Antiulcerative Properties of Cabbage Juice on Indomethacin Induced Ulcer in Albino Rats

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Abstract

Cabbage (Brassica oleracae) is a leafy green biennal plant widely used as spice all over the world. It is usually grown as an annual vegetable crop and is available in various shades of green, as well as purple varieties. When cabbage is shredded and blended, it gives pure cabbage juice. Cabbage juice contains beta-carotene, vitamin C and fiber. This present study investigates the antiulcerative properties of cabbage juice on indomethacin- induced ulcer in adult wister rats. A total of twenty – five (25) male albino rats weighing between 120g – 160g was used for this study and were randomly selected into five (5) groups of six (6) rats per group.Gastric ulceration was induced in the animals by oral administration of 30mg/kg of indomethacin in all the groups of animals after fasting them for 24hours. they were deprived of food but had free access to water 24 hours prior to ulcer induction. Various degrees of ulceration have manifested in four hours after indomethacin administration. The animals were anaesthetized using diethylether and stomach was incised along the greater curvature and ulceration were scored. Data were analyzed using SPSS (Version 16) software package. The result shows that Brassica oleracae juice had a more significant healing effect at 750mg/kg than the other treated groups when compared with control, , this healing effect of the extract is as a result of the nutritional constituent (L-glutamine, S-methylmethionine, gefarnate and L-arginine). In conclusion, this present study shows that brassica oreracae capitata juice may possess antiulcerative properties and thus have a high cytoprotective property against erosion of the mucosa lining of the stomach.

Key words: *Antiulcerative Properties, Cabbage Juice, Albino Rats*

INTRODUCTION

1.1 BACKGROUND OF STUDY

The stomach, in particular the gastric mucosa is continuously exposed to various agents such as food, acid, alcohol, pepsin, food condiments /spices, bacteria (Helicobacter pylori) and drugs which could sometimes be injurious to the stomach (Peskar *et al.,* 1998). Increased gastric acid secretion, pepsin secretion, inhibition of prostaglandin synthesis, cell proliferation, diminished gastric blood flow and gastric motility have been implicated in the pathogenesis of gastric ulcer (Toma *et al.,* 2005). Ulcer is an erosion of the mucosal layer or excavation of the surface of a tissue as a result of the sloughing of inflammatory necrotic tissue (Yang *et al.,* 2006). The normal stomach maintains a balance between protective factors and aggressive factors (Rifat *et al.,* 2004). Gastric ulcers therefore develops when aggressive forces (increased hydrochloric acid and pepsin, parietal cell mass and gastrin production) overcome the protective factors (prostaglandins and increased mucous cells) (Wallace 2001 ; Zhu et al., 2008). Drug treatment of peptic ulcer is targeted at either counteracting aggressive factors like acid, pepsin, active oxidants, Platelet Aggravating Factor'PAF', leukotrienes, and exogenous factors

including Non Steroidal Anti inflammatory Drugs (NSAIDs) or stimulating the mucosal defences such as mucus, bicarbonate, normal blood flow, prostaglandins and nitric oxide (Borelli *et al.,* 2000).

Ulcers are crater- like sores on the skin and mucous membrane (Heloina *et al.,*al2008). Gastric ulcer also known as peptic ulcer disease (PUD) is a distinct breach in the mucosa of the stomach as a result of caustic effect of acid and pepsin in the lumen. It is the most common ulcer of an area of the gastrointestinal tract that is usually acidic and thus extremely painful (Sumbul *et al;* 2011).

For over a century ago, PUD has been one of the leading cause of gastrointestinal surgery with high morbidity rates which affects several people worldwide and some researchers consider it a new plague of the twenty-first century. (Malley *et al*; 2011) pathophysiology of PUD involves an imbalance between the protective factors (Mucin, prostaglandins, growth factors, nitric oxides and bicarbonate) and aggressive factors (acid, pepsin and Helicobacter pylori) in the stomach (Umamaheswari *et al;* 2007). Provocative factors could also aggrevate the pathological state of the individual (berardi *et al;*2005), for example, use of drugs like indomethacin and other non-steroidal anti-inflammatory agents, alcohol, cigarette smoking and caused by the bacterium Helicobacter pylori, a spiral- shaped bacterium of the stomach (Malagelada *et al;* 2007). There are about 500,000 new cases of peptic ulcer in the United States every year, with as many as 4 million recurrences. The true prevalence rate of PUD in the Nigeria populace is not certain although over three decades ago, Nigeria was listed as an area of high PUD prevalence with perforation being the most frequent indication for surgery (Oribabor *et al;*2013).

As the various traditions of herbal medicine have their tools in many different cultures and have only recently been investigated scientifically, it must been recognised that knowledge above herbal remedies is apt to be still perpetuated by oral tradition and found in anecdotal observation rather than in systematic laboratory and clinical studies that have been (Dubey et al; 2004). Plant derived products have been used for medicinal purposes for centuries. At present,it is estimated that 80% of the world population relies on botanical preparations as medicines to meet their raw and cooked forms to keep fit (Kafaru et al; 2003). The importance of herbs in the management of human aliments cannot be emphasized. It is clear that the plant kingdom harbours an inexhaustible source of active ingredients invaluable in the management of many intraceable disease (kafaru et al; 2003). 0ne of the plants that has the medical property in treating and preventing of diseases is cabbage.

Cabbage or headed cabbage (comprising several cultivars of brassica oleracea) is a leafy green or purple biennal plant, grown as an annual vegetable crop for its dense-leaved heads. Cabbage heads generally range from 0.5 to 4 kilograms (1 to 9 lb), and can be green, purple and white.

Cabbage is a member of the cruciferous family. Other vegetables that have developed from the early strains of cabbage include brussels sprouts, cauliflower, savoy cabbage, kale and kohlrabi. Cabbage is also a hardy vegetable that is available in various shades of green as well as purple varieties (Angie *etal;* 2013) Most varieties are red, green, savoy and Chinese. Cabbage is usually shredded into salads, or used as an ingredient in stews, soups or baked dishes. When cabbage is shredded and blended, it gives cabbage juice. Cabbage juice contains beta-carotene, vitamin C and fiber (Chen et al; 2011).it also contain significant amount of glutamine, an amino-acid which has anti inflammatory properties. Several researches that have been carried shows that cabbage juice can be employed as herbal remedy for the prevention and treatment of diseases and disorders including arthritis, scurvy, leg ulcer asthma cough and constipation in different parts of the world(Ou et al;2002). Cabbage contain S-methylmethionine, compounds with anti-ulcer properties which protect the gastric mucosal layer which help for re-epithalization of the mucosal layer (Ou et al 2002).

Cabbage is a very important plant that is consumed by majority of the population in the world without knowing its medical importance. It is prepared and consumed in many ways. Thus, this study

is undertaken to assess if cabbage juice can treat induced-ulcer in wister rats.

Peptic ulcer disease (also known as peptic ulcer or stomach ulcer) has been one of the leading causes of gastrointestinal surgery with high morbity and mortality rate that some researchers has considered it a new plague of the twenty-first century.

1.2 STATEMENT OF PROBLEMS

Gastric ulcer is the most prevalent gastrointestinal disorder which can be found in the stomach lining or small intestine. It is the most visible sign of peptic ulcer diseases. Gastric ulcer occur when the thick layer of mucus that protects the stomach from digestive juices is reduced, thus allowing the digestive acids to eat away at the lining tissues of the stomach. It is usually caused by an infection with a germ (bacterium) called Helicobacter pylori (H. pyroli). When the mucous membrane lining the digestive tract erodes, it causes a gradual breakdown of tissue. This breakdown causes a gnawing or burning pain in the upper middle part of the abdomen.

1.3 AIM AND OBJECTIVE OF STUDY

Making use of cabbage juice this study intends to carefully examine and find out:

- The anti- ulcerative properties of cabbage juice on indomethacin induced ulcer in Wister rats.
- Effective management of induced ulceration using cabbage juice.
- If the effect of cabbage juice is beneficial or detrimental to the animal (Wister rat).

1.4 SIGNIFICANT OF THE STUDY

It is believe and hope that this study at the end, will further help to resolve the problem of stomach ulcer and how to effectively manage it.

1.5 SCOPE OF THE STUDY

This study is confined only to investigating the anti-ulcerative properties of cabbage juice on indomethacin induced ulcer in albino rats.

MATERIALS AND METOHD

3.1 MATERIALS

- ✓ Cabbage Juice extract (*Brassica oleracae capitata*)
- ✓ Wistar Rats
- ✓ Oral Cannula
- ✓ Indomethacin (25mg)
- ✓ Electronic weighing balance (NAPCO Precision Instruments JA-410)
- ✓ Standard Cages
- ✓ Distilled water
- ✓ Cotton wool and Hand gloves
- ✓ Beakers and Measuring cylinder
- ✓ 2ml hypodermic syringe
- ✓ Weighing balance (CAMRY LB11)
- ✓ Diethyl ether
- ✓ Vital top feed (Jos, Nigeria)

- ✓ Dissecting kits
- ✓ Filter paper (WHATMAN QUALITATIVE FILTER PAPER NO. 1, SIGMA ALDRICH WHA1001042)
- ✓ Blender (Philips HR1847/00)

3.2 CHEMICALS / DRUGS

Indomethacin capsule (25mg) was produced by Yangzhou, no. 3 Pharma. Co. Ltd, Yiling, Jiangdu, Jiangsu, China with batch no. 150402 and were purchased from a local pharmaceutical shop (Index Pharmaceutical) in Nnewi, Anambra State, Nigeria.

3.3 PLANT PROCUREMENT AND EXTRACTION PROCEDURE

Brassica oleracae capitata (cabbage) was bought from a local market in Nnewi, Anambra state, Nigeria. The collected samples were washed, weighed and sliced. 200g of *Brassica oleracae capitata* was blended with an electric blender together with 500mls of distilled water and was kept in a refrigerator for 72 hours after which it was filtered using whatman filter no. 1 and the liquid filtered was kept in a close container. This was stored in a refrigerator at 20°C for further use.

3.4 EXPERIMENTAL ANIMALS

A total of 25 male Albino (wistar) rats weighing 120g to 160g were purchased and house in the animal house, College of Health Science, Nnamdi Azikiwe University, Nigeria. Animals were housed in standard animal cages that are well ventilated and was kept at a temperature of 27±2°C, and was maintained on normal laboratory chow (Vital Top feed, Jos, Nigeria) and water, which was fed *ad libitium*. Animals were acclimatized for a period of two weeks before administration of *Brassica oleracae capitata* (cabbage) juice extract. Animals were kept on 12 hours light and dark cycle. Rats handling and treatments conform to guidelines of the faculty of Basic Medical Science, College Of Health Science And Technology, Nnamdi Azikiwe University, Nigeria for laboratory animal care and use.

3.5 EXPERIMENTAL DESIGN

A total of twenty-five (25) male wistar rats was used in this study and were randomly selected into five (5) groups of six (6) rats per group. Animals were acclimatized for a period of two weeks before the administration of *Brassica oleracae capitata* (cabbage) juice extract on the treated groups. The administration of the extract will last for a period of 7 days.

Group A: Negative Control (There was induction of ulcer but was not given extract).

Group B: Ulcer treated (Animals received 500mg/kg of *Brassica oleracae capitata*juice extract).

Group C: Ulcer treated (Animals received 750mg/kg of *Brassica oleracae capitata*juice extract).

Group D: Ulcer treated (Animals received 1000mg/kg of *Brassica oleracae capitata*juice extract).

Group E: Ulcer treated (Animals received 1500mg/kg of *Brassica oleracae capitata*juice extract).

3.6 INDULCTION OF ULCER

Gastric ulceration was induced in the animals according to the method described by [Shirisha and Subash, 2012]. The rats were administered a single dose of indomethacin (30mg/kg), they were deprived of food but had free access to water 24hour prior to ulcer induction. Various degrees of ulceration have manifested 4hours after indomethacin administration. The animals were anaesthetized using diethylether and stomach was incised along the greater curvature and ulceration were scored.

3.7 MEASUREMENT OF ULCER INDEX

A scoring criteria for ulcer were scored with the help of magnascope (hand lens) under 5X

magnification using the scoring criteria [Brzozowski et al., 1998].

Normal stomach.....(0)

Red coloration.....(0.5)

Spot ulcer.....(1)

Hemorrhagic streak… (1.5)

Ulcers.....(2)

Perforation.....(3)

Mean ulcer score for each animal will be expressed as ulcer index.

Percentage Protection = (Control mean ulcer index –Test mean ulcer index) / Control mean ulcer index X 100.

Calculation of Ulcer index [Vogel, 2002] is as follows:

$U1 = (UN + US + UP) X 10^{-1}$

U1 = Ulcer index

UN = Average of number of ulcer per animal

US = Average of severity score

UP = Percentage of animal with ulcer

3.8 PREPARATION OF ADMINISTERED DOSAGE

200mg of indomethacin was dissolved in 10mls of distilled water to have a stock solution of 20mg/mls. 200g of *Brassica oleracae capitata* was dissolved in 500mls of distilled water to have a stock solution of 400mg/mls.

Group A was administered 30mg/kg of indomethacin only

Group B was administered 30mg/kg of indomethacin for ulcer induction and was treated with 500mg/kg of the extract which is equivalent to 0.15mls.

Group C was administered 30mg/kg of indomethacin for ulcer induction and was treated with 750mg/kg of the extract which is equivalent to 0.3mls.

Group D was administered 30mg/kg of indomethacin for ulcer induction and was treated with 1000mg/kg of the extract which is equivalent to 0.31mls.

Group E was administered 30mg/kg of indomethacin for ulcer induction and was treated with 1500mg/kg of the extract which is equivalent to 0.5mls.

3.9 STATISTICAL ANALYSIS

Data were analyzed using SPSS (Version 16) software package. The results were expressed as mean ± S.E.M.Data of ulcer index was analyzed by non-parametric ANOVA followed by post hoc LSD. All values were considered significant at p-value < 0.05

RESULT

Table 4.1 shows the effect of cabbage juice extract (*Brassica oleracae capitata*) on indomethacin induced ulcer after seven (7) days of administration.

GROUPS	MEAN±SEM	P-VALUE	% Protection
Group 1 (control)	2.61±0.50		
Group 2 (500mg B.O)	1.04±0.30	0.003**	60.15
Group 3 (750mg B.O)	0.79±0.22	0.001**	69.73
Group 4 (1000mg B.O)	0.82±0.16	0.001**	68.58
Group 5 (1500mg B.O)	1.05±0.34	0.003**	59.77

Result from table 4.1, shows that the cyto-protective of *Brassica oleracae capitata* juice extract is more effective in group 3 than in other groups when compared with control. While the ulcer index of *Brassica oleracae capitata* juice extract in the indomethacin induced ulcer was effective in group 3 than other groups when compared with control. All values for the ulcer index were represented as MEAN ± SEM and were considered significant at $p<0.05$ and that of the protective (Cytoprotective or Inhibition) effective of the *Brassica oleracae capitata* juice extract were represented in percentage (%). All data were analyzed using one-way Anova. (B.O-*Brassica oleracae capitata*juice extract and ** means that the values were statically significant).

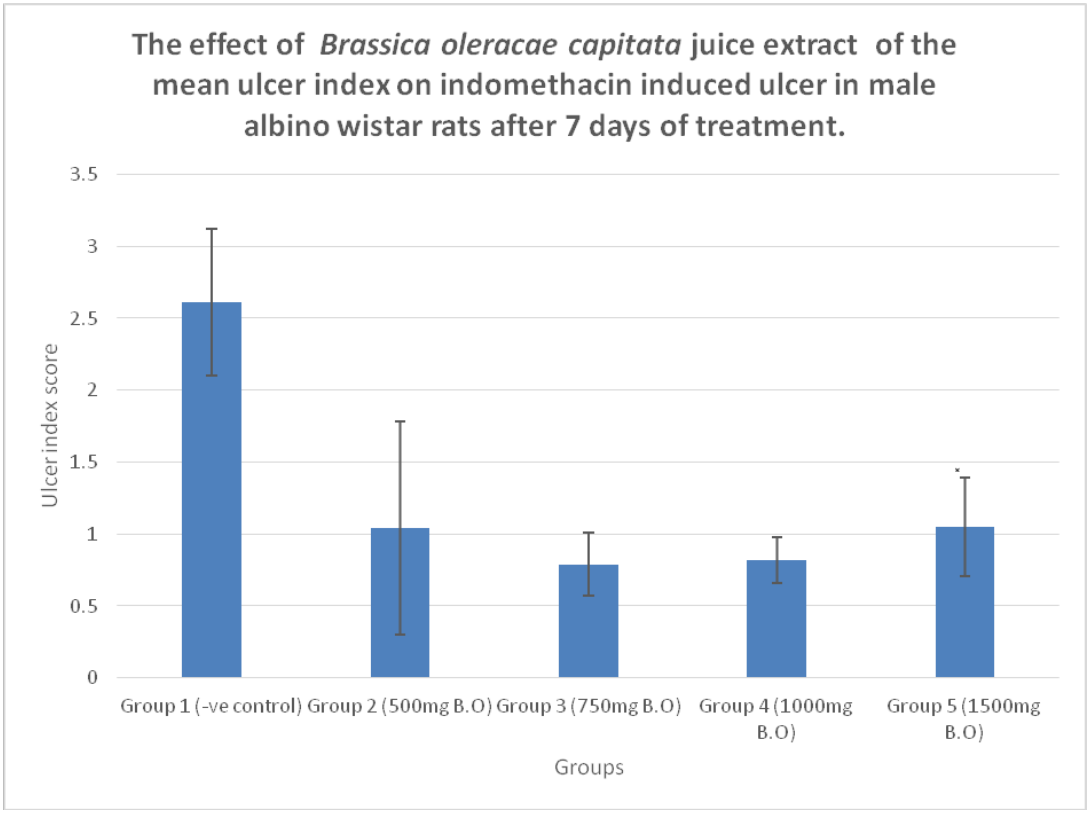

Fig 4.1 Bar chart showing the effect of *Brassica oleracae capitata* juice extract of the mean ulcer index on indomethacin induced ulcer in male albino wistar rats after 7 days of treatment.

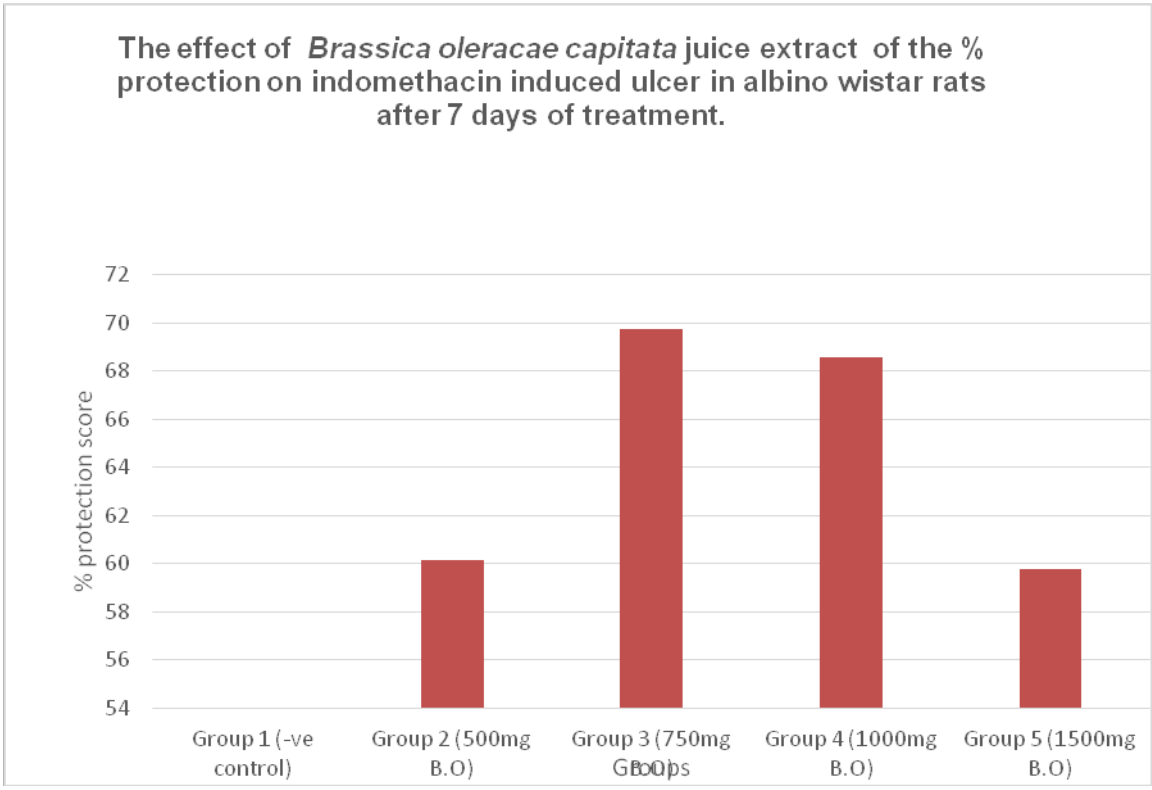

Fig 4.2 Bar chart showing the % protection on effect of *Brassica oleracae capitata* juice extract on indomethacin induced ulcer in male albino wistar rats after 7 days of treatment.

DISCUSSION AND CONCLUSION

5.1 DISCUSSION

Non-steroidal anti-inflammatory drugs (NSAIDs) are widely used with major limitation and a potential risk of gastrointestinal side effects ranging in severity from mild dyspepsia to gastrointestinal hemorrhage and perforations (Laine, 2002). Gastrointestinal injury is induced by various chemical agents [Desai, Goyal&Parmar,1996]. Indomethacin, a known non-steroidal anti-inflammatory drug used in the treatment of pain, fever, stiffness and inflammation is a known prostaglandin synthesis inhibitor (Koji et al., 2012). The pathological effect of Indomethacin, according to (Menguy and Desbaillets 1968), was its exertion of an ulcerogenic effect by decreasing the rate of secretion of gastrointestinal mucus and the lowering of the concentration of the carbohydrate component of the gastric mucous substance. Reduction in the mucous secretion will expose mucous lining of the GIT to the action of acid-pepsin secretion resulting in lesions.

This study was designed to investigate the gastro-protective effect of *Brassica oleracae* juice on indomethacin induce ulcer. Result from table 4.1 above shows that *Brassica oleracae* juice had a more significant healing effect at 750mg/kg than the other treated groups when compared with control, this healing effect of the extract is a result of the nutritional constituent (L-glutamine, S-methylmethionine, gefarnate and L-arginine), with L-glutamine and L-arginine having the highest content and thus have the capacity to rebuild the walls of the mucus membrane that have been destroyed by the inhibition of prostaglandin synthesis. This study is in line with work done by (Mahmoud, Mohamed and Dalaal, 2001) in which L-arginine showed a great deduction in the mean ulcer index score of indomethacin induced ulceration and maintenance of mucosal nitric oxide (NO), and this is also in agreement with study of (Brzozowski et al., 1995) in which L-arginine accelerates ulcer healing due to its hyperemic, angiogenic and growth promoting actions, possibly involving NO, gastrin and polyamines. The healing effect of cabbage juice of this study is in agreement with work

done by (Indran et al., 2008) were there was reduction in the ulcer lesion and also increase in alkaline content and pH.

The cytoprotective study of *Brassica oleracae* juice as represented in table 4.1 is dosed dependent and it shows that *Brassica oleracae* juice has more cytoprotective action at 750mg/kg than the rest treated groups when compared with the control group, however the main reason for this action could be as a result of the presence of rich mineral constituent (zinc, phosphorous), amino acid (L-glutamine) and S-methymethionine.

5.2 CONCLUSION

Natural products of plant origin have played an important role globally in ethno-medical studies showing their efficacy in various gastrointestinal disorders, however *Brassica oleracae* juice is not exception to this. It therefore shows that *Brassica oleracae* (Cabbbage) possess antiulcerative property in this present study and thus have a high cytoprotective property against erosion of the mucosal lining.It is therefore advisable for individuals with gastric ulcer to have a glass full of cabbage juice twice daily.

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