Trop. J. Eng., Sci.& Techn. 2025. 4(1):20-30 Tropical Journal of Engineering, Science and Technology

Impact of Ashes of Crop Residues on Fresh Tomatoes storage and Conservation in Benue State, Nigeria

Ukpoko E. K * Anhwange B. A.** Kukwa R. E**

*Chemistry Department, Joseph Sarwuaan Tarka University Makurdi, Nigeria.

** Chemistry Deparment Benue State University Makurdi Nigeria

Corresponding Author; ukachiiemma@gmail.com

Abstract

Postharvest losses are major challenge hampering tomatoes productivity in Nigeria, suggesting an alternative to improve on shelf life of fresh tomatoes. Postharvest residues of eight (common crops namely Cassava Peel (CP), Groundnut Stalk (GSK), Guinea Corn Chaff (GCC), Maize Corn Peels (MCP), Millet Chaff (MCF), Rice Stalk (RS), Soya-beans Stalk (SS) and Yam Peel (YP) from Konshisha L.G A, Benue State were processed into crude ashes at 600^{o}C.These crude ashes were used to preserve four species of tomatoes namely local cultivar, roma tomatoes, plum tomatoes and pear tomatoes, which was stored for six weeks on daily observation and records. The percentage of good plum tomatoes sustained in the ashes for six weeks was 88.88% in GSK ash, 70% in CP ash, 55.55% in MCP and MCF ash, 40% in GCC and 33.33 % in SS ash but 51.14 % of plum in YP ash and 14.28% in RS ash couldn't exceed fifth and fourth weeks respectively. Pear tomatoes sustained freshness in four ashes of MCP, CP, GCC and YP up to 88.88%, 51.14%, 50% and 37.5% respectively for more than six weeks. Roma tomatoes kept fresh in GCC, MCP, GSK, SS and RS ashes at 88.88%, 60%, 55.55%, 40% and 22.22 % respectively whereas local cultivar did not yield encouraging result in any of the ashes beyond three weeks. The proximate analyses revealed that there was a decrease in moisture content while increased percentage crude fiber for all cases in preserved tomatoes. There were no significant differences at 0.05 among other proximate parameters. The pH of ashes that yield good results ranges from of 8.0-8.5.

Keywords: Fresh, Tomatoes, Storage Ashes, weeks.

Impact des cendres de résidus de récolte sur le stockage et la conservation des tomates fraîches dans l'État de Benue, au Nigéria

Résumé

Les pertes post-récolte constituent un défi majeur entravant la productivité des tomates au Nigeria, ce qui nécessite des alternatives pour améliorer leur durée de conservation. Les résidus post-récolte de huit cultures courantes, à savoir les épluchures de manioc (CP), les tiges d'arachide (GSK), les balles de sorgho (GCC), les enveloppes de maïs (MCP), les balles de mil (MCF), les tiges de riz (RS), les tiges de soja (SS) et les épluchures d'igname (YP) provenant de la zone de Konshisha (L.G.A), dans l'État de Benue, ont été transformés en cendres brutes à 600°C. Ces cendres ont été utilisées pour conserver quatre variétés de tomates : une variété locale, des tomates Roma, des tomates Prune et des tomates Poire, stockées pendant six semaines avec des observations et enregistrements quotidiens. Le pourcentage de tomates Prune bien

conservées dans les cendres après six semaines était de 88,88 % avec les cendres GSK, 70 % avec CP, 55,55 % avec MCP et MCF, 40 % avec GCC et 33,33 % avec SS. Cependant, seulement 51,14 % des tomates Prune dans les cendres YP et 14,28 % dans RS n'ont pas dépassé respectivement la cinquième et la quatrième semaine. Les tomates Poire ont conservé leur fraîcheur dans quatre types de cendres (MCP, CP, GCC et YP) à des taux de 88,88 %, 51,14 %, 50 % et 37,5 % pendant plus de six semaines. Les tomates Roma sont restées fraîches dans les cendres GCC, MCP, GSK, SS et RS à des taux respectifs de 88,88 %, 60 %, 55,55 %, 40 % et 22,22 %, tandis que la variété locale n'a donné aucun résultat satisfaisant au-delà de trois semaines dans aucune des cendres. Les analyses proximales ont révélé une diminution de la teneur en humidité et une augmentation du pourcentage de fibres brutes dans tous les cas de tomates conservées. Aucune différence significative (à 0,05) n'a été observée parmi les autres paramètres proximaux. Le pH des cendres ayant donné de bons résultats se situait entre 8,0 et 8,5.
Mots-clés : Fraîcheur, Tomates, Cendres de stockage, Semaines

٩. تأثير رماد مخلفات المحاصيل على حفظ وتخزين الطماطم الطازجة في ولاية بينو، نيجيريا.

تُعد خسائر ما بعد الحصاد من التحديات الرئيسية التي تعيق إنتاجية الطماطم في نيجيريا، مما يستدعي البحث عن بدائل لتحسين العمر التخزيني للطماطم الطازجة. تم استخدام مخلفات ما بعد الحصاد لثمانية محاصيل شائعة، وهي: قشور الكسافا (CP)، سيقان الفول السوداني(GSK) ، قشور الذرة الرفيعة(GCC) ، قشور الذرة(MCP) ، قشور الدخن(MCF) ، سيقان الأرز(RS) ، سيقان فول الصويا(SS) ، وقشور اليام (YP) من منطقة الحكومة المحلية كونشيشا، ولاية بينو، وتمت معالجتها إلى رماد خام عند درجة حرارة 600 درجة مئوية.

استُخدم هذا الرماد الخام لحفظ أربعة أنواع من الطماطم وهي: الصنف المحلي، طماطم روما، الطماطم البرقوقية، والطماطم الكمثرية، والتي تم تخزينها لمدة ستة أسابيع مع المراقبة اليومية وتسجيل النتائج. وقد بلغت نسبة الطماطم البرقوقية السليمة المحفوظة في الرماد بعد ستة أسابيع: 88.88٪ في رمادGSK ، 70٪ في رمادCP ، 55.55٪ في رماد MCP وMCF، 40٪ في رمادGCC ، و33.33٪ في رمادSS ، بينما لم تتجاوز نسبة 51.14٪ من طماطم البرقوق المحفوظة في رماد YP الأسبوع الخامس، و14.28٪ في رماد RS لم تتجاوز الأسبوع الرابع.

أما الطماطم الكمثرية فقد احتفظت بنضارتها في أربعة أنواع من الرماد، وهي MCP :بنسبة 88.88٪، CPبنسبة 51.14٪، GCCبنسبة 50٪، و YPبنسبة 37.5٪، لأكثر من ستة أسابيع. كما بقيت طماطم روما طازجة في رمادGCC ، MCP، GSK، SS، و RSبنسبة 88.88٪، 60٪، 55.55٪، 40٪، و22.22٪ على التوالي، في حين لم يُظهر الصنف المحلي نتائج مشجعة في أي من أنواع الرماد بعد الأسبوع الثالث.

وكشفت التحليلات الأولية عن انخفاض في نسبة الرطوبة وزيادة في نسبة الألياف الخام في جميع أنواع الطماطم المحفوظة، مع عدم وجود فروق معنوية عند مستوى 0.05 في باقي مكونات التحليل التقريبي. وبلغت درجة الحموضة (pH) للرماد الذي أعطى نتائج جيدة ما بين 8.0 إلى 8.5.

الكلمات المفتاحية: **طازجة، طماطم، رماد التخزين، أسابيع.**

Introduction

Tomato is an edible fruit of the plant *Solanumly copersicum*, commonly known as tomato plant (Ugonna et al., 2015). The plant belongs to the family, *Solanaceae* and the species originated in western South America (Bell et al 2010; Blanca et al., 2013; Nuez, 2013). Tomato is composed of oils and protein, consumed in diverse ways, including raw, as an ingredient in many dishes, sauces, salads and drinks. Tomato fruit is about 95 % moisture, which contains carbohydrates and other nutrients 5 % per100 gram (Toivonen, 2007).

The global tomatoes exports in 2013 were valued at 88 billion US dollars with postharvest lost estimated at 101 billion US dollars (Joas and Léchaudel, 2008; Bell, et al., 2010; Kalhryn, et al., 2013; Charity and Peter, 2014). Tomato being a perishable crop as a result of its high moisture content has a short shelf life of about 48 hours under tropical conditions (Tigist, et al., 2013; Arah et al., 2015). Specialised postharvest handling practices and treatment methods are needed in order to extend the shelf life of fresh tomatoes after harvest (Joas and Léchaudel, 2008; Beckles, 2012; Shahi, et al., 2012). Failure to adhere to these specialised handling practices and treatment methods will result in a high amount of losses (Abimbo, 2014; Mbajiuka, et al., 2014; Aigbogun, et al., 2018)

According to Anhwange *et al* (2009) some postharvest materials like banana peels (*Musa sapientum*) ash contained minerals like Potassium, Calcium, Sodium, Iron, Manganese, Bromine Rubidium, Strontium, Zirconium and Niobium which will constitute specific pH needed (Swati and Rajan, 2014) for preservation treatment of fresh tomatoes to reduce postharvest losses thereby increasing profitability for Tomatoes dealers in tropical developing countries (Watkin, 2006; Hakeem, et al., 2015).

The purpose of this project therefore, is to consider some postharvest handling practices and impact of storage preservation of Tomatoes with minerals in ashes from postharvest residues on spoilage and proximate composition (Abdullahi, et al., 2016; Ivana et al., 2017). This could increase the shelf life of harvested fresh tomatoes it could be used by dealers of fresh tomatoes in developing countries

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Materials and methods

Collection and identification of residues material for ashes

Materials for ashes were sourced from eight crops residues of specific species. These materials were collected from farmers at Tse-Adaghee Mbagbaa Konshisha Local Government Area of Benue State. The residues were identified at the Department of Crop and Environmental Protection, Federal University of Agriculture Makurdi as Cassava Peels *manihotesculalenta* (Pro-vitamin A) (CP),Groundnut Stalk *Arachishypogaea* (Samnut 21) (GSK),Guinea Corn Chaff *sorghum bicolor* (Brown Corn) (GCC),Maize corn peels *Zea mays* (Yellow Maize)(MCP),Millet Chaff *Penninsetumamericanum*(MCF),Rice Stalk *Oryza sativa* (Sipi)(RS),Soya beans Stalk *Glycine max*(SS) andYam Peels *Dioscorea species* (White Yam)(YP) consecutively.

Preparation of the Ashes

Materials collected were dried under the sun to a constant weight to reduce the bulkiness of the residues. One kilogram (1kg) of the sample materials was weighed into a partially closed system with a vent to permit air for combustion and to prevent wind from blowing the mixed product of carbon and ash. The process continued to obtain at least ten kilograms (10kg) of the carbon and ash mixture for each sample materials.

Only 250 g of samples were weighed into open porcelain crucibles and arrange into preheated muffle furnace and heated at 600^{o}C (3 hours or) until white or gray pure ash observed. The process repeated till one kilogram (1kg) of ash was obtained for each sample residue. The ashes were stored in airtight glass Bama bottles and later used to preserved and stored Tomatoes appropriately.

Tomatoes collection, identification and preparations for preservation

Fresh tomatoes were purchased from farmers beside Swange Cinema Hall near Zenith Bank Wurukum Market Makurdi Benue State, with emphasis on four common species predominantly cultivated by local farmers in

Benue. The Tomatoes were transported safely to the Department of Crop and Environmental Protection, Federal University of Agriculture Makurdi for identification. The process of identification involved cleaning, sorting for varieties shapes. Grading was by arranging the tomatoes into uniform categories according to the physical, economically important and quality characteristics. These Tomatoes were identified, classified by an expert and separated as Local Cultivars, Plum Tomatoes, Roma Tomatoes Pear Tomatoes, Cherry Tomatoes and Sun gold Tomatoes consecutively into six species. The first four species were identified as the most common in Benue and so we took it to Laboratory for treatment, preservation and storage with ash same day.

Proximate Analysis

Determination of moisture

Pyrex glass dish was washed thoroughly and dried with filter papers in the oven. The filter paper was cool in the desiccators and was weighed. Only 5 g of the Tomatoes sample was weighed on the filter paper and the weight of sample plus papers was recorded. This was dried in the oven at 70 ^{o}C for 2 hours and at 105 ^{o}C for next 4hours to ensure the constant weight. It was removed and cooled in desiccators and reweighed [37]. The moisture was calculated as % moisture= $\frac{(W2-W3)}{(W2-W1)}$ X 100 (1)

Determination of ash content (AC)

Exactly 5grams of Tomatoes sample was weighed into a weighed clean ceramics dish and reweighed. The sample was put into the muffle furnace for 3 hours at 600 ^{o}C to obtain a white or light gray ash. (Where it was still black in colour after 3 hours, it was moisten, dry in the oven and the ashing repeated). Cool in desiccators and reweigh. Calculating AC % =$\frac{(W3-W1)}{(W2-W1)}$ X 100 (2)

Determination of protein with formol titration

Exactly 5 gram of tomatoes was crushed in 50 mL of deionised water**,** 10mL of the tomatoes juice was pipette into 100 mL conical flask. 1.0mL phenolphthalein and 0.4mL saturated potassium oxalate solution was added into the tomato juice to stay for 2minute. (Potassium oxalate was to removes the disturbing effect of soluble calcium salt if present). The mixture was titrated to a faint pink colour with 0.1 mL sodium hydroxide solution from the burette. Then, 2mL of 40% formaldehyde solution wasadded and the titration continued to a clear pink colour. Only the amount of 0.1M sodium hydroxide used for the second step titration was recorded.

%crude protein was calculated as: Aldehyde value x 0.17 (3)

Where aldehyde value is equivalent to volume of 0.1M sodium hydroxide solution required to reduce acidity produced by formaldehyde.

Determination of crude fiber (CF)

Only 2g of the sample was weighed into a 200mL solution containing 1.25 mL of 9 M sulphuric acid per 100mL of the solution and boiled under reflux for 30minutes filtered the solution with linen cloth on a fluted funnel. Wash with boiled water until the no more acidic on litmus paper test, transfer the residues to a beaker and boiled for 30minute with 200mL of a solution containing 1.25 g carbon free sodium hydroxide per 100 mL. The final filtered residue through a thin weighed filter pad in a Gooch crucible was dried in the oven and reweighed, incinerated, cooled and weighed. Finally, the loss in weight after incineration x 100 was the percentage weight of crude fibre.

Determination of crude lipids (CL) content

A 250mL boiling flask was dried in the oven, cool in desiccators and weighed. Only 5g of the sun dries tomatoes sample was weighed into a labeled thimble which was fixed on the labeled flask and filled with 150 mL

petroleum ether of analytical grade. The soxhlet extractor was assembled with a weighed boiling flask on the heating mantle and heated at 60ºC to reflux for 4 hours. The petroleum ether was collected by distillation, leaving 5 to 10 mL solution in the flask. The remaining petroleum ether in the boiling flask was dried on water Bath, cool in desiccator and reweighed. The gained in weight of flask is equal to the amount of crude lipids per weight of sample used.

That is CL =weight of dried flask plus sample –weight of empty flask

(4)

Determination of carbohydrate (g)

The percentage carbohydrate was calculated by difference of sum total of other proximate in mg/g.

% CHO = 100% - (%weight of Ash +%Moisture +% Protein + % Crude lipids + %C. Fibre) (5)

Determination of ascorbic acid (Vitamin C)

From a crushed sample of tomatoes, 5g of the paste was weighed into a clean beaker and 100mL of distilled water was added. Then from the solution, 50mL was measured into a volumetric flask of 100 mL. Then, exactly 25mL of 20 % metaphosphoric and 0.5% oxalic acid was added as a stabilizer and dilute to 100mL. From the stabilized solution 10mL was pipette into 250 mL conical flask and 2.5mL acetone was added to titrate with indophenols solution (2,6-dichlorophenolindophenol) to a faint pink colour which persists for 15seconds.

Vitamin C was calculated as = mg/100 mL sample =20(v) (c)

(6)

where v = mL of indophenols in titration and c = mg vitamin C/mL indophenols.

Results and discussions

Table 1: Weekly Percentage of Tomatoes in the Period of Preservation and Storage.

Ashes	Weeks	Local Tomato %	Roma Tomatoes %	Plum Tomatoes %	Pears Tomatoes %
CP	0	100	100	100	100
	1	85	100	100	100
	2	0	75	90	100
	3	0	25	80	85.7
	4	0	25	70	71.42
	5	0	25	70	57.14
	6	0	0	70	57.14
GSK	0	100	100	100	100
	1	50	100	100	100
	2	50	77.77	100	71.42
	3	50	77.77	100	0.0
	4	37.5	66.66	88.88	0.0
	5	0	55.55	88.88	0.0
	6	0	55.55	88.88	0.0
GCC	0	100	100	100	100
	1	66.66	100	100	100
	2	50	100	90	62.5

	3	0.0	90	90	65.5
	4	0.0	90	90	65.6
	5	0.0	80	90	50.0
	6	0.0	80	40	50.0
MCP	1	100	100	100	100
	2	85.71	90	100	88.88
	3	0.0	80	88.88	88.88
	4	0.0	70	88.88	88.88
	5	0.0	60	55.55	88.88
	6	0.0	60	55.55	88.88
MCF	0	100	100	100	100
	1	80	88.88	100	100
	2	20	77.77	100	80
	3	0.0	66.66	77.77	40
	4	0.0	0.0	77.77	40
	5	0.0	0.0	55.55	20
	6	0.0	0.0	55.55	0.0

Note: Loss on ignition (LOI) ,Not detected (ND), Maize corn peel ash (MCP), Rice stalk ash (RS), Guinea corn chaff ash (GCC), Yam peel ash (YP), Cassava peel ash (CP), Millet chaff ash (MCF), Groundnut stalk ash (GSK), Soya beans stalk ash (SS).

Table 1: Weekly Percentage of Tomatoes in the Period of Preservation and Storage Continued.

Ashes	Weeks	Local Tomato %	Roma Tomatoes %	Plum Tomatoes %	Pears Tomatoes %
RS	0	100	100	100	100
	1	100	100	100	85.71
	2	100	88.88	85.71	85.71
	3	66.66	44.44	14.28	57.15
	4	0.0	44.44	0.0	28.57
	5	0.0	22.22	0.0	0.0
	6	0.0	22.22	0.0	0.0
SS	0	100	100	100	100
	1	100	100	100	100
	2	60	100	100	77.77
	3	0.0	70	66.66	0.0
	4	0.0	40	66.66	0.0
	5	0.0	40	66.66	0.0
	6	0.0	40	33.33	0.0
YP	0	100	100	100	100
	1	100	100	71.43	100
	2	71.42	100	51.14	62.6

3	0.0	50	51.14	37.5
4	0.0	50	51.14	37.5
5	0.0	12.5	51.14	37.5
6	0.0	0.0	0.0	37.5

Note: Loss on ignition (LOI) ,Not detected (ND), Maize corn peel ash (MCP), Rice stalk ash (RS), Guinea corn chaff ash (GCC), Yam peel ash (YP), Cassava peel ash (CP), Millet chaff ash (MCF), Groundnut stalk ash (GSK), Soya beans stalk ash (SS).

Percentages of fresh Tomatoes in the Period of Preservation and Storage

Each species of the tomatoes was preserved with various ashes for six weeks and the results are shown in Table 1. In Cassava Peel (CP) ash, 70% and 57.14 % of Plum tomatoes and Pear tomatoes have been sustained. Roma tomatoes made it only 25 % to fifth week. Local cultivar sustained only 85 % to the first week in Cassava Peel(CP) ash.

In Groundnut Stalk (GSK) ash, Plum tomatoes recorded 88.88% and Roma tomatoes 55.55 % to the sixth week. 37.5% Local cultivar and 71.42% Pear Tomatoes sustained good Tomatoes to second and fourth week in GSK ash, respectively as presented on Table1.

In Guinea Corn Chaff(GCC) ashes 80% Roma Tomatoes, 50% Pear Tomatoes and 40% Plum Tomatoes remains fresh to the sixth week but 50% of Local cultivar didn't last up to the third week in Guinea Corn Chaff(GCC) ash.

For Maize Corn Peel (MCP) ash, 88.88% Pear Tomatoes, 60% Roma Tomatoes and 55.55 % Plum tomatoes showed outstanding sustainability of good tomatoes beyond the sixth week while 85.71% Local cultivar did not make it to the third week in same ash.

Only 55.55% Plum tomatoes retained it freshness beyond the sixth week in Maize Corn Peel(MCF)ashes, while 66.66% Roma, 20% Local cultivar and Pear decay completely after third, second and fifth week, respectively in the same ash.

Ash of Rice Stalk (RS) shows very low preservation in which only 22.22% Roma Tomatoes sustained its freshness to the sixth week, 66.66% Local cultivar, 14.28% Plum Tomatoes and 28.57% Pear Tomatoes decay after third and fourth weeks in RS ash as shown in Table 1

Preservation performance in SS ash shows that only 40% Roma and 33.33% Plum were intact to six weeks but 77.77% Pear and 60% Local cultivar could not exceed the third week.

Yam Peel(YP) ash shows a storage/preservation success in which 37.5% Pear Tomatoes made it to the sixth week, 51.14% Plum and 12.5% Roma Tomatoes decays after the fifth week while 71.42% could not make it the third week in Yam Peel(YP) ash as shown on Table 1.

The overall result shows that Plum tomatoes gave outstanding result in six ashes for the period of six weeks with 88.88% in Groundnut Stalk (GSK) ash, 70% in Cassava Peel (CP) ash, 55.55% in Maize Corn Peel (MCP) ash and Millet Chaff (MCF) ash. Plum tomatoes also have 40% in GCC and 33.33% in SS ash though 51.14% of Plum in Yam Peel (YP) ash and 14.28% in RS ash couldn't exceed fifth and fourth weeks, respectively as presented on Table 1.

Pear Tomatoes gave it highest percent fresh sustainability for good ones in four ashes of Maize Corn Peel (MCP), Cassava (CP), Groundnut Corn Chaff (GCC) and Yam Peel (YP) up to 88.88%, 51.14%, 50% and 37.5%, respectively for six weeks as indicated on Table 1.

Roma tomatoes gave the best result in five ashes of Guinea Corn Chaff (GCC) ash, Maize Corn Peel (MCP) ash, Groundnut Stalk (GSK), Soya beans Stalk (SS) ash and Rice Stalk (RS) ash by preserving 88.88%,

60%,55.55%, 40% and 22.22% Tomatoes, respectively whereas Local cultivar does not yield encouraging result in any of the ashes beyond three weeks as shown on Table 1

Table 2: Percentage Proximate Compositions of Tomatoes Before and After Preservation

	Sample	Moisture%	Crude Lipids %	Ash %	Protein%	Crude Fiber %	CHO %	Vit.C(mg)
1	Local C	95.236±.3a	0.133±.02a	.584±.06a	1.270±.04a	.526±.08a	2.24±.01a	3.800±.9a
	RS	91.066±.03b	0.124±.02a	1.344±.04b	1.190.004b	3.118±.01b	3.11±.2b	4.386±.01b
2	RomaT.	95.326±.3a	0.851±.06a	0.507±.1a	0.730±.001a	.610±0a	1.94±.02a	5.066±.5a
	GSK	92.40±.02d	0.840±.008a	0.532±.003a	0.680±.002b	2.598±0e	2.75±.2a	5.046±.09a
	GCC	93.532±.09b	0.860±.002a	0.508±.001a	0.680±.004a	2.328±.01f	2.18±0a	5.00±.05a
	MCP	90.400±.02e	0.840±.002a	0.530±.002a	0.714±.004a	3.614±.2b	3.88±.03a	5.00±.08a
	RS	91.320±.04c	0.812±.003a	0.526±.004a	0.714±.004a	3.932±.02b	2.80±.1a	5.00±.1a
	SS	93.066±.02b	0.820±.004a	0.522±.001b	0.724±.04a	2.906±.09d	1.96±.4a	4.920±.01a
3	Plum T	95.070±.1a	0.202±.06a	0.446±.03a	0.741±.003a	0.504±.04a	3.13±0a	4.800±.4a
	CP	90.733±.02f	0.104±.004c	0.442±.002a	0.736±.003a	3.710±.02b	4.26±.1b	4.680±.05b
	GSK	89.800±.3g	0.112±.001c	0.446±.001a	0.692±.006a	4.350±.02c	4.60±0c	4.680±.05b
	GCC	93.200±.04d	0.122±.002c	0.434±.002a	0.758±.001a	2.514±.02d	2.97±.1d	4.320±.02c
	MCP	91.723±.09e	0.104±.001c	0.396±.003b	0.748±.008a	3.464±.04e	4.27±.7b	4.360±0c
	MCF	93.332±.01c	0.098±.008d	0.424±.003a	0.714±.004a	2.632±.08d	2.80±0e	4.360±.07c
	SS	93.466±.02b	0.812±.002b	0.374±.002c	0.680±.007b	2.612±.07d	2.78±.7e	4.346±.05c
4	Pears T	95.333±.08a	0.092±.03a	0.583±.02a	0.819±.02a	0.672±.05a	2.49±.02a	4.666±.5a
	CP	92.332±.1b	0.090±.002a	0.538±.009a	0.792±.006a	3.426.±01d	2.82±.01e	4.452±.01c
	GCC	91.466±.03c	0.130±.002a	0.556±.004a	0.782±.007a	2.952±.04e	4.11±.01d	4.292±0d
	MCP	91.332±.02d	0.086±.004a	0.592±.002a	0.804±005a	3.928±.07b	4.48±1c	4.480±.02b
	YP	89.666±.01e	0.096±.001a	0.554±.002a	0.748±.002b	3.530±.05c	5.40±.02b	4.506±.07b

Note: First value in a column is control and values with same alphabet are not significant different.

Loss on ignition (LOI) ,Not detected (ND), Maize corn peel ash (MCP), Rice stalk ash (RS), Guinea corn chaff ash (GCC), Yam peel ash (YP), Cassava peel ash (CP), Millet chaff ash (MCF), Groundnut stalk ash (GSK), Soya beans stalk ash (SS).

Proximate Compositions of Tomatoes Before and After Preservation Period

Moisture content of tomatoes revealed significant percentage decreased after preservation in all the ashes shown in the

table 2. Local cultivar control moisture was 95.236% but decreased in Rice Stalk (RS) ash to 91.066 %. Roman tomatoes control value of moisture was 95.326 but has decreased in various ashes to Groundnut Stalk (GSK) 92.40 %, Guinea Corn Chaff (GCC) 93.532 %, Maize Corn Peel (MCP) 90.40 %, Rice Stalk (RS) 91.32 %, and Soya-beans Stalk (SS) 93.066 %. Plum tomatoes control sample moisture was 95.070 % but decreased in all the ashes after preservation, having in Cassava Peel (CP) ash 90.733, Groundnut Stalk (GSK) ash 89.800 %, Guinea Corn Chaff GCC) ash 93.200 %, Maize Corn Peel(MCP) ash 91.723 %, Millet Chaff (MCF) ash 93.332 % and Soya-beans Stalk(SS) 93.466 % moisture respectively. Pear tomatoes percentage moisture for control was 95.333 %,but decreased on preservation in all ashes as in Cassava Peel (CP) 92.332 %, Guinea Corn Chaff (GCC) 91.466 %, Maize Corn Peel(MCP) 91.332 % and Yam Peel(YP) 89.666 %. Significantly decreased in moisture content indicates diffusion of water from tomatoes into the ashes environment but there was no test to determine the movement of any element (ions) into tomatoes.

The Crude fibre content values observed on Table 2 have significant percentage increased in all the tomatoes species preserved in various ashes. Local cultivar crude fibre was 0.526 %, which were observed to have increased in Rice Stalk(RS) ash to 3.118 %. Roma tomatoes crude fibre percentage was 0.610 % but increased after preservation in Groundnut Stalk (GSK)ash 2.598 %, Guinea Corn Chaff (GCC) ash 2.328 %, Maize Corn Peel (MCP) ash 3.614 %, Rice Salk (RS) ash 3.932 % and Soyabean Stalk (SS) 2.960 %. Plum tomatoes have % crude fibre for a control sample of 0.504 % which increased upon preservation in all ashes of Cassava Peel (CP) 3.710 % Groundnut Stalk(GSK) 4.350 %, (GCC) 2.514 %, Maize Corn Peel(MCP) 3.464 %, Millet Chaff (MCF) 2.632 % and ash Soyabeans Stalk (SS) 2.612 %. Pear tomatoes percentage crude fibre for control sample was 0.672 % which revealed increased in all successfully preserved ashes of Cassava Peel (CP) 3.426 %, Guinea Corn Chaff (GCC) 2.952 %, Maize Corn Peel(MCP) 3.928 % and Yam Peel YP ash 3.530 %.

Crude Lipids percentage in the Plume tomatoes decreased after preservation in which the ashes of Cassava Peel (CP) 0.104 %, Groundnut Stalk(GSK) 0.112 %, Guinea Corn Chaff(GCC) 0.122 %, Maize Corn Peel(MCP) 0.104 % and Millet Chaff (MCF) 0.098 % compared to control sample value of 0.202 % while plum tomatoes Crude Lipid in Soyabean Stalk(SS) ash increased drastically to 0.812 %.

The result of Carbohydrate on Table 2 does not have significant difference for Roma tomatoes preserved in all the ashes but the rest of the three tomatoes species recorded a significant difference in carbohydrate % for all the ashes. Percentage carbohydrate of Local cultivars in Rice Stalk (RS) ash increased to 3.110 % from 2.240 % of control. Percentage carbohydrates in Plum tomatoes increased after preservation in Groundnut Stalk (GSK), Maize Corn Peel (MCP) and Cassava Peel (CP) to 4.60, 4.27 % and 4.26 % ashes respectively from the control value of 3.13 %, whereas there was a decreased in Guinea Corn Chaff (GCC) ash, Millet Chaff (MCF) ash and Soyabeans Stalk (SS) ash values to 2.970 %, 2.80 % and 2.78 % respectively. Pear tomatoes have increased carbohydrates in all the preserved ashes of Cassava Peel (CP), Guinea Corn Chaff(GCC), Maize Corn Peel(MCP) and Yam Peel (YP) to 2.82 %, 4.11 %, 4.480 % and 5.400% respectively from 2.49 % control value on Table 2.

From the results on Table 2, there was no significant difference at 0.05 levels in vitamin C composition for Roman tomatoes in all the preserved ashes compared to control value. Local tomatoes, Plum tomatoes and Pear tomatoes reviewed significant differences at

0.05 levels in vitamin C composition after preservation in all the ashes.
Protein and pH parameters do not record the trend of significant differences for four hown on Table 2.

species of tomatoes in all the ashes used for preservation as s

Conclusions

From this research finding, we concluded that some ashes from residues of postharvest crops can be used to sustained freshness of Tomatoes for at least two weeks above depending on the species of Tomatoes and the source of ash. It was observed that Local cultivars gave poor results of preservation in the choice of ashes applied though Roma Tomatoes, Plum Tomatoes and Pear Tomatoes sustained 88.88%, 80%, and 88.88% in GCC, GSK and MCP respectively for six weeks.

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The range of pH in these ashes is un-favorable for most tomatoes fungi and molds growth(Swati and Rajan 2014). It's implied that tomatoes preserved with these ashes will be free from these microorganisms. The study also revealed that preserving tomatoes with these ashes reduces moisture content drastically which is an indication that the tomatoes will be stored for a long time if carefully handle from harvest in farms to storage processes

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