

## The Comparison of Nutrients Values in Various Cabbages

Tin Htwe Mu\*

### Abstract

Humans need to consume food compounds such as carbohydrates, proteins, fats, and vitamins to meet their energy requirements. In this research, reagents were used as indicators to test various cabbages for the presence of specific nutrients. The various cabbages (broccoli, white cauliflower, green cabbage and red cabbage) purchased from Myoma market in Magway Township, Magway Region. In this study, the determination of nutritional values such as moisture, ash, fat, fibre, protein, carbohydrate and vitamin C were carried out dried powder sample by using AOAC method and advance techniques. The water content in cabbages and cauliflower samples were found to be in the range 12.89 % - 13.29 % and 13.05 % - 16.67 %. The ash contents of sample broccoli, white cauliflower, green cabbage and red cabbage were found to be 6.93 %, 8.31 %, 6.00 % and 10.00 %, respectively. The fat content of white cauliflower has the highest value 6.81% and red cabbage has the lowest value 0.3 % were found in various cabbages. The fibre content of red cabbage was found 20% and green cabbage has 10%. The four of various cabbages are most nutritious and palatable vegetables as well as it contains fewer calories.

**Keywords:** broccoli, white cauliflower, green cabbage, red cabbage, nutrients, vitamin C

### Introduction

Cabbage or headed cabbage (comprising several cultivars of *Brassica oleracea*) is a leaf green, red (purple) or white (pale green) biennial plant grown as an annual vegetable crop for its dense-leaved heads. Cabbage is high in nutritional value. It is full of vitamin K and anthocyanins that help with mental function and concentration. These nutrients also prevent nerve damage, improving your defense against Alzheimer's disease and dementia. Red cabbage has the highest amount of these power nutrients. Cabbage helps dry up oily and acne skin. The fiber and water content in cabbage also help to prevent constipation and maintain a healthy digestive tract. The high content of vitamin C and sulphur in cabbage remove toxins (free radicals and uric acid), which the main causes of arthritis, skin diseases, rheumatism and gout (Ambrosone & Tang, 2009). When cabbages levels become too high, they can damage your cells. Cabbages are especially high in vitamin C, a potent antioxidant that may protect against heart disease, certain cancers and vision loss. Cabbage is a low-calorie vegetable that is rich in vitamins, minerals and antioxidants. Most natural foods are composed largely of water. Reduction of water content has the greatest effect of increasing protein. Vitamin C can be determined by using of an oxidation-reduction reaction. Vitamin C, more properly called ascorbic acid, is an essential antioxidant needed by the human body. Once all the ascorbic acid has been oxidized the excess iodine is free to react with the starch indicator, forming the blue-black starch-iodine complex (Jaffe, 1994). Fibre refers to the indigestible carbohydrate component that is present in plants. The name is derived from the fact that it has a naturally fibrous structure. Its primary purpose in plants is to form part of the structure in the cells, but it is also useful for the human diet. The aim of this research studied the comparison of the specific nutrients in various cabbages.



Botanical Aspects of Green Cauliflower (Broccoli)

Scientific name	: <i>Brassica oleracea</i> var. <i>botrytis</i> L.
Family	: Brassicaceae / Cruciferae
Genus	: <i>Brassica</i>
Species	: <i>capitata</i>
English Name	: Broccoli
Common name	: Cauliflower
Myanmar Name	: pan-mon-la/ Kobi-pwin



Botanical Aspects of White Cauliflower

Scientific name	: <i>Brassica oleracea</i> var. <i>botrytis</i> L.
Family	: Brassicaceae / Cruciferae
Genus	: <i>Brassica</i>
Species	: <i>capitata</i>
English Name	: White Cauliflower
Common name	: Cauliflower
Myanmar Name	: pan-mon-la/ Kobi-pwin



Botanical Aspects of Green cabbage

Scientific name	:	<i>Brassica oleracea</i> var. <i>capitata</i> L.
Family	:	Brassicaceae / Cruciferae
Genus	:	<i>Brassica</i>
Species	:	<i>capitata</i>
English Name	:	Green cabbage
Common name	:	Cabbage
Myanmar Name	:	Kobi-htoke/ Monla-htoke



Botanical Aspects of Red cabbage

Scientific name	:	<i>Brassica oleracea</i> L. var. <i>capitata</i> L. <i>rubra</i>
Family	:	Brassicaceae
Genus	:	<i>Brassica</i>
Species	:	<i>capitata</i>
English Name	:	Red cabbage
Common name	:	Cabbage
Myanmar Name	:	Kobi-htoke/ Monla-htoke

## Materials and Methods

### Sample Collection and Preparation

The four kinds of cabbages were purchased from Myoma Market in Magway Township, Magway Region. These collected samples were rinsed three times with distilled water and air dried at room temperature. Then dry samples were ground by electric blender. The powdered samples were stored in an air-tight container to prevent moisture and other contamination. The dried powdered samples were used to determine some nutrient of various cabbages.

### Preliminary Physicochemical Analysis of Various Cabbages

The nutritional value of moisture, fiber, fat, ash, protein, carbohydrate and vitamin-C value of various cabbages were determined by AOAC method (AOAC, 2000).

#### Determination of Moisture Content

The moisture content of four cabbages was determined by oven drying method. The moisture content was the weight lost due to the evaporation of water the drying temperature.

#### Determination of Ash Content

The ash content is the inorganic residue remaining after the organic matter has been burnt away, usually at a temperature not exceeding red heat.

#### Determination of Fat Content

Crude fat content was determined by extracting the dried sample with petroleum ether (40° - 60 °C) in a continuous extraction apparatus of the Soxhlet type.

#### Determination of Fiber Content

Fiber content of samples was determined by acid-base digestion method.

#### Determination of Protein Content

The protein content was determined by micro-Kjeldal's method

#### Determination of Carbohydrate Content

Carbohydrate content was determined by subtraction method. The total carbohydrate content of samples can be obtained as the difference between 100 and the sum of the percentage of ash, fat, fiber, moisture and protein.

#### Determination of Vitamin C

Vitamin C can be determined by using of an oxidation-reduction reaction. Vitamin C, more properly called ascorbic acid, is an essential antioxidant needed by the human body. Once all the ascorbic acid has been oxidized the excess iodine is free to react with the starch indicator, forming the blue-black starch-iodine complex. This is the endpoint of the titration. This method is suitable for use with vitamin C tablets, fresh of packed fruit juices and solid fruits and vegetables (Weber, et al., 1996).

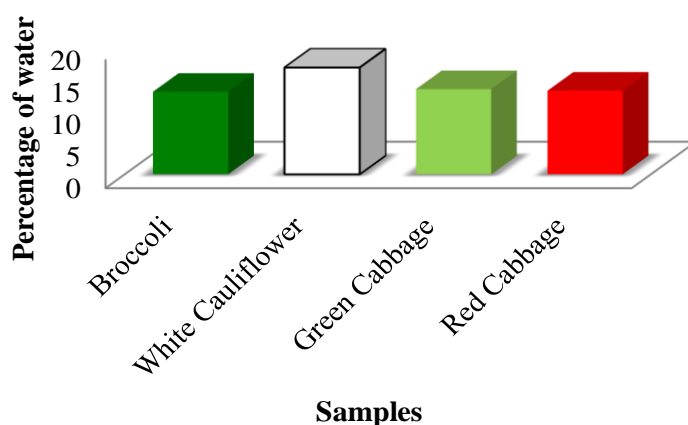
## Results and Discussion

Water is present in all food in varying amounts. Generally, water is determined by drying to constant weight and taking the loss in weight as water. In the

present work water contents of four cabbage samples were determined by oven drying method. The water content in four cabbage samples was found to be in the range 12.89 % - 16.67 % (Table 1). The loss of water content in cabbage could also help to preserve the sample and to keep longer shelf life.

**Table 1 The Experimental Results of Water Contents in Various Cabbages**

No	Samples	Water (%)
1	Broccoli	12.89
2	White Cauliflower	16.67
3	Green Cabbage	13.29
4	Red Cabbage	13.05

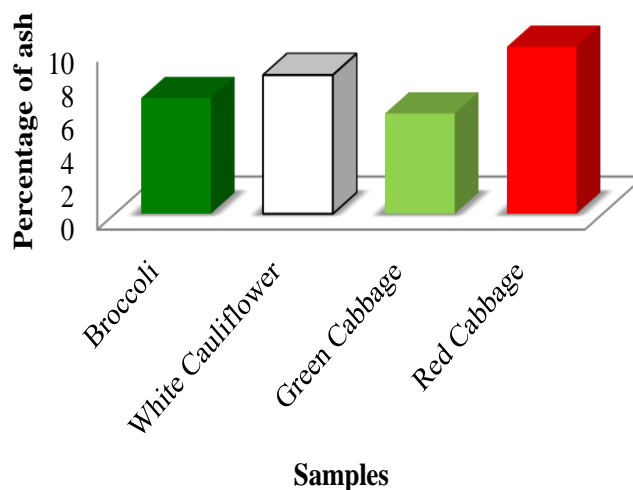


**Figure 1 Percent of water contents in various cabbages**

In this work the ash content of the samples was determined by ashing method. The results are shown in Table 2. It was found that the ash contents of broccoli, white cauliflower sample, green cabbage, and red cabbage are 6.93 %, 8.31 %, 6.00 % and 10.00 % respectively.

**Table 2 The Experimental Results of Ash Contents in Various Cabbages**

No	Samples	Ash (%)
1	Broccoli	6.93
2	White Cauliflower	8.31
3	Green Cabbage	6.00
4	Red Cabbage	10.00

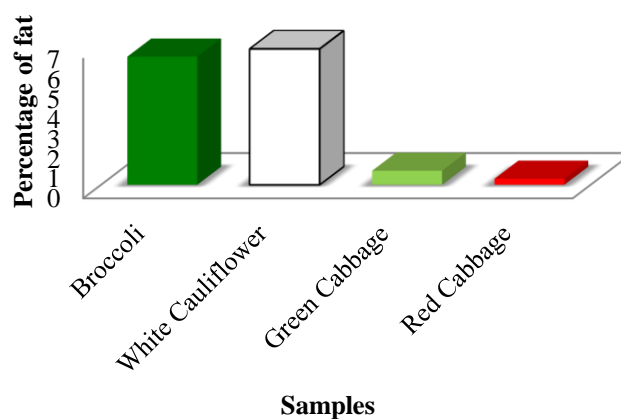


**Figure 2 Ash percent in four cabbages**

Fat is determined in food by extracting the dried material with petroleum ether (40 °C -60 °C) in a continuous extraction apparatus of the soxhlet type. In the present study, the fat contents of the determined by the above method (Rosenthal, et al., 1985). These results are shown in Table 3 and Figure 3. It was found that sample white cauliflower has the highest content of fat 6.81 % and sample red cabbage has the lowest content of fat 0.3 %.

**Table 3 The Experimental Results of Fat Contents in Various Cabbages**

No	Samples	Fat (%)
1	Broccoli	6.42
2	White Cauliflower	6.81
3	Green Cabbage	0.70
4	Red Cabbage	0.30

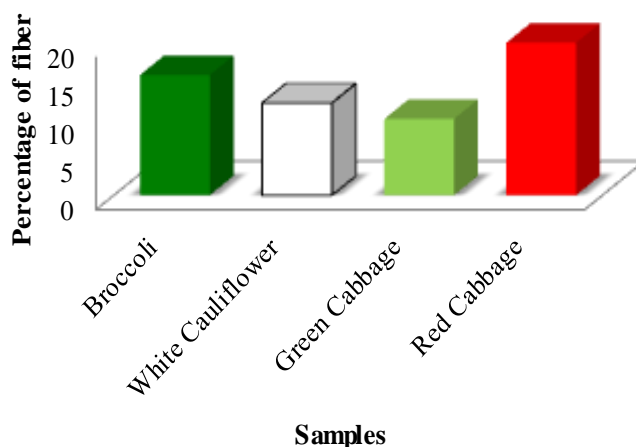


**Figure 3 The percentage of fat contents in various cabbages**

The crude fibre content of samples are given in Table 4 and Figure 4. It was found that sample red cabbage has the highest content of fibre 20 % and green cabbage has the lowest content of fibre 10 %. Virtually every food eaten contributed its share of fibre to the diets.

**Table 4 The Experimental Results of Fibre Contents in Various Cabbages**

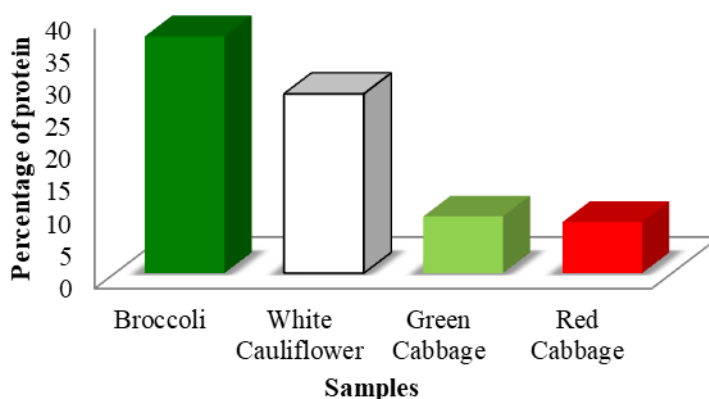
No	Samples	Fiber (%)
1	Broccoli	15.76
2	White Cauliflower	12.09
3	Green Cabbage	10.00
4	Red Cabbage	20.00

**Figure 4 The percentage of fibre contents in four cabbages**

Protein are essential component of the diet needed for survival of animals and humans, their basic function in nutrition is to supply and adequate amounts of required amino acids. The protein content of four cabbages samples is shown in Table 5 and Figure 5. It was found that broccoli has high protein content (36.55 %) and red cabbage has low protein content (7.88 %). By the indirect method (AOAC, 2000), chemical analyses are made for protein, fat, water and ash. The carbohydrate percent content of the diet is then calculated by difference.

**Table 5 Experimental Results of Protein Contents in Various Cabbages**

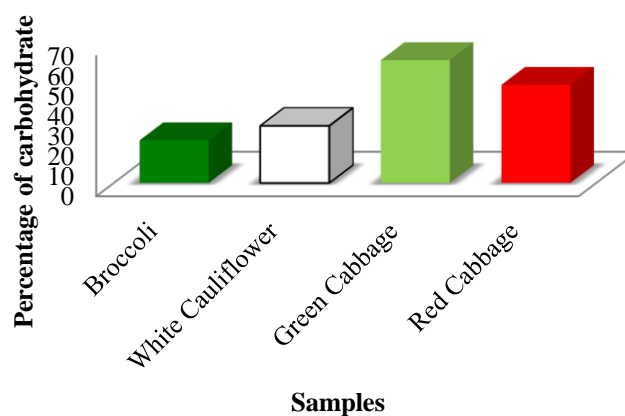
No	Sample	Protein (%)
1	Broccoli	36.56
2	White Cauliflower	27.66
3	Green Cabbage	8.75
4	Red Cabbage	7.88



**Figure 5 Protein contents in various cabbages**

**Table 6 Experimental Results of Carbohydrate Contents in Various Cabbages**

No	Samples	Carbohydrate (%)
1	Broccoli	21.28
2	White Cauliflower	28.46
3	Green Cabbage	61.26
4	Red Cabbage	48.96

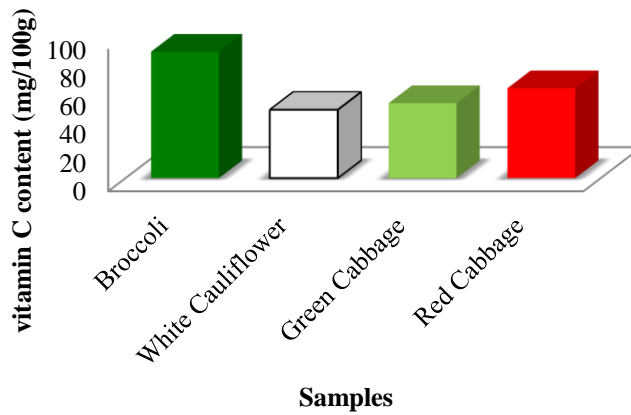


**Figure 6 Carbohydrate contents in various cabbages**

In this study, vitamin C content in various cabbage sample were determined by titration method. The results are shown in Table 7. It was found that broccoli has the highest vitamin C content (89.2 mg/100 g) and the white cauliflower has the lowest vitamin C content (48.2 mg/100 g).

**Table 7 Experimental Results of Vitamin-C Contents in Various Cabbages**

No	Sample	Vitamin-C (mg/100g)
1	Broccoli	89.20
2	White Cauliflower	48.20
3	Green Cabbage	52.84
4	Red Cabbage	63.40

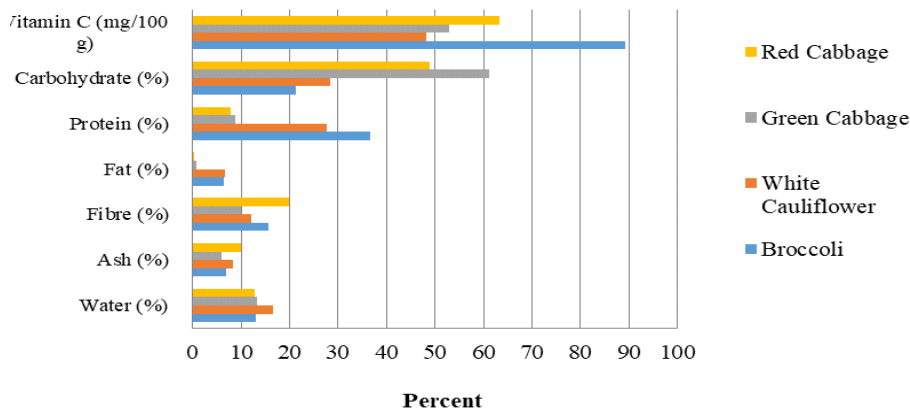


**Figure 7 Vitamin-C contents in four cabbages**

The nutritional values between various cabbages were compared in Table 8. According to this table, the water and fat content of cauliflower were found to be 16.67 % and 6.81 %. The red cabbage is observed the highest value of ash and fibre content between in four cabbages. The value of protein and vitamin C content of broccoli were found to the highest value in various cabbages. The recommended daily dietary allowance for adults for vitamin C is 60 mg/day (both male and female). From these data, it was seen that the vitamin C content in broccoli and red cabbage were much higher than the recommended daily dietary allowance.

**Table 8 Comparison of the Nutritional Values in Various Cabbages**

No	Experiment	Broccoli	White Cauliflower	Green Cabbage	Red Cabbage
1	Water (%)	12.89	16.67	13.29	13.05
2	Ash (%)	6.93	8.31	6.00	10.00
3	Fibre (%)	15.76	12.09	10.00	20.00
5	Fat (%)	6.42	6.81	0.70	0.30
4	Protein (%)	36.56	27.66	8.75	7.88
6	Carbohydrate (%)	21.28	28.46	61.26	48.96
7	Vitamin C (mg/100 g)	89.20	48.20	52.84	63.40



**Figure 8 Comparison of the nutritional values in various cabbages**

### Conclusion

Cabbages may be consumed either roasted, boiled fried, steamed, pickled or eaten raw, throughout the seasons. Four brands of cabbages were chosen to investigate for nutritional values in this study.

The water contents in various cabbages samples were determined by using oven drying method and water content was found to be in the range of (12.89 % - 16.67 %). The loss of water content in cabbages could help to preserve the sample and to keep longer shelf life. Water has a key factor in controlling microbial growth, product shelf life and overall quality.

The ash content of analyzed samples was found to be in range of (6.00 % - 10.00 %). Ash content was not significantly different in all four samples. The ash content contained in these samples was small amount, although inorganic materials or mineral are essential to the human nutrition.

The fat content of the samples for broccoli, and white cauliflower, green cabbage and red cabbage were detected 6.42 %, 6.81 %, 0.70 % and 0.30 %, respectively. The percent of fat content was the highest in white cauliflower.

The fibre content of red cabbage has the highest content of fibre (20.00 %) and green cabbage has the lowest content of fibre (10.00 %).

The protein content of the cabbage samples for broccoli, white cauliflower, green cabbage and red cabbage were found to be 36.56 %, 27.66 %, 8.75 % and 7.88 % respectively. The highest protein contents were observed in broccoli.

The carbohydrate contents were found to be 21.28 % for broccoli, 28.46 % for white cauliflower, 61.26 % for green cabbage and 48.96 % for red cabbage, respectively.

Vitamin C contents were found to be in the range of (48.20 - 89.20) mg/100 g. The highest vitamin C content was observed in broccoli 89.20 mg/100 g and red cabbage 63.40 mg/100 g. The recommended daily dietary allowance for adults for vitamin C is 60 mg/day (both male and female). From these data, it was seen that the vitamin C content in broccoli and red cabbage were much higher than the recommended daily dietary allowance.

Finally, the four of various cabbages are most nutritious and palatable vegetables as well as it contains fewer calories due to which consumer have a chance of low calorie intake, leading the weight loss. This study contributes food safety product to public regarding low fat diet which is suitable for the healthiest way of eating.

### Acknowledgements

I would like to thank to the Department of Botany, Dagon University for inviting the research paper. The authors would like to express their profound gratitude to Rector Dr. Theingi Shwe and Pro-Rectors Dr. Yee Yee Than and Dr. Aye Lwin, Hinthada University for their permission. And also express appreciation to Chemistry family, Department of Chemistry, Hinthada University for encouragement.

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