

Research Article

# Effects of Preservation Methods on the Proximate Composition of Three Varieties of Pepper

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## Abstract

Pepper is a vital commercial crop, cultivated for vegetable, spice, and value-added processed products. It is an important constituent of many foods, adding flavour, colour, minerals and vitamins A and C, therefore, indispensable to Ghana and world food industries. Proximate analysis of food is very critical in the food science that determine the composition of any food substance. It is through the proximate analysis that nutritional assessment on moisture, ash, crude protein crude fat and crude fibre are made. Essentially, proximate analysis allows manufacturers to maintain quality control. This study aimed at determining the effects of preservation on the proximate composition of three varieties of pepper (*Capsicum frutescens*, *Capsicum cayenne* and *Capsicum chinense*) in the Bibiani Municipality of the Western North Region. The study was laboratory experiment. From the findings it was revealed that the pepper stored under room temperature was noted for good protein (14.64%), ash (8.04%) and fat (10.71%) and carbohydrate (68.09%) while parboiling pepper and drying influence a very high fibre (11.50%) content, and retain good amount of ash (5.53%), carbohydrate (68.09%) with poor fat (4.56%) and protein (10.21%) content. It was also observed that the ash content of pepper due to interaction effect of varietal variation and method of preservation also showed a distinct difference ( $p < 0.01$ ) The effect of interaction between the variety and method of preservation influenced a significant variation in the protein content of the pepper samples. The study showed moisture content in pepper differs with respect to difference in the variety. Hence, different variety of pepper has moisture level of a vary effect.

## Keywords

Pepper, Preservation, Proximate, *C. frutescens*, *C. chinense*, and *C. cayenne*

## 1. Introduction

Pepper (*Capsicum sp*) is an economically important crop belonging to the family Solanaceae. It originated from South and Central America where it is still under cultivation [1]. The major centre of diversity is Brazil where representatives at all cited levels are found [2]. Peppers are considered the first spice to have been used by human beings and there is archaeological evidence of pepper and other fossil foods from as early as 6000 years ago [3]. The genus *Capsicum* has

five domesticated species (*C. annum*, *C. frutescens*, *C. chinense*, *C. pubescens* and *C. cayenne*) of which *C. annum* is the most widely cultivated species worldwide.

Pepper is a vital commercial crop, cultivated for vegetable, spice, and value-added processed products [4]. It is an important constituent of many foods, adding flavour, colour, vitamins A and C and pungency and is, therefore, indispensable to Ghana and world food industries. It can be used

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medically for the treatment of fevers, colds, indigestion, constipation and pain killing [5]. It is also used by the security agencies in the preparation of tear gas.

For all these benefits the study aims at investigating the effects of preservation on the proximate composition of three varieties of pepper through the following objectives.

- 1) To determine the proximate composition of three pepper
- 2) To determine the effects of preservation on the proximate composition of the pepper

## 2. The Proximate Composition of Pepper

Water is an important part of all cells and fluids in the body. It carries nutrients to and waste products from cells in the body, aids in digestion and absorption of food and helps to regulate body temperature [6]. The maximum water content varies between individual vegetables because of structural differences and cultivation condition that influence structural differentiation and may also have a marked effect on water levels in vegetables [7]. The presence of water generally refers to Moisture (Moisture-[www.wikipedia.com](http://www.wikipedia.com)). High moisture content in vegetables is indicative of its freshness as well as easy perishability [8]. Higher moisture content in vegetables also suggests that the vegetable will not store for long without spoilage since a higher water activity could enhance microbial activity, bringing about food spoilage [9]. For vegetables to be kept for a long time before use, the moisture content must be reduced to inhibit the autocatalytic enzymes [10]. Removal of moisture results in increased concentration of nutrients [11]. Hot pepper has been reported to have varied moisture content of 81.8-89.6% [12] and 86.6% [13].

### 2.1. Crude Protein

Proteins are essential organic compounds of high molecular weight found in all living tissues which synthesize them at one time or another. They are formed from much similar building units called amino acids. Proteins may be categorized based on factors such as solubility and shape. They are broadly divided in two groups namely: simply and conjugated. Simple proteins consist of only amino acids as building blocks while Conjugated proteins contain amino acids but in addition, a non-protein or prosthetic group which may be glycoprotein, lipoprotein, chromoprotein [14].

Results of a study by [15] on nutrient values of three underutilized indigenous vegetables *Vitex doniana* Sweet, *Adenia cissamploides* Zepernick and *Zanthoxylum zanthoxyloides* Herms, indicated their protein contents as 8.74, 8.5 and 6.12 %, respectively. Crude Protein content of 3.1-7.7 % has been reported for hot pepper [12]. On the other hand, [16] reported protein content of 14.30 %-dry weight.

### 2.2. Dietary Crude Fibre

Dietary crude fibre is the edible parts of plants or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine. Dietary crude fibre includes polysaccharides, oligosaccharides, lignin, and associated plant substances. It promotes beneficial physiological effects including laxation, and/or blood cholesterol attenuation, and/or blood glucose attenuation. Dietary fibre may be classified into three major groups according to structure and properties. The groupings are cellulose, non-cellulose and lignin [17]. Dietary fibre or foods containing a high amount of dietary fibre are very low in caloric content. Dietary fibre yields only 2-3 calories/g. Thus, a high fibre diet is recommended or weight reducing regimes [18]. Mensah reported crude fibre content of *Amaranthus cruentus*, *Corchorus olitorius* and *Basella rubra* as 1.8, 8.5 and 0.6 g/100 g D M respectively [19]. Hot pepper has a crude fibre content of 1.3-1.4 % [12]. Emmanuel-Ikpeme *et al.* also reported a fibre content of pepper to be 1.02% - 13.22% [20].

### 2.3. Crude Fat Content

Dietary fats represent the most compact chemical energy available to man. They contain twice the caloric value of an equivalent weight of sugar. However, dietary fats should not be thought of solely as providers of unwanted calories as fats are as vital to cell structure and biological function as protein. Dietary fats provide the essential linoleic acid which seems to have both a structural and functional role in animal tissue. However, leafy vegetables are not noted for contributing significantly to the fat supply in foods [21]. It was also reported by [22] that crude fat contents of 3.19%, 3.0%, 1.33% and 1.50% in *Xanthosoma sagittifolia*, *Amaranthus cruentus*, *Talinum triangulare* and *Moringa oleifera* respectively.

### 2.4. Ash Content

Ash is the inorganic residue remaining after the water and organic matter have been removed by heating in the presence of oxidizing agents, which provides a measure of the total amount of minerals within a food. Higher ash content predicts the presence of an array of mineral elements as well as high molecular weight elements [22]. Ejoh *et al.* reported that *Vernonia amygdalina* has ash content of 7.7 g/100 g [23]. A study by [15] on *Zanthoxylum zanthoxyloides*, *Vitex doniana* and *Adenia cissamploides* stated that Ash content of the test vegetables ranged from 8.10 - 6.30 %. Hot pepper has a Total Ash content of 2.1-3.0 % [12]. Ogunlade *et al.* has also reported that the ash content of pepper to be (1.21 to 3.03%) in four *Capsicum species* – which includes *C. frutescens* (Cayenne and Bird pepper), and *C. annum* (Sweet and Bell pepper) [24].

## 2.5. Carbohydrate

The term “carbohydrate” from the French “hydrate de carbon” was originally defined to include all organic compounds containing C, H and O with the latter occurring in the same ratio as in water (2:1) with the exception of deoxyribose with the formula C. The modern definition is that carbohydrates are polyhydroxy aldehydes or ketones and their derivatives and other compounds that yield them on hydrolysis. Carbohydrates are the most abundant organic material on earth and in vegetable matter may form 50-80 % of the dry matter in the form of non-starch polysaccharides including cellulose, hemicelluloses and lignin [14]. Carbohydrate is the most important food energy provider among the macronutrients, accounting for between 40 and 80 percent of total energy intake. Foods containing carbohydrates are part of a healthful diet because they provide dietary fibre, sugars, and starches that help the body function well. The sugars and starches in foods supply energy to the body in the form of glucose, which is the preferred fuel for your brain and nervous system. It's important to choose carbohydrates wisely [25]. Mensah *et al.* reported carbohydrate content of *Amaranthus cruentus*, *Cochorus olitorius* and *Basella rubra* as 7.0, 26.6 and 2.9 g/100 g DM respectively [14]. Pepper has a carbohydrate 4.4-6.4 % as revealed by [12] with no specific carbohydrate requirements exist in humans [14].

## 2.6. Materials and Methods

### 2.6.1. Materials

The fruits were selected according to uniformity of size

and skin colour and fruits with defects or diseased were discarded. The fruits were randomly grouped into batches of ten. Fruits with uniform size, colour and no visible signs of defects were selected. A total of 165 fruits were randomly selected. 90 fruits were used to test for preservation methods. The fruits were then kept under ambient temperature ranging between 29.0 °C -30.0 °C.

### 2.6.2. Methods

A 3 x 3 factorial in a Completely Randomised Design (CRD) was used. Each treatment was replicated three (3) times. Factor one consists of the three varieties of pepper (African Bird eye, Yellow Lantern, Cayenne). Factor two consist of three methods of preservation (storage in room, storage in fridge and parboil and dry). The proximate composition of pepper involves analysing its moisture content, ash content, lipid (fat) content, protein content, and carbohydrate content. The following methods were used. The moisture content of pepper was determined using oven drying [26]. The ash content was also determined by incinerating a known weight of the sample in a muffle furnace at high temperatures until complete ashing was obtained [27]. The lipid content of pepper was determined using solvent extraction methods such as Soxhlet extraction with petroleum ether or hexane as applied by [28]. The protein content of pepper was determined using Kjeldahl method which involves combustion and nitrogen determination [29]. The carbohydrate content of pepper was determined by calculating the difference between 100% and the sum of moisture, ash, lipid, and protein contents [30].

## 3. Results

### 3.1. Proximate Composition of Pepper

**Table 1.** Proximate Composition of *C. Cayenne*, *C. Chinense* and *C. Frutescence*.

Variety of pepper	Proximate Composition					
	Moisture	Ash	Fat	Protein	Fibre	Carbohydrate
C. cayenne	5.00	4.25	12.75	11.99	1.79	69.23%
C. Chinense	4.75	2.40	6.25	9.54	6.96	74.86 %
C. frutescence	3.00	3.90	4.50	11.76	1.53	78.22%

The moisture level before storage ranged from 3.0% in *Capsicum frutescence* to 4.75% in *Capsicum Chinense* with *C. chinense* having 6.0%. *Capsicum cayenne* prior to storage had the highest ash content 4.25% of a similar effect as *C.*

*frutescence* 3.90% but differed from that of *C. chinense*, which had the lowest ash level of 2.40%.

*C. Chinense* had fibre content of 6.96% as the highest. It differed from *C. cayenne* and *C. frutescence* of 1.79% and

1.52% respectively of similar effect prior to storage. Concerning the fat content *C. cayenne* had the highest amount of 12.75% while *C. frutescence* had the lowest 4.50%. The effect of 4.50% was not different from 6.25% fat recorded in *C. Chinense*. For protein, *C. cayenne*, *C. frutescence* and *C. Chinense* had protein content of 11.99, 11.76 and 9.54 per-

cent respectively. *C. Chinense* had fibre content of 6.96% as the highest. It differed from *C. cayenne* and *C. frutescence* of 1.79% and 1.52% respectively of similar effect prior to storage. For Carbohydrate the highest amount was recorded in *C. frutescence* 78.22% while the least, in *C. cayenne* (69.23%) with *C. Chinense* having 74.86% of carbohydrate.

### 3.2. Effect of Preservation Method on the Proximate of Pepper

**Table 2.** The interaction effect of variety and method of preservation on the proximate composition of pepper.

Variety of Pepper*Method of Preservation	Moisture (%)	Ash (%)	Fat (%)	Protein (%)	Fibre (%)	CHO (%)
<i>C. cayenne</i> *storage in room	9.50 d	3.75 e	10.71 a	14.64 b	4.46 e	56.94 g
<i>C. cayenne</i> *storage in fridge	10.50 c	2.99 h	9.06 c	10.65 f	3.48 g	63.32 d
<i>C. cayenne</i> *parboiled	11.50 a	3.49 f	7.48 e	10.21 g	4.05 f	63.04 e
<i>C. chinense</i> *storage in room	5.50 f	2.67 i	9.98 b	11.98 e	3.10 h	66.86 b
<i>C. chinense</i> *storage in fridge	7.00 e	3.05 g	8.22 d	12.87 c	3.50 g	65.36 c
<i>C. chinense</i> *parboiled	5.50 f	3.99 d	4.72 f	12.87 c	4.63 d	68.09 a
<i>C. frutescence</i> *storage in room	10.50 c	8.04 a	3.82 g	15.09 a	8.93 b	53.62 i
<i>C. frutescence</i> *storage in fridge	11.30 b	5.19 c	3.16 h	12.43 d	5.16 c	62.31 f
<i>C. frutescence</i> *parboiled	11.50 a	5.53 b	4.56 f	10.65 f	11.70 a	55.99 h
Lsd (0.01)	0.106	0.06	0.51	0.05	0.06	0.06
CV	0.32	0.39	2.08	0.12	0.29	0.03

#### Moisture content

The results on moisture content due to interaction effect of pepper variety and method of preservation showed a distinct difference ( $p < 0.01$ ) among the means. Moisture content was highest (11.50%) when *C. cayenne* and *C. frutescence* were parboiled and dried. The least (5.50%) was recorded in *C. chinense* when either stored open in room or parboiled and dried. *C. cayenne* and *C. frutescence* had same moisture level of 10.50% when stored in fridge and room respectively. Their mean effect was lower to 11.30% recorded in *C. frutescence* stored in fridge but higher than 9.50% and 7.00% observed in *C. cayenne* and *C. chinense* when stored in room and fridge respectively

#### Ash content

The results on ash content of pepper due to interaction effect of varietal variation and method of preservation also showed a distinct difference ( $p < 0.01$ ) in the means. That is, the treatment samples had ash level of a distinct effect. Ash content was highest (8.04%) when *C. frutescence* was stored in room but lowest (2.67%) in *C. chinense*, also stored in room. The ash content in *C. frutescence* was 5.53% and 5.19% when parboiled and dried, and stored in fridge respectively. Their effect varied from the 3.90% recorded in *C. chinense*

when parboiled and dried, 3.75% and 3.49% of *C. cayenne* stored in room and, parboiled and dried as well as 3.05% and 2.99% in *C. chinense* and *C. cayenne* respectively when stored in fridge.

#### Fat content

Significant difference ( $p < 0.01$ ) was observed in the fat content of pepper due to effect of interaction between variety and method of preservation. Fat content was highest (10.71%) in *C. cayenne* when stored in room but, lowest (3.16%) in *C. frutescence* stored in fridge. They varied significantly from each other with regards to their effect and also, against the rest of the treatment means.

*C. chinense* had 9.98% fat, the second highest when also store in room, followed by *C. cayenne* (9.06%) and *C. Chinense* (8.22%) when stored in fridge, *C. cayenne* (7.48%), *C. chinense* (4.92%) and *C. frutescence* (4.56%) when parboiled and dried, and *C. frutescence* (3.82%) when stored in room.

#### Protein content

The effect of interaction between the variety and method of preservation influenced a significant variation in the protein content of the pepper samples. The protein levels ranged from 10.21% in *C. cayenne* parboiled and dried to 15.09% in *C. frutescence* stored in room.



*C. cayenne* when kept under room storage had 14.64% protein higher in value than 12.87% observed in *C. chinense* when either stored in fridge or parboiled and dried. Likewise, the protein value in *C. frutescence* (12.43%) was higher than the amount observed in *C. chinense* (11.98%) stored in room as well as *C. cayenne* and *C. frutescence* kept in fridge and, parboiled and dried respectively.

#### Fibre content

Fibre content varied significantly ( $p < 0.01$ ) among the pepper samples as result of the interaction effect between variety and method of preservation. The fibre content ranged from 3.10% in *C. chinense* to 11.77% in *C. frutescence* when stored in room and parboiled and dried respectively.

Also, *C. frutescence* recorded 8.93% and 5.61% fibre content of a varied effect when stored in room and in fridge respectively. Parboiled *C. chinense* when dried had 4.63% fibre and it differed from *C. cayenne* with 4.46% and 4.05% when stored in room, and preserved by parboiling and dried. No difference was observed in the fibre content when *C. chinense* and *C. cayenne* were stored in fridge with 3.50 and 3.48 percent fibre.

#### Carbohydrate content

There was a significant difference ( $p < 0.01$ ) in the carbohydrate content of pepper as a result of the interaction of the treatment factors. The amount was highest (68.09%) in *C. chinense* when it was parboiled, dried and stored in room. It was however lowest (53.62%) in *C. frutescence* when stored in room. All the treatment samples varied from one another in terms of their effect.

Also, *C. chinense* in room and fridge had 66.86% and 65.36% carbohydrate in turns greater in effect than rest of the treatment samples. *C. cayenne* recorded 63.32% when kept in fridge, 63.04% when parboiled and 56.94% when stored in room. *C. frutescence* when preserved in fridge had 62.31% but, 55.99% when parboiled, dried and stored in room.

## 4. Discussion

The study showed moisture content in pepper differs with respect to difference in the variety. Hence, different variety of pepper has moisture level of a vary effect. A similar outcome is observed in the [20] study. There was also variability in the amount of moisture in fresh pepper before, and after storage. The amount of moisture increased in the pepper varieties except for *Capsicum chinense* when kept preserved for some period. This occurrence may be as results vary rate of reaction of the varieties to storage condition.

The moisture content in pepper, based on the study ranged from 5.50% to 11.50% depending on treatment applied. For instance, *C. chinense* had the lowest moisture level when stored fresh under room condition or when parboiled, dried and stored. *C. cayenne* and *C. frutescence* on the hand were observed to contain the highest moisture level of similar effect when parboiled, dried and stored. The outcome indicates

pepper reacts differently to the treatment(s) with regards to level of moisture.

The results on the preservation methods indicated that storage in fridge had a high impact on pepper as it influenced very high moisture retention unlike when pepper was stored preserved in room condition. The variation may be due to the storage condition such as the temperature, relative humidity and vapour pressure deficit (VPD) [26]. Hence, the low moisture level as observed when storage was done under room condition is as a result of a possibly high temperature, low relative humidity and high VPD. And high moisture level effect observed in pepper when in fridge occurred due to constant cooling effect and high moisture retention effect. This in effect, maintains freshness of fresh produce for much long.

The treatment factors; variety and method of preservation singly and interactively had a significant ( $p < 0.01$ ) effect on the ash content of pepper. From the results, ash content in pepper ranged from 2.67% in *C. chinense* to 8.04% in *C. frutescence* when stored fresh under room condition. [24] reported low ash levels (1.21 to 3.03%) in four *Capsicum species* – which includes *C. frutescence* (Cayenne and Bird pepper), and *C. annuum* (Sweet and Bell pepper).

Analysis on the fresh pepper samples prior to treatment application and storage indicated a very high ash level in *C. cayenne* whose effect was not different from *C. frutescence*. *C. chinense* was low in ash and its effect differed. The ash level was 2.40% to 4.25%. After being preserved for a period of time, the ash level dipped in *C. cayenne* but increased in the rest of assessed varieties. And the amount was highest in *C. frutescence* but lowest in *C. chinense*. The outcome suggests that, pepper may either increase or decrease in ash level depending on the variety when kept preserved for some period of time. The ash content in the pepper samples were noted to range from 2.67% to 8.04%. This level was lower than the amount (9.78% to 16.77%) reported by [19] in three pepper varieties; *C. annuum*, *C. genus* and *C. frutescence*. In their report, they observed *C. frutescence* being richer in ash content than the other two varieties studied.

Preserving fresh pepper under room condition had a positive effect and yielded higher ash level as compared to when kept in fridge. But this also depends a lot on the variety of pepper. For instance, *C. frutescence* recorded the highest ash level when kept preserved in room. However, under the same room condition, *C. chinense* had the lowest ash level.

There was significant difference ( $p < 0.01$ ) in the fat content of pepper due to the single and interactive effect of the variety and method of preservation. As regards to the effect in differences in the variety of pepper, fat content of fresh pepper ranged from 4.50% in *C. frutescence* to 12.75% in *C. cayenne* prior to any treatment application. Both varieties of pepper in storage however had 3.85% and 9.08% fat respectively. Therefore, a dip in ash level of pepper may occur when stored for some period of storage. *C. chinense* however reacted differently as its fat content increased.

Preserving the fat level in fresh pepper by storage in room was most effective. This is based on the fact that samples kept under this condition largely recorded the highest fat content while pepper samples that were parboiled, dried and stored in room had significantly, the lowest fat levels. The extent of heating and length of time during parboiling may contribute the low-fat level. Parboiling, as preservation method is done on the principle of applying heat (of a specifically high temperature) shortly to alter or/and stop the enzymatic reaction or metabolic processes of the living produce. The heating may have cause fat to be volatile and influence a loss in the level.

On the impact of the interaction of the treatment factors on the pepper, it was noted that fat level of the pepper samples varied. The means ranged from 3.16% in *C. frutescence* to 10.71% in *C. cayenne* when kept in fridge and preserved fresh under room condition respectively. The difference in the mean values of the fat was as result of the combined effect and also, the variation in the reaction of the varieties to the preservation methods. It may be deduced from the results; specific pepper variety could react and record different fat levels of a significant effect when subjected to different method of preservation. [19, 10] findings have indicated that, the pepper's fat could be lower as compared to the currents study with 2.1% - 5.06%, 0.35% - 1.75% and 1.52% - 2.87% respectively. Some several factors such varietal variations, processing methods, packaging and storage may account for the variations in the amount of fat.

Literature has shown vary level of protein recorded in pepper for which varietal variation contributes significantly to such variations [19, 24]. As regards to the current study, protein content of pepper was singly and interactively affected by difference in variety and method of preservation. The amount ranged from 10.21% in *C. cayenne* to 15.09% in *C. frutescence* which is more than 2.64% - 3.51% reported by [10] but similar to 9.63% - 11.97% and 8.2% - 11.22% [19]. The outcome suggests *C. frutescence* is naturally rich in protein content as compared to the rest of the pepper varieties assessed. Also, the lowest and highest protein values were attained when preservation was done by parboiling, and storage in room respectively. This suggests that, protein content is highly preserved in pepper at fresh state when stored under room condition.

Fresh *C. cayenne* and *C. frutescence* were similar in protein but differed from *C. chinense* prior to storage. And their protein levels increased during storage except for *C. cayenne* – which was of lowest protein. *C. frutescence* however, had the highest protein content. Hence, storage effect on pepper is significant and there is the tendency for *C. chinense* and *C. frutescence* to increase their protein levels. This may due to a slow but steady ripening process observed in them – making available more protein content as compared to what is noted in *C. cayenne*.

There was a change in the protein per a specific pepper variety when subjected to the different methods of preservation.

Similarly, protein varied with a significant effect when the three pepper varieties were preserved using a specific kind of preservation. This shows that, the quantity of protein in pepper could either vary depending on the variety or how it is preserved. Also, a change may occur due to the interaction effect.

The treatment samples' fibre varied significantly ( $p < 0.01$ ) due to effect of the variety and method of preservation singly and interactively. The fibre content of pepper ranged from 3.10% to 11.77% in *C. Chinese* and *C. frutescence* when stored fresh in room and parboiled respectively. The level falls within 1.02% - 13.22% observed by [19] but lower and higher than 29.26% - 33.17% [18] and 2.37% - 4.71% [10].

The results on the effect of interactions of the treatment factors showed a difference in the varieties when they were subjected to a specific method of preservation except in the case of *C. Chinese* and *C. cayenne* when preserved fresh in fridge. The similarity may be due to an equal response of both varieties to cooled condition on fibre level. Also, each of the variety had diverse fibre content when preserved by use of the different preservation methods.

Preservation had a significant impact and could increase fibre content depending on the approach. For instance, parboiling largely enhanced fibre level especially *C. frutescence*. But a significantly low fibre was noted in the same variety when it was preserved in fridge. The fibre content of *C. cayenne* and *C. frutescence* were very low and not different in effect unlike *C. Chinese*, based on the baseline analysis. That is, a very freshly *C. Chinese* variety is good in fibre until when kept for some time. And after a period of storage, the sole effect of varietal variation revealed *C. frutescence* is a fibre rich variety as compared to *C. cayenne* and *C. Chinese* whose levels were largely low.

The carbohydrate content of pepper ranged from 53.62% to 68.09% with regards to the interaction effect. Carbohydrate was highest in *C. Chinese* when parboiled but lowest in *C. frutescence* when kept fresh in room. The levels significantly varied among the treatment samples. The interaction effect also indicated each variety varied in the amount of carbohydrate when subjected to the various preservation methods. Similarly, the pepper varieties differed in the nutrient level when they subjected to a specific preservation method.

Preservation of fresh pepper in fridge largely influenced very high carbohydrate content. For instance, *C. cayenne* and *C. frutescence* individually had high level of carbohydrate when preserved in fridge as compared to the rest of the methods. However, under room condition the carbohydrate level in pepper was largely low. This occurred in each of the variety except for *C. Chinese* (with respect on the interaction effect).

According to the varietal effect after storage, *Capsicum Chinese* is observed to be very high in carbohydrate unlike *C. frutescence*. This occurrence did not change with effect of preservation on them (with reference to the interaction ef-

fect). However, the baseline results proved otherwise – *C. frutescence* was very high in carbohydrate at a very fresh state. Varietal difference of the varieties hence had a significant impact. A lost occurred in the value of carbohydrate after storage.

## 5. Conclusion

In fact, this study has revealed the effect of storage on the proximate composition of pepper that underscores the importance of proper storage conditions to maintain its quality and nutritional integrity. Ideal storage conditions for pepper include cool, dry, and dark environments to minimize moisture absorption, prevent lipid oxidation, and inhibit microbial growth. From this study, the findings have revealed that pepper in room storage condition provide a good source of fat, protein and carbohydrate for *C. chinense*. Parboil storage condition has also proved to be a good source of carbohydrate.

## 6. Recommendations

The existence of variation proximate composition of pepper as result of different temperature condition gives a clear caution on how the pepper should be stored. It is therefore, recommended that irrespective of the variety and storage conditions regular monitoring of stored pepper for signs of deterioration and adherence to recommended storage practices are essential for preserving its nutritional quality due to the moisture content.

## Abbreviations

DM	Dry Matter
g	Grams
c	Capsicum
sp	Species
C, H and O	Carbom, Hydrogen and Oxygen

## Author Contributions

Gyamfi Austin Christopher is the sole author. The author read and approved the final manuscript.

## Conflicts of Interest

Author declared that this work is sole financed by author and therefore, this article is not affiliated to any organisation which may not have any conflicts of interest by the academic community or organisation. In this case I declare no conflicts of interest.

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## Research Field

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