IKR Publishers [International Knowledge and Research Publishers]

IKR Journal of Multidisciplinary Studies (IKRJMS)
Journal homepage: https://ikrpublishers.com/ikrjms/
Volume-1, Issue-2 (May-June) 2025
ISSN: 3107-3999 (Online)

Effect of Roasting, soaking and Alkaline Treatment on Chemical properties of Neem Seed (Azadirachtaindica A. juss)

SALAMI Latifat Olajumoke*[1], AKINOSO Rahman[2], SANNIL ateef Oladimeji[3], OMONIYI Oluleye[4], KAJIHAUSA Olatundun[5], ADEBAYO Kafayat O.[6].

[1] phD Department of Food Technology, University of Ibadan.
[2] phD (Professor) Department of Food Technology Unversity of Ibadan.
[3] phD (Professor) University of Agriculture Abeokuta.
[4] phD Department of Wood Engineering, University of Ibadan.
[5] phD (Associate Professor) university of Agriculture Abeokuta.
[6] phD (Associate Professor) University of Agriculture Abeokuta.

Corresponding author: SALAMI Latifat Olajumoke

DOI:*10.5281/zenodo.16471861*

ARTICLE INFO

Article history:
Received : 08-07-2025
Accepted : 21-07-2025
Available online : 27-07-2025

Citation: SALAMI Latifat Olajumoke, AKINOSO Rahman, SANNIL ateef Oladimeji, OMONIYI Oluleye, KAJIHAUSA Olatundun, ADEBAYO Kafayat O. (2025). Effect of Roasting, soaking and Alkaline Treatment on Chemical properties of Neem Seed (Azadirachtaindica A. juss). *IKR Journal of Multidisciplinary Studies (IKRJMS)*, 1(2), 74-78.

ABSTRACT **Original research paper**

Neem tree products including seed are reported to possess scientific and economic benefits (USDA GRIN, 2003). Neem seeds are appropriate supply of Azadirachtin, a triterpeniod compound, which might be also determined from other parts of the plant. The compound acts as an insect repellent by inhibiting them from feeding and disrupting their increase reproduction. However, there may be sparse literature on secure human consumption of neem seed. Thus, in this study effect of roasting at temperature of 60ocfor 45 mins, soaking in water and alkaline soaking in 40% NaOH m/v, for 24 hrs were carried out to determine its effects on chemical properties of neem seeds. Neem seeds were subjected to three treatments based on preliminary studies such as; steeping in water, and 10% NaOH solution for 24 h, and roasting for 10 min at 160oC. Proximate (crude protein, oil, crude fibre, ash, moisture and carbohydrate contents), minerals (Ca, Na, Mg, P, K, Cu, Zn, Fe, Mn and Se) ofun-treated and treated seeds were determined using AOAC methods. A sample of 200g neem seeds was treated separately under each method and chemical analyses were carried out to estimate its level of crude protein, carbohydrates, crude fat, fibre content and the ash content. The control sample was set aside as non-treated neem seed and used as comparison to the treated samples. Roasting increased the crude fat content. Treatment also exhibit some impacts on mineral composition of the seed, alkaline treatment brought about significant increase in the levels of Sodium ( ) Magnesium ( ) and Phosphorus.

Keywords: Pre-treatments, Neem seeds, Minerals, Nutritive Components.

Introduction:

Soaking, cooking, toasting, autoclaving, microwave heating, sprouting, chemical remedy improve legumes traits through the elimination and inactivation of some anti-nutritional elements (Farran*et al.*,2001). It is, consequently, crucial lessen the anti-dietary factors and toxins in neem a good way to boom its nutritional satisfactory and to allow effective usage of neem seeds. The fruits have thin epicarps, mucilagenous fleshy mesocarps and hard endocarps with variable ovoid shaped oil seeds (Puri, 1999). Soaking usually increase the hydration diploma of legumes and cereals, thereby making it mild and activate endogenous enzymesuch as phytate which decorate ease of additional processes. It is usually recommended that wheat and barley have to be soaked for a time frame (Gupta et al.,2015) earlier than intake, generally 12 to 24 hours.

Neem seed has enumoursebenefits that only a few natural products can provide, however being obtained from toxic palnt, called for reason to investigate on the impact of treatments on its chemical properties.Seeds: yield oil and cake. Its bitters are used for controlling pests as discipline trials on rice and cotton in Pakistan. It is safe and cheap to use as environmental bio-pesticide (Siddiqui, 1995).

Variations innutritional components of neem depend on a few factors. For instance, its seed desserts received from complete seeds have particularly low protein content material and a excessive fibre content, crude fibre(Ismael*et al.*,2009). Neem cake, received from decorticated seeds,contain high protein material and low fibre contents. Neem leaf has high protein content material, mild nutritional and anti-nutritional dietary fibre with a high degree of lignin. It also contains high amounts of calcium with low quantities of phosphorus (Gowda*et al.*,2000).

Oil content material of the seed varies, relying on technique of extraction normally between (1-10%) DM. In addition, cakes obtained from decorticated seeds and partly de-pulped seeds vary, based on record of decortication and de-pulping of the seeds (Dutta *et al.*,2012).

Materials and Methods

Neem seeds were obtained from neem treefrom the Faculty of Education in University of Ibadan. The seeds were carefully sorted to obtain clean and wholesome ones. Pre-treatment of seeds were carried out in batches of four groups based on the methods alkaline soaking (chemical treatment), water soaking, roasting while raw neem seed sample was used as control of which each batch was made with 250g weight of seed.

Soaking: A measured weight 250 g of neem seeds was steeped in 250mL of water. The soaking hour was for 24 hours after which its water was discarded (Meseret*et al.*,2019). The seeds were sundried and milled, aseptically sealed for further analysis.

Roasting: Roasting was carried out by using microwave oven. This was carried out at a temperature of 160^{o}C for period of 10 mins.

Chemical Treatment: This was carried out by soaking 250g of the seed in alkaline solution (10% sodium hydroxide) using 40 g of seed, for 24h. The seeds were sundried, milled into powdery form packed and covered in containers for further analyses.The seeds were analysedto determine the impacts of its treatment on their chemical properties in terms of their proximate compositions and also their mineral composition.

Results and Discussion

Table 1: Proximate Composition of Raw and Pre-treated neem Seeds

Chemical Parameters (%)	Raw Neem Seeds	Water Soaked Neem Seeds	Alkaline Soaked Neem Seeds	Roasted Neem Seeds
Crude protein	18.57±0.09^{b}	16.99±0.27^{a}	18.57±0.09^{b}	19.08±0.11^{b}
Crude fat	41.18±0.03^{a}	40.35±0.03^{b}	41.18±0.03^{a}	41.84±0.05^{a}
Crude fibre	3.57±0.04^{a}	3.53±0.04^{a}	3.57±0.04^{a}	3.64±0.03^{b}
Ash	2.58±0.05^{b}	2.42±0.04^{a}	2.58±0.04^{b}	2.51±0.03^{b}
Moisture	6.03±0.02^{ab}	12.31±0.03^{c}	6.03±0.02^{ab}	5.89±0.02^{a}
Carbohydrate	28.11±0.02^{b}	24.41±0.43^{a}	28.07±0.02^{b}	27.04±0.02^{b}

Values with a different superscript in the row are significantly different($p<0.05$).

The chemical properties of neem oil revealed that the pretreatment of seed gave a resultant increase in proximate composition of neem seed.

Nutritional components in raw and treated neem seed from table 4.1 indicated that **Crude protein** content was retained best in roasted neem seed (19.08%) while the lowest value was observed in water soaked neem seed (16.99%). No significant difference ($p \leq 0.05$) was recorded in level of protein content between raw seed (18.57%) and alkaline treated seed (18.57%). This was in agreement with the observation of Prakash, (2004) and Wang, (2005), as reported from their cooking effects on nutrient composition of eight legumes.

Crude fat content was significantly increased in roasted neem seed (41.84%) from 41.18% in raw seed. Lowest value of fat content was observed in water soaked neem seed (40 35%) and alkaline treated seed. Crude fibre content was retained best in roasted neem seed (3.64%). The increase was due to protein fibre complexes (Bressani,1993) formed after possible chemical modification induced by roasting of seed. The lowest value of 3.53% was obtained from water soaked neem seed. This may occurred as a result of diffusion into soaking water. No significant difference ($p \leq 0.05$)occurred between crude fibre content of raw neem seed (3.57%) and alkaline treated seed (3.57%).Ash content of neem seed was lowest in water soaked neem seed (2.42%). A value of 2.51% was observed in roasted neem seed. No significant difference ($p \leq 0.05$) in ash content between raw seed and alkaline treated seed (2. 58%). This value is closer to 3.3% reported for raw melon seed by (Omafuvbe*at al.*,2004).

Moisture contents of raw neem seed and alkaline treated seed were (6.03%). Increased moisture content observed in water soaked seed (12.13%) was due to water used in soaking the seed. The moisture content in roasted seed was in the lowest value of (5.89%). This could be due to dehydrating impacts of roasting treatment. No significance difference ($p \leq 0.05$) occurred in carbohydrate content between raw neem seed (28.11%) and alkaline treated seed (28.07%). Lowest value was observed in water soaked neem seed (24.41%), while a value of 27.04% carbohydrate content was obtained in roasted neem seed.

Table 2: Minerals Composition of Neem Seed during Treatment Methods

Minerals(mg/100g)	Roasted Neem Seeds	Raw Neem Seeds	Alkaline Soaked Neem Seeds	Water Soaked Neem Seeds
Ca	54.20^{b}	56.93^{c}	54.70^{b}	52.93^{a}
Na	38.10^{b}	38.80^{b}	40.20^{c}	37.50^{a}
Mg	47.80^{b}	48.50^{b}	49.10^{b}	45.90^{a}
P	38.07^{b}	38.40^{b}	39.30^{b}	37.30^{a}
K	111.73^{a}	112.50^{a}	112.30^{a}	111.20^{a}
Cu	379.00^{b}	382.00^{b}	381.00^{b}	368.00^{a}
Zn	2418.33^{b}	2463.00^{b}	2429.00^{b}	2398.00^{a}
Fe	16418.00^{b}	16482.00^{b}	16425.33^{b}	16364.00^{a}
Mn	1175.00^{b}	1182.00^{b}	1179.00^{b}	1164.33^{a}
Se	5.10^{c}	1.50^{a}	2.27^{b}	1.10^{a}

Values with the same superscript are not significantly different ($p \leq 0.05$).

Minerals contained in raw and treated neem seed were showed in table 1.0 above. Content of calcium was significantly reduced from (56.93mg/100g) in raw seed to (52.93mg/100g) in water soaked neem seed. Calcium contents were reduced to 54.20and 54.70mg/100g in roasted and alkaline treated seeds respectively. However sodium (Na) content of neem seed was increased from 38.80mg/100g in raw seed to 40.20 mg/100g by alkaline treatment. This might due to the sodium content of the alkaline solution used in soaking the seed. Sodium content was significantly ($p \leq 0.05$) reduced in roasted seed (38.19mg/100g) and water soaked seed (37.50mg/100g).There was a significant increase in levels of sodium 9 40 20), Magnesium (49.10) and Phosphorus (39. 30) under alkaline treatment in comparison with raw neem seed.

Magnesium (Mg) content of neem seed increased during treatment from (48.50mg/100g) in raw seed to (49.10mg/100g) in alkaline treated seed. Roasting and

water soaking brought about a decrease in magnesium content with (47.80 mg/100g) and (45.90mg/100g) respectively. The report was similar to the report of Longe (1983) who recorded decrease of 23% magnesium from autoclaving of mature cowpea seed. There were decrease in phosphorus (P) content of neem seed from (38.40mg/100g) in raw seed to (38.07mg/100g) and (37.30mg/100g) in roasted and water soaked seed respectively. Potassium (K) content of neem seed was significantly ($p<0.05$) decreased from (112.50mg/100g) in raw seed to (112.30 mg/100g), (111.73mg/100g), and (111.20mg/100g) in alkaline treated, Roasted and water soaked seed respectively. This was related to the report of Heylowitz and Mattew (1983) , who reported 30% loss in potassium during cooking of matured cowpea seed in boiling water.

Copper (Cu) content of neem seed is reduced from 382mg/100g in raw seed to 381, 379 and 368mg/100g in alkaline, roasted and water soaked neem seeds respectively. Zinc content of neem seed was also reduced drastically from 2463 mg/100g in raw seed to 2429, 2418 and 2398mg/100g in alkaline treated, roasted and water soaked neem seed respectively. This report was similar to the result of Hefnawy (2011) who recorded drastic decrease in zinc content of lentil seed during autolaving and microwave processing methods.

Iron (Fe) contents of neem seed were reduced during treatment from 16482mg/100g in raw seed to 16425, 16418 and 16364mg/100g in alkaline soaked, roasted, and water soaked neem seed respectively. Manganese (Mn) content of neem seed also reduced from (1182Mg/100g) in raw seed to (1179 – 1164 Mg/100g) in treated seeds. However, Selenium (Se) content of neem seed increased significantlyfrom 1.50Mg/100g in raw seed to 5.10Mg/100g in roasted neem seed and also increased to 2.27Mg/100g in alkaline treated seed while a reduction in the content was recorded in water soaked seed with 1.10Mg/100g. This result was related to the report of Habtamu in nutritional properties of lemabean (Habtamu et al.,2020)
Thus, among the treatment methods, alkaline treatment gave best retention of mineral content of neem.

Conclusion

Roasting, soaking in water and alkaline (10% sodium hydroxide) solution affected neem seed anti-nutritional contents including cyanide, nitrate, total oxalate, azadirachtin, phytate, tannin, and oxalate. Levels of reduction depended on roasting temperature and soaking duration. Roasting and soaking in water reduced both cyanide and azadirachtin contents of neem seeds, with water soaking being more effective. Soaking in alkaline solution reduced only cyanide but increase azadirachtin contents. None of the treatments reduced azadirachtin contents to safe level for human consumption. Roasting and soaking neem seed in alkaline solution did not affect percentage distribution of nutritive composition. Conversely, percentage distribution of proximate composition was influenced by water soaking. Predominant minerals in neem seed were iron, zinc, manganese, copper, potassium and calcium. They were not significantly influenced by the treatments.

Acknowledgement

Efforts of Mr. Babarinde is highly acknowleged in obtainins seeds and his kind support in carrying out laboratory ananlysis. Also financial support of Prof R. Akinoss and Prof L.O sanni as well as Dr. Omoniyi is highly acknowledged. Other materials gathered by L.O Salami is also appreceaited. Also unique efforts of Dr. Kaji-Hausa is reading through the manuscript is highly important.

References

1. Gupta B.S., Srivastava J.P., Tripathi A.K., Verma A.K. and Thakur S. (1981). "Biological valuation of karanja (*P. glabra*) cake". .*Indian Journal of Animal Health* 6: 75-77
2. GowdaN.S., Katiyar R.C., Sastry V.B. (1994). "Detoxified Mahua (*Bassialatifolia*) seed cake as protein source for high growth potential animals".*Indian Journal of Animal Nutrition* 11: 1-6.
3. Habtamu G and EBirhanu (2020). "Nutritional, Antinutritional and Phenolic Properties of Lima Bean (*Phaseoluslunatus*) Accessions: Underutilized Legume in Ethiopia", ActaUniversitatisCibiniensis. Series E: Food Technology.
4. Haytowitz, D.B., Mattews, R.H., (1983). "Effect of cooking on nutrients retention of legumes." Cereal Food World28, 382-384
5. Longe, O.G. (1983). "Varietal differences in chemical characteristics related to cooking quality of cowpea". J. Food Process, Preserv. 7, 143-150

6. Meseret B. B. Shimelis A. E. Clemens P., Sabine A. and Ralf G. (2019). "Reduction
    a. of β-ODAP and IP6 contents in Lathyrussativus L. seed by high hydrostatic pressure" , Food Research International
7. Omafuvbe O. O., Falade O. S., Osuntogun B. A., Adewusi R. A., (2004). “Chemical and biochemical changes in African locust bean (*Parkiabiglobosa*) and melon (*Citrullus vulgaris*) seeds during fermentation to condiments”. Pak. J. Nutr. 3:140-145.
8. Prakash, Gunja; Bhojwani; Sant S., Srivastava; Ashok K.(2004).”Production of Azardiractin from plant tissue culture; state of the art and future prospects”. Biotechnology and Bioprocess Engineering 7(4): 185-195 doi; 10.1007/BF02932968. ISSN 1226-8372.
9. PuriH.S., (1999). Neem: the divine tree (*Azadirachtaindica*). Harwood academic publisher
10. Siddiqua S., Anusha B. A., Ashwini L. S. andNegi P. S. (1995). "Antibacterial activity of cinnam aldehyde and clove oil: effect on selected foodborne pathogens in model food systems and watermelon juice", Journal of Food Science and Technology.
11. Wang N., Hatcher D.W., Toews R., Gawalko E.J. (2005). “Influence of cookinganddehulling on nutritional compositionof several varieties of lentils (*Lens culinaris)”.* Food Sci. Technol. 42, 842-848