Journal of Agriculture and Value Addition
December 2022, Vol. 5(2): 54-81
https://dx.doi.org/10.4038/java.v5i2.48

RESEARCH ARTICLE

Effects of curing time, abscisic acid content and storage methods on the organoleptic properties of boiled potato (*Solamun tuberosum)* chips

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Submitted: October 25, 2022; Revised: November 12, 2022; Accepted: December 15, 2022

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ABSTRACT

The study assesses the role of curing, exogenous Abscisic Acids (ABA) and storage methods on the organoleptic properties of ware potatoes after long term storage. The study consisted of three factors namely; curing, storage methods and ABA rates which were allocated to main plot, subplot and sub-sub-plot respectively in a Split-Split-Plot Design (SSPD). Treatments were replicated three times, consisting of 20 tubers, and data on organoleptic properties were generated at the end of the storage period. The data were subjected to Analysis of Variance (ANOVA) using SPSS. Means that showed significant difference was separated using Duncan's Multiple Range Test (DMRT) at 0.5% level of probability. The findings revealed that curing, storage methods and exogenous ABA rates had a very high significant (P≤0.001) impact and interaction of these factors on acceptability, aroma, colour, taste and texture of potatoes after long-term storage. Thus, curing period, storage condition and ABA can be employed in the extension of the shelf-life of potato tubers under ambient conditions with little loss of organoleptic properties of the tubers after storage. Further studies are required for confirming results.

***Keywords**: Curing, Abscisic acid, organoleptic properties, Storage methods*

INTRODUCTION

Potato (*Solamun tubersum)* is a valuable vegetable that could be prepared in many different recipes such as boiled, steamed, fried, baked, as well as soup ingredients of stew and fries. Industrially, it is processed into chips, dehydrated mashed potatoes, frozen products, French fries, flour, starch, dextrose and industrial alcohol; similarly, large quantities of potatoes are manufactured into animal feed (Burgos *et al.*, 2020).

Nowadays, potatoes are used by pharmaceutical, textile, wood and paper industries as an adhesive, binder, texture agent and fillers additionally, disposable biodegradable spoons, plates, dishes and fuel-grade ethanol are derived from it and agent for washing boreholes in petroleum drilling industry (FAO, 2009). It is noteworthy that potato is highly perishable in nature as such requires proper postharvest handling and storage to minimize the high rate of losses.

Fresh potato tuber at harvest contains 80% water and the remaining 20% is dry matter while 60 to 80% of the dry matter consists of starch with sugar content (Gumul *et al*., 2011; Brar *et al*., 2017; Tolessa, 2018). Nutritionally, it is considered a good source of many vitamins (B, C, E, K, folic acid and carotenoid), minerals (K, Mg, Fe, Cu, P) and antioxidants (polyphenols and flavonoids) with proximate composition of 78.0% water, 1.9% protein, 20.1% carbohydrates, 0.9% sugar, 1.8% fibre and 0.1% fat with high content of calories (Gumul *et al*., 2011; Aliyu, 2016; Tolessa, 2018; Burgos *et al*, 2020). In addition, potato contains dietary fibre (cellulose, hemicelluloses, pectin and lignin) that play an important role in human nutritional requirement (Gumul *et al*., 2011). Potato has high nutritive value due to its protein content which consists of a high percentage of amino acids such as lysine, leucine, phenylalanine, threonine and valine.

The global annual potato production is about 330 million metric tonnes from an area of 18,651,838 hectares while in Africa, the total production is about 17,625,680 MT from a hectarage of 1,765,617 (Tolessa, 2018). In Nigeria, the production and consumption of potatoes is on increase as depicted by the figures released by Food and Agriculture Organization (FAO). For 2017 production period, the figures reveal that Nigeria is placed at the 40th in the world, seventh in Africa and the fourth in Sub Saharan regions in terms potato production (Teme, 2019). Nigeria produces 1,284,368 MT per year from 400,000 hectares of land under potato cultivation; the country is also ranked seventh in terms of land area dedicated to potato production globally (Plaisier *et al*., 2019).

The total quantity that reaches the consumer from this vast area is merely 1,287,368 MT (Factfish, 2019) which is grossly inadequate to meet both the nutritional and food security requirement of the country. The disparity between cropped area and available potatoes in Nigeria is attributable to poor pre and most especially postharvest management practices that lead to the failure of harvested potatoes to reach the table of the consumers. These postharvest losses could consequently plunge the country into hunger, malnutrition, low income, deprivation and food insecurity which are further complicated by insecurity and the perishable nature of the produce.

Many research has been carried out to minimize postharvest losses of potato and preserve its postharvest quality attributes (Khanal and Uprety, 2014; Abbasi *et al*. 2016; Poberezny *et al*. 2017; Wang *et al*. 2020; Jiru and Usmane, 2021). Unfortunately, most of these works were done outside the present study area or did not focus fully on the impact of such efforts on sensory quality of boiled potato chips to reveal the role of these factors. The aim of this study was therefore to find out the influence of curing time, storage methods and ABA rate on the organoleptic attributes of boiled potato tubers stored under ambient condition, and also to unearth the concomitant tripartite interplay of these three factors on the sensory attribute of the product.

MATERIALS AND METHODS

Description of the study area

The study was carried out at the Teaching and Research Farm of Food and Agriculture/Tree Crop Plantation (FAO/TCP) of Adamawa State University, Mubi. The location of the study area was between latitude 10° 06' to 10° 29' North of the Equator and longitude 13° 07' to 13° 30' East of the Greenwich Meridian (Adebayo, 2004; Daniel *et al.*, 2016; Zemba *et al.*, 2020). The agro-ecological zone of the area is located within the Sudan Savanna zone of Nigeria and is characterized by distinct rainy and dry seasons.

Materials

Fresh matured dry season potato tubers (Marabel cv) were obtained from Kwaja village in Mubi South Local Government Area of Adamawa State. Abscisic Acid (ABA) with a purity of 95% purchased from Zhengzhon Panpan Chemical Co. Ltd., China.

Source of materials

Fully matured and fresh potato (Marabel cv whose seeds were obtained from National Root Crops Research Institute, Jos-Nigeria) were used. The potato tubers were then allowed to precool under a shade before packing inside a polypropylene bag and transported carefully to the laboratory for the immediate commencement of the research.

Healthy and well matured dry-season potato tubers that were free from dirt, cut, shrivel and rot were selected for the experiment. Selected tubers were immediately cleaned and stored on sharp riverside sand and covered with black tarpaulin curing.

Curing periods

The potato tubers for the research were subjected to the following three curing periods under high temperature and relative humidity (35 °C and 80% caused by the respiration of the tubers due to covering with tarpaulin):

a. Zero curing periods (control): the potato tubers of the control samples were not subjected to any period of curing. They were just stored straight away without any curing.

b. Three days curing periods: samples under this category were subjected to curing period of three 3 d before taking them to the storage facility.

c. Five days curing periods: samples of potato tubers in this group were kept under curing for 5 d which were later stored under different types of storage methods under investigation.

d. *Seven days curing period*: potato samples in this class were cured for 7 d before storage commences under varied storage methods.

Plant hormone

The following rates of plant hormones (abscisic acid) were applied to the experimental samples of the potato tubers:

a. Ordinary water (control)
b. Two parts per million (2 ppm)
c. Four parts per million (4 ppm)

Storage methods

The following storage methods were adopted for the research:

a. Heap storage on the concrete floor (control)
b. Heap Storage between alternate layers of paddy straw
c. Shaded pit storage (50 x 50 x 70 cm) with alternate layers of paddy straw under shade.

Experimental design

The experiment was laid out in a Split-Split-Plot Design (SSPD) with a curing period assigned to the main plot while storage condition and ABA levels were allotted to subplot and sub-sub-plot, respectively. Each treatment was replicated three times and temperature and relative humidity of the storage environment was monitored using a digital Thermo-hygrometer model HTC-2 throughout the experimental period. The experiment consisted of three factors [curing period, storage condition and ABA level (plant growth regulator)] and the factors were combined together to give a 4×3×3 factorial experiment. The factorial combination of factors gave rise to 36 treatments. Each treatment consisted of 20 tubers out of which ten were randomly selected, labeled and earmarked for data collection.

Field work

Fieldwork was carried out at the Food and Agriculture Organisation Tree Crop Plantation (FAO/TCP) of Adamawa State University (ADSU), Mubi. Pits were dug and shade was constructed over the entire pit using local mat 'zana' for the storage of the potatoes.

Sampling techniques and collection of data

Random sampling technique was adopted in the selection of the ten representative samples on which data were generated. Data were taken on sensory attributes of boiled potato chips at the end of the experiment *i.e.* 3 months.

Sensory analysis

Sensory analysis was conducted using eight trained panelists consisting of male, female youths and adults within the age range of 15-50 y to assess the effect of the treatments on the sensory properties of the potato tubers. Boiled potato chips were prepared and served to the 8-member panel of assessors along with a 9-Point Hedonic Scale questionnaire for scoring. The scale scores ranged from Like Extremely (9) to Dislike Extremely (1) as described by the Society of Sensory Professionals [SSP] (2019). The sensory quality attributes determined were acceptability, aroma, colour, taste and texture (Table 1).

Table1: A 9-Point Hedonic scale for potato sensory evaluation.

	Attributes				
Point	Acceptability	Aroma	Colour	Taste	Texture
9	Like Extremely	Like Extremely	Like Extremely	Like Extremely	Like Extremely
8	Like Very Much	Like Very Much	Like Very Much	Like Very Much	Like Very Much
7	Like Moderately	Like Moderately	Like Moderately	Like Moderately	Like Moderately
6	Like Slightly	Like Slightly	Like Slightly	Like Slightly	Like Slightly
5	Neither Like or Dislike	Neither Like or Dislike	Neither Like or Dislike	Neither Like or Dislike	Neither Like or Dislike
4	Dislike Slightly	Dislike Slightly	Dislike Slightly	Dislike Slightly	Dislike Slightly
3	Dislike Moderately	Dislike Moderately	Dislike Moderately	Dislike Moderately	Dislike Moderately
2	Dislike Very Much	Dislike Very Much	Dislike Very Much	Dislike Very Much	Dislike Very Much
1	Dislike Extremely	Dislike Extremely	Dislike Extremely	Dislike Extremely	Dislike Extremely

(Source: SSP, 2019)

Statistical Analysis

Data collected were subject to Analysis of Variance (ANOVA) using generalized linear model of SPSS version 21 while means showing significant difference were separated using Duncan Multiple Range Test (DMRT) at 0.5% level of probability.

RESULTS AND DISCUSSION

Effect of curing periods on acceptability of boiled potato chips after storage

There was a significant ($P \leq 0.001$) effect of curing period on the acceptability of boiled potato chips after 12 weeks of storage as presented in Table 2. Boiled chips made from potato tubers cured for five days was liked moderately by the panelists who gave it the highest score of acceptability followed by those cured for zero days that was again liked moderately. Meanwhile, the lowest score was obtained on potato tubers cured for three days that was rated as liked moderately on the acceptability rating scale.

The outcome of this work could be due to ribonucleotides which act as flavor precursor potentiators or umami compounds that is released during boiling of potato (Jansky, 2010). This is promoted by five days curing period as previously recounted by Jiru and Usmane (2021) who recently parsed that six days curing period gave potato product with the highest preference.

Effect of curing periods on aroma of boiled potato chips after storage

Curing periods showed a significant ($P \leq 0.001$) impression on the aroma of boiled potato chips processed from tubers cured under varying curing time as shown in Table 2. Control sample was ranked as like moderately with the highest value then tailed by sample cured for seven days which was regarded as like slightly. On the other hand, sample cured for five days recorded the lowest ranking but still considered as liked slightly by the sensory assessors.

This upshot could be due to none curing of the tubers after harvest as observed by Jiru and Usmane (2021) who recently reported that curing period influences the sensory qualities of processed potato product.

Effect of curing periods on colour of boiled potato chips after storage

Table 2 revealed that curing periods had a significant ($P \leq 0.001$) influence on the colour of boiled potato after three months in storage. Tubers cured for three days recorded the topmost rating of like very much and trailed by boiled potato chips from tubers cured for zero days with a rating that was termed as like moderately by sensory analysts. On the contrary, boiled potato from tubers cured for seven days had low most rating and valued by sensory analysts as like slightly.

This finding may be caused by after-cooking darkening resulting from enzymatic and non-enzymatic browning (Lisinska *et al.*, 2009). It is also similar with the result of Jansky (2010) who apprised that processing potato cause flavor elements to undergo Millard reaction which produce compound that can affect product colour.

Effect of curing periods on taste of boiled potato chips after storage

Curing treatments of potato tubers before storage affected the taste of boiled potato chips in a significant ($P \leq 0.001$) way as exhibited in Table 2. Maximum valuation was gained on chips from potatoes cured for three days while those treated with zero days curing attained the second valuation after three months of storage and both were judged as like moderately by the panel of sensory judges. On the opposing side, potato tubers cured for seven days produced chips that received the minimum valuation with and deemed like slightly by the judges. This is compatible with Yee and Bussell (2007); Jiru and Usmane (2021) who explained that taste of fried potato is affected by acrylamide formation associated with curing

Table 2: Effect of curing periods, storage condition and abscisic acid levels on organoleptic properties of boiled potato chips after storage for three months.

Sensory attributes Treatments	Acceptability	Aroma	Colour	Taste	Texture
CRP					
0	7.000b	7.222a	7.778b	7.333b	6.444c
3	6.333d	6.519cb	8.000a	7.444a	6.778a
5	7.333a	6.148c	6.889c	6.889c	6.667b
7	6.778c	6.741b	6.444d	6.111d	6.222d
P of F	<0.001	<0.001	<0.001	<0.001	<0.001
S.E (±)	0.0002	0.0676	0.0001	0.0003	0.0001
STC					
Floor	6.667c	6.250b	7.500a	7.083a	6.750a
Heap	7.000a	6.528b	7.000c	6.833c	6.250c
Pit	6.917b	7.194a	7.333b	6.917b	6.583b
P of F	<0.001	<0.001	<0.001	<0.001	<0.001
S.E (±)	0.0002	0.1361	0.0001	0.0003	0.0001
ABA (ppm)					
Water	6.917b	6.722a	7.083c	7.167a	6.417b
2	7.083a	6.750a	7.167b	6.833b	6.583a
4	6.683c	6.500a	7,583a	6.833b	6.583a
P of F	<0.001	0.2755	<0.001	<0.001	<0.001
S.E (±)	0.0002	0.1786	0.0001	0.0003	0.0001
Interactions					
CRP×STC	<0.001	<0.001	<0.001	<0.001	<0.001
CRP×ABA	<0.001	0.0152	<0.001	<0.001	<0.001
STC×ABA	<0.001	0.1342	<0.001	<0.001	<0.001
CRP×STC×ABA	<0.001	0.2025	<0.001	<0.001	<0.001

Effect of curing period on texture of boiled potato chips after storage

There was a significant ($P \leq 0.001$) impact of curing period on the textural properties of boiled potatoes stored for three months as manifested in Table 2. Boiled potato processed from potato tubers cured for three days was considered as like slightly by the sensory panelists who awarded the highest score, it is followed by those cured for five days and was adjudged similarly as like slightly. Though, the lowest score was presented by boiled potatoes from tubers cured for seven days which was nonetheless declared as like slightly.

This may be due to the degradation of starch as reported by Jansky (2010) which is influenced by curing. The finding could be attributable to the effect of curing on the sensory attributes of boiled chips as earlier remarked by Jiru and Usmane (2021).

Effect of storage conditions on acceptability of boiled potato chips after storage

There was a significant ($P \leq 0.001$) influence of storage conditions on the general acceptability of boiled potato chips after three months of storage as displayed in Table 2. Boiled potato chips prepared from tubers stored in heap were allocated the highest value of acceptability and were graded as like moderately by sensory evaluators and straggled by potato tuber stored in the shaded pit while the lowest value was given from boiled potato made from potato tubers stored on the floor; both were equally declared as like moderately.

This could be attributable to the effect of the heap storage method encourages low ventilation and temperature that favours low respiration of the tuber arising from storage condition that influences the conversion of starch to reducing sugar. This finding is in agreement with Jansky (2010); Saran and Chhabra (2014) who informed that the storage environment affects the organoleptic properties of processed potato.

Effect of storage conditions on aroma of boiled potato chips after storage

Storage conditions had a significant ($P \leq 0.001$) effect on the aroma of boiled potato chips processed from tubers stored under various storage conditions as disclosed in Table 2. Samples stored in a shaded pit posted the highest value and were classified as like moderately and followed by those made from potato tubers stored in heap which was classified as like slightly. On the other hand, samples stored on the floor posted the lowest aroma classification despite that, it is still classified as liked slightly during sensory assessment.

This could be due to the reaction of nucleotides and amino acids present in the tuber that produce flavonoids and volatile substances resulting from low respiration induced by the partially modified atmosphere created by this storage method. This is in concord with Lisinska *et al.* (2009); Jansky (2010); Saran and Chhabra (2014) who narrate that storage condition caused changes in the sensory qualities of potato tubers.

Effect of storage conditions on colour of boiled potato chips after storage

Table 2 indicates that there was a significant ($P \leq 0.001$) difference between treated and untreated samples in terms of colour of boiled potato chips after 12 months in storage due to different storage conditions. Boiled potato chips obtained from potato tubers stored on floor recorded the topmost ranking and backed by boiled chips from potatoes stored in shaded pit. Lastly, boiled chips from potatoes stored in heap received the low most rating in spite that they were all ranked as like moderately by sensory analysts.

This result may be caused by reaction of flavour compounds which promote Millard reaction and the low temperature for boiling potato that encourage enzymatic browning which influences colour formation. This is in agreement with Saran and Chhabra (2014) who have revealed that the storage environment affects colour of processed potato tubers.

Effect of storage conditions on taste of boiled potato chips after storage

Different storage treatments on potato tubers affected the taste of boiled potato chips in a significant ($P \leq 0.001$) manner as illustrated in Table 2. Maximum grade was achieved on boiled potato from potatoes stored on floor and regarded as liked moderately whilst those subjected to shaded pit storage took the second position and considered like slightly according to panel of sensory evaluators. Conversely, potato tubers stored in heap produced boiled potato that had the minimum grade and was also viewed as like slightly.

This finding may be due to the influence of storage condition on the reaction between nucleotides and amino acids. Lisinska *et al*. (2009); Jansky (2010); Saran and Chhabra (2014); Juri and Usmane (2021) all conveyed that simple sugars are responsible for umami taste in boiled potato.

Effect of storage conditions on texture of boiled potato chips after storage

There was a significant ($P \leq 0.001$) effect of storage conditions on the texture of boiled potato chips after 12 weeks of storage as demonstrated in Table 2. Boiled potato chips processed from potato tubers stored on the floor was esteemed as like slightly by the sensory panelists who gave it the highest mark, it is followed by those stored in shaded pit and was again valued as like slightly. Even though, the lowest mark was realized on chips from potato tubers stored on heap (6.250) but it was still announced as like slightly.

This could be due to breakdown down of during storage which affects potato texture and the outcome is in harmony with Yee and Bussell (2007); Lisinska *et al*. (2009); Jansky (2010); Saran and Chhabra (2014); Juri and Usmane (2021). They all indicate that degradation of starch and breakdown of middle lamella of the cell wall during storage affect the texture of boiled potato.

Effect of ABA levels on acceptability of boiled potato after storage

There was a significant ($P \leq 0.001$) impact of ABA levels on the acceptability of boiled potato chips after three months of storage as presented in Table 2. Boiled potato chips made from potato tubers having a 2 ppm dose of ABA was marked as like moderately by sensory assessors because of its greatest acceptability ranking. However, second ranking was acquired from boiled potato chips processed from potato tubers dosed with water. While the rate of 4 ppm ABA level provided boiled potato chips with the least acceptability marking but both were acknowledged also as like slightly.

This development could be because of the effect of ABA at that level on dormancy maintenance during storage as earlier reported by Suttle and Hultstrand (1994); Jayanty (2008); Kulen *et al*. (2011) who argued that the quality attributes of potato tubers including sensory quality are influenced by threshold level of plant hormones and other factors.

Effect of ABA levels on colour of boiled potato chips after storage

Table 2 portrayed that there was a significant ($P \leq 0.001$) variation between treated and untreated potato samples in terms of colour of boiled potato after three months in storage due to varying ABA rates. Boiled chips taken from potato tubers misted with 4 ppm ABA posted the highest rate trailed by chips obtained from potatoes misted with 2 ppm ABA and the lowest rated boiled potato chips was found on potatoes misted with 4 ppm ABA. Nonetheless, all were termed as like moderately by sensory judges.

This could be due to effect of the high level of ABA as testified by Lisinska *et al*. (2009); Asalfew (2016); Gemeda *et al*. (2017) who described that discolouration of processed potatoes is directly related to the amount of reduced sugar arising from low levels of ABA and high amount of Gibberellic Acid (GA) which induces higher rates of respiration thereby converting starch to reducing sugar.

Effect of ABA levels on taste of boiled potato chips after storage

Variation in ABA levels on potato tubers in three months of storage had influenced the taste of boiled potato chips in a significant ($P \leq 0.001$) style as elucidated in Table 2. The greatest rank was obtained on boiled potato chips from potatoes subjected to a treatment of water ABA and regarded as like moderately. Meanwhile, those subjected to both 2 and 4 ppm ABA both gave equal least rank and were both considered as like slightly by sensor evaluators.

This may be credited to the effect of ABA on changing tuber sugar profile of treated samples through decelerating the rate of respiration, this position is in accordance with Yee and Bussell (2007); Lisinskas *et al*. (2009) who also informed that varying sugar profile affects the finished quality of potato.

Effect of ABA levels on texture of boiled potato after storage

Abscisic acid levels had a significant ($P \leq 0.001$) impact on the texture of boiled potato after 12 weeks of storage as exhibited in Table 2. Boiled potato chips made from potato tubers treated with 2 and 4 ppm of ABA both gave equal highest points. The lowest point was deduced on boiled potato from potato tubers treated with water. Nevertheless, all were categorised as like slightly by the sensory assessors. This finding is in accord with Lisinskas *et al*. (2009) who relayed that low respiration rate influences taste of boiled potato chips.

Interaction between curing periods and storage conditions on acceptability of boiled potato chips after storage

Table 3 presents the interactive effect between curing periods and storage conditions on acceptability of boiled potato chips after storage. There was a significant ($P \leq 0.001$) interaction between the two factors under consideration. Potatoes cured for 5 d and stored on floor produced chips with the highest acceptability and considered like moderately by the panel of sensory judges, those cured for three days gave the lowest acceptability and thought to be neither like nor dislike by the judges. Swopping storage condition from floor to heap caused both samples cured for 0 and 5 d to give the equal highest acceptability values which was regarded as like moderately whereas those cured for 7 d had the lowest value and was placed as like slightly. A further switching of storage condition to shaded pit method encourage samples cured for zero days to produce the leading value and rated as like moderately but samples cured for three days supplied the lowest value and was rated as like slightly.

Table 3: Interaction between curing periods and storage conditions.

Storage condition Curing period (d)	Floor	Heap	Pit
0	6.33	7.33	7.33
3	5.67	7.00	6.33
5	7.67	7.33	7.00
7	7.00	6.33	7.00
S.E (±)		0.0002	

This could be due to the dual role of curing periods and storage conditions on the acceptability of chips. This result is in accord with Lisinska *et al*. (2009); Saran and Chhabra (2014) who acknowledged that curing periods and storage conditions affect potato quality including sensory attributes.

Interaction between curing periods and storage conditions on aroma of boiled potato chips after storage

Table 4 illustrates the interactive effect between curing periods and storage conditions on aroma of boiled potato chips after 12 weeks of storage. There was a significant ($P \leq 0.001$) interaction between them on boiled potato chips aroma. Chips processed from potato tubers cured for 7 d and stored on floor produced the highest aroma ranking and was tagged as like moderately by sensory assessors. Potato chips from tubers cured for 3 d gave the lowest aroma ranking and was termed as dislike slightly. Replacing storage condition from floor to heap caused samples cured for 3 d to give the highest aroma value which was labeled as like very much whereas those cured for 0 d produced the boiled potato with the lowest aroma value and was dubbed as like slightly. Moreover, exchanging of storage condition to shaded pit method encourage samples cured for 0 d to produce the most preferred chips in terms of aroma which was named as like slightly but samples cured for 5 and 7 d both supplied the least preferred chips and was called neither like nor dislike. This result is in agreement with Saran and Chhabra (2014) who related that curing period and storage conditions influence the sensory attributes of potato chips.

Table 4: Interaction between curing periods and storage conditions on aroma of boiled potato chips after storage.

Storage condition Curing period (d)	Floor	Heap	Pit
0	6.67	6.00	6.67
3	4.00	7.00	6.33
5	7.00	6.67	5.67
7	7.33	6.67	5.67
S.E (±)		0.2323	

Produced chips had the highest colour preference during sensory analysis and characterised as like very much. Meanwhile, those from tubers cured for 3 d borne boiled potato chips had the lowest colour preference and was branded as dislike slightly. Swapping storage condition to heap method triggered samples from tubers cured for 3 and 7 d to give boiled potato chips with the highest colour preference that were described as like moderately but those from tubers cured for 5 d produced boiled potato chips with the lowest colour preference which was categorized as like slightly. In addition, switching storage condition to shaded pit method made samples cured for 3 d to continue generating boiled potato chips with the highest colour preference which are regarded as like very much. The samples from tubers cured for 5 and 7 d yielded boiled potato chips with the lowest colour preference which were perceived as neither like nor dislike by the sensory panelists.

Interaction between curing periods and storage conditions on colour of boiled potato chips after storage

In Table 5, interaction between curing periods and storage conditions on colour of boiled potato chips processed from tubers kept for three months was significant (*P*≤0.001). Potato boiled chips made from tubers cured for 5 d and stored on floor.

Table 5: Interaction between curing periods and storage conditions on colour of boiled potato chips after storage.

Storage condition Curing period (d)	Floor	Heap	Pit
0	7.33	6.33	6.33
3	4.67	7.33	8.33
5	8.67	6.00	5.67
7	7.00	7.33	5.67
S.E (±)		0.0004	

Interaction between curing periods and storage conditions on taste of boiled potato chips after storage

The interaction between curing periods and storage conditions on taste of boiled potato chips obtained from tubers stored for three months had a significant (*P*≤0.001) interplay as presented in Table 6. Boiled potato chips from potato tubers cured for 0 d and stored on floor received the highest taste score from the sensory evaluators who viewed it as like moderately meanwhile, those from tubers cured for 3 d had the lowest score which was considered as dislike moderately. Changing storage condition from floor to heap caused boiled potato chips from tubers cured for 7 d to give the highest taste likeness and was seen as like slightly but those from tubers cured for five days produce boiled potato chips that attracted the lowest taste likeness and graded as neither like nor dislike. Furthermore, substituting storage condition to shaded pit method made samples from tubers cured for three days to command the highest taste likeness with a rank of like moderately however, samples from tubers cured for 7 d was awarded the lowest taste ranking of neither like nor dislike.

Table 6: Interaction between curing periods and storage conditions on taste of boiled potato chips after storage.

Storage condition Curing period (d)	Floor	Heap	Pit
0	7.33	6.00	5.67
3	3.67	6.33	7.33
5	6.33	5.67	6.00
7	7.00	6.67	5.00
S.E (±)		0.0002	

The combine effect of curing and storage conditions on the taste of the chips could be accountable for this result and similar view was expressed by Yee and Bussell (2007); Saran and Chhabra (2014).

Interaction between curing periods and storage conditions on texture of boiled potato chips after storage

There was a significant (*P*≤0.001) interaction between curing periods and storage condition on the texture of boiled potato chips as manifested in Table 7.

Table 7: Interaction between curing periods and storage conditions on texture of boiled potato chips after storage.

Storage condition Curing period (d)	Floor	Heap	Pit
0	6.67	6.33	5.33
3	3.67	6.00	6.67
5	7.33	6.00	6.00
7	7.00	6.67	6.00
S.E (±)		0.0002	

Potato cured for 5 d and stored on floor produced boiled potato chips with the highest texture grade and appraised as like moderately by the sensory analysts. While those cured for 3 d gave the lowest texture grade and assessed as dislike moderately by sensory analysts. Replacing floor storage condition with heap caused samples cured for 7 d to give the highest value in terms of boiled potato chips texture which was judged as like slightly whereas those cured for 3 and 5 d had boiled potato chips with the lowest texture grade but were equally ranked as like moderately with the highest grade. Also, substitution of heap storage condition with shaded pit method caused boiled potato chips made from the samples cured for 3 d to produce the highest texture grade that was evaluated as like slightly. Conversely, samples cured for 0 d supplied the boiled potato chips with the lowest texture grade and gauged as neither like nor dislike by the analysts.

This could be assigned to the dual action of the factors under study on the texture of boiled chips. Saran and Chhabra (2014); Jiru and Usmane (2021) upheld similar position on the effect of potato curing and storage condition on the sensory properties of boiled potato chips.

Interaction between curing periods and ABA levels on acceptability of boiled potato chips after storage

There was a significant (*P*≤0.001) interaction between curing periods and ABA levels throughout the experimental period (Table 8).

Water application on tubers cured for zero days produced boiled potato chips with the greatest acceptability value that was considered as like very much by 8-member panel of sensory assessors, whilst least value was reported on boiled potato chips from tubers cured for 7 d which neither was valued as neither like nor dislike. Nonetheless, an increase in ABA rates from 0 to 2 ppm ABA caused boiled potato chips from potato tubers treated cured for 7 d had the greatest value of acceptability and valued as like moderately whereas least acceptability value was found on tubers cured for 3 d which was appraised as neither like nor dislike. When ABA level was further concentrated to 4 ppm, boiled potato chips from tubers cured for 5 d generated the greatest value of acceptability which was rated as like moderately. Whilst least acceptability was recorded on boiled potato chips from tubers cured for three days that was assessed as like slightly.

Table 8: Interaction between curing periods and abscisic acids Levels on acceptability of boiled chips potato after storage.

Abscisic acid level (ppm) Curing period (d)	Water	2	4
0	8.00	6.67	7.33
3	7.00	5.00	6.67
5	7.00	6.33	7.67
7	5.00	7.00	7.00
S.E (±)		0.0001	

This opinion is in concord with Saran and Chhabra (2014) and Jiru and Usmane (2021) who described that curing and plant hormones including ABA have some influence on the sensory attributes of boiled potato chips.

Interaction between curing periods and ABA levels on aroma of boiled potato chips at twelve weeks after storage

Curing periods and ABA levels interacted in significant ($P \leq 0.05$) pattern on boiled potato chips at the end of the experimental period as showed in Table 9.

Table 9: Interaction between curing periods and abscisic acids levels on aroma of fried potato chips after storage.

Abscisic acid level (ppm) Curing period (d)	Water	2	4
0	6.67	5.33	7.33
3	7.00	5.00	6.67
5	7.00	6.33	7.33
7	4.67	7.67	7.33
S.E (±)		0.2994	

An application of water to potato tubers and cured for 3 and 5 d produced boiled potato chips with the highest aroma rating each that was assessed as like moderately though those cured for 7 d had least aroma rating which was rated as dislike slightly by sensory panelists. Equally, dosing potato tubers with 2 ppm ABA and cured for 7 d when processed into boiled potato gave the greatest aroma value and was evaluated as like moderately whereas least aroma value was found on chips from tubers cured for 3 d and valued as like nor dislike. In furtherance to that, an increment in ABA level to 4 ppm affected the chips from tubers cured for zero, five and seven days to continue generating the product with the greatest aroma value each and were rated as like moderately though least value that was obtained on products from tubers cured for three days which was valued as like slightly by the panelists.

This could be caused by double influence of curing periods and ABA levels as earlier observed by Saran and Chhabra (2014) who informed that curing period and plant growth regulation substances affect chips' sensory attributes.

Interaction between curing periods and ABA levels on colour of boiled potato chips after storage

The interaction effect between curing periods and ABA levels was significant ($P \leq 0.001$) at the end of three months of study as demonstrated in Table 10.

Table 10: Interaction between curing periods and abscisic acids levels on colour of boiled potato chips after storage.

Abscisic acid level (ppm) Curing period (d)	Water	2	4
0	7.00	8.67	7.67
3	8.00	8.67	7.67
5	6.67	7.67	6.33
7	6.67	5.67	7.00
S.E (±)		0.0001	

Potato tubers misted with water and cured for 3 d produced boiled potato chips with the best colour ranking and ranked as like very much although the poorest colour value was found on boiled potato from tubers cured for five and seven days which were both ranked as like slightly by the sensory judges. As potato tubers were misted with 2 ppm ABA, tubers cured for zero and three days had the best boiled potato colour rating each and were both rated as like very much whereas poorest colour value was found on boiled potato chips from tubers cured for seven days and rated as neither like nor dislike. A further increase in ABA level to 4 ppm, tubers cured for 0 and 3 d created boiled potato chips with the best colour valuing each that were valued as like moderately. However, poorest valuation was observed on boiled potato chips from tubers cured for 5 d which was valued as like slightly. This finding may be attributed to action of the duo (curing and phytohormone) on chips' colour as earlier observed by Saran and Chhabra (2014).

Interaction between curing periods and ABA levels on taste of boiled potato chips storage

Table 11 presents the interactive effect of curing periods and ABA levels on the taste of boiled potato chips storage.

Table 11: Interaction between curing periods and abscisic acids levels on taste of boiled potato chips after storage.

Abscisic acid level (ppm) Curing period (d)	Water	2	4
0	7.33	7.33	7.33
3	7.67	7.00	7.67
5	7.00	7.33	6.33
7	6.67	5.67	6.00
S.E (±)		0.0004	

There was a significant (*P*≤0.001) interface between curing periods and ABA levels. Tubers treated with water and cured for 3 d was processed into boiled potato chips with the greatest taste appraisal although, least taste appraisal was reported on boiled potato chips processed from tubers cured for 7 d and were considered as like moderately and like slightly respectively by sensory evaluators. Treating potato tubers with 2 ppm ABA, made tubers cured for 0 and 5 d to give boiled potato with the greatest taste value each whereas the least taste value was obtained from tubers cured for 7 d which were regarded as like moderately and neither like nor dislike correspondingly. An additional increment of ABA level to 4 ppm made boiled potato chips with the greatest taste value to emanate from tubers cured for 3 d and was considered like moderately. Besides, the least taste value was obtained on boiled potato chips from tubers cured for 7 d which was considered as like slightly.

This finding could be due to the joint impact of the two factors under study which was supported by Saran and Chhabra (2014); Jiru and Usmane (2021) who testified that curing and plant growth regulators have effect on the taste of processed potato chips.

Interaction between curing periods and ABA levels on texture of boiled potato chips after storage

There was a significant (*P*≤0.001) interaction between curing periods and ABA levels at the end of the experimental period as depicted in Table 12.

Dosing potato tubers with water and cured for 5 d produced the greatest texture score for boiled potato chips whilst least texture score each were reported on the remaining curing periods and were all branded as like slightly according to sensory evaluators. In the same way, dosing potato tubers with 2 ppm ABA, boiled potato chips processed from tubers cured for 3 d had the product with the highest texture ranking and was categorized as like moderately whereas boiled potato chips from tubers cured for zero and 5 d had the lowest each texture ranking and was characterized as like slightly. Doubling of ABA level to 4 ppm, caused tubers cured for three and five days to produce boiled potato with the highest texture ranking each. The lowest ranking came from boiled potato chips cooked from tubers cured for seven days and was classified as like moderately and neither like nor dislike correspondingly.

Table 12: Interaction between curing periods and abscisic acids levels on texture of boiled potato chips after storage.

Abscisic acid level (ppm) Curing period (d)	Water	2	4
0	6.33	6.33	6.67
3	6.33	7.00	7.00
5	6.67	6.33	7.00
7	6.33	6.67	5.67

This occurrence could be credited to the influence of both curing period and ABA levels on the texture of the chips as earlier advanced by Jayanty (2008); Saran and Chhabra (2014); Jiru and Usmane (2021) who expressed that four plant growth regulators (GA, cytokinins, ABA and brassinolide) and curing have clout on the sensory of boiled potato chips.

Interaction between storage conditions and ABA level on acceptability of boiled potato chips after storage

The interaction effect of storage conditions and ABA rates after storage on the acceptability of potato-boiled chips is presented in Table 13, a significant ($P \leq 0.001$) interaction was noticed.

Table 13: Interaction between storage conditions and abscisic acid levels on acceptability of boiled potato chips after storage.

ABA level (ppm) Storage condition	Water	2	4
Floor	6.50	6.50	7.00
Heap	7.50	7.25	6.25
Pit	6.75	7.50	6.50
S.E (±)		0.0003	

The application of water caused samples stored on heap to produce boiled potato chips with the highest acceptability status which was considered like moderately notwithstanding whereas the boiled potato chips from tubers stored on floor was the least accepted product and considered as like slightly by panel of sensory assessors. When ABA was jacked up to 2 ppm, the product from samples stored in shaded pit was accepted highly even though product from tubers stored on floor was least accepted by the panel of assessors which were categorized as like moderately and like slightly respectively. Although, a further augmentation of ABA to 4 ppm provoke product from potatoes stored on the floor to be accepted greatly while those from potatoes stored in heap were hardly accepted and were also classified as like moderately and like slightly accordingly.

This could be caused by the influence of storage condition and ABA level on acceptability of the boiled chips. This outcome is in harmony with Saran and Chhabra (2014); Jiru and Usmane (2021) who asserted that storage condition and phytohormone affect the acceptability of boiled chips.

Interaction between storage conditions and ABA levels on colour of boiled potato chips after storage

A significant ($P \leq 0.001$) interaction was discovered after three months of the study between storage conditions and ABA rates on colour of boiled potato (Table 14).

Table 14: Interaction between storage conditions and abscisic acid levels on colour of boiled potato chips after storage.

ABA level (ppm) Storage condition	Water	2	4
Floor	7.25	7.50	7.75
Heap	6.75	8.00	6.25
Pit	7.25	7.25	7.00
S.E (±)		0.0002	

The treatment of water caused samples stored on floor and shaded pit to record the best colour rating of boiled potato chips and the worst colour rating of boiled potato chips was taken from the samples stored in heap. They were classed as like moderately and like slightly respectively by the sensory analysts. However, treating the samples with 2 ppm of ABA initiated the choicest colour grade of boiled potato chips to originate from potatoes stored in heap even though worst colour grade was found on boiled potato chips made with potatoes tubers stored in shaded pit that were branded as like very much and like moderately in that order. Although, a further increment of ABA level to 4 ppm prompted potatoes stored on floor to provide the product with the best colour grade while those stored under heap storage reported the worst colour grade. They were both ranked as like moderately and like slightly correspondingly.

This effect could be attributed to the amalgamated role of the two factors under consideration on the colour and this result is in conformity with Saran and Chhabra (2014) who reported the active part played by storage condition and plant hormone in sensory attribute of processed potato chips.

Interaction between storage conditions and ABA levels on taste of boiled potato chips after storage

The interaction effect of storage conditions and ABA rates after three months of storage on the taste of boiled potato chips is presented in Table 15, a significant ($P \leq 0.001$) interaction was unearthed after the three months of the study.

Table 15: Interaction between storage conditions and abscisic acid levels on taste of boiled potato chips weeks after storage.

ABA level (ppm) Storage condition	Water	2	4
Floor	7.25	7.50	6.50
Heap	7.25	6.25	7.00
Pit	7.00	6.75	7.00
S.E (±)		0.0003	

The usage of water produced superior each taste score to emanate from potato samples stored on floor and in heap whilst inferior taste score of boiled potato chips was acquired from samples stored in shaded pit. Despite that, they were both graded equally as like moderately by panel of sensory judges. However, the usage of 2 ppm of ABA on the samples initiated the most preferred taste of boiled potato to arise from potatoes stored on floor nonetheless; least preferred taste was found in heap storage. They were graded as like moderately and like slightly accordingly by sensory evaluators. Furthermore, an enhancement of ABA to 4 ppm encourages potatoes stored in heap and shaded pit to produce the most each preferred taste of boiled potato and on the contrary, those stored on floor provided the boiled potato with the least (6.50) preferred taste. Which were labeled like moderately and like slightly.

Interaction between storage conditions and ABA levels on texture of boiled potato chips after storage

Storage conditions and ABA rates gave a significant ($P \leq 0.001$) interaction during three months of study on boiled potato chips texture as illustrated in Table 16.

Application of water caused samples stored on the floor to produce boiled chips with the highest textural rating even though the lowest each texture rating was found on both samples processed from tubers stored in a heap and shaded pit. Both the highest and lowest rates were classified as like slightly by 8-member panel of sensory assessors. Likewise, raising ABA level to 2 ppm produced boiled potato chips with the highest texture score from tubers stored under floor storage conditions and the lowest each score were reported by boiled potato chips from both heap and shaded pit storage conditions and were tagged as like moderately and like slightly. More to that, a further raised in ABA level to 4 ppm caused the highest texture rating to come from boiled potato chips obtained from tubers stored under shaded pit storage conditions whilst lowest each rating was from both boiled potato chips processed from tubers stored in on floor and in heap. These textural classes were classified as like moderately and like slightly correspondingly.

Table 16: Interaction between storage conditions and abscisic acid levels on texture of boiled potato chips after storage.

ABA level (ppm) Storage condition	Water	2	4
Floor	6.75	7.25	6.25
Heap	6.25	6.25	6.25
Pit	6.25	6.25	7.25
S.E (±)		0.0001	

The result may attributable to double effect of storage conditions and ABA levels as earlier stated by Jiru and Usmane (2021) that the texture of processed potato product is influenced by both storage methods and plant hormones among other factors.

Interaction between curing periods, storage conditions and ABA levels on acceptability of boiled potato chips after storage

A significant (P≤0.001) interaction was exhibited between curing periods, storage conditions and ABA rates on the acceptability of boiled potato chips at the termination of the sampling periods as demonstrated in Table 17. Boiled potato chips prepared from potato tubers subjected to zero curing days stored in heap and shaded pit so also three days curing with heap storage and 5 d curing period alongside heap storage all treated with water received the highest scoring for acceptability. Sensory analysts regarded them as like very much. On the other hand, lowest acceptability score was obtained from boiled chips made from potato tubers cured for 0 d stored on floor, 3 d stored in shaded pit, 5 d alongside shaded pit and finally 7 d stored on floor and heap that were all viewed as like slightly.

An ABA rate of 2 ppm caused highest score to originate on boiled chips from potato tubers cured for zero days alongside heap and shaded pit storage; 5 d with all the storage conditions and 7 d with storage on floor and shaded pit. They were all ranked as like very much by sensory evaluators. In spite that, lowest score emanated from boiled chip gotten from potato tubers cured for three days and stored on floor, it was identified as dislike moderately by the analysts. A further supplementation of ABA to 4 ppm prompted potato tubers cured for 5 d and stored on floor produced boiled chips with the highest acceptability score and described as like very much by sensory analysts. Meanwhile, the lowest acceptability score came from chips made with potato tubers cured for 0 d together with all the storage conditions under consideration. 3 and 5 d curing in conjunction with heap storage and lastly, seven days curing with storage under shaded pit were all designated as like slightly.

Table 17: Interaction between curing periods, storage conditions and abscisic acid levels on acceptability of boiled potato chips after storage.

Curing period (d)	Storage condition	Abscisic acids level (ppm)		
		Water	2	4
0	Floor	6	7	6
	Heap	8	8	6
	Pit	8	8	6
3	Floor	7	3	7
	Heap	8	7	6
	Pit	6	6	7
5	Floor	7	8	8
	Heap	8	8	6
	Pit	6	8	7
7	Floor	6	8	7
	Heap	6	6	7
	Pit	7	8	6
S.E (±)		0.0004		

This finding could be triggered by the tripartite role of curing periods, storage conditions and ABA rates on the acceptability of boiled potato chips. Saran and Chhabra (2014); Juri and Usmane (2021) have reported similar finding that sensory quality of processed potato tubers can be influenced by curing periods, storage conditions and plant hormones.

Interaction between curing periods, storage conditions and ABA levels on colour of boiled potato chips after storage

The interaction between curing periods, storage conditions and ABA rates on the colour of fried potato chips after storage showed a significant ($P \leq 0.001$) interaction as shown in Table 18.

A dosage of water produced boiled potato chips with the greatest colour score from potato tubers subjected to 0 d curing period coupled with both floor and shaded pit storage. 3 d curing alongside all the storage conditions in question were all rated as like very much by the sensory evaluators.

This effect could be due to the joint effect of curing periods, storage conditions and ABA rates on the colour of the chips that coincided with Saran Chhabra (2014); Jiru and Usmane (2021) who communicated that curing periods, storage conditions and plant growth regulator may be among the factors responsible for potato chips colour.

Least colour score was obtained on boiled chips made from potato tubers cured for zero days combined with floor storage and was rated as neither like nor dislike by the evaluators.

Table 18: Interaction between curing periods, storage conditions and abscisic acid levels on colour of boiled potato chips after storage.

Curing period (d)	Storage condition	Abscisic acids level (ppm)		
		Water	2	4
0	Floor	8	8	8
	Heap	5	9	7
	Pit	8	9	8
3	Floor	8	8	7
	Heap	8	9	8
	Pit	8	8	8
5	Floor	6	8	8
	Heap	7	8	4
	Pit	7	7	7
7	Floor	7	6	8
	Heap	7	6	6
	Pit	6	5	7
S.E (±)		0.0002		

Application of ABA rate to 2 ppm resulted in chips from potato tubers cured for zero days under heap and shaded pit storage conditions as well as chips from tubers cured for three days stored in heap to provide the greatest colour score and rated as like very extremely by evaluators. Nevertheless, the least colour score was noticed on boiled chips from potato tubers cured for seven days paired with shaded pit storage and was rated as neither like nor dislike.

Additional increment of ABA to 4 ppm incited potato tubers cured for zero together with floor with shaded pit storage, 3 d curing with heap and shaded pit storage, finally 5 and 7 d curing periods alongside floor storage to offer boiled chips with the greatest colour score and rated as like very much. On the contrary, least colour score was noted on chips prepared from tubers cured for five days stored in heap which was graded as dislike slightly.

This finding may be caused by intermix between curing, storage conditions and ABA levels and it is similarly reported by Saran and Chhabra (2014); Jiru and Usmane (2021) that curing, storage condition and plan hormone affect processed potato quality.

Interaction between curing periods, storage conditions and ABA levels on taste of boiled potato chips after storage

Curing periods, storage conditions and ABA rates interacted in a significant ($P \leq 0.001$) manner on the taste of boiled potato chips at the end of the sampling periods (Table 19).

Table 19: Interaction between curing periods, storage conditions and abscisic acid levels on taste of boiled chips potato after storage.

Curing period (d)	Storage condition	Abscisic acids levels (ppm)		
		Water	2	4
0	Floor	7	7	6
	Heap	7	7	8
	Pit	8	8	8
3	Floor	8	8	8
	Heap	8	6	8
	Pit	7	7	7
5	Floor	7	8	6
	Heap	7	7	6
	Pit	7	7	7
7	Floor	7	7	6
	Heap	7	5	6
	Pit	6	5	6
S.E (±)		0.0001		

The use of water on potato tubers subjected to various curing periods and storage conditions produced boiled potato chips with the most preferred taste rating from potato tubers subjected to zero curing period and stored in shaded pit, also tubers with 3 d curing period alongside floor and heap storage conditions. They all got a like very much sensory ranking from the sensory judges. However, least preferred taste rating was obtained on boiled chips processed from potato tubers cured for 7 d in combination with shaded pit storage, which attracted a like slightly from sensory judges.

An application of 2 ppm ABA instigated chips from potato tubers cured for 0 d curing with shaded pit, 3 d curing together with floor storage and 5 d curing in conjunction with floor storage to exhibit the most preferred taste rating that was seen as like very much by the panel of sensory judges. The least taste preference rating was expressed by boiled chips from potato tubers cured for 7 d and stored in both heap and shaded pit that was ranked as neither like nor dislike.

Further magnification of ABA from 2 to 4 ppm lead potato tubers cured for 0 d stored on floor and in shaded pit jointly with 3 d curing tied to floor and heap storage to produced boiled chips with the most preferred taste rating that was judged as like very much. Conversely, least preferred taste rating was revealed by chips produced from tubers cured for 0 d alongside floor storage, 5 d curing together with floor and heap storage and lastly, 7 d curing concurrently with all storage conditions. They were all declared as like slightly.

This result could be attributable to the three-way impact of curing periods, storage conditions and ABA rates on taste of chips which is in line with Saran and Chhabra (2014); Jiru and Usmane (2021) who postulated that factors storage condition, curing, phytohormone and others can influences the taste of processed potato.

Interaction between curing periods, storage conditions and ABA levels on texture of boiled potato chips after storage

There was a significant ($P \leq 0.001$) interaction between all the factors under consideration on the texture of boiled potato chips at the culmination of the sampling periods as shown in Table 20.

Table 20: Interaction between curing periods, storage conditions and abscisic acid levels on texture of boiled chips potato after storage.

Curing period	Storage condition	Abscisic acids levels (ppm)		
(d)		Water	2	4
0	Floor	7	7	6
	Heap	7	5	7
	Pit	5	7	7
3	Floor	7	7	7
	Heap	5	6	7
	Pit	6	7	6
5	Floor	7	7	7
	Heap	7	8	7
	Pit	7	5	7
7	Floor	7	8	5
	Heap	6	6	5
	Pit	6	6	7
S.E (±)		0.0003		

The administration of water to potato tubers subjected to different curing periods and storage conditions initiated boiled potato chips with the highest textural classification to spring from potato tubers open to 0 d curing period in combination to floor and heap storage, three days curing paired with heap storage, 5 d curing with all the storage conditions under review and 7 d curing a long side floor storage. They were all valued as like moderately by the sensory evaluators. That notwithstanding, the lowest texture was advanced by boiled chips formed from potato tubers cured for zero with shaded pit storage and 3 d curing together with heap storage that were valued as like slightly by the appraisers.

Replacing water with an ABA rate of 2 ppm produced chips from potato tubers cured for 5 d in combination with heap storage and 7 d curing period in conjunction with floor storage offered the highest texture classification that was valued as like very much by panel of sensory evaluators. Despite that, the lowest texture was delivered by boiled chips made from potato tubers cured for 0 d with heap storage and five days alongside shaded pit storage that were valued as neither like nor dislike.

Further concentration of ABA from 2 to 4 ppm caused potato tubers cured for 0 d stored in heap and shaded pit, 3 d curing together with floor and heap storage, 5 d curing period in conjunction with all the storage conditions and ultimately seven days curing period alongside shaded pit storage supplied boiled chips with the highest texture classification that was valued as like moderately. The lowest texture class was obtained on chips processed from tubers cured for seven days in combination with floor and heap storage that was valued as neither like nor dislike.

This sequel could be ascribed to the shared influence of curing periods, storage conditions and ABA rates on the texture of boiled potato chips as asserted earlier by Saran and Chhabra (2014); Jiru and Usmane (2021) who discussed that these factors under review are among some of factors those that can affect texture of boiled potato chips.

CONCLUSIONS

This paper examined the influence of the curing period, storage condition and ABA rate on the sensory quality of potato tubers after storage for three months. The study thus concludes that curing period, storage condition and ABA can be employed in the extension of the shelf-life of potato tubers under ambient conditions with little loss of organoleptic properties of the tubers after storage. This technology of storing potatoes under ambient conditions can therefore be recommended to people involve in its value chain in the study area and other areas with similar resource challenges to embark on cold storage.

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