Bulletin of Pure and Applied Sciences.
Vol.38 B (Botany), No.2.
July-December 2019: P.82-84
Original Research Article

Print version ISSN 0970 4612
Online version ISSN 2320 3196
DOI: 10.5958/2320-3196.2019.00011.9
Available online at www.bpasjournals.com

The Ascorbic Acid Content of Cabbage (*Brassica oleracea*)

Rishan Singh

Author's Affiliation
Discipline of Biological Sciences, University of KwaZulu-Natal, Westville campus, Durban, 4001, South Africa

***Corresponding Author:**
Rishan Singh
Discipline of Biological Sciences, University of KwaZulu-Natal, Westville campus, Durban, 4001, South Africa.

E-mail:
rshnsingh1@yahoo.com

Received on 27.06.2019,
Accepted on 19.08.2019

Keywords:

Recommended daily allowance,
Ascorbate,
Antioxidant,
Indicator,
End point,
Oxidizing agent,
Immunoprotection

Abstract

The antioxidant potential of many plant species have been elucidated. Cabbage is a vegetable that's widely eaten. It's unsure whether the raw or cooked state of cabbage is required to meet the recommended daily allowance needed by patient with vitamin C deficiency. This paper discusses the ascorbic acid content of cabbage.

INTRODUCTION

Cabbage can be a homegrown vegetable since it can be propagated by seeds (Leike, 1988). It is known that cabbage contains a lot of vitamins. One vitamin that cabbage contains is vitamin C. Vitamin C is said to play a crucial role in maintaining healthy gums, bones and teeth (Singh, 2019). A synonym for vitamin C is ascorbic acid. Ascorbic acid is known to be consumed by patients who suffer from vitamin C deficiency, or by the general public in the form of a dietary supplement. However, people who take these supplements as well as those who don't, consume ascorbic acid in their daily diet. Cabbage, as mentioned, contains vitamin C and it is uncertain whether cooked or uncooked cabbage contains more of this vitamin (Singh, 2019). It is a known fact that 60 mg is the recommended daily allowance of vitamin C that a patient should consume (Carr and Frei, 1999; UKZN, BIOL 103 Practical Manual, 2019). This research would discuss whether cooked or raw cabbage contains more or less vitamin C using 10 g of each type in this study.

MATERIALS AND METHODS

10 g of raw and boiled cabbage was placed in separate mortar and pestles. The mortar and pestle had been rinsed with metaphosphoric acid. Thereafter, a few pinches of sand was added to the cabbage to facilitate the grinding. The cabbage was thereafter immersed in 30 ml 3 % metaphosphoric acid and ground. The metaphosphoric acid was added to inactivate the enzyme, ascorbic acid oxidase because the enzyme in the active state could destroy the tissues of the cabbage. Once grinding had been complete, the extract had been filtered through a small plug of glass fibre into a measuring cylinder. The residue was washed with additional metaphosphoric acid, until the total volume of 60 ml was achieved. In order to perform the titrations against the standard, 2,6-dicholorophenol-indophenol, 10

ml aliquots of the extract was pipetted in a flask and 50 ml of distilled water had been added to bring the volume in the volumetric flask up to 60 ml. It was taken that 1 ml of 2,6-dichlorophenol-indophenol was equivalent to 4.8 mg of ascorbic acid in the flask (UKZN, BIOL 103 Practical Manual, 2019).

RESULTS

Table1: 2,6-dicholorophenol volumes used, final volume and initial volume of 10g raw cabbage

Number	Final volume (ml)	Initial volume (ml)	Volume used (ml)
Flask 1	29.1	30	+/- 0.90
Flask 2	25.9	27	+/- 1.10
Flask 3	31.2	32	+/- 0.80

The results in Table 1 indicate an experiment performed 3 times. It can be observed that approximately 1 ml of 2,6-dichlorophenol indicator was required to detect ascorbic acid in raw cabbage. The pink colour indicated the endpoint for each of the 3 reactions.

Table 2: 2,6-dichlorophenol volume used, final volume and initial volume of 10g boiled cabbage

Number	Final volume (ml)	Initial volume (ml)	Volume used (ml)
Flask 1	28.69	29	+/- 0.31
Flask 2	32.6	33	+/- 0.40
Flask 3	39.4	40	+/- 0.60

The results in Table 2 indicate an experiment performed 3 times. It can be observed that approximately + / - 0.45 ml of 2,6-dichlorophenol indicator was required to detect ascorbic acid in boiled cabbage. The pink colour indicated the end point for each of the reactions.

Table 3: Ascorbic acid in 100 g raw and cooked cabbage in mg

Number	Raw	Cooked
Flask 1	143.2	14.88
Flask 2	52.8	19.2
Flask 3	38.4	28.8

In Table 3, it is evident that there is more vitamin C in raw cabbage than in cooked cabbage. This is evidenced by the higher values in mg/100g of cabbage for each of the 3 sets of results. As the cabbage was not boiled in metaphosphoric acid, the results for each set is conclusive.

DISCUSSION

Cabbage is a crop that's grown in South Africa (Singh, 2019). However, it can also be cultivated in gardens and areas where farming is pursued, since it is possible to grow cabbage using seeds (Leike, 1988). Cabbage is rich in vitamin C, a vitamin that's necessary by the human body. Vitamin C is known to be a powerful antioxidant that protects the immune system of all mammals. Apart from its role in immunoprotection, it is also used by patients to prevent scurvy and rickets (Bradford, 215). This paper examined the ascorbic acid, or vitamin C, content in raw and cooked cabbage. The stain, 2,6-dichlorophenol was used as an indicator in the titration of vitamin C. It was found that a large volume of indicator has been used for the reaction with raw cabbage (table 1) compared to cooked cabbage (table 2). This indicated that there was more ascorbic acid in 10 g of cabbage that was raw than cooked. This showed the direct proportionality between the amount of 2,6-dichlorophenol used and the amount of ascorbic acid used in the sample (Singh, 2019). As the reactions reached endpoint, since a pink colour persisted for about 15 minutes after the last drop of indicator that had been

titrated. He ascorbic acid result was confirmed by the indicator that ascorbate was present in the reaction, 2,6-dichlorophenol is reduced from the bluish colour to a colourless colour, until a light pink colour is obtained at the endpoint (Singh, 2019). The results show that approximately 40 – 55 mg of ascorbate can be found in raw cabbage (Singh, 2019), and this is in keeping with the recommended daily allowance (60 mg) that a patient ought to consume (Carr and Frei, 1999). Table 3 also indicates that there is less ascorbate in cooked cabbage, since cooked cabbage is more of an oxidizing agent to 2,6-dichlorophenol. This is the reason for the lower vitamin C content (15-29 mg) of cooked cabbage. It is thus better to consume raw cabbage, since it is a better source of antioxidants (Singh, 2019). Cabbage is thus a good source of vitamin C.

REFERENCES

[1]. Bradford A. 2015. Vitamin C: Sources and Benefits. Live Science. Source: https://www.livescience.com/51827-vitamin-c.html. Accessed: 7/5/2019.

[2]. Carr A, Frei B. 1999. Toward a new recommended dietary allowance for vitamin C based on antioxidant and health effects in humans. The American Journal of Clinical Nutrition 69 (6): 1086-1107.

[3]. Leike H. 1988. Cabbage (Brassica oleracea var. capitata L.). Chapter in Biotechnology in Agriculture andForestry, Vol 6. Crops II (ed. Y.P.S. Bajaj), Springer-Verlag Berlin Heidelberg, 1988.

[4]. UKZN BIOL103 Practical Manual. 2019. University of KwaZulu-Natal, Westville campus, Durban, South Africa.

[5]. Singh, R. 2019. Personal writing. Representing the Republic of South African, my country.