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Proximate and Mineral Compositions of Dried Cauliflower (Brassica Oleracea L.) Grown In Sindh, Pakistan

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Abstract The study was examined the fresh, cabinet dehydrated and sun-dried cauliflower samples were analyzed for proximate as well as mineral analysis. Proximate analysis was cauliflower samples contained 90.62% moisture, 4.42% carbohydrate, 1.98% protein, 0.23% fat, 2.03% dietary fiber and 0.62% ash. Cabinet dehydration and sun drying substantially decreased moisture content to 9.99% and 13.27, respectively. Proportions of others components were increased, which include carbohydrate (42.44% and 38.37% for cabinet and sun drying, respectively, protein(19.06% and 18.37%), fats (2.24% and 2.16%),dietary fiber (18.59% and 18.80%) and ash (5.98% and 5.76%).In terms of mineral composition, fresh cauliflower samples were rich in phosphorus (61.35 mg/100 g), calcium (41.16 mg /100 g) and potassium (1.68 mg/100 g). These findings suggest that cauliflower is good source of dietary fiber, phosphorus and calcium. Both cabinet dehydration and sun drying are effective in preserving the chemical composition of cauliflower and preventing deterioration by reducing moisture.

Keywords: *vegetable, cauliflower, proximate, mineral composition, cabinet dehydration, sun drying*

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1. Introduction

Vegetables as a whole are considered natural sources of nutrients gifted by nature to human beings. Vegetables are important sources of food and are highly beneficial for health. Vegetables consumption is encouraged in many countries to prevent various diseases such as cancer and cardiovascular disorders [1]. Pakistan is an agricultural country and more than 60 different types of vegetable species are cultivated as summer and winter crops in Pakistan [2]. In Pakistan, among the vegetables, cauliflower is the most commonly grown as it gives better return over investment to the farmers [3,4,5]. Indian occupies first position in the production of cauliflowers and Pakistan ranked 22nd in area and 19th in production of cauliflower in the world. Its share in vegetables production of the world is 1.09 percent [6].

Vegetables occupy an important place among the food crops as they provide adequate amount of many vitamins and minerals for humans. They are rich source of carotene, ascorbic acid, riboflavin, folic acid and minerals like calcium, iron, and phosphorus [7]. Vegetables contained a large proportion of water and are susceptible to deterioration. Vegetable can be preserved by various techniques, but the widely used technique for vegetable preservation is drying. Removal of water from food is the key to enhance the shelf life of vegetables [8]. Pakistan has majority of urban and rural population surviving on vegetables, which is relishing food due to nutritive value such as vitamins, proteins, Calcium, Phosphorous, Iron, water and mineral salts etc. [9]. During the last five years per capita income (in dollars) in Pakistan has increased at an annual rate of 6.4 percent [10] and the vegetable per capita monthly consumption has shown an increase of 7.27 percent during the period 2007-08 to 2010-11 [11], that reflects a reasonable boost in the purchasing power and quantity of food consumed in general and vegetables in particular. Overall, the quality elasticities turned out to be positive (except tomato) with an estimated value of 0.0328, 0.019, 0.0712 and 0.1115 for potato, onion, cabbage & cauliflower and peas respectively implying that households in Pakistan purchase higher quality vegetables as their income rises.

Cauliflower (*Brassica oleracea* L.) belongs to family Cruciferous. Typically, only the head (the *white curd*) of aborted floral meristems is eaten, while the stalk and surrounding thick, green leaves are discarded. Whereas, its leaves which are generally thrown away as waste are also rich source of iron and β-carotene and thus can be utilized in various value added products [12]. Cauliflower is low in calories, high in vitamin C, a good source of folic acid and fiber. The main component of the cauliflower is water and it is a low calorie food because it has a low content of carbohydrates, proteins and fats. However, it is considered a good source of dietary fiber, vitamin B6, folic acid, Vitamin B5, and small amounts of other B group vitamins (like B1, B2 and B3) and minerals especially potassium and phosphorus [13]. Cauliflower contains important phytochemicals with its bioactive compounds, *glucosinolates*, and *indole-3- carbinol*, [14] cauliflower shows great promise in providing substantial protection against cardiovascular disease, cancer, diabetes. Phytochemical are plant compounds that exhibit potent anti-inflammatory, antioxidant, and anti-proliferative properties, making them ideal cancer fighters [15]. Cauliflower contains a high concentration of a class of phytochemicals known as glucosinolates, which are metabolized into isothiocyanates**.** A recent study published in the Journal of Medicinal Chemistry sheds light on how isothiocyanates in cauliflower exert their anti-cancer activity [16].

The basic essence of drying is to reduce the moisture content of the product to a level that prevents deterioration within a certain period of time, normally regarded as the "safe storage period"as reported by [17].Three techniques for foods drying are sun drying, cabinet (oven) drying and freeze drying. For the first two drying, two processes take place simultaneously which include a heat transfer to the product from the heating source and mass transfer of moisture from the interior of the product to its surface and from the surface to the surrounding air. Freezing drying involves the removal of water or other solvent from the frozen product by a process called sublimation. Freeze-drying is a drying process takes place by which the liquid state through sublimated and the suspension medium is crystallized at a low temperature from the solid state directly into the vapor phase [18]. As the liquid suspension becomes more concentrated, its viscosity increases inducing inhibition of further crystallization. This highly concentrated and viscous liquid solidifies, yielding an amorphous, crystalline, or combined amorphous-crystalline phase [19]. Freeze-drying is considered the best methods for drying. Freeze dried products are characterized with low bulk density, high porosity and better rehydration properties compared to products of alternative drying processes such as hot air drying, vacuum drying etc. [20,21]. The drying process may alter these properties, such as such as hot air vacuum drying and resulting in products with modified texture, optical, thermal and nutritional properties [22]. The other quality attributes of dried products, such as color, flavor, volatile components and nutrient retention, also are influenced by freeze-drying conditions.

The effect of drying methods (air, freeze, vacuum, and microwave, and osmotic) on shrinkage and porosity of dried fruits and vegetables were studied by [23].

Sun drying is one of the most economical methods of food preservation. Sun is the cheapest source of renewable energy and sun drying is still the most common method used to preserve agricultural products in most tropical and sub tropical countries despite the problems and the risk of contamination involved. High food losses result from inadequate drying, fungal attacks insects, birds and rodents, rain and other weathering effects. The quality of the dried products often degrades seriously, sometime beyond edibility [17]. However, at present a large proportion of the world supply of dried fruits and vegetables continue to be sun dried in the open under primitive conditions. Cabinet drying or dehydration is the removal of the majority of water contained in the fruit or vegetable and is the main stage in the production of dehydrated fruits and vegetables. Some drying methods are commercially available and the selection of the optimal method is determined by quality requirements, raw material characteristics, and economic factors [24]. Although food preservation is the primary reason for dehydration, dehydration of fruits and vegetables also lowers the cost of packaging, storing, and transportation by reducing both the weight and volume of the final product. To give the improvement in the quality of dehydrated foods, along with the increased focus on instant and convenience foods Dried or dehydrated fruits and vegetables can be produced by a variety of processes [25].

Although the nutritional profile of cauliflower has been reported that cauliflower production in Pakistan is very low as compared others like India with almost similar agro climatic conditions is the second largest vegetable producer in the world, while Pakistan ranks 48th and 42nd with respect to acreage and production of vegetables, respectively. Pakistan contributes only 0.44 percent to world vegetable production and ranks 19th in cauliflower production in the world [26]. Among the vegetables cauliflower is of much importance and cultivated about all over the year. It is a nutritious vegetable crop in the fact that unripe heads contain 7-10% dry mass, 4% carbohydrate, 2-3% protein, 60 mg vitamin C/100 g and other vitamins as well as minerals in traces. The produce of fruit and vegetable in Pakistan comes from approximately 811,800 hectares or about 4 per cent of the country's cultivated areas. Out of total annual agriculture production of the country, the province of Punjab contributes 59.6 percent, Sindh 8.6 per cent, Balochistan 25.6 per cent and NWFP contributed 6.2 percent [27]. Dried vegetables have gained commercial importance and their growth on a commercial scale has become an important sector of agriculture industry [28]. Considering these situations, the aim of this study were: (1) to investigate the effect of drying methods on proximate and mineral compositions of cauliflower grown in Sindh, Pakistan; (2) to evaluate and compare two drying methods on their ability in preserving the proximate and mineral components of cauliflower.

2. Materials and Methods

2.1. Sampling Design and Collection

Fresh cauliflower (*Brassica Oleracea* L.) 36 samples were collected from the local vegetable market of Tandojam and were brought to the Institute of Food Sciences and Technology, Sindh Agriculture University, Tandojam. The cauliflower was washed and cleaned with plain water to remove dirt, dust, etc. Next it was surface dried on filter paper for draining the water. Each whole cauliflower was cut with stainless steel knife and florets (edible portion) were kept for further study whereas non-edible portion comprising of upper stem, stalks and leaf midribs were discarded. The edible portion was further cut into small pieces and divided into three portions (fresh as control, open sun-drying and cabinet dehydration), placed in polyethylene bags and stored at -20^{0}C in freezer until further processing.

2.2. Cabinet Dehydration

Cauliflower samples were placed in the trays of dehydration chamber at 70°C or 12h. After the removal of moisture, the samples were packed and labeled in the transparent polyethylene bags for further analysis

2.3. Open Sun Drying

The samples of the cauliflower were kept in the flat dishes and exposed to shining sun for three days for sun drying in order to remove moisture. Dried cauliflower samples were then transferred into transparent polyethylene bags and labeled till further analysis.

2.4. Proximate and Mineral Analysis

The proximate analysis of food refers to the analysis of the total content of a food component. The macro components are usually analyzed for their proximate amounts [29]. The fresh and dried cauliflowers were analyzed for proximate composition that is, moisture, and protein, fats, carbohydrates, fiber, and ash contents. The samples were also evaluated for mineral compositions including zinc, phosphorus, calcium, potassium, magnesium and iron. All the experiment was triplicated. Detailed procedures for proximate and mineral analysis were as follows.

2.5. Determination of Carbohydrate (%)

The carbohydrates were determined by Anthrone method [30]. Standard solution was prepared in conical flask by dissolving 10 mg of glucose in 100 ml of distilled water. Sample solution was prepared in another conical flask by dissolving 50 mg of Anthrone reagent in 72 ml of sulphuric acid and mixing 28 ml of distilled water for the determination of carbohydrates. Three ml of solution was prepared in 6 test tubes by adding 0, 0.2, 0.4, 0.6, 0.8 and 1ml of standard solution and 3.0, 2.8, 2.6, 2.4, 2.2 and 2.0 ml of distilled water respectively. Six ml of sample solution was added in each test tube to bring the solution at the level of 9.0 ml. Then all the test tubes were kept in water bath at boiling temperature for 3 minutes. Then the test tubes were immersed in cold water to 15mins lower down the temperature and were kept on room temperature for further cooling. The absorbance on spectrophotometer (Hitachi 1800, Japan) was measured at 620 nm. The values of total carbohydrates were obtained from the calibration curve.

2.6. Determination of Fat (%)

Fat was determined by Mojonnier method [31]. The fat content was determined gravimetrically after extraction with diethyl ether (ethoxyethane) and petroleum ether from an ammonia alcoholic solution of the sample. About 10 g of sample was taken into a Mojonnier tube and then added 10 ml ethanol, and 2-3 ml ammonia solution was added. The sample was mixed well and cooled at room temperature. After cooling 25 ml diethyl ether was added and plugged the tubes with stopper and shaked vigorously. Again 25 ml petroleum ether was added and tubes were left for 1 hour. Repeat this extraction three times using a mixture of 5 ml ethanol, 25 ml diethyl ether and 25 ml petroleum ether, adding the extraction to the distillation flask. Distilled off the solvents, dried the flask for 01 hr at 100C and reweighed. Calculated the fat percentage of the sample given that the difference in the weight or the original flask and the flask plus extracted fat represent the weight of fat present in the original sample by the following formula.

$$\text{Fat content of sample} = \frac{W_2 - W_1 \times 100}{W_3}$$

Where W_1 = Weight of empty flask (g), W_2 = Weight of flask + fat (g) and W_3 = Weight of sample taken (g).

2.7. Determination of Protein (%)

The protein content was determined by following method of [32]. Fresh cauliflower samples were digested using micro kejldhal digester in the presence of Catalyst (0.3g) copper sulphate and 3 g sodium sulfate/potassium sulfate or catalyst tablets and sulfuric acid (25 ml). They were used as an oxidizing agent. The digested samples were diluted with distilled water (250 ml) using micro-Kjeldhal distillation unit. Steam was distilled over 2% boric acid (5ml) containing an indicator for 3 minutes.

The ammonia trapped in boric acid was determined by titrating with 0.1 N HCl. The nitrogen percentage was calculated by using the following formula.

$$N\% = \frac{1.4\left(V1 - V2\right) \text{ X normality)}}{\text{Wt of sample}} \text{X}100 -$$

While protein percentage was estimated by conversion of nitrogen percentage to protein, assuming that all the nitrogen in cauliflower was present as proteins, i.e.

$$\text{Protein \%} = \text{N\% X conversion factor}$$

Where Conversion factor = 100/N (N% in fruit products [31].

2.8. Determination of Moisture (%)

The moisture percentage of cauliflower was determined according to the method of [32]. The sterilized empty flat-bottomed dish was weighed on weighing machine and weight was recorded 5gm sample was placed in a dish and kept in an oven at 80^{o}C up to constant time (12-18 hours). Then dish was removed and placed in desiccators for 15 minutes and weight was recorded. The moisture % was calculated according to the following formula.

$$\text{Moisture\%} = \frac{\begin{pmatrix}\text{Wt of fresh sample}\\ -\text{wt of dried sample}\end{pmatrix}}{\text{Wt of fresh sample}} \text{X}100$$

2.9. Determination of Dietary Fiber

For determination of fiber, the estimation was based on treating the moisture and fat-free material with 1.25% dilute acid, then with 1.25% alkali. Then 2 g of moisture and fat-free material was treated with 200 ml of 1.25% H_2SO_4. After filtration with whattman filter paper No. 42 and washing, the residue was treated with 1.25% NaOH. It was then filtered, washed with hot water and then 1%

HNO_3 and again with hot water. The residue was ignited and the ash weighed. Loss in weight gave the weight of fiber.

$$\text{Fiber \%} = \frac{(c-b)-(d-b)}{(a)} x100$$

Where: a = weight of sample, b = weight of crucible, c = initial weight of crucible containing tissue sample before ignition and d = final weight of crucible containing ash after ignition.

2.10. Determination of Ash (%)

The Ash percentage was determined by using gravimetric techniques according to the method of AOAC, (2000) as follows. The 10gm sample was placed in a crucible and kept in Muffle furnace at 550°C for 6 hours and desiccators then cool and weight was recorded and calculated as follows.

$$\text{Ash \%} = \frac{\text{Weight of sample after ashing}}{\text{Total weight of fresh sample}} x100$$

2.11. Determination of Minerals

Zero point five gram of cauliflower powder or 0.5 ml fresh cauliflower juice was taken in conical flask in duplicate and 10 ml of nitric acid (HNO_3) was added. The mixture was heated on hot plate at 70-80°C for powder samples and at 35-40°C. Briefly, a known amount of the sample was digested with a mixture of concentrated nitric acid, sulphuric acid, and perchloric acid (10:0.5:2, v/v). After proper dilution, content of Potassium, calcium, magnesium, iron, zinc and phosphorus were determined by measuring atomic absorption spectrophotometer (Milner BA, Whitside PJ). An appropriate dilution was done with 0.4% lanthanum (w/w) to overcome ionic interference during the estimation of Ca and Mg. The results for minerals contents were expressed as mg/100g.

3. Results

Proximate compositions of fresh and dried cauliflower are presented in Table 1.

Table 1. Effect of different drying methods on proximate composition (%) of Cauliflower

Treatment	Fresh	Dehydrated	Open Sun-Drying
Moisture (%)	90.62 a	9.99 c	13.27 b
Ash (%)	0.62 b	5.98 a	5.76 a
Carbohydrate (%)	4.42 b	42.44 a	38.37 a
Protein (%)	1.98 b	19.06 a	18.37 a
Fat (%)	0.23 b	2.24 a	2.16 a
Dietary Fiber (%)	2.03 b	18.59 a	18.80 a

The highest moisture content was recorded in fresh sample i.e. (90.62 %) followed by open sun drying sample was found to be (13.27%) whereas, the lowest values of (9.99%) was recorded in the dehydrated sample and the results were highly significant at ($P < 0.01$) among the different drying methods. The highest moisture (5.98%) ash was found in dehydrated sample followed by open sun drying sample at (5.76%), whereas the lowest values of (0.62%) ash observed in the fresh sample, which were significantly different from each other. The high water content in cauliflower makes it ideal for vegetable juicing as a supplement to whole vegetable. Simultaneously, high moisture content tends to promote microbial contamination and chemical degradation [33].

The results indicated that the highest mean values (42.44%) carbohydrate was recorded in dehydrated sample, while in the open sun drying sample ranked 2nd which was observed (38.37%), whereas the minimum mean values (4.42%) observed in fresh sample of cauliflower. The result obtained from dehydrated sample was statistically different ($P< 0.01$) as compared to fresh sample. The highest (%) of protein was observed in dehydrated sample i.e. (19.06%) followed by open sun drying sample (18.37%). The lowest value of protein (%) of cauliflower (1.98%) was recorded in fresh sample and the results were highly significant ($P<0.01$).The highest fat (%) of cauliflower (2.24%) was recorded in dehydrated sample, followed by open sun drying sample that stood at (2.16%). The lowest mean value (0.23%) observed in fresh sample. The differences amongst treatments were statistically significant. The highest (%) of dietary fiber was observed in the open sun-drying sample i.e. (18.80%) followed by dehydrated sample i.e. (18.59%). The lowest value of (2.03%) was recorded in the fresh sample. The results obtained from dehydrated samples were statistically significantly different ($P<0.01$) as compared to the fresh sample.

Mineral compositions of fresh and dried cauliflower are presented in Table 2.

Table 2. Effect of different drying methods on mineral composition (mg/100g) of cauliflower

Treatment	Fresh	Dehydrated	Open Sun-Drying
Potassium content (mg/100g)	1.68 b	11.14 a	7.39 ab
Calcium content (mg/100g)	41.16 b	395.03 a	380.64 a
Magnesium content (mg/100g)	12.28 b	117.87 a	113.57 a
Iron content (mg/100g)	2.83 b	27.22 a	26.22 a
Zinc content(mg/100g)	1.86 b	17.88 a	17.23 ab
Phosphorus Content (mg/100g)	61.35 b	588.74 a	567.29 a

The potassium content of dehydrated sample of cauliflower was observed highest values i.e. (11.14 mg/100g), whereas the potassium contents by open sun drying and fresh samples were recorded (7.39 mg/100g) and (1.68mg/100g), respectively. The differences among treatments were statistically highly significant. Calcium content of cauliflower in the dehydrated samples highly significant (395.03 mg/100 g) followed by open sun drying sample (380.64 mg/100 g). While the calcium content in the fresh sample was recorded (41.16mg/100 g). The results obtained from dehydrated samples were statistically significant different ($P<0.01$) as compared to the fresh sample. The magnesium content of dehydrated cauliflower sample was (117.87mg/100g) observed highly significant. Whereas magnesium content in cauliflower in sun dried and fresh samples were (113.57mg/g) and (12.28 mg/100 g), respectively. The dehydrated cauliflower sample found to contain substantial iron content (27.22 mg/100 g), while the open sun drying sample ranked 2nd which was recorded (26.22 mg/100 g), whereas the minimum mean values observed (2.38 mg/100 g) in fresh sample. The results obtained from dehydrated samples were highly significant as compare to fresh sample. The data revealed that dehydrated cauliflower sample contained much better zinc values (17.88 mg/100 g) while the zinc contents of open sun drying sample, which stood at (17.23 mg/100g). The lowest mean values (1.86 mg/100 g) were recorded in the fresh samples, which were statistically different from each other. The phosphorus content of dehydrated cauliflower sample was highly significant (588.74 mg/100 g), whereas the phosphorus content followed by open sun drying sample was recorded (567.29mg/100g). while the fresh sample observed less value (61.35 mg/100 g). These results were showed highly significant differences in dehydrated samples as compared to fresh sample.

4. Discussion

This study showed that cauliflower has high moisture (90.62%). It is known that products that have low fat values normally have high moisture contents. Moisture (%) is a widely used parameter in the processing and testing of food. The observed value implies that cauliflower may have a short shelf life since microorganisms that cause spoilage thrive in foods having high moisture content and also is indicative of low total solids [34]. The high moisture content of cauliflower is consistent with the report of (Ekumankama, 2008) from Nigeria. which a high moisture value for vegetables like Oha (83.75%), Nturukpa (80.75%) and Okazi (83.75%) was observed.

The carbohydrate (%) of cauliflower (4.42%) in this study is low but it is higher than that of the related vegetable kale (2.36%) reported by [35]. Similarly, protein (%) in cauliflower (1.98%) is low and similar to these values reported by researchers in other vegetables. such as "Oha" (2.0%) and 'Okazi' (1.5%) [36]. No major changes in the sugar composition of extracted material were noted due to drying or cooking. The fat (%) of cauliflower is (0.23%) which is than that of kale (0.26%) [35]. since cauliflower is low fat (%) in vegetable, it can be used by individuals as a low caloric diet to reduce weight. The dietary fiber (%) of cauliflower (2.03%) was found to be lower than some other vegetables such as "Oha" (Pterocarpussoyauxii) 13.1%, "Nturukpa" (Pterocarpussantalinoides) 10.55%, "Okazi" (Gnetumafricanum) 24.6% Ekumankama (2008) and pigweed (Amaranthushybridus) 8.61 % [37] and *Telferiaoccidentalis* (2.3%) [38]. Fiber cleanses the digestive tract, by removing potential carcinogens from the body and prevents the absorption of excess cholesterol. Fiber also adds bulk to the food and prevents the intake of excess starchy food and may therefore guard against metabolic conditions such as hypercholesterolemia and diabetes mellitus. Fiber can also help to keep blood sugar levels under control. Cauliflowers have been considered a good source of dietary fiber. Our results are similar to [35] who reported that kale (3.0%) has been recognized excellent source of fiber, which is an important consideration for people who suffer from elevated cholesterol levels and in helping to cleanse the colon [39].

Cabinet dehydration and open sun-drying of cauliflower had higher proximate analysis values due to removal of moisture. Our results are in fair agreement with those of [40] who reported the gross chemical composition of white Cauliflower by-product powders as moisture (7. 65%), crude protein (22.01%), fat (4.44 %), ash content (8.64 %), total dietary fiber (10.05%) and total carbohydrates (47.21%).The result of the mineral composition Showed that cauliflower was show high values in phosphorus (61.35 mg/100 g), calcium (41.16 mg/100 g) and potassium (1.68 mg/100 g) as compared to other minerals. Because cauliflower to be considered good source of phosphorus, potassium and calcium [13] also reported that, cauliflower is a good source of these minerals. Calcium was abundant a significant percent of the daily calcium requirement could be obtained from consuming cauliflower. Iron level of cauliflower was very low (2.83 gm /100 g) in this study than the kale (8.94 mg/100 g) but it is higher than the [13] recommended dietary allowance for males (1.37 mg/day) and lower than the females (2.94 mg/day) [41], also reported a lower iron value (2.83 mg/100 g) for cauliflower. Iron has been reported as an essential trace metal and plays numerous biochemical roles in the body, including oxygen binding in haemoglobin and acting as an important catalytic center in many enzymes, [42].

Similarly findings have been reported by [43]. Cauliflower waste is rich in proteins and minerals by the different drying methods would have a direct impact on the nutrient availability for the growth of fungus and subsequent enzyme production. In present study, we were also observed low values of minerals especially iron and zinc by effected of different drying methods. Zinc content of cauliflower (1.86 mg/100 g) was observed in this study is lower than the kale (2.16 mg/100 g) reported by [35]. Similarly, the zinc content of cauliflower was also found to be lower than that of other vegetables like "Afang" (5.20 mg/100 g), "Afiakukwo" (3.81 mg/100 g), "Editan" (7.40 mg/100 g) and "Atama" (12.00 mg/100 g). The Required Daily Allowance (RDA) of zinc for infants, children, adolescents and adult males and females range between 2.0 mg/100 g to 11 mg/100gm [44].Magnesium is widely distributed in plant and animal foods and geochemical and other environmental Variables rarely have a major influence on its content in foods. Our result revealed that magnesium content in cauliflower was higher (12.28mg /100 g) which is also higher than the kale (6.69mg/100g) and other vegetables. Similar values have been reported by [35]. Most green vegetables, legume seeds, peas, beans and nuts are rich in magnesium, Most green vegetables, legume seeds, peas, beans and nuts are rich in magnesium, as are some shellfish, spices and soya flour, all of which usually protein content of kale confers on it the advantage as a contain more than 500 mg/kg fresh weight [45]. Magnesium content of cauliflower (12.28mg /100 g) was found to be lower than that of Purslane (101 mg/100 g) but higher than that of Oha (Pterocarpusmildbreadii) (0.25 mg/100 g), Nturukpa (Pterocarpussantalinoides) (0.28 mg/100 g), Okazi (Gnetum Africana) (0.21 mg/100 g), *A.* cruentus(2.53 mg/100 g), *T.* triangulare(2.22 mg/100 g), *Celosia* (1.41 mg/100 g) and *G.* latifolium(1.32 mg/100 g) respectively [38] and [36].

5. Conclusion

In conclusion, our findings indicate that cauliflower is a good source of dietary fiber, calcium and phosphorus. In addition, it was also concluded that cabinet dehydration and sun-drying are effective in not only preserving the chemical composition of cauliflower and preventing deterioration by reducing moisture.

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Conflict of Interest

The authors have declared that there is no conflict of interest.

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