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IMPACT OF ONION ON GASTROINTESTINAL DISCOMFORT AMONG BEAN EATERS IN SOUTH-EAST NIGERIA

Chinonso Obinna Nwankwo
Department Of Biochemistry, Imo State University, P.M.B 2000, Owerri Imo State Nigeria.
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Abstract: This study was carried out to evaluate the medicinal effect of putting onion just at the start of cooking beans. This is in view of the problems of indigestion people experience when they eat beans. The research was carried out to find a solution to problems like flatulence, diarrhea, heartburn etc which most people experience on eating beans. Five Secondary Schools were involved in this study in which three hundred and twenty two (322) cross sectional subjects were interviewed using questionnaires. All the subjects had one or more of the common problems of indigestion with beans. They were asked to cook beans for three months, putting onion when the beans was almost done. Then they were asked to cook for another three months putting onion just at start of cooking. It was observed that at the first instance when onion was put late, the problems of indigestion persisted. However, there was significant reduction in problems like heartburn, body weakness, stomach swelling, diarrhea, flatulence and vomiting when onion was put at start of cooking.

Keywords: Study; medicinal; onion; subjects; diarrhea; indigestion.

INTRODUCTION

Beans is a dicotyledonous legume and commonly eaten by diverse ethnic groups in Nigerian. Cowpea (Vigna unguiculata (L. Walp) is the second most important food grain legume in tropical Africa (Dominic et al., 2005). People from Imo State (Igbos) of south Eastern Nigerian call cowpea „Agwa". Other vernacular names include „Ewa" by the Yorubas and „Wake" by Hausas. More than 5.4 million tons of dried cowpea are produced worldwide, with Africa producing nearly 5.2 million. Nigeria, the largest producer and consumer, accounts for 61% of production in Africa and 58% worldwide (IITA, 2009).

According to the VSDA food database, the leaves of the cowpea plant have the highest percentage of calories from protein among vegetarian foods (Shaw, 2007). The protein content of cowpea ranges from 23-30% depending on the genotype and environmental factors. The lysine content (an essential amino acid) is relatively high and thus improves the protein quality of cereals (Romain, 2001).

Cowpeas are warm weather annual crops, they withstand heat better than most other legumes and are very drought resistant (Onwueme & Sinha, 1991; Singh, 2003).Cowpea performs well on a wide variety of soils and soil conditions, but performs best on well drained sandy loam or sandy soil where soil pH is in the range of 5.5 to 6.5 (Onwueme & Sinha 1991). Germination is epigeal and rapid at temperatures above 65^{O}F (Chikezie & Agomuo, 2011; Davis *et al.,* 2013). As all other legumes, the cowpea is able to fix atmospheric nitrogen due to symbiosis with soil bacteria (Romain, 2001; Singh, 2003). Cowpea seeds are harvested when one-half to two-thirds of the pods have matured (John *et al.,* 2006).

However, beans (including the cowpea) are known to contain oligosaccharides; short chains of monosaccharide units or residues, joined by characteristic linkages called glycosidic bonds (Nelson & Cox, 2008). Stacchyose and raffinose have been found to be the principal oligosaccharides found in

beans. Stacchyose is typical of the oligosaccharide components found in substantial quantities in beans, peas, bran and whole grains (Garreth & Grisham, 2005). In most cases, the oligosaccharides are not affected by digestive enzymes, but are metabolized readily by bacteria in the intestines. This is the cause of problems like flatulence and diarrhea that accompanies the consumption of beans. The medicinal usefulness of onion (*Allium cepa*) in stopping various symptoms of indigestion has been studied and scientifically documented.

Medicinal plants may be defined as any plant that can be put to culinary or medicinal use (Serrentino, 1991). Azu & Onyeagba (2006) studied the antimicrobial properties of various extracts of *Allium Cepa* (onions) and *Zingiber officinale* (ginger) against *Escherichia coli, Salmonella typhi* and *Bacillus subtilis* that are common cause of gastrointestinal tract infections. They did their investigation using the cup-plate diffusion method. Results show that *Escheric coli* and *Salmonella typhi* were more sensitive to the extract of onion bulbs compared to *Bacillus subtilis* which was predominantly resistant. More and more researchers find that food and their individual constituents perform similar fashion to modern drugs and sometimes better without the dreaded side effect (Wainright, 2001). Every culture on earth, through written or oral traditions has relied on the vast variety of natural chemistry found in healing plants (including onions) for their therapeutic properties (Wainright, 2001).

The onion is one of the oldest cultivated vegetables in history. It is a light loving plant; fairly high temperatures and long photoperiod required for bulb formation. Onion consists of its herbaceous plant part and its edible bulb part. It is probably a native of south western Asia (Ody, 1997). The leaves are bluish-green and hollow. The bulbs are large, fleshy and firm. There are three main varieties-white, red and purple skinned (Irrine, 1976). The relative pungency of onion has both genetic and environmental components. Thiosulphinates found in onion have been shown to inhibit in-vitro platelet aggregation (Moristsau *et al*., 1992; Briggs and Goldman, 2002). This is an important factor in cardiovascular health.

Flavenoids are a second class of health enhancing compounds produced by onion; an example is quarcetin. Flavenoids are chemical compounds active against micro organisms. They have been found in-vitro to be effective antimicrobial substances against a wide array of microorganisms. (Ekwenye & Elegalam, 2005). Some of these microorganisms are causative agents of vomiting and diarrhea, resulting from indigestion of beans meals. The genus *Salmonella* is among the most common causes of food and water borne infectious diseases in the world (Baird, 1990).

A number of studies in Nigeria have shown that *Salmonella* infections is endemic in many parts of the country (Katung 2000; Onunkwo *et al.,* 2001). The bioability of onion (*Allium cepa*) in stopping these problems when it is put at the start of cooking beans is the bedrock of this study.

MATERIALS AND METHODS:

THE STUDY AREA

The research was carried out in Owerri and its environs. Owerri is the capital of Imo State, South East Nigeria. Five secondary schools were involved in the study. The schools are:

Comprehensive Secondary School Amakohia, Government Secondary School, Girls Secondary School Akwakuma, Alvana Secondary School and Enyiogugu Secondary School. The study lasted from October 2009 to July 2013.

STUDY POPULATION

The study population is consistently adolescent; Secondary School Students whose ages range from 10 – 17 years.

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IDENTIFICATION OF SUBJECTS, TREATMENT WITH ONION.

Three hundred and twenty two subjects that experience the various problems of indigestion when they eat beans were selected from the schools. The problems are: heartburn, body weakness, stomach swelling, diarrhea, flatulence and vomiting. They were interviewed by questionnaires. At different times during the study; subjects (in different groups of about 40) were asked to cook beans for a period of 6 months. At the first 3 months they were asked to put onion late when the beans was about getting done. Then they are to put onion just at the start of cooking; when the cooking water (with beans in it) is still cold.

RESULTS

Table 1: Comparison of the effects of Onion on the problems of beans indigestion when it is put at start of cooking beans and when it is put late.

Table 2: Effects of Onion on the problems of beans indigestion when it is put at start of cooking beans and when it is put late analyzed using probability distribution.

Parameter	No. of subjects	Put Onion late during cooking (No of problem stopped)	Put Onion at Start of cooking (No. of problem stopped)	No. of problems that persisted	Success Rate (%)	Failure Rate (%)
Heartburn	86	0	86	0	100	0
Body weakness	108	0	87	21	80.6	19.4
Stomach swelling	128	0	106	22	82.8	17.2
Diarrhea	121	0	108	13	89.3	10.7
Flatulence	156	0	126	30	80.8	19.2
Vomiting	9	0	5	4	55.6	44.4

Number of observations	Heartburn	Body weakness	Stomach swelling	Diarrhea	Flatulence	Vomiting
	86	108	128	121	156	9
X	86	87	106	108	126	5

Y	0	21	22	13	30	4
X_1	1	0.81	0.83	0.89	0.81	0.56
Y_1	0	0.19	0.17	0.11	0.19	0.44

Key:
X = Success rate that putting Onion at start of cooking beans stopped the above mentioned problems.
Y= Failure rate that putting Onion late on cooking did not stop the above mentioned problems.
X_1 = Probability of success.
Y_1 = probability of failure.

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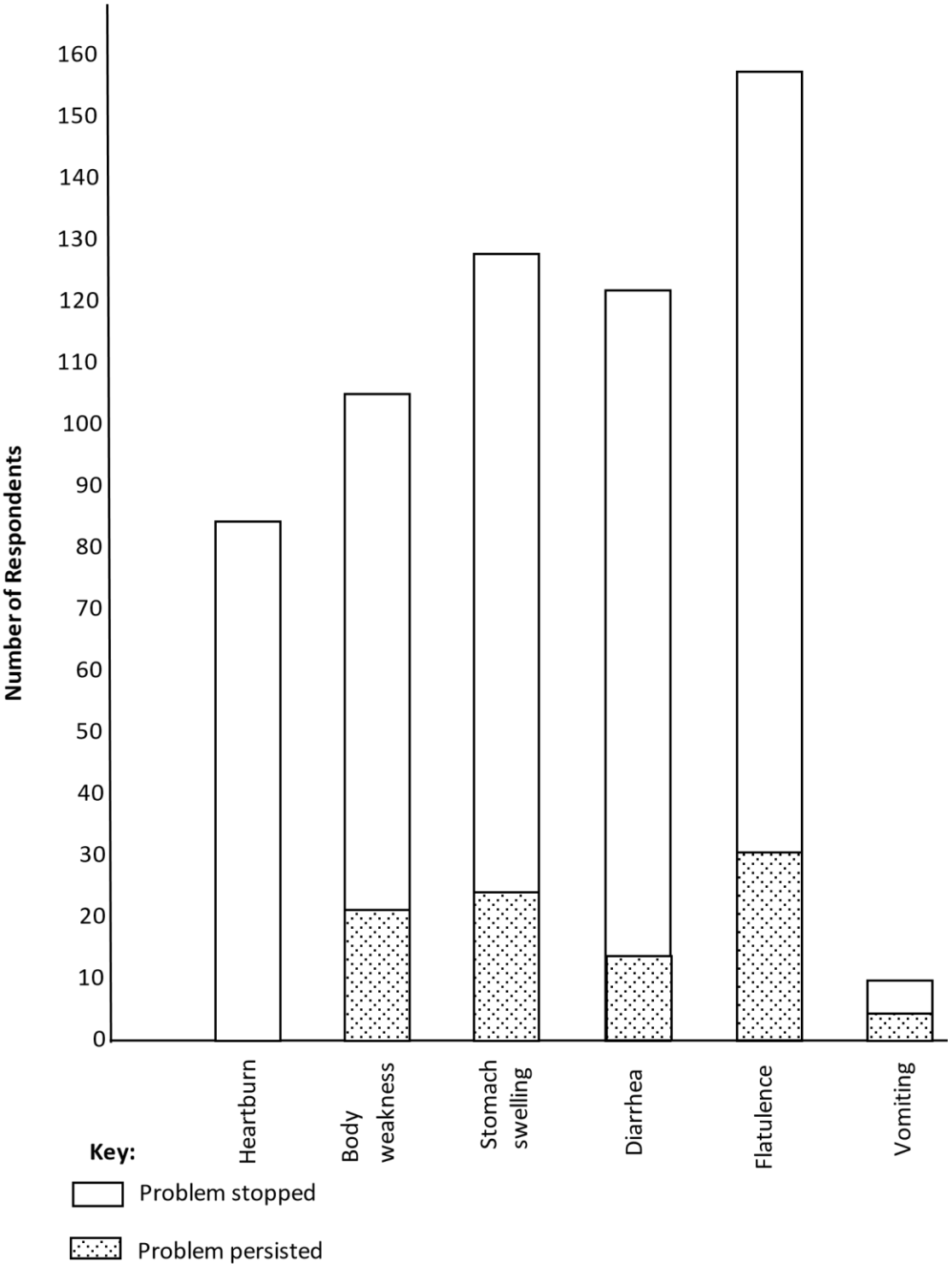

Fig 1: Representation of Table 1 using a bar chart.

DISCUSSION

The result of the study showed that the problem of subjects persisted when they ate beans that onion was put late on cooking. On the contrary when they ate beans which onion was added just at start of cooking beans, the problems of indigestion were significantly reduced. The success rate of onion stopping the problems when it is put at the start of cooking beans is consistently greater than fifty percent (>50%) and the probability consistently greater than 0.5; with that of heartburn having a probability of 1(Tables 1 and 2). This corroborates the works of Makris and Rossiter (2001) and Im et al., (2011) in which they stated that the medicinal compounds of onion are sensitive to cooking. In a comparative study with Korean Lotus Roots (KLR) and Polish White Onion (PWO) they discovered that the phenolic, tannin, anthocyanin, flavin and other contents of PWO are highly unstable against overheating. Extended boiling time (10, 20, 40 & 60 minutes) of onion decreases the concentration of these compounds.

Onion contains glycosidases that hydrolyze the glycosidic bonds in the oligosaccharides present in beans. The problems of indigestion are caused by the oligosaccharides not being digested in the human gastrointestinal tract (Garrett & Grisham, 2005). However, as the enzymes hydrolyze the glycosidic bonds during cooking, the monosaccharide products can then be properly digested in the gastrointestinal tract and no problems of indigestion results.

Enzymes are sensitive to temperature and perform best at their optimum temperature (Vasudevan & Sreekumari, 2005; Chatterjea & Shinde, 2012). Addition of onion at the start of cooking beans (when the cooking water is still cold) provide the enzymes an optimum temperature of activity. Again adding the onion on time, when no other ingredients of cooking has been added, removes the possibility of altering the pH required for the enzyme action and the ingredients actually acting as inhibitors to the activity of the enzymes (Chartterjea & Shinde, 2012). Subjects also reported reduction in cooking time when the onion is added at the start of cooking the beans. This also suggests enzyme activity that led to the breaking of existing bonds and reduction in activation energy (Nelson & Cox, 2008).

CONCLUSION

On cooking beans, it is beneficial to put onion at the start, when the cooking water (with beans in it) is still cold. This provides the required conditions; in terms of temperature, pH, and absence of impurities, for the enzymes in onion to hydrolyze the oligosaccharides in beans. Since these oligosaccharides have been implicated as the causative agents of the gastro-enterological problems people have after eating beans; it can be eaten without any problems if cooked as recommended. On the contrary; the various problems of indigestion persist when the recommendation of this study is not followed, with the consequent nutritional losses.

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