

Evaluation of Quality of Raw Cashew (*Anacardium occidentale*, L) Nut from Major Cashew Producing Areas of Nigeria

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Abstract This study evaluate the quality of raw cashew nut (RCN) from some major Cashew producing areas of Nigeria. Raw cashew nut samples were collected from the farmers/ Local Buying agents (LBA) in three towns each in three States; Kogi, Osun, and Oyo states. Raw cashew nut qualities were evaluated using the Out-turn (OT) method. Determinations were made in triplicates; Means were separated using Duncan multiple range test and Significance was accepted at 0.05 level of probability. Also, Two-tailed correlation analysis of the quality parameters was done and significance was accepted at 0.01 and 0.05. Nut count, Moisture content, Good kernels, Total useful kernel and Out-turn quality of RCN from the three states were significantly different ($p > 0.05$) from each other. However, RCN samples from different towns/villages within each state were not significantly different ($p < 0.05$) from one another. The good kernel, total useful kernel and Out-turn quality of RCN from Oyo state were significantly higher than those from Kwara state which were significantly higher than those from Kogi state. High Nut count with high moisture content gave low total useful kernel and low Out-turn quality as was the case of RCN from Kogi State, this shown the importance of adequate drying of the RCN after harvesting. RCN of moisture content lower than 12% gave high total useful kernel and high Out-turn quality. Correlation analysis revealed that, OT quality was positively correlated to good kernel and total useful kernels at 0.01 significance, while OT was negatively correlated to Nut count, Moisture content and bad kernel at 0.01, 0.01 and 0.05 significance respectively.

Keywords: raw cashew nut, out-turn quality, kernel, nut count and Nigeria

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1. Introduction

Quality is a major issues resulting in Nigeria Cashew being discounted by approximately 20%, which can cost the sub-sector about USD 8, 000, 000 (i.e discounting of USD 100/MT x production of 80, 000 MT). According to [1], in Nigeria raw cashew nuts reaching the exporters or processors are often un-dried and un-graded, most of the nuts reported to have over 20% moisture content, when normal moisture content should be less than 12% according to the trade. He reported further that, since the raw cashew nuts are bought on the basis of weight, some farmers have tendency to keep the nuts without drying before selling in order to obtain a higher weight. Low quality nuts could be immature, could have undergone inappropriate drying and thus contain excess moisture, or a mixture of foreign matter, etc. [2]. Nuts reaching the exporters or processors are often un-dried and un-graded. This increases the cost of drying, cleaning, removal of spoilt, void, damaged, immature nuts in the warehouses (in some cases more than 20% of a given consignment may be regarded as not suitable for export, after having

been transported to Lagos). This practice has greatly affected quality of nuts supplied. An increased price for raw nuts in the export market is a possibility through the introduction of standards and grading systems at producer and LBA levels in the short term. This will also offer an incentive to increase production through rehabilitation of existing "wild" plantations and promotion of cultivation of high yielding large nut producing varieties. In terms of prices, raw nuts of Nigerian origin presently sells at 20-30% below world market prices and those quoted for other African suppliers notably Tanzania, Guinea Bissau and Benin. Ranking among the first ten countries in the world in terms of production, Nigeria offers the cheapest source of raw nuts among the producers and has consistently supplied the Indian processing industry and lately Vietnam. Consequently, efforts to improve quality and quantity of nut will give Nigeria a bigger share of the Indian and Vietnamese market for raw nuts. Cashews from Nigeria are sold either in raw form – Nut in Shell (NIS) or as kernels after processing. Both products are sold in the domestic and export markets. 90% of the traded quantity is exported by local and foreign trading companies to India, Vietnam and smaller quantities to Brazil and lately to China where the nuts are processed

into kernels and sold at a higher value. Only about 5 to 10% of total production are processed locally for local and export market consumption by handful of Nigerian entrepreneurs with various capacities ranging from 500 to 1,000 MT/year. For Nigeria, among other factors, there are two major issues affecting quality; The kernel Out-turn Ratio (KOR), and peel-ability. Processors use out-turn as a common platform to analyze the quality of cashew nuts accepted by all market players worldwide [3]. Out-turn is the amount of kernel retrieved from 1 kg of raw cashew nuts in shell. It is measured in pounds of kernel per 80 kg of raw nuts. Out-turn is an important indicator of quality of the raw cashew nut and determines processing yields [3]. At present farmers are not much concerned about quality. There is no price incentive for grading and buying is done on weight rather than based on quality. Many farmers do not have any awareness on quality standards of cashew and the present buying practices do not encourage farmers to maintain quality or grading and drying prior to selling. If this system continues, not only will Nigeria fail to exploit the full potential of cashew, as Guinea-Bissau and other cashew producing countries have done, but also production and quality will continue to decline as yield from aged trees declines. In order to secure good quality supplies of Nigeria cashew nuts at competitive prices; increase the quality and value of the nuts, improve the competitiveness and help farmers to receive better prices on the world market, farmers and LBA need to be educated on the factors responsible for current low quality of Nigeria cashew nuts and how to improve quality. The objective of this study is therefore to evaluate the quality of raw cashew nut from major three cashew producing states of Nigeria; Oyo, Kwara and Kogi States.

2. Materials and Methods

The experiment was conducted in the Crop Processing and Utilization Division of Cocoa Research Institute of Nigeria, Ibadan, Oyo State in year 2015.

2.1. Samples Collection

Raw cashew nuts were obtained from farmers and Licenced Buying Agents (LBAs) in Oyo State (Ogbomoso, Ibadan and Oyo), Kwara state (Oro, Ilorin and Offa), Kogi State (Idah, Ankpa, Ochaja), Farmers were interviewed on Harvest and post-harvest practices they applied during the cashew production. 2Kg each of RCN sample was collected from three towns/villages in each of the three states using quarters method.

2.2. Quality Evaluation

Raw cashew nut quality was evaluated using the globally accepted Out-Turn method [4] as follows;

2.2.1. Sample Preparation

1 kg raw cashew nut sample was obtained from the bulk collected from 9 locations in 3 states using Quarter sampling method

2.2.2. Moisture Content

Moisture content of the raw cashew nuts was carried out using [5].

2.2.3. Nut Count

Numbers of raw cashew nut in the One kilogram raw cashew nut samples were counted and expressed in nuts/kg.

2.2.4. Cutting Test

One kilogram each of the raw cashew nuts were cut through the line of intersection shell, the shells were separated from the kernel with attached testa. The kernel were then separated into different grades; Good kernels, Spotted kernels, Bad kernels, Premature kernels and Humidified kernels, using standard quality chart under good light. All the grades were weighed separately.

2.2.5. Total Useful Kernels (U)

This was calculated using the standard method thus;

$U = 100\% \text{ of good kernel} + 50\% \text{ dotted kernels} + 0\% \text{ bad kernels} + 50\% \text{ premature kernels} + 20\% \text{ humidified kernels.}$

2.2.6. Out-turn (Kernel output ratio) (OT)

This was calculated using standard method thus;

$OT = \text{Total useful kernels weight (gm)} \times 80/454.$

Express in pounds quality (lbs quality).

2.3. Statistical Analysis

Determinations were made in triplicates; standard errors of the mean (SEM) and analysis of variance (ANOVA) in SPSS 10 were used to analyze the results. Means were separated using Duncan multiple range test. Significance was accepted at 0.05 level of probability. Also, Correlation analysis of the quality parameters was done using IBM SPSS Statistics 20 and significance was accepted at 0.01 and 0.05 levels of probability in a two-tailed correlation analysis.

3. Results and Discussions

The raw cashew nut (RCN) quality parameters and the Out-turn (OT) quality of RCN obtained from three cashew major producing states of Nigeria are as shown in Table 1. The Nut count, Moisture content, Good kernels, Total useful kernel and Out-turn quality of RCN from the three states were significantly different ($p > 0.05$) from each other. However, RCN samples from different towns/villages within each state were not significantly different ($p < 0.05$) from one another. The good kernel, total useful kernel and Out-turn quality of RCN from Oyo state (Highlighted in blue colour on the Table 1 above) were significantly higher than those from Kwara state which were significantly higher than those from Kogi state. High Nut count with high moisture content gave low total useful kernel and Out-turn quality (Highlighted in red colour on the Table 1 above) as was the case of RCN from Kogi State, this shown the importance of adequate drying of the RCN after harvesting. RCN of moisture content lower than 12% gave high total useful kernel and Out-turn quality as shown in Table 1. According to [6], the acceptable range of moisture content for good raw cashew nut is 8 - 10% moisture content. From the Table 1 above, it could be deduced that RCN from Oyo state had highest OT (50.6 lbs quality) which were significantly different

($p > 0.05$) from that of Kwara and Kogi states, while the lowest OT (44.37 lbs quality) was recorded from RCN of Kogi origin which was significantly different from that of Kwara state. 48 lbs Out-turn quality and above is standard grade buyers normally prefer. Less than 43 lbs Out-turn quality is a poor grade and is usually rejected. From the oral interview of the Cashew farmers, difference in post-harvest handlings of RCN were observed in the three states, this could be part of the factors contributed to the difference in OT quality of the RCN. Raw cashew nuts

from Oyo state were better dried than those from Kwara and Kogi States as reflected in their moisture contents (Table 1). According to [3], the excellence and thoroughness of post harvest handling affects the quality of the product, which in turn affects the country's reputation for those products. Product quality influences the demand for those products on the world market, which in turn positively affects the price based on the quality of raw cashew nuts.

Table 1. Quality parameters and Out-turn (OT) quality of Raw Cashew Nut

Sample No	NC/ kg	MC (%)	GK (g)	DK (g)	BK (g)	PK (g)	HK (g)	UK (g)	Out-turn (lb)
1	185a	12.0a	240.6c	15.4b	10.2c	16.4a	10.2b	258.5c	45.55c
2	186a	12.5a	239.5c	14.4c	12.0b	16.8a	12.0b	257.6c	45.37c
3	178c	8.3c	260.8a	20.2a	7.0d	16.8a	10.0b	275.6a	48.57a
4	190a	12.7a	237.5c	8.6d	14.5a	16.0a	10.0b	251.8c	44.37c
5	182b	11.5b	260.6a	10.2e	5.0d	5.4d	10.0b	270.4b	47.65b
6	180b	10.9b	250.8b	20.2a	12.4b	10.4c	20.0a	270.1b	47.59b
7	175c	8.5c	265.0a	16.4b	5.0d	14.6b	10.0b	282.5a	49.78a
8	170c	8.0c	270.0a	14.4c	6.0d	16.0a	10.0b	287.2a	50.60a
9	179b	9.0b	255.0b	20.0a	10.5c	10.6a	20.0a	274.3b	48.33b

NOTES: Means followed by the same alphabetic on the same column are not significantly different at $P < 0.05$, Sample Nos 1, 2, 4 = Kogi State, Sample Nos 9, 5, 6 = Kwara state, Sample Nos 3, 7, 8 = Oyo State, NC = Nut count, GK = Good kernels, DK = Dotted kernels, BK = Bad kernels, PK = Premature kernels, HK = Humidified kernels, UK = Useful kernels.

Table 2. Pearson Correlations of Raw cashew nut quality parameters and Out-turn

	NC	MC	GK	DK	BK	PK	HK	UK	OT
NC	1	.916**	-.923**	-.461	.720*	.042	-.045	-.983**	-.982**
MC	-.916**	1	-.871**	-.570	.649	-.066	-.060	-.929**	-.929**
GK	-.923**	-.871**	1	.273	-.866**	-.260	-.093	.967**	.968**
DK	-.461	-.570	.273	1	-.060	.058	.609	.441	.441
BK	.720*	.649	-.866**	-.060	1	.230	.421	-.775*	-.776*
PK	.042	-.066	-.260	.058	.230	1	-.410	-.160	-.160
HK	-.045	-.060	-.093	.609	.421	-.410	1	.053	.053
UK	-.983**	-.929**	.967**	.441	-.775*	-.160	.053	1	1.000**
OT	-.982**	-.929**	.968**	.441	-.776*	-.160	.053	1.000**	1

NOTES: ** ; Correlation is significant at the 0.01 level (2-tailed), *; Correlation is significant at the 0.05 level (2-tailed), Sample Nos 1, 2, 4 = Kogi State, Sample Nos 9, 5, 6 = Kwara state, Sample Nos 3, 7, 8 = Oyo State, NC = Nut count, GK = Good kernels, DK = Dotted kernels, BK = Bad kernels, PK = Premature kernels, HK = Humidified kernels, UK = Useful kernels.

From the Pearson Correlations analysis of the quality parameters and OT of RCN (Table 2), it was observed that, OT quality was positively correlated to good kernel and total useful kernels at 0.01 significance (Highlighted in blue colour in Table 2 above), while OT was negatively correlated to Nut count, Moisture content and bad kernel at 0.01, 0.01 and 0.05 significance respectively (Highlighted in red colour on Table 2 above). This implies that the higher the good kernel and total useful kernel, the higher the OT, while the higher the nuts count, moisture content and bad kernel, the lower the OT. This was confirmed by the study carried out in North District of Goa [7]. This correlation revealed the reason why Nigeria Cashew nut are of low quality and attract low price at the world market.

4. Conclusion

From this research work, Out-turn quality of raw cashew nuts from Oyo state was found to be higher than those from Kwara state which was higher than that of Kogi state. However, RCN samples from different towns/villages within each state were not significantly different from one another. The study also revealed the

factors responsible for low quality and high discount put on Nigeria Cashew, as OT quality was positively correlated to good kernel and total useful kernels and negatively correlated to Nut count, Moisture content and bad kernel. In the future, the effects of post-harvest practices on the Out-turn Quality will be research upon.

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