Review Article

Quantification of Sodium from Food Sources by Using Various Analytical Techniques

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Abstract | Sodium is an essential element to regulate the various functions of body. There are different sources of sodium such as table salt, breads and rolls, sandwiches, soups, cold cuts and cured meats, savory snacks, chicken etc. However, the excessive intake of sodium may cause health issues such as hypertension, brain strokes, renal irregularity, heart attack etc. Various analytical techniques including atomic absorption spectroscopy, chromatography methods, ion selective electrode method, laser-induced breakdown spectroscopy, complexometric titration method and thermometric endpoint titrimetry are developed to determine the quantity of sodium. Spectrophotometric methods are cheap, easy to handle and more precise to quantify sodium in food contents.

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Introduction

The world health organization's recommendation of daily sodium intake is 5.0g (Grillo *et al.*, 2019). The exceeding from this level may cause various health hazards. Different foods have different amounts of sodium. With the inception of fast food and baked items, the consumption of sodium has increased. The intake of sodium, higher than recommendation is most common nowadays which is causing smaller to bigger issues in most people. The utilization of a high concentration of salt can cause various health conditions like strokes, heart attack impaired renal functions, and high blood pressure (Floren *et al.*, 2005). A study was done in Portugal on urinary sodium excretion which concluded that high urinary sodium excretion is related to hypertension. It is also related to arterial stiffness (Castanheira *et al.*, 2009). Moreover, Sodium azide (NaN_3) which is highly toxic for the human body is used in beverages. It is a preservative for laboratory reagents and also a propellent for automobile safety bags, its oral use may cause less absorption of oxygen by the cells. This may result in greater harm to the heart and brain as they use a lot of oxygen. Figure 1 shows the structure of Sodium azide.

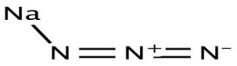

Figure 1: *Structure of sodium azide.*

In 1998, a large population get poisoned by ingesting sodium azide in Japan. After this ministry of health and welfare took administrative actions and declared it as poison. But it is still used in some factories for making beverages, which is troublesome. Due to this reason, it becomes necessary to examine food products with different analytical techniques and find safe ways to reduce or exterminate hazardous elements (Oshima *et al.*, 2000).

Various analytical techniques have been developed for this purpose which are as follows:

- Atomic absorption spectroscopy
- Chromatography methods
- Ion selective electrode method
- Laser-induced breakdown spectroscopy
- Complexometric titration method
- Thermometric endpoint titrimetry

This manuscript is a review of these techniques, how they do qualitative and quantitative analysis, and how they give results.

Atomic absorption spectroscopy

In 1992, the sodium content of olives (packaged) was estimated using a flame photometer and ion-selective electrode. Sample ash was prepared by grinding with distilled water and heating at 350°C for 2 hours and at 250°C for 7-8 hours. Then HCl was added and diluted by deionized water. The sample was introduced into a flame photometer. The ground paste with distilled water (5g paste and 95 ml distilled water) was then added with a 4ml ionic strength adjuster (ISA) and stirred for 5 minutes. The sample was then analyzed and quantified by flame photometry and ion-selective electrode methods as shown in Table 1 (Garcia *et al.*, 1992).

Table 1: *Sodium content in olive flesh with different amounts of added Na^+ by flame photometric and ion-selective electrode methods.*

	Na^+ found/ mg g^{-1}	
Sodium added/mg per 100 g of flesh	**Flame photometer**	**Ion-selective electrode**
0	11.66	10.23
3.93	16.00	14.16
7.86	20.00	18.13
15.72	26.33	25.96
23.59	35.33	33.86

These methods proved to be useful for routine monitoring and inspection. However, it was needed that there should be correlation graphs to improve results (Garcia *et al.*, 1992).

In 2005, five different foods (broccoli, carrot, bread, pork, and cheese) were studied to check the concentration of sodium in mg/kg. The values of relative standard deviation, reproducibility and repeatability of sodium in the above mentioned foods are shown in Table 2 (Floren *et al.*, 2005).

Table 2: *The sodium content, RSD, reproducibility, and repeatability in 5 different foods.*

Parameters	**Broccoli**	**Carrot**	**Bread**	**Pork**	**Cheese**
Mean value of sodium x, (mg/kg)	2290	3540	8260	1480	5380
Standard deviation (RSD)	3.3	3.3	2.5	1.9	6.5
% RSD	5.0	4.2	4.4	6.1	6.9
Reproducibility (S_R)	110	150	370	100	370
Repeatability (S_r)	210	330	570	77	980
S_r/S_R	0.63	0.80	0.54	0.30	0.95

The standards used were Bovine liver and non-fat milk powder. The sodium concentration was 2420 mg/kg in the bovine liver and non-fat milk powder was 4970 mg/kg. The samples were studied by nine laboratories to get diverse data and better observation. All the samples were dried thermally at 105°C. Two reagent blanks i.e., HNO_3 and H_2O_2 were prepared without any sodium content. The samples were digested by adding nitric acid and hydrogen peroxide to each of them. The dilution is done by adding cesium chloride solution (1ml) to each sample aliquot. This was done to get the concentration of sodium in the linear range in all samples. The standard solutions were made with different concentrations and diluted with nitric acid (2.7%) and cesium chloride (1 ml). The flame photometer is switched on and set at wavelength 589.0nm. The absorbance of reagent blanks and sample solutions were found by it. The concentration of sodium in the samples were found by the formula, $C=(C_s-C_{bl})/m$, in which c is the concentration in the sample (µg/g), C_s is the weight of sodium in (µg), C_{bl} is the weight of sodium in blank solution and m is the weight of the sample in grams. The results were the amount of sodium in pork was 1350 and 1550 mg/kg from two laboratories, in cheese was 3380 and 3790 mg/kg and 7730 and 7900 mg/kg from

two laboratories, in broccoli was 2210-2430 mg/kg, in bread was 7920-88970 mg/kg and in carrot was 3330-3890 mg/kg. The values for their standard deviation, reproducibility (S_R), and repeatability (S_r) are expressed in the table below (Floren *et al*., 2005).

Table 3: *The concentration of sodium and potassium (mg/100g) in different bread samples.*

Sampling point	Concentration ± U	
	Na (mg/100 g bread) (n ≥ 9)	K (mg/100 g bread) (n ≥ 9)
A1	603.60 ±17.66	138.04 ± 1.63
A2	620.75 ± 8.56	140.38 ± 2.36
A3	550.90 ± 10.89	121.96 ± 3.18
A4	619.42 ± 8.27	126.01 ± 2.62
B1	721.82 ± 13.47	158.48 ± 4.93
B2	550.51 ± 15.73	149.76 ± 4.10
B3	538.35 ± 17.74	171.20 ± 2.14
C1	641.62 ± 21.10	159.69 ± 4.17
C2	724.27 ± 8.57	164.54 ± 3.92
C3	647.69 ± 35.39	150.26 ± 7.60
D1	490.44 ± 20.58	159.24 ± 2.04
D2	650.37 ± 8.56	154.10 ± 2.56
E1	650.42 ± 40.18	169.26 ± 3.78
E2	666.77 ± 27.90	171.43 ± 22.28
F1	682.22 ± 7.42	150.22 ± 3.64
F2	676.80 ± 15.16	130.38 ± 4.87

In 2009, Ten brands of bread were analyzed for sodium and potassium content. The bread was purchased from 16 retail shops. These were dried, grind, and made into ash. Hydrochloric ash solutions of the test samples were prepared and ionized by using lithium solution. Na and K ions are determined on a flame photometer while Cl^{-1} ions were determined by Charpentier Volhard's titration method. In this titration, chloride ions were titrated with silver nitrate solution. The analytical grade reagents were used are potassium thiocyanate (KSCN, 0.1N) and silver nitrate ($AgNO_3$, 0.1N). How much NaCl was added in the dough was estimated by chloride ions determination from the endpoint of this titration. Two reference materials were used, one was the typical diet NIST 1548, which has 1207.8±35.6 mg/100 g chlorine, 697.0±12.5 mg/100 g potassium, and 813.2±94.2 mg/100 g sodium, and other was wheat flour NIST 1567. That contained 133 mg/100 g of potassium. During analysis, the values of the elements were found and compared with standard references to confirm that the analytical method was originating the correct results. The most consumed white bread was found to contain sodium in the range from 490 to 724 mg/100 g. The sample which contained the lowest sodium was retail D1 with the amount of 490.44mg/100g and highest in retail sample C2 with the value of 724.27mg/100g. That difference was thought to be due to taste differences in various areas. The potassium was found in a lower concentration than sodium (Na), in the range of 121.96–171.43 mg/100 g of bread. The experimental results show that bread contributed to 11% of the daily recommended K intake in the Portuguese diet. Table 3 is showing the concentration of sodium (Na) and potassium (K) in different bread samples (Castanheira *et al*., 2009).

Chromatography method

In 2000, the beverages (milk coffee, grape juice, vegetable juice, sports drink, oolong tea, coffee, cocoa, milk, and wine) were collected from different markets. In this experiment, the samples were spiked for validation. The samples were alkalized with 0.1M NaOH. To extract azide ions, the bubble and trap method was used. In this method, two tubes (test tube A and test tube B) are attached with Teflon tubing. In test tube A, the sample solution was added with an antifoaming agent (tri-n-butyl phosphate) and in test tube B, dilute sulfuric acid (trapping solution) was added. The bubbles of sodium azide travel to tube B and react with sulfuric acid forming hydrazoic acid that can be subjected to ion chromatography for determination. The average recovery for milk coffee was 74.4%. The same method is employed for other samples. Then the samples were subjected to ion chromatography by using Sodium carbonate as the eluent solution. The results of the content of sodium azide in beverages is presented below in the Table 4 (Oshima *et al*., 2000).

Table 4: *Analysis of various beverages spiked with sodium azide.*

Sample	Added (µg/g)	Added (µg/ml)	Found (µg/ml)	Recovery (%)
Grape juice	10.0	1.00	0.837	83.7
Vegetable juice	10.0	1.00	0.866	86.6
Sports drink	10.0	1.00	0.866	86.6
Oolong tea	10.0	1.00	0.881	88.1
Coffee drink	10.0	1.00	0.858	85.8
Milk cocoa	10.0	1.00	0.899	89.9
Milk	10.0	1.00	0.826	82.6
Wine	10.0	1.00	0.901	90.1

Ion-selective electrode method

The Ion-selective electrode method is faster and less expensive than the atomic absorption spectroscopic method and ion-exchange chromatography.

In 1984, the ion-selective electrode method was used to determine sodium in processed meat products. For this purpose, standard sodium solutions were prepared and suspension 2 % (w/w) of ground mixture with 125 ml water. It was swirled for 2-3 min to extract the salt. The electrode was dipped both in standard as well as of the sample for at least 30 s and noted the readings. The various error-causing factors were eliminated by different precautionary measures for example adsorption of fats were eliminated by washing the electrode after every measurement, suspended solids by stirring for a few seconds, pH error by adding suitable buffer. The ionic strength was adjusted by using an ionic strength adjuster so that the results were accurate.

The results of the sodium content and its comparison with the results of flame photometer were elaborated in the Table 5 (Fulton *et al.*, 1984).

Table 5: *Blind comparison of the ion selective electrode method with the flame photometric method.*

Sample	% Na in each solid sample	
	Ion selective electrode	Flame photometer
Bacon	0.70	0.71
Pizza	0.76	0.73
Sausage	0.76	0.72
Salami	1.1	0.98
Bologna	0.97	1.0
Ham	1.1	1.2

This method was found to be as rapid as flame photometer method if time consuming steps such as rinsing and drying of the electrode, ionic strength adjustments were minimized by suitable techniques (Fulton *et al.*, 1984).

In 2003, the sodium content of food was investigated with this method. Four different foods were selected for analysis i.e., ketchup, potato chips, cottage cheese, and Gatorade (white or clear). As the samples were of different physical states, they were prepared by converting in the liquid phase and adding 2ml ionic strength adjuster (ISA) which is 4M NH_4Cl, 4M NH_4OH, and distilled water to make 100ml of the final solution. Standard solutions of sodium were also prepared. The analysis of all the samples was done by immersing sensing and reference electrodes in all the samples one by one and potentials were noted by comparing with a reference electrode. The results were converted into mg/ml and sodium content was investigated. Further, chloride content was determined by changing the sodium sensing electrode to chloride sensing electrode. Thus, sodium chloride content was also investigated (Carpenter *et al.*, 2003).

High-performance liquid chromatography method

Sodium benzoate and potassium sorbate are the preservatives in food that are bacteriostatic and fungistatic and inhibit the growth of molds and yeast in many foods, respectively. These are harmful in many ways so research was conducted in 2007 to detect sodium benzoate in soft drinks, various jams, and ketchup. The reverse-phase technique was combined with UV monitoring at 245 nm. Mobile phase methanol and water (70:30) were used. The beverage samples were diluted with 10 ml of mobile phase and solid samples by blending 10 g of samples with 50 ml of mobile phase for 2 minutes. Amoxicillin was used as an internal standard. The retention time was found to be 5.01 min and 12.07 for internal standard. The results of the experiment were listed in Table 6 (Altiokka *et al.*, 2007).

The final analysis was done by a diode array detector. The results showed that the levels of sodium benzoate complied with the regulations stated by FDA, EU, and Turkish Food Codex (Altiokka *et al.*, 2007).

In 2018, research was done to detect additives, Sodium benzoate, and potassium sorbate in food by reverse phase chromatography method. First, standard solutions of sodium benzoate were made by taking 10 mg of sodium benzoate, 10 ml of HPLC water, and made the volume of 1000µg/ml. Same as done for potassium sorbate. The samples used were lauki-amla juice, jam, cake, and fizz juice. The samples were prepared to convert in the liquid phase and HPLC water was added to all of them. All the samples were degassed in an ultrasonicator for 30 minutes and then filtered through a nylon filter. The mobile phase was prepared by taking acetonitrile and sodium acetate buffer (pH: 4.3) in 1:4, degassed and filtered by nylon filter. All the sample solutions were injected into the HPLC column one after another for 10 minutes and chromatograms were recorded in Table 7 after establishing a stable baseline and the chromatograms of samples are shown in Figures 2 to 5 (Shaikh *et al.*, 2018; Quinghua *et al.*, 2013; Sohrabvandi *et al.*, 2015).

Table 6: *Assay results of the foodstuffs.*

Sample	Concentration (μ g ml^{-1})	RSD %	Sample	Concentration (μg ml^{-1})	RSD %
Soft drink No. 1	11.68	1.56	Jam No. 11	53.72	2.89
Soft drink No. 2	61.44	2.25	Jam No. 12	59.28	1.69
Soft drink No. 3	22.25	2.36	Jam No. 13	33.50	3.34
Soft drink No. 4	48.30	2.04	Jam No. 14	17.26	3.83
Soft drink No. 5	39.99	2.15	Jam No. 15	31.15	3.86
Soft drink No. 6	36.29	2.83	Jam No. 16	67.16	1.79
Soft drink No. 7	45.27	2.62	Jam No. 17	19.25	3.39
Soft drink No. 8	47.14	1.85	Jam No. 18	73.16	1.78
Soft drink No. 9	21.40	0.70	Jam No. 19	28.05	4.05
Soft drink No. 10	52.89	2.36	Ketchup No. 1	82.03	1.57
Soft drink No. 11	53.72	2.89	Ketchup No. 2	55.82	1.89
Soft drink No. 12	59.29	1.69	Ketchup No. 3	71.94	2.01
Soft drink No. 13	52.84	2.61	Ketchup No. 4	43.49	2.31
Soft drink No. 14	18.63	3.09	Ketchup No. 5	35.94	3.40
Soft drink No. 15	20.16	1.76	Ketchup No. 6	52.15	2.14
Soft drink No. 16	91.51	2.07	Ketchup No. 7	31.27	4.47
Soft drink No. 17	85.08	2.28	Ketchup No. 8	58.82	3.02
Soft drink No. 18	12.50	5.67	Ketchup No. 9	49.84	2.30
Soft drink No. 19	20.75	3.79	Ketchup No. 10	58.54	3.43
Soft drink No. 20	85.88	2.33	Ketchup No. 11	62.54	2.14
Jam No. 1	29.19	3.14	Ketchup No. 12	87.12	3.87
Jam No. 2	61.84	1.87	Ketchup No. 13	45.17	2.51
Jam No. 3	35.16	3.94	Ketchup No. 14	65.88	1.63
Jam No.4	49.97	2.34	Ketchup No. 15	32.56	4.11
Jam No. 5	53.33	2.59			
Jam No. 6	46.22	2.31			
Jam No. 7	21.50	3.52			
Jam No. 8	56.47	2.11			
Jam No. 9	24.38	4.26			
Jam No. 10	52.89	2.36			

Table 7: *The results for sodium benzoate and potassium sorbate content.*

S. No.	Sample	Level of recovery	Amount of sample (ml)	Amount of standard drug added (μg/ml)		Total amount found (μg/ml)		Amount recovered (μg/ml)		% Recovery	
				SB	PS	SB	PS	SB	PS	SB	**PS**
1	Juice	0%	1	10	10	11.38	8.38	0	0	0	0
		100%				11.38	8.38	19.86	17.35	97.7	98.8
2	Jam	0%	0.5	10	10	2.31	1.15	0	0	0	0
		100%				2.31	1.15	11.19	10.40	101.1	102.2
3	Cake	0%	0.5	10	10	-	14.21	0	0	0	0
		100%				-	14.21	8.61	24.39	-	98.6
4	Fizz juice	0%	2	10	10	23.86	2.68	0	0	0	0
		100%				23.86	2.86	32.2	11.91	98	102.2

From that experiment, the HPLC method was found to be accurate, less time-consuming, sensitive, reliable, and selective even at low concentrations. It could recognize the preservatives at one wavelength

in less than 10 minutes, involves no special sample preparations and recoveries were within 97-102 % which implies that the method is accurate. It was found that the cake sample exceeded the permissible preservatives limit and was not by the limits set by the Food Safety and Standards Authority of India and CODEX STAN. However, the other three samples complied with the limits.

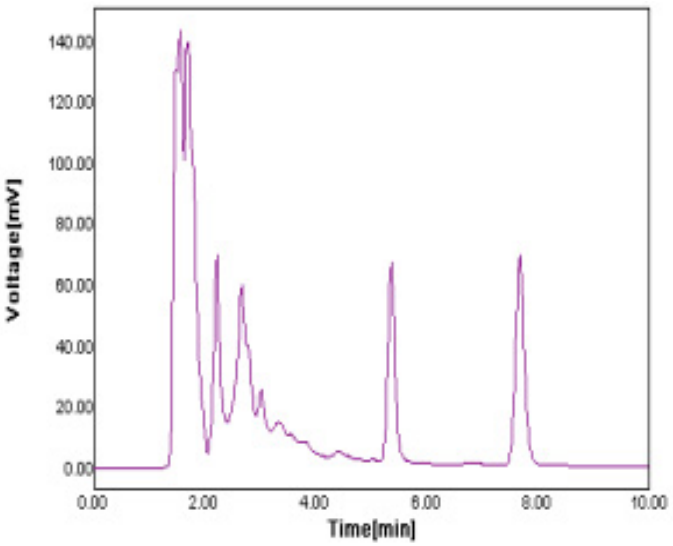

Figure 2: *Chromatogram of juice sample.*

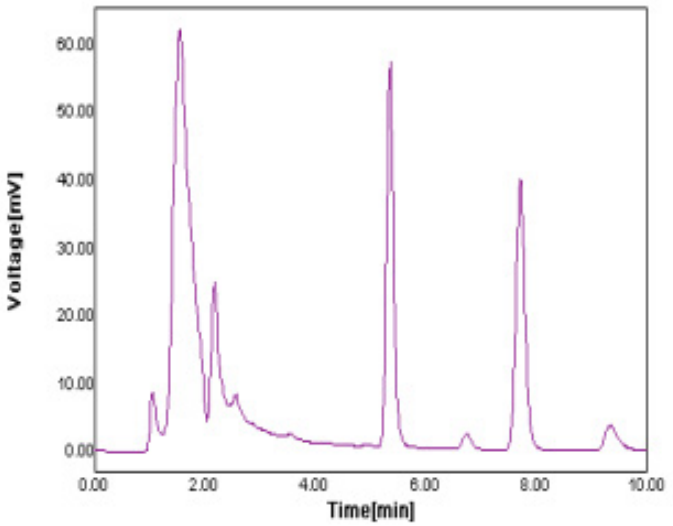

Figure 3: *Chromatogram of jam sample.*

Laser induced breakdown spectroscopy

In 2004, a new technique, Laser induced breakdown spectroscopy was used to determine sodium in bread samples at 589 nm. LIBS is an optical emission spectroscopy technique based on laser-produced plasma, in which a laser beam excites and intensively heats a small volume of the sample. The heated sample is taken to a gaseous plasma state and is broken down into atoms, which produces a characteristic light. This light is analyzed spectrally; and through calibration, the intensity of the spectra indicates the concentration of the elements in the sample (St-Onge *et al.*, 2004).

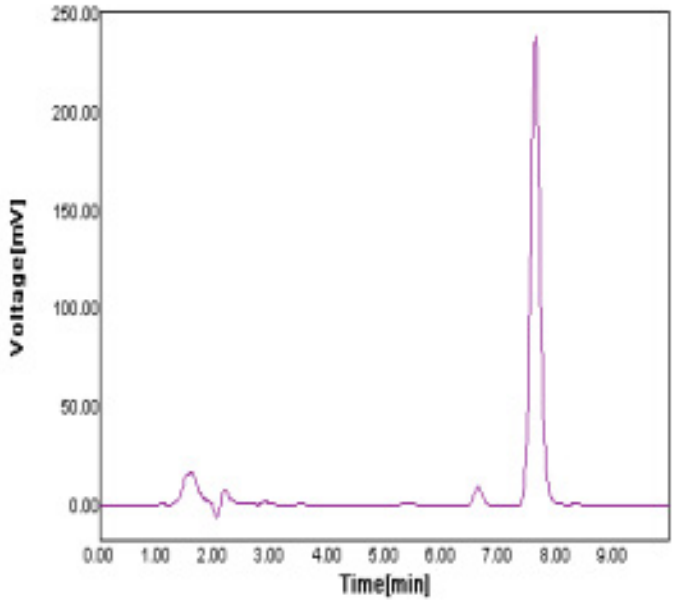

Figure 4: *Chromatogram of cake sample.*

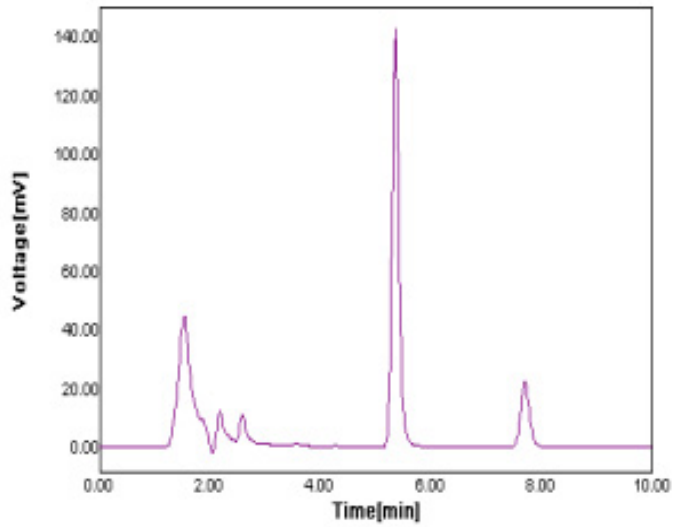

Figure 5: *Chromatogram of fizz juice sample.*

In 2015, experimentation was done by LIBS. The bread samples (400 mg) were dried in the oven and then pressurized to get the pellets of the samples. The samples were analyzed by laser induced breakdown spectroscopy in triplicate, scanned five different locations and five excitations per location. The calibration curves were recorded at 589 nm. The LIBS results were checked by two methods: Mohr method and atomic absorption spectroscopy method. It was done by determining Cl^- ion. For atomic absorption spectroscopy method, microwave digestion method was used and spectra was recorded at 589 nm. The results on the LIBS for standard samples shown that increasing the NaCl concentration, also increases the

sodium emission at 589 nm. The other low intensity lines were seen at 568 nm and 818 nm. First the standard samples were checked by the both reference method and then the samples were analyzed and confirmed by these methods. A comparison of the both emission intensity peaks were carried out. By LIBS method, good linear calibration curves were obtained with correlation coefficient (R^2) for Na was 0.962 and for NaCl was 0.981.

To conclude, the atomic absorption results of the commercial bread samples showed good correlation with low relative accuracy (RA) complying that LIBS proved to be a good technique for Na determination in food (Bilge et al., 2015; Gondal et al., 2009, 2010, 2014; Hussain and Gondal, 2013; Kim et al., 2012; Ahmad et al., 2020).

Another study was done on salt diffusion in meat by LIBS method. It was the first study of brine diffusion done by the more convenient LIBS method. For this purpose, three cubes of meat of equal cross section were taken. One piece was placed in the distilled water as a control sample and other two were placed in 6% brine solution for 2 h and 24 h, respectively. These were removed and their cross section were subjected to LIBS analysis. The results of LIBS images showed that the control sample had lowest sodium concentration, whereas the brined sample for 2 h had more sodium concentration over the edges than in the center. The diffusion of sodium for the 24 h sample showed more sodium intensity towards the center (Jolivet et al., 2019).

The LIBS images of the sodium intensity at 589.05 nm for three samples is shown in the Figures 6, 7, 8 (Dixit et al., 2017).

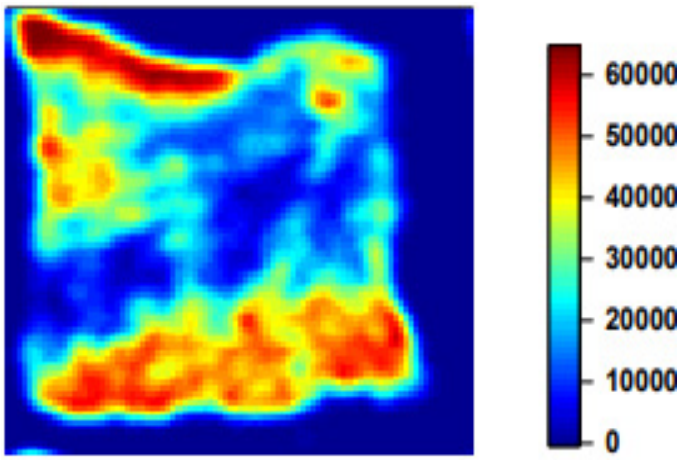

Figure 6: *Control sample.*

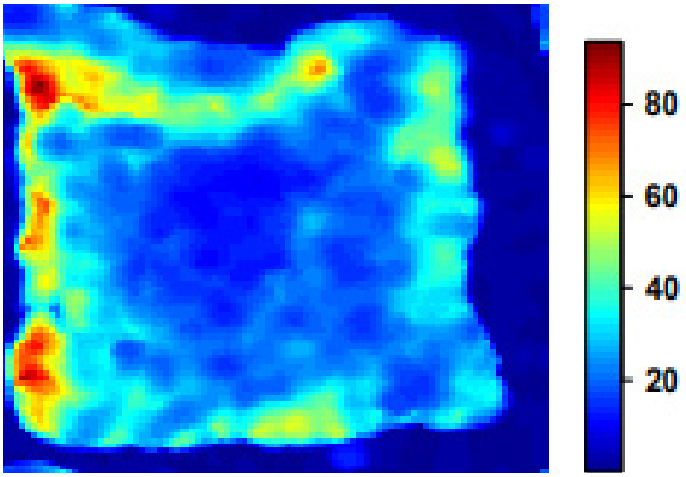

Figure 7: *Brined sample in 2 h (Na intensity on the edges).*

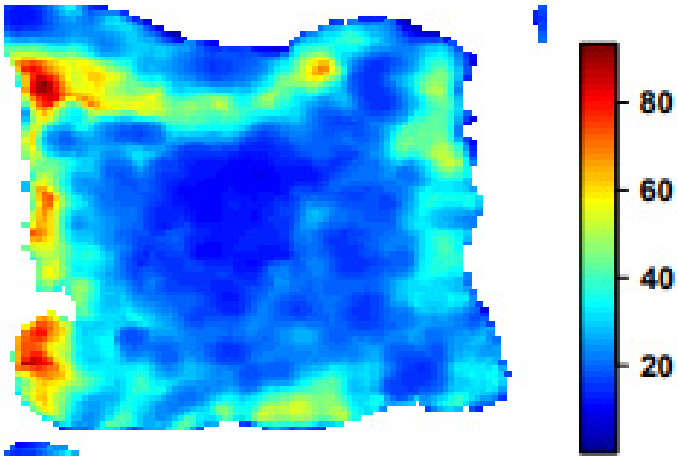

Figure 8: *Brined sample in 24 hr (Na intensity on the center).*

Overall, the results showed LIBS ability for sodium imaging. It was regarded as a favorable technique for optimizing brining time, brine concentration and brine temperature.

In 2020, the LIBS method was used for spectrophotometrically analysis of three bread samples (simple bread, milk bread and brown bread) of different brands in Pakistan. The samples were dried and made pellets by pressure treatment then subjected to LIBS with laser energy of 20-120 mJ. The emission spectra of the samples were obtained at 80 mJ laser energy and 2μs delay time. Seven different elements (Na, Ca, Mg, K, Fe, Ti and Ba) were detected in which two spectral lines of the neutral sodium were obtained at 588.99 nm, 589.59 nm. The experiment was concluded as there is low concentration of Na and K in Pakistani breads whereas the concentrations of magnesium and zinc were higher. It was further found that LIBS is a fast and convenient technique

for food analysis (Ahmad *et al.*, 2020; Jovanovic, 2014; Zafar *et al.*, 2019).

Thermometric endpoint titrimetry

In 2014, the sodium content in different food products was studied using thermometric endpoint titrimetry. First of all, sodium content in dairy and non-dairy milk products was determined using standard addition method. The results show the low concentration of sodium as shown in Table 8 (Smith and Haider, 2014).

Table 8: *Thermometric endpoint titrimetry results of total sodium content of soy and cow's milks.*

Mg, Na/100g		
Sample	**Nutritional information stated average values**	**Found by TET method**
Soy milk 1	25	24.9 ± 0.2 (n = 7)
Soy milk 2	44	65.1 ± 0.1 (n = 8)
Soy milk 3	60	61.2 ± 0.8[1] (AAS = 62.0[2])
Cow's milk	40	44.4 ± 0.41

The analysis of 2 minutes noodles was done. First, the dried noodle cake was crushed into a fine powder and then analyzed for sodium content. The flavor sachet was also passed through analysis procedure. The results were not close to the values stated in the nutritional contents of the label. The comparison of the both results, labelled and those determined by TET were elaborated in the Table 9 (Smith and Haider, 2014).

Table 9: *Comparison of manufacturer-stated average values with TET-analyzed values.*

Na mg/100g		
Component	**Nutritional information stated average values (label)**	**Found by TET**
Noodle cake	-	273±5(n = 8)
Beef flavor sachet	-	984±3(n = 5)
Chicken flavor sachet	-	1228±4(n = 5)
Total beef flavored sachet	1025	1256
Total chicken flavored sachet	1255	1501

Further the sodium content of cheese was determined. The shredded and sliced cheese was purchased from different shops and analyzed by TET. The results in comparison with the values stated on the label was shown in the Table 10 (Smith and Haider, 2014).

Table 10: *Comparison of manufacturer-stated average values with TET-analyzed values.*

Quantity of Na mg/100g		
Cheese sample	**Nutritional information stated values (label)**	**Found by TET**
Shredded parmesan	1060	986 ± 3 (n = 5)
Shredded tasty cheese	610	732 ± 5 (n = 5)
"Light" cheese slices	600	684 ± 3 (n = 5)
"Colby" slices	668	725 ± 9 (n = 5)

Lastly, sodium content in canned fish was checked by TET. The sodium in chunk style tuna in natural spring water was found to be approximately 236 mg/100 g whereas the labelled value was 253 mg/100 g. This method was found to be robust and reliable technique for sodium determination in foodstuffs.

Conclusions and Recommendations

Sodium is an essential element of food stuffs. The review discusses different analytical techniques for determining the quantity of sodium in various substances. These techniques include atomic absorption spectroscopy, chromatography methods, ion-selective electrode method, laser-induced breakdown spectroscopy, complexometric titration method, and thermometric endpoint titrimetry. Among these methods, spectrophotometric methods are highlighted for their cost-effectiveness, ease of use, and precision in quantifying sodium in food contents. In summary, the paragraph emphasizes the range of analytical methods available, with a particular focus on the advantages of spectrophotometric techniques for sodium quantification in food.

Novelty Statement

Sodium is an essential element to regulate the various functions of body. Spectrophotometric methods are cheap, easy to handle and more precise to quantify sodium in food contents.

Author's Contribution

Nauman Jamil Khan: Designing of project, proof-reading of the review article.
Rabia Tariq and Hina Saleem: Literature review, write up of review article.
Muhammad Waheed Mushtaq: Literature review, write up, and final form of complete review article.

Statement of conflict of interest

The authors have declared no conflict of interest.

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