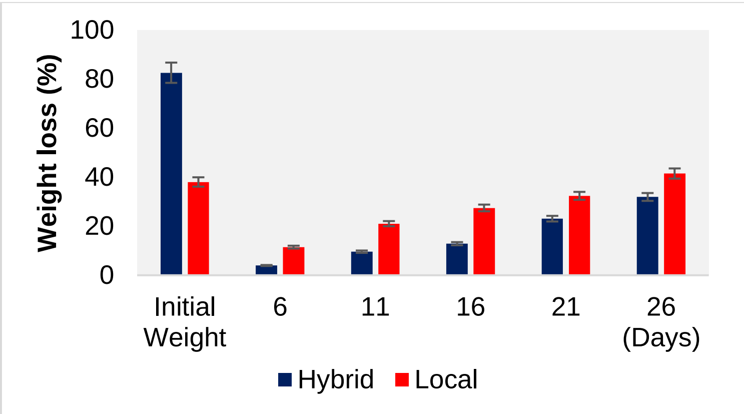


**Fig. 1. Effect of Variety on the Weight loss (%) of Tomato fruits during storage in Makurdi**

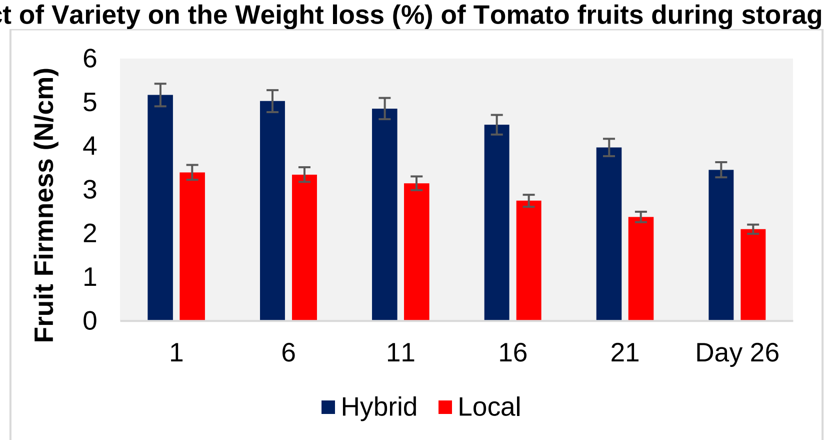


**Fig. 2. Effect of Variety on the Fruit Firmness (N/cm) of Tomato fruits during storage in Makurdi**

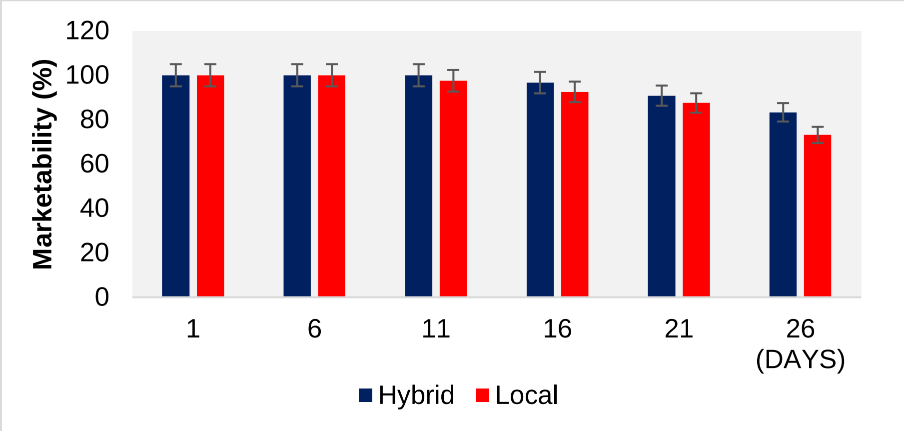


**Fig. 3. Effect of Variety on the Marketability (%) of Tomato fruits during storage in Makurdi**

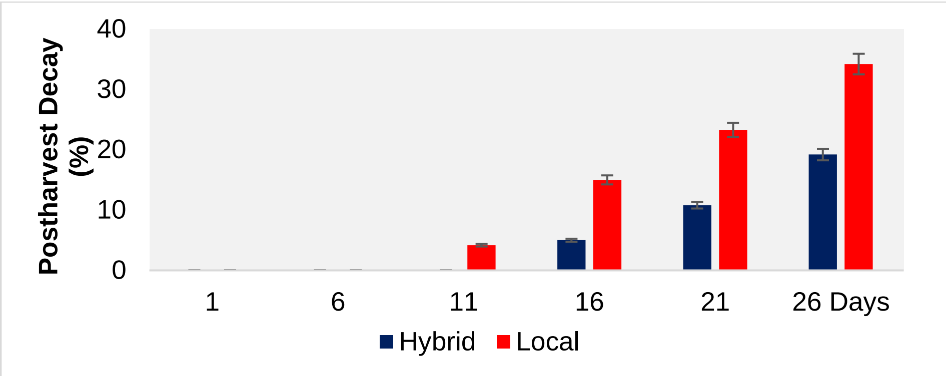


**Fig. 4. Effect of Variety on the Postharvest Decay (%) of Tomato fruits during storage in Makurdi**

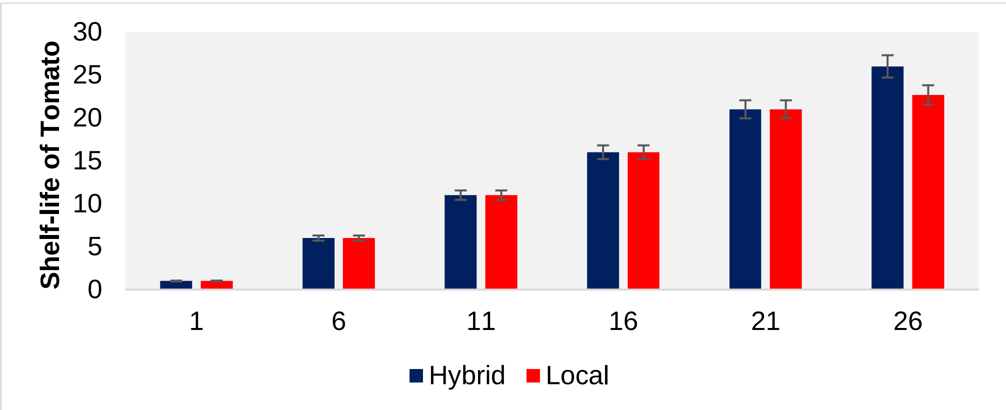


**Fig. 5. Effect of Variety on the Shelf-life of Tomato fruits during storage in Makurdi**

authors (Ada et al. 2019; Liamngee et al. 2018; Falodun and Adewunmi 2020; Falodun and Adewunmi 2020; Iorliam and Ugoo 2023). Zakki et al. (2017) also observed the highest marketability on UTC tomato variety as compared to other variety. On shelf-life of tomato, the study results (Fig. 5) showed that variety of tomato exhibited significant difference Padma F1 variety had the longest shelf-life (26days) as compared to the local variety which had the shelf-life of 22.67days. The varietal difference on the shelf-life of tomato could be accrued to genetic variability and environmental conditions. This is line with Tunwari et al. (2019) reported significantly difference on shelf-life of two tomato varieties Tangino and Seria in

Wukari. Garuba et al. (2018) also affirmed to the current study variety difference on shelf life of tomatoes with Hausa variety recording the longest shelf life (20days) as compared to other varieties like Tropimech and Roma VF with 17 and 16 days of shelf-life respectively.

The chemical parameters of tomato such as pH and total soluble solids (TSS) was influenced by variety as Padma F1 variety recorded the highest pH and TSS values as compare to the local variety (Fig. 6 and 7). However, the pH and TSS of the tomato fruits consistently increased with increase in storage duration. Increase in pH and TSS of tomato fruits could be due to excessive moisture loss which increases concentration as well as the hydrolysis of carbohydrates to soluble sugars Nath et al. (2017); Birhanu and Tilahun (2011); Tigist et al. (2011), Yeshiwas and Tolessa (2018) reported that significant variation for total soluble solid due to varietal difference for TSS of the fruits. The increase in TSS at 26 days storage was due to the direct relationship between total soluble solids increase and colour change with maturity which is in agreement with the present result.

On total titratable acidity (TTA) and vitamin C, Padma F1 recorded the highest TTA and vitamin C of tomato fruits while the local variety recorded the lowest TTA (Fig. 8 and 9). Furthermore, increase in storage duration decreases the TTA and Vitamin C of the fruits. The higher loss of titratable acidity during the storage time could be related to higher respiration rate as ripening advances where organic acids are used as substrate in respiration process. This in line with Yeshiwas and Tolessa (2018) who reported similar results working on tomatoes. Furthermore, varieties with higher titratable acidity could have lower incidence of fungal infection and suitable processing (2011). The present study also revealed less percentage of decay on Padma F1 as compared to the local variety.

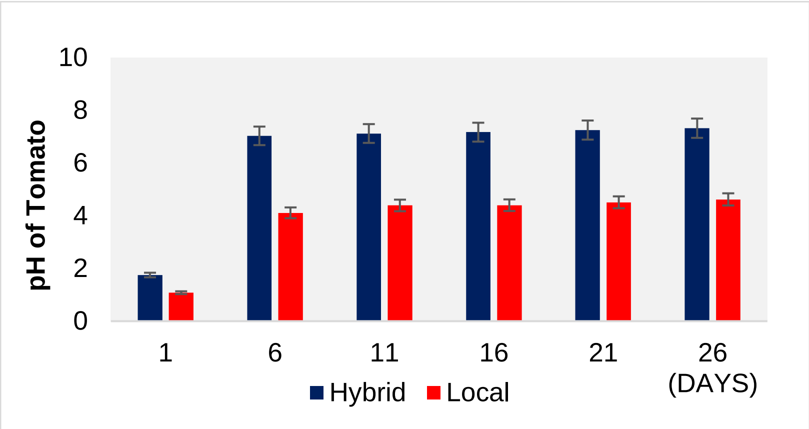


**Fig. 6. Effect of Variety on the pH of Tomato fruits during storage in Makurdi**

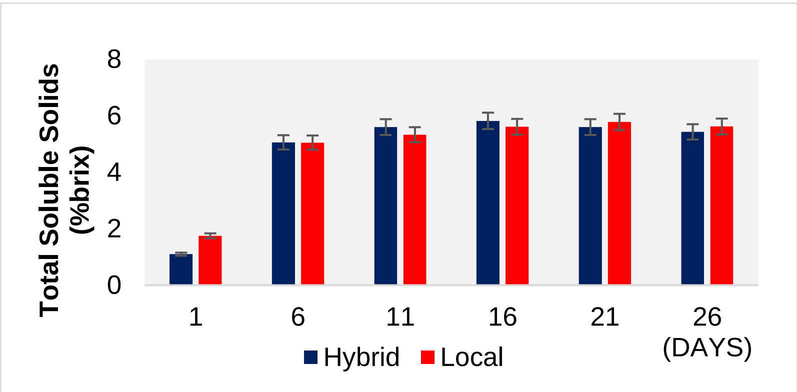


**Fig. 7. Effect of Variety on the Total Soluble Solids (%brix) of Tomato fruits during storage in Makurdi**

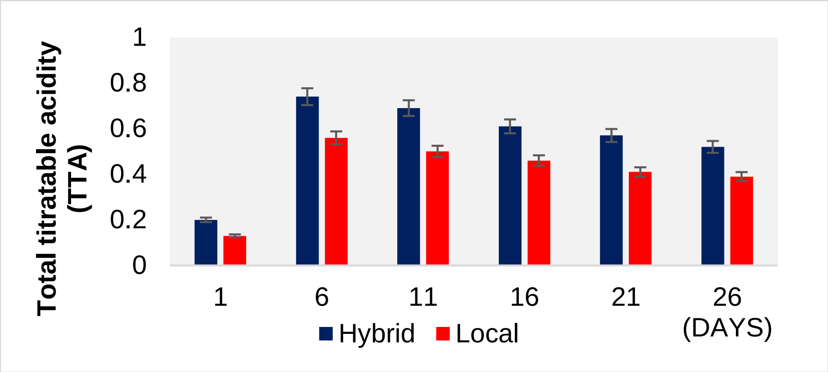


**Fig. 8. Effect of Variety on the Total titratable acidity (TTA) of Tomato fruits during storage in Makurdi**

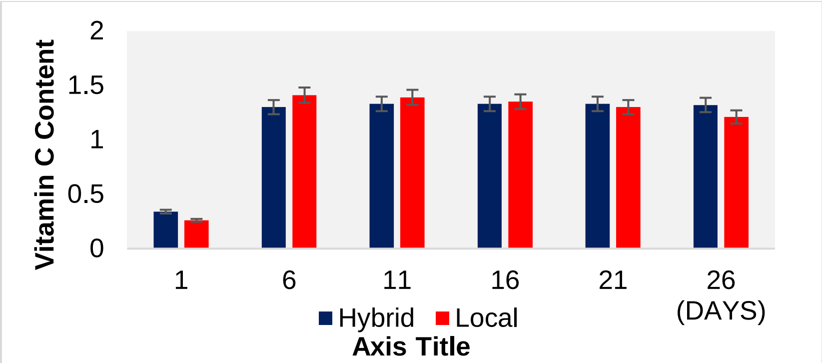


**Fig. 9. Effect of Variety on the Vitamin C Content of Tomato fruits during storage in Makurdi**

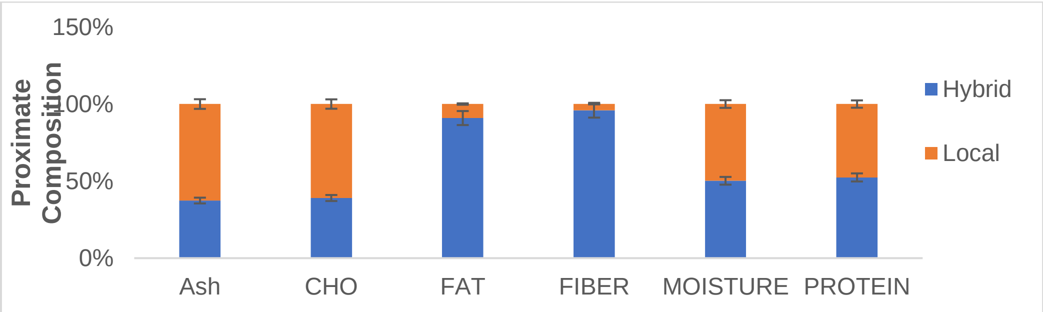


**Fig.10. Effect of Variety on the Proximate Composition of Tomato fruits during Storage in Makurdi (Before Application of SA)**

The proximate composition of tomato fruits was influenced by variety with Padma F1 recording higher fiber content, fat, protein and moisture content as to those produced by the local variety. However, ash and carbohydrate content were higher with the local variety as compared the Padma F1 variety (Fig. 10). The variation among varieties could be ascribed to genetic variability and environmental conditions. This results in conformity with Olaniyi et al. (2010); Mohammed et al. (2017) and Sanusi et al. (2020) who reported variation on the proximate and mineral composition of tomato varieties in Nigeria.

### 3.2 Effect of Postharvest Treatment of Salicyclic Acid (SA) on Quality and Shelf-life Tomato Fruits during Storage in Benue State

Throughout the whole storage time, there was a considerable decrease in the percentage of weight loss with varying concentrations of salicylic acid (Fig. 11). Increases in SA (g) concentrations from 10g/l to 30g/l decreased loss in fruit weight, indicating that SA treatment had a substantial impact on changes in tomato fruit weight loss. Treated fruits in storage demonstrated a substantial influence on the weight loss of all fruit samples throughout the storage period. Weight loss is caused mostly by the respiration process, as well as the loss of water during transpiration. Salicylic acid treatment reduces weight loss by blocking stomatal openings, resulting in decreased respiration Zheng and Zhang (2004). The findings are consistent with those of Abassi et al. (2010), Moradinezhad and Jahani, (2010), Baninaiem et al. (2016), Shah et al. (2022), and Nicktam et al. (2023), who found that postharvest application of SA reduced the weight loss (%) and fruit length in apricot, tomato, and peach fruits during cold storage. According to the study, fruits treated with salicylic acid (30g/l) lost the least weight compared to other treatments and untreated fruits, which lost the most.

The study found that untreated fruits showed the greatest loss of firmness (Fig. 12), while lowest decreased was found in treatment SA (30g/l). Babalar et al. (2007) affirms that Salicylic acid acts as an ethylene inhibitor and restrict the enzymes which are responsible for deterioration of the membrane that leads to softened fruits (Asghari and Aghdam 2010). In conformity to this present study, Bal (2016) explained the effectiveness of salicylic acid in maintaining higher firmness in nectarine fruit during storage. Similar feature of salicylic acid is also illustrated in mango (Win and Setha 2022), 'Kinnow' Mandarin (Baswal et al. 2021), Plum (Angrej et al. 2022), apricot fruit Moradinezhad and Jahani (2016) and grapes (Peyro et al. 2017).

No fungal infection was observed on the fruit during the first 10 days of storage (Fig. 16). After that, the control fruit quickly decayed, and the percentage of decayed fruit was higher than that of the SA-treated fruit. However, significant differences among the SA-treated fruit as the decay and marketable fruits increases from 10g/l to 30g/l SA treated fruits as well as shelf-life. Fruit decay is one of the most important parameters affecting postharvest shelf life as well

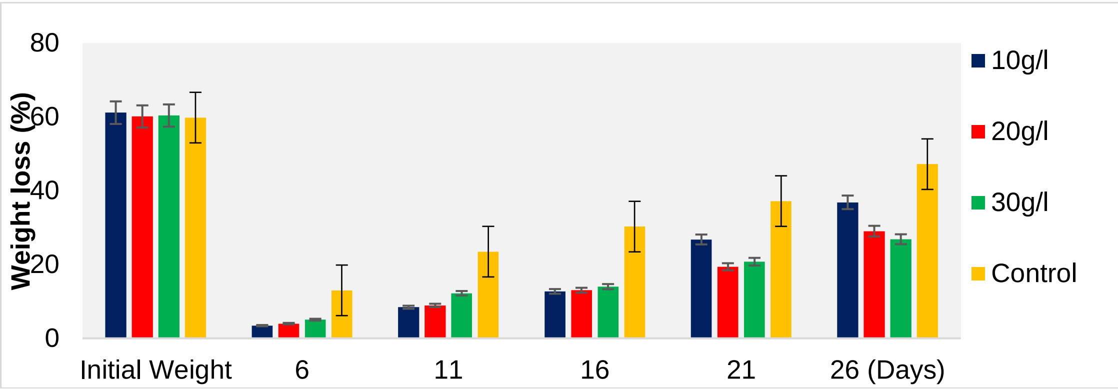


**Fig. 11. Effect of Salicylic Acid (SA) concentration of on the Weight loss (%) of Tomato in Makurdi**

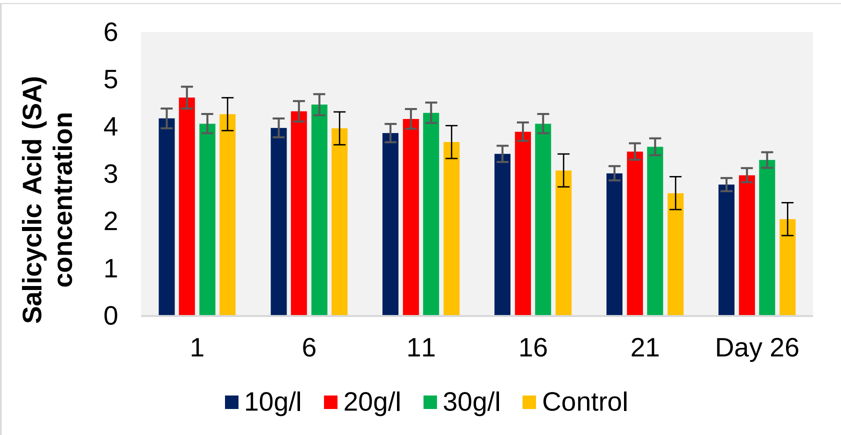


**Fig. 12. Effect of Salicylic Acid (SA) concentration of on the Fruit Firmness (N/cm) of Tomato in Makurdi**

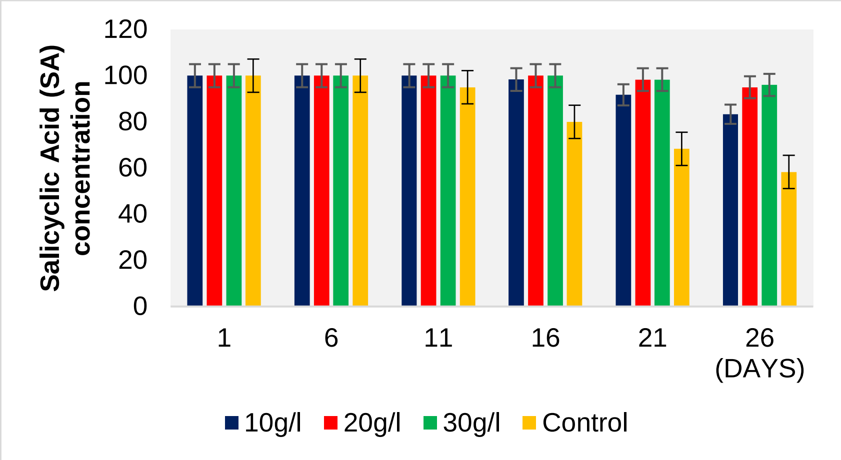


**Fig.13. Effect of Salicyclic Acid (SA) concentration of on the Marketability (%) of Tomato in Makurdi**

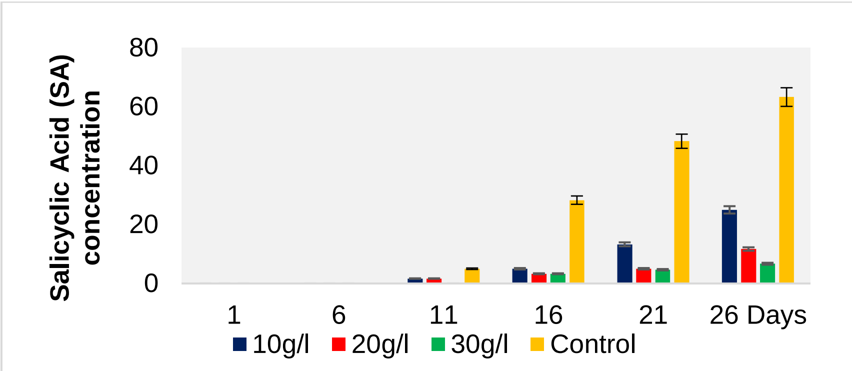


**Fig. 14. Effect of Salicyclic Acid (SA) concentration of on the Postharvest Decay (%) of Tomato in Makurdi**

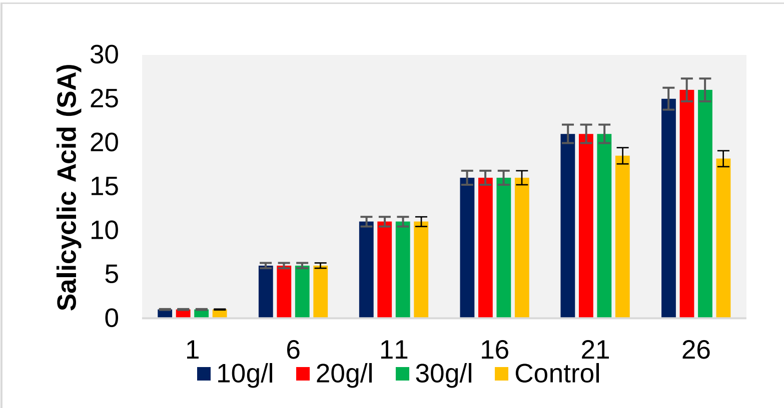


**Fig. 15. Effect of Salicyclic Acid (SA) concentration of on the Shelf-life (days) of Tomato in Makurdi**

as marketability (Fig. 13, 14 and 15). According to Win and Setha (2012), SA stimulates the expression of pathogenesis-related genes, which confers pathogen resistance. Similarly, Baninaiem et al. (2016) found that the postharvest SA treatments also had the most beneficial effects on storage life and fruit quality of tomato fruit, including reductions in decay and hence higher marketability at the 26$^{th}$ day of storage.

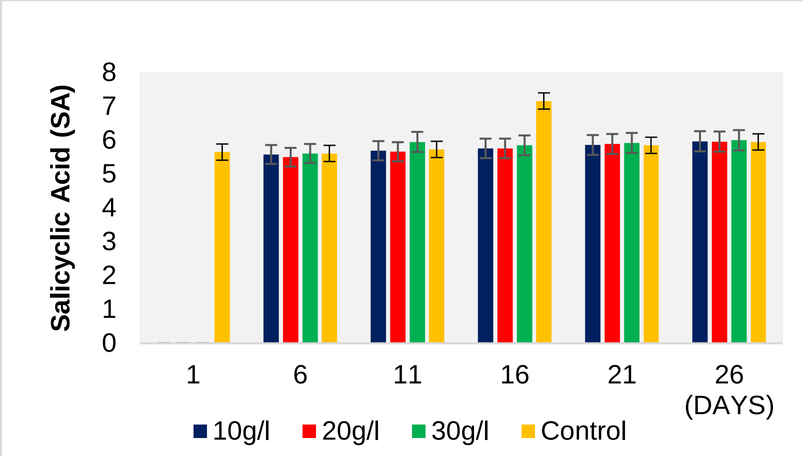


**Fig. 16. Effect of Salicyclic Acid (SA) concentration of on the pH (N/cm) of Tomato in Makurdi**

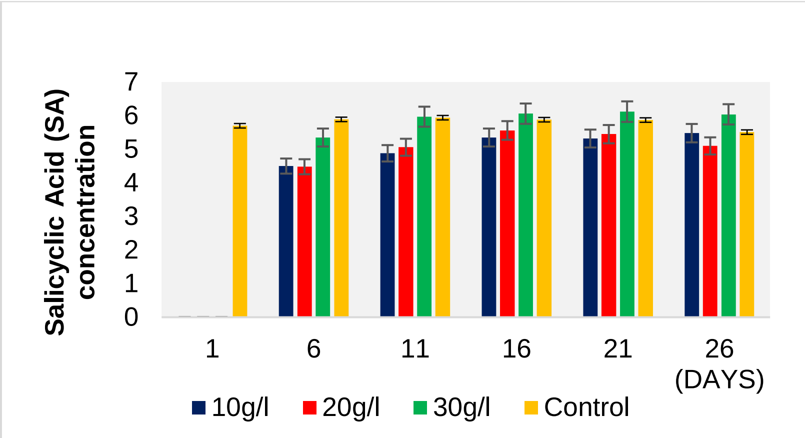


**Fig. 17. Effect of Salicyclic Acid (SA) concentration of on the Total soluble solids (%) of Tomato in Makurdi**

Results for the pH of control and treated tomatoes (Fig. 16) increased during the storage period however, salicylic acid treatment at higher concentrations assisted in maintaining pH values. Lower pH was obtained with untreated fruits. Results regarding fruit pH varies from Al-Qurashi (2012), who identified that the pear fruits treated with salicylic acid had lower pH. The disparity may arise from the fruit crops assessed and the research environment. Similarly, Salgotra and Chauhan (2023) affirms that under environmental changes, different crop varieties survive due to the presence of genetic variation, which enables the varieties to adapt. Fig. 17 showed that the total soluble solids increased progressively during total period of storage. With the increased in concentration of salicylic acid, the increasing trend in TSS delays. In line with the present study, Asghari and Aghdam, (2010), reported SA treatment delays the fruit ripening during storage and also enhance fruit quality attributes. Similarly, Shah et al*.* (2022) found an increase in TSS value from rom 7.84-10.18%Brix of peach fruits during storage. The increased amounts of TSS may be happening due to lowering of juice content or weight-loss. Furthermore, Peyro et al*.* (2017); Amanullah et al*.* (2017) found out that guava fruits treated with salicylic acid contained higher TSS than the untreated fruits. This suggests that tomato fruits treated with SA showed a higher TSS as compared to the untreated fruits.

Total titratable acidity (TTA) significantly decreases from day 6 to day 26 of the storage duration (Fig. 18). Fruits treated with SA (30g/l) significantly recorded the highest TTA value of tomato fruits in this study while fruits untreated fruits recorded the lowest TTA of tomato fruits except for day 1. Shah et al*.* (2022) reported similar results, saying that there was a constant decline (from 0.82-0.52) during the storage period. The decrease in acidity during storage might be due to the use of organic acids in respiration. In conjunction with the current work, Reddy and Sharma (2016), Baninaiem et al. (2016), and Win and Setha (2022) found that pre- or postharvest SA treatment reduced TA reductions in Amrapali mangoes and tomato fruit.

Vitamin C (Ascorbic acid) content dropped in all fruit samples over this period, regardless of SA treatments; however, fruits treated with higher doses of salicylic acid retained a higher level of vitamin-C content than untreated fruits (Fig. 19). This finding is consistent with Akhtar et al. (2010), who stated that Vitamin-C is more susceptible to deterioration during storage and processing, and that the postharvest application salicylic acid preserved a higher concentration of ascorbic acid in guava Amanullah et al. (2017). Shah et al. (2022) found that SA helped peach fruits retain more ascorbic acid during storage. Furthermore, Win and Setha (2022) regarded SA to be an elicitor since it raises concentrations of bioactive substances such as phenolics, carotenoids, and vitamins, all of which boost fruit defensive responses.

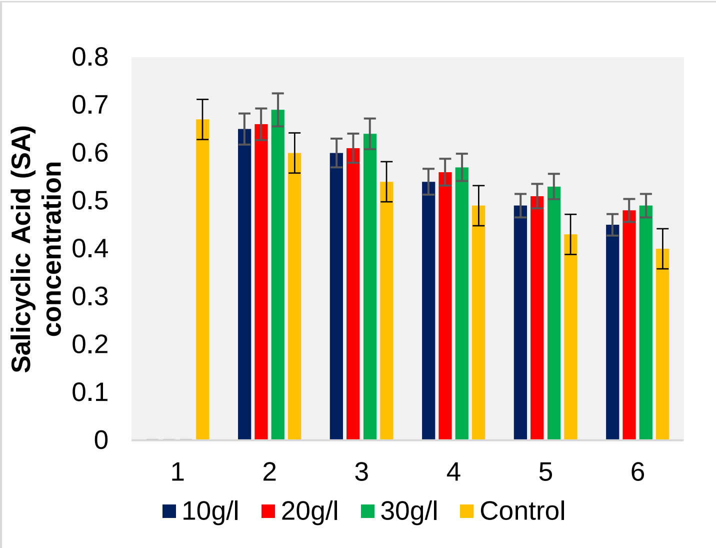


**Fig. 18. Effect of Salicyclic Acid (SA) concentration of on the Total titratable acidity of Tomato in Makurdi**

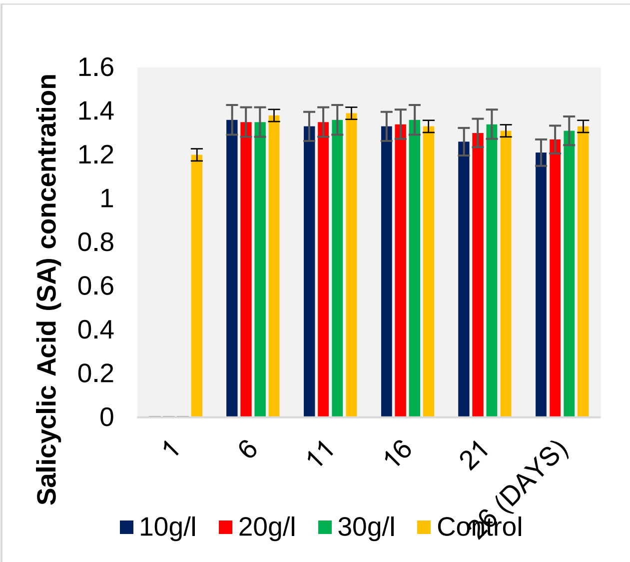


**Fig. 19. Effect of Salicyclic Acid (SA) concentration of on the Vitamin C Content of Tomato in Makurdi**

Although there was no statistically significant difference between treatments, fruits treated with SA (%), regardless of level, had the longest shelf-life (26 days - Padma F1; 23.67 - local variety), whereas untreated fruits, regardless of variety, had the shortest shelf-life (20.67 days - Padma F1; 17.67 days - local variety – Fig. 20). The current study demonstrates that SA is a successful method of reducing the ripening process and so preserving the quality of tomato fruit during storage. Yang et al. (2010), Deniz and Imail (2020), and Win and Setha (2022) published similar findings on mango and peach fruits, demonstrating that SA treatment preserves postharvest quality and biochemical contents while also extending storage life.

SA-treated fruits retained nutrients better during storage (Table 1). The decrease or rise in the proximate composition of tomato fruits following treatment may be due to dehydration and respiration rates related with storage conditions. Barman and Asrey (2022) and Win and Setha (2022) reported similar findings that the postharvest treatments of 2 mM SA have been demonstrated to sustain carotenoid concentrations in Chausa mango fruit.

### 3.3 Effect of Postharvest Treatment of Salicyclic Acid (SA) on the Sensory Evaluation of Tomato Fruits during storage in Benue State

SA-treated fruits outperformed untreated fruits in terms of sensory quality. Figures 21 and 22 demonstrated that, regardless of variety, fruits treated with 30g/l SA outperformed other levels and untreated fruits (control). When the variety were compared, the hybrid (Padma F1 variety) outperformed the local variety. When compared to the untreated fruits, salicylic acid was the most efficient in preserving scores for all of the sensory characteristics tested. The findings are consistent with Shah et al. (2022), Sharma and Sharma (2020), and Ali et al. (2013), who discovered that applying salicylic acid preserved the sensory properties of peach, apricot, and plum fruits as compared to untreated fruits.

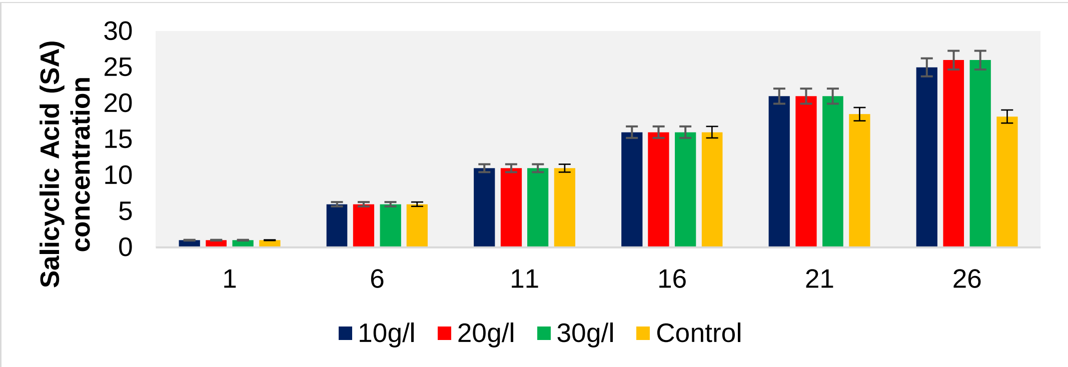


**Fig. 20. Effect of Salicyclic Acid (SA) concentration of on the Shelf-life of Tomato fruits during storage in Makurdi**

**Table 1. Effect of Variety and SA (g) on the Proximate Composition of Tomato fruits during Storage in Benue State (After Application)**

| | | Proximate Composition | | | | | |
|---|---|---|---|---|---|---|---|
| **Variety** | **SA (g/l)** | **Ash** | **CHO** | **Fat** | **Fiber** | **Moisture** | **Protein** |
| Padma F1 | 10 | 0.61 | 2.37 | 0.13 | 1.00 | 95.00 | 0.89 |
| | 20 | 0.62 | 2.30 | 0.14 | 1.01 | 95.07 | 0.87 |
| | 30 | 0.62 | 3.04 | 0.16 | 1.02 | 94.26 | 0.90 |
| | Control | 0.68 | 1.70 | 0.06 | 0.83 | 95.43 | 0.67 |
| Local Variety | 10 | 0.80 | 4.00 | 0.001 | 0.02 | 94.50 | 0.67 |
| | 20 | 0.90 | 3.42 | 0.001 | 0.02 | 94.90 | 0.76 |
| | 30 | 0.98 | 3.99 | 0.001 | 0.03 | 94.17 | 0.83 |
| | Control | 1.10 | 3.36 | 0.000 | 0.01 | 94.87 | 0.66 |
| F-LSD (P≤0.05) | | 0.08 | NS | 0.30 | 0.07 | NS | 0.07 |
| CV (%) | | 5.70 | 23.80 | 25.30 | 8.40 | 0.70 | 5.20 |

*CHO – Carbohydrate*

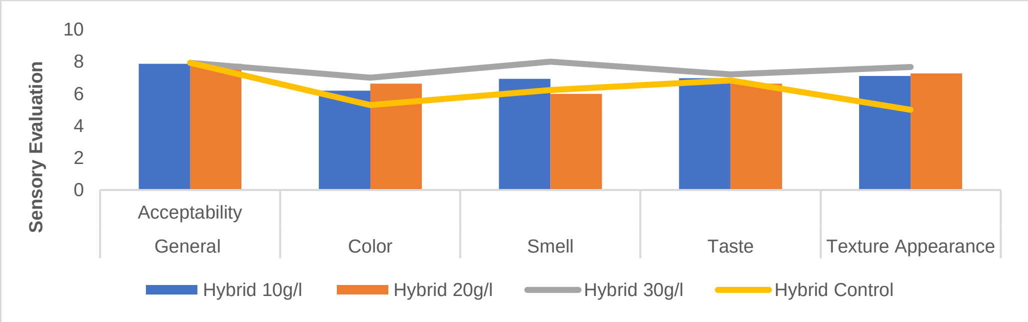


**Fig. 21. Effect of Hybrid Variety and SA Treatment on the Sensory Evaluation of Tomato fruits during storage in Makurdi**

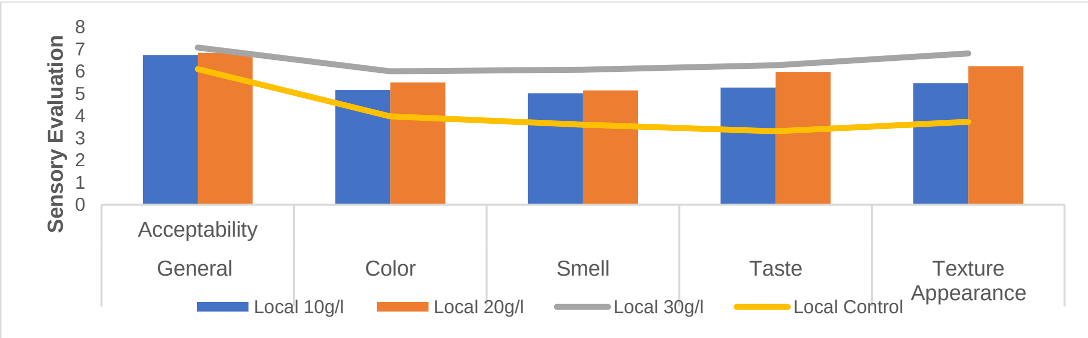


**Fig. 22. Effect of Local Variety and SA Treatment on the Sensory Evaluation of Tomato fruits during storage in Makurdi**

## 4. CONCLUSION

The postharvest application of salicyclic acid (SA), particularly at higher concentration (30g/l), can be used to preserve and maintain fruit firmness, slowed physiological weight loss, and higher values of pH, TSS, TTA and vitamin C of tomato fruit. SA application significantly reduced decay percentage of fruits thus increasing the marketability of fruits during the 26$^{th}$ day of storage. Treated Padma F1 and local variety had an extended shelf life of 26days and 23.67days respectively under ambient conditions of Makurdi. Furthermore, SA treated fruits had higher overall acceptability and other sensory qualities as well as the better retention of nutrients during storage as compared to the treated fruits. Therefore, postharvest application of SA application at 30g/l is recommended for preserving the quality and shelf-life of tomato fruits, such as Padma and local variety, and maintaining their nutritional properties for human health

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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