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Capsicum Annum Exhibits Saturation Phenomenon in Gastric Acid Secretion.

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Abstract: *Capsicum annum(pepper) is a ubiquitous spice widely consumed in Nigeria, West Africa and many parts of the world. A few studies have been done in Nigeria on Capsicum frutescens and Capsicum annum [1,2] The present study was carried out to investigate the effect of Capsicum annum on gastric acid secretion. 48 male and female albino Wistar rats weighing between 200-300 g were randomly allocated to 6 groups with 8 rats per group. Aqueous extract of Capsicum annum prepared after the method of Alnaqueeb (1996) was administered through a gastric fistula at the fundus. 10%, 20%, 30% of LD 50 and supramaximal doses of 10mg, 20mg, 30mg, 40mg, per 100g body weight of the aqueous extract were administered. Gastric acid was measured after the method of Ghosh and S child 1958 as modified by Ibu (1987). The result in in mmol/L/hour showed for basal acid output (BAO) was 15.6 ± .19and 17.52 ± 0.03, 18.30 ± 0.03, 18.84 ±0.04, 19.20 ± 0.05, 19.08 ±0.07 at 40, 50, 60, 70,and 80 minutes respectively. The secretory response rose to a plateau indicating saturation phenomenon of the secretory capacity of the stomach. It is concluded that Capsicum annum exhibits saturation phenomenon in gastric acid secretion in the albino Wistar rat.*

Key words*- Gastric acid secretion, Capsicum annum, Saturation phenomenon.*

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I. Introduction

The effects of orally ingested substances on gastric function have been the subject of human investigation almost since the discovery of hydrochloric acid in gastric juice [3]. The best-known component of gastric juice secreted in the stomach is HCl (gastric acid) and it is the secretory product of the parietal or oxyntic cell [4].

Capsicum annum includes a wide variety of peppers with varying shape, colour, and size because of ease of cross pollination. Common varieties include, paprika (sweet varieties), bell pepper, cayenne, halopens, chitlepin (hot varieties), Christmas pepper (ornamental). Capsicum annum was originally from South and Central America but now grown extensively around the world both commercially and domestically [5]. Its common name in the local market in Benue state, Nigeria is Atarodo, Atarugu in Igede . Capsicums also contain approximately 1.5% of the irritant oil oleoresin. The major component of the oil which is capsaicin (0.02%), is a very pungent phenolic chemical. Capsaicin binds on transient receptor potential vanilloid 1 (TRPV1) [6]. Other naturally occurring vanilloids that are TRPV1 agonists include piperine, resiniferatoxin, zingerone and gingerol [7,8].

II. Materials And Method

Capsicum annum were bought from the local market (Wadata Market) in Makurdi, Benue State, Nigeria. It was identified by a taxonomist in the department of Botany, Faculty of Sciences of Benue State University, Nigeria and a specimen voucher deposited in their herbarium.

2.1 **Drugs and Chemicals**

Analytical grade Sodium hydroxide (NaOH), Sodium Chloride (NaCl) and phenolphthalein made by May and Baker (Dagenham, England) and urethrane made by Sigma Chemical Co. (Poole, UK).

2.2 **ANIMALS**

Forty-eight Albino Wistar rats weighing 200-300g of both sexes were obtained from the animal house of the College of Health Sciences, Benue State University, Makurdi and nursed under the same conditions in the

animal house research laboratory. They were subjected to a 12-hour light and dark photic cycle. And fed on normal rat chow (Pfizer Limited, Kaduna, Nigeria) and given water ad libitum. Permission for the use of the animals was obtained from the Animal Ethics Committee of Benue State University Makurdi, Nigeria.

2.3 ***Preparation of the Extract***

The aqueous extract preparation was modified following the method of Alnaqeeb *et al*., [9]. 50g (Wt 1) of the fresh fruit was thoroughly washed and placed in clean beakers (Pyrex, 500 ml). It was homogenized in 75ml (V1) of cold sterile 0.9 % saline in the presence of some crushed ice using an electric blender. The homogenous mixture was filtered with Whatman no1 filter paper and centrifuged at 2000 rev/min for 10 minutes and the clear supernatant was collected and volume noted (V2). The volume of the wet residue was noted as Wt 2. The volume of the supernatant was subtracted from the volume of the cold saline used in homogenization (V1 – V2) or V3 which was noted as Wt 3. The yield of each of the three preparations was used to determine the stock concentration:

stock concentration = Wt1 - (Wt2 + Wt3) ÷ V2……..(1)

[yield = Wt1 - (Wt2 - Wt3)]…….(2)

The above formula was used to calculate the stock concentration of each which was then stored in refrigerator until used. The required amount was administered in mg / 100 gram body weight of each animal.

50 g of *Capsicum annum* contains 0.001 ± 0.00 g of capsaicin [10]. Oral LD_{50} values of Capsaicin are 161.2 mg / kg (16.12 mg / 100 g body weight) and 148.1 mg / kg (14.81 mg / 100 g body weight) for male and female rats respectively [11].

The above information from literature was used to determine the dose of capsicum extract that will be administered.

2.4 ANIMAL GROUPING AND EXPERIMENTAL DESIGN

48 Wistar rats weighing between 200 - 300 grams were randomly assigned to five groups consisting of 8 each as follows:

Group 1- Control group for *Capsicum annum* which were administered normal saline.

Group 2- were administered 10% LD_{50} of *Capsicum annum*.

Group 3- were administered 20% LD_{50} of *Capsicum annum*.

Group 4- were administered 30% LD_{50} of *Capsicum annum*

Group 5- Control group for successive supramaximal doses of *Capsicum annum* which were administered normal saline.

Group 6 - were administered successive supramaximal doses of *Capsicum annum* of 10mg, 20mg, 30mg, and 40mg,

2.5 SURGICAL PROCEDURE

After a 12 hour fast, each animal was anaesthesized with 25 % Ethyl Carbonate (urethane) at a dose of 0.6 ml/100 g body weight intraperitoneally.

Tracheostomy was performed. A nasogastric tube was passed. A duodenostomy was performed and normal saline was used as gastric lavage to wash out the debris from the stomach until clear effluent was obtained. A duodenogastric canula was passed and ligated insitu for subsequent collection of gastric acid secretion. 10 minutes aliquot samples were collected from the duodenal canula. A gastric fistula was created in the fundus with insertion of a 2 way canula to allow the administration of the extract. The aliquots were each titrated to a phenolphthalein end point using 0.01M NaOH and the acid output or concentration is calculated as described by Ibu [12,13] :

Where Normality = Molarity

MA x VA = MB x VB……(3)

MA = (MB x VB) ÷ VA…… (4)

Where,

MB = Molarity of base known (0.01N) = 10mMol

VB = Volume of base known (titrate of NaOH) used

VA = Volume of acid (effluent volume) = 10ml

Substituting for MB and VA

MA = 10 x VB ÷ 10…… (5)

Therefore MA=VB ……(6)

Acid output / 10 minutes = VB mMol / L / 10 mins……..(7)

Acid output per hour = VB x 6 mMol/ L / hour as stated by Ibu [1]…….(8)

The results were analysed for graphics and statistics using SPSS version 22. Statistical differences were accepted at 95% Confidence level when P <0.05.

III. Results

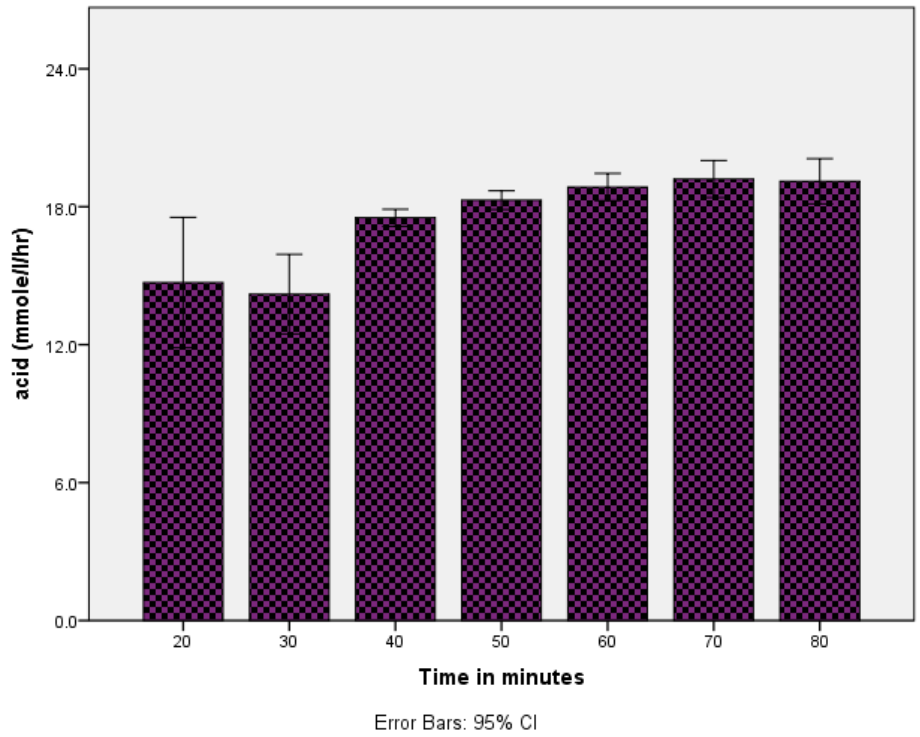

Figure 1- A graph showing the effect of administering a dose of 10% of LD50 of Capsicum annum extract. The acid produced increased steadily until it reached a plateau between 70 and 80 minutes.

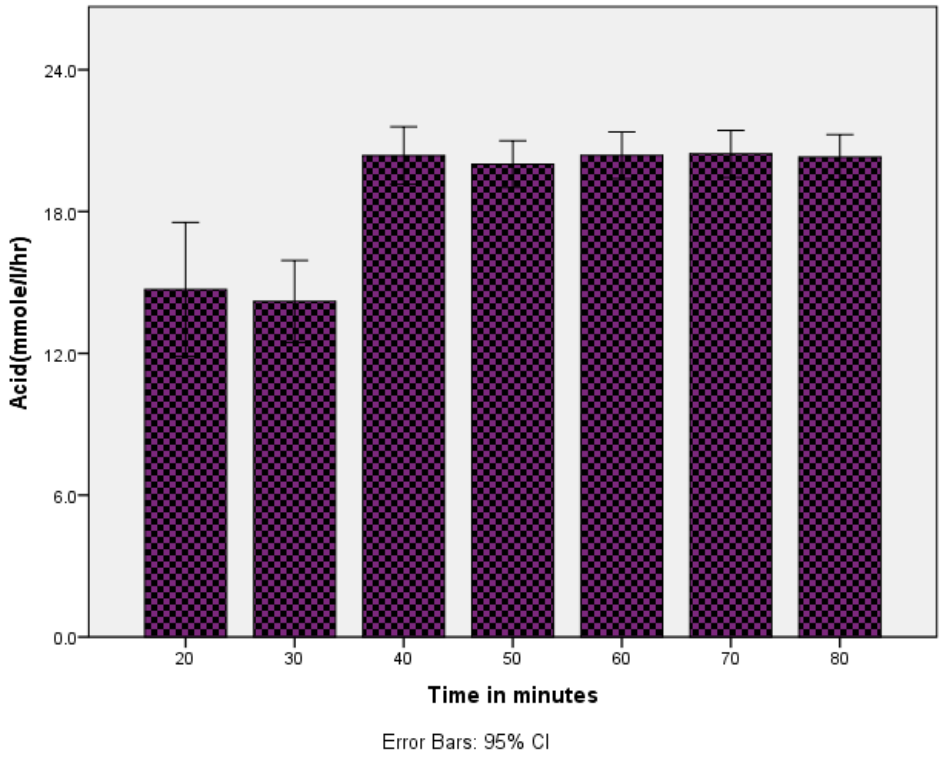

Figure 2- A graph showing the effect of administering a dose of 20% of LD50 of Capsicum annum extract. Saturation phenomenon is observed from 40 to 80 minutes

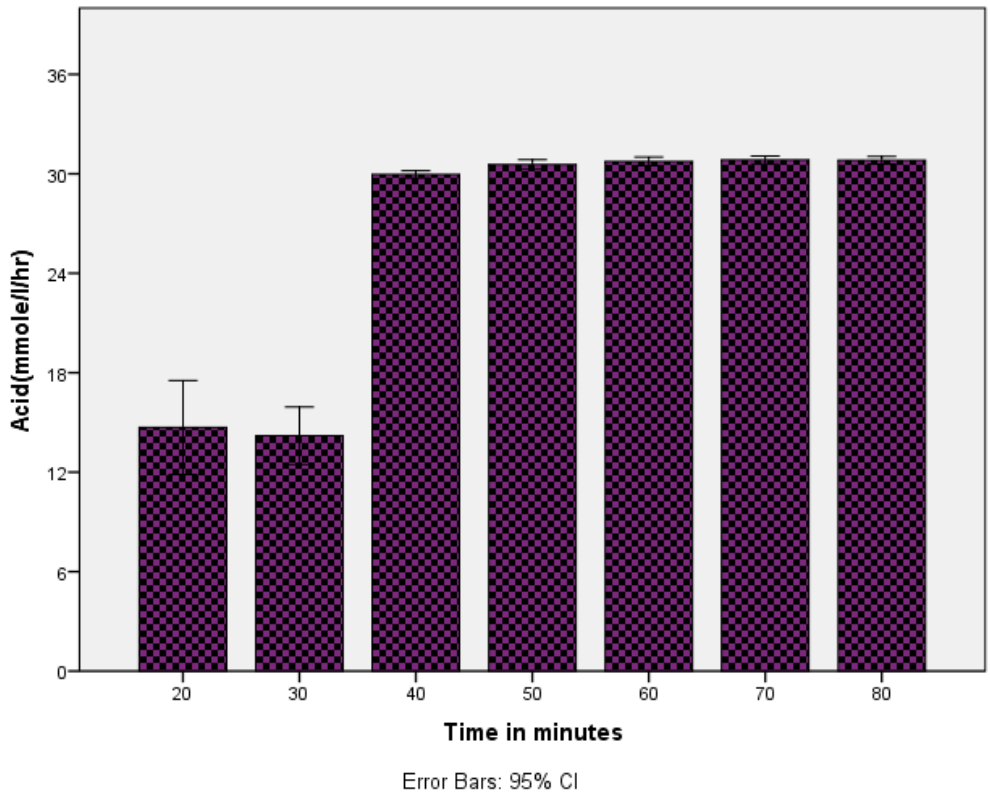

Figure 3- A graph showing the effect of administering a dose of 30% of LD50 of Capsicum annum extract. Saturation phenomenon is observed from 40 to 80 minutes

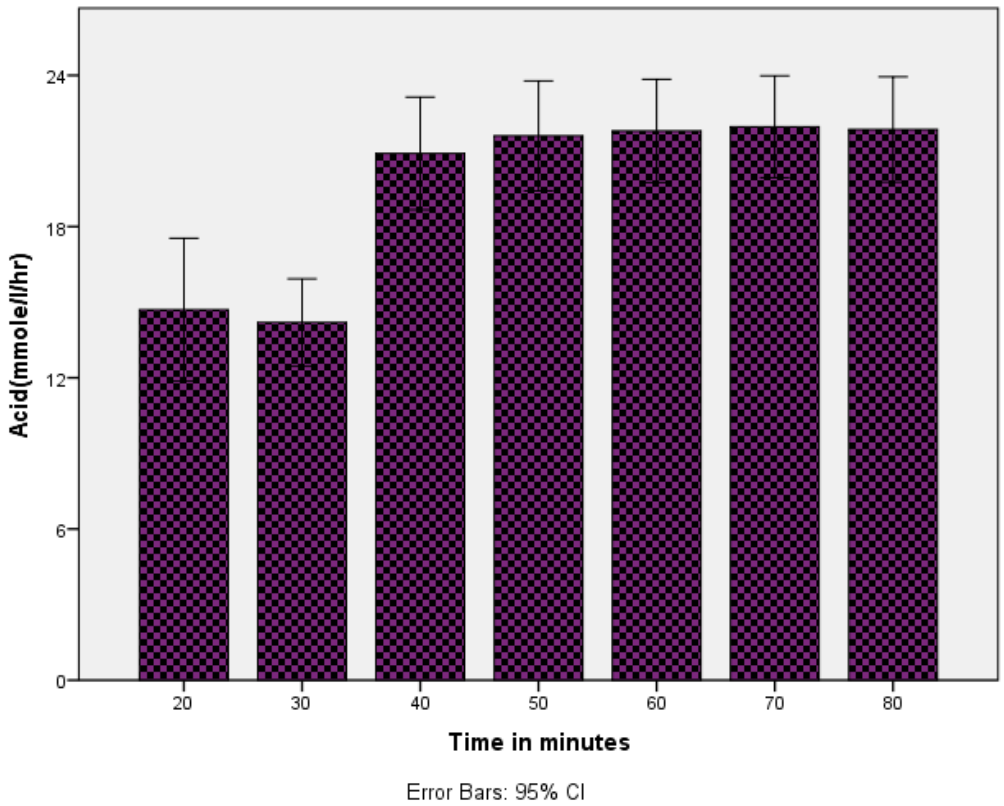

Figure 4- A graph showing the effect of administering a dose of 10mg supramaximal dose of Capsicum annum extract. Saturation phenomenon is observed from 40 to 80 minutes

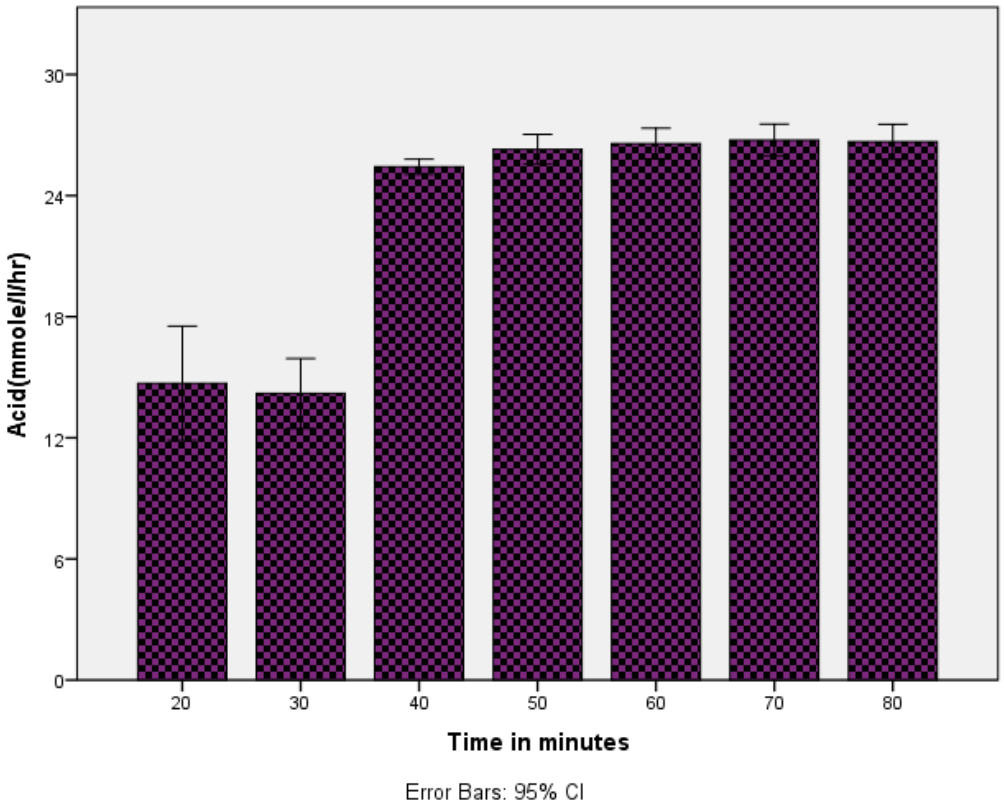

Figure 5- A graph showing the effect of administering a dose of 20mg supramaximal dose of Capsicum annum extract. Saturation phenomenon is observed from 40 to 80 minutes

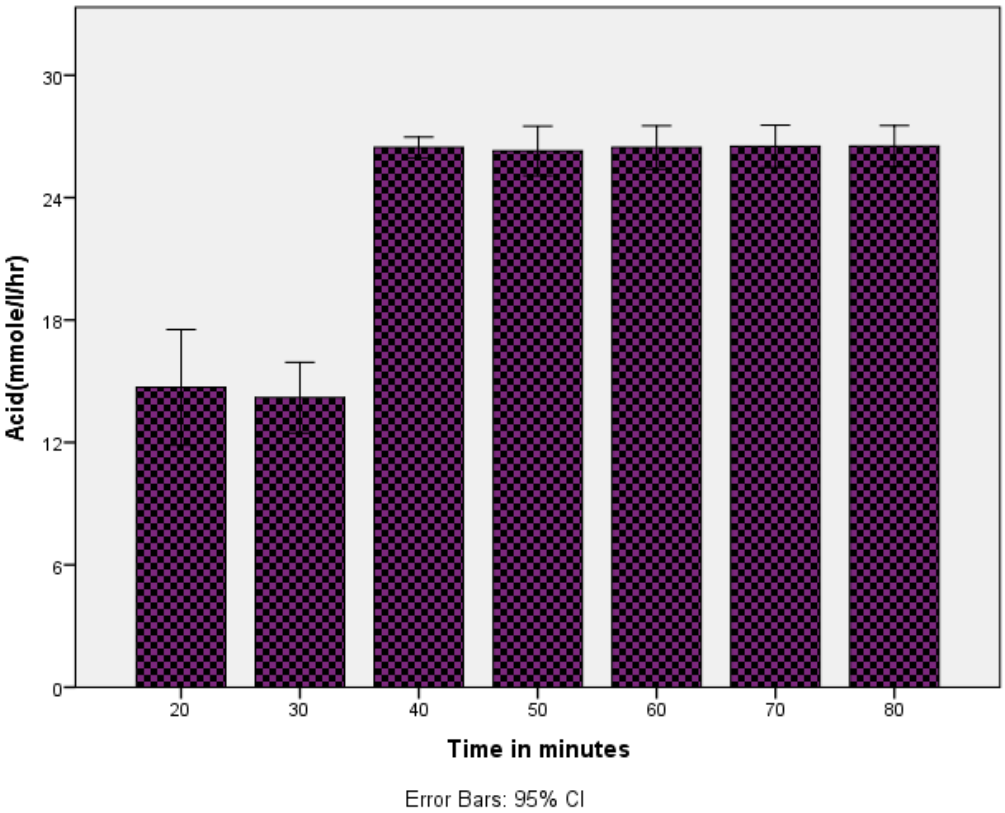

Figure 6- A graph showing the effect of administering a dose of 30mg supramaximal dose of Capsicum annum extract. Saturation phenomenon is observed from 40 to 80 minutes

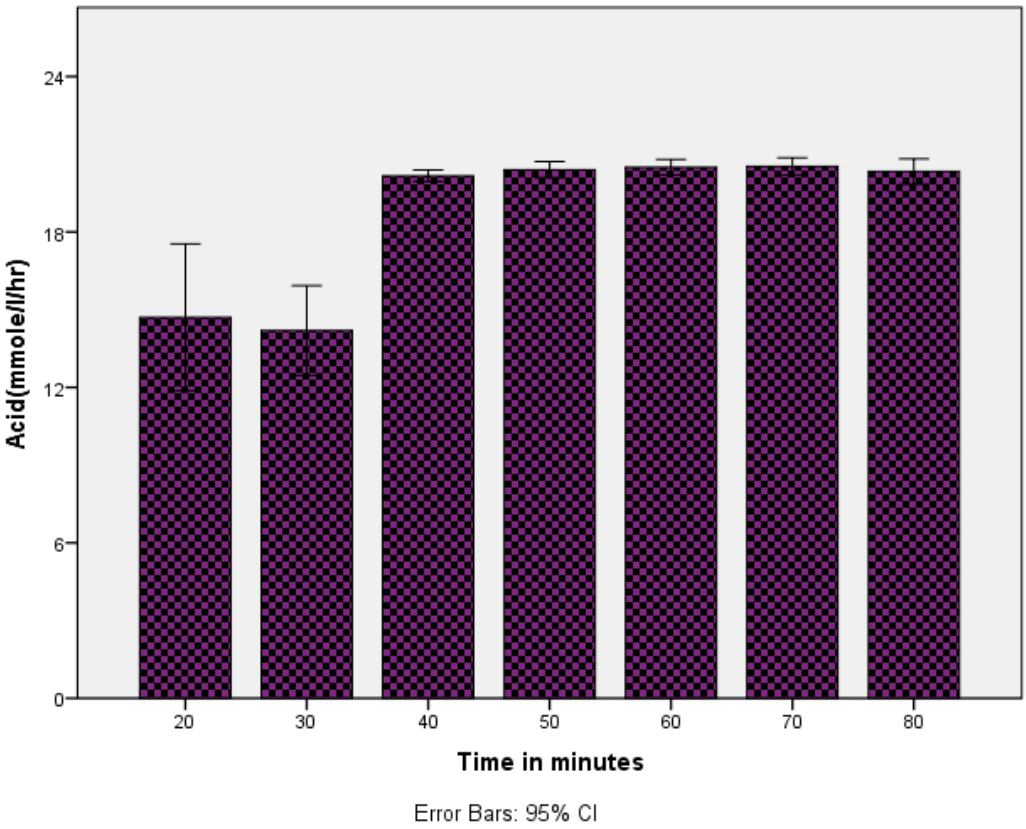

Figure 7- A graph showing the effect of administering a dose of 40mg supramaximal dose of Capsicum annum extract. Saturation phenomenon is observed from 40 to 80 minutes

IV. Discussion

Capsicum annum (hot pepper) contains capsaicin as the active principle. Capsaicin exerts it activity through the capsaicin-sensitive sensory afferent nerves. This study demonstrated that C. annum significantly increases gastric acid secretion ($p<0.05$). This action is dose dependent for the first 30mins of the experiment. However, from 40 to 80 minutes, acid secretory response reached a peak and remained as a plateau response. This plateau response is called saturation phenomenon. Several natural phenomena have been described to exhibit saturation phenomena. These include ligand binding, enzyme kinetics, facilitated diffusion, predator-prey behavior, bacterial culture growth rate, infection transmission and surface adsorption [14]

Capsaicin-sensitive afferent neurons play a central role in the neuronal mechanism of the stomach [15]. These afferent neurons control several actions such as mucosal blood flow, secretion, motility and maintenance of the mucosal integrity of the stomach [15]

Capsaicin has several actions, its effects on gastric acid secretion however attracts a lot of attention. Some studies report that low-dose capsaicin can decrease gastric acid secretion while high-dose may increase gastric acid secretion [16,17].

It is concluded that there is saturation phenomenon exhibited by Capsicum annum stimulated gastric acid secretion in albino Wistar rats. Similar saturation phenomenon in gastric acid secretion was reported for Capsicum frutescens in albino rats [14].

V. Recommendation

Public health education is advocated to give people awareness of the findings in this research.
Advice should be given to people to be careful in the use of pepper in preparing their meals by using this pepper in moderation to avoid saturation phenomenon

References

[1]. Ibu , J.O., Irozuru, M.N., Dakar, D.D. (1993). Effects of Capsicum annum, Capsicum frutescens and Tamarindus indica (African peppers) on gastric acid secretion. Nig Med J. Vol 24(suppl): 9-12.

[2]. Nndunno Akwaras., Julie Ibu., Christian Onahinon., Eru Emmanuel., Adugba Augustine., Saalu Linus., John Ibu(2018).Capsicum Frutescens Exhibits Tachyphylaxis In Gastric Acid Secretion (*International Journal of Innovative Research and Development 7 (4)*:148-157

[3]. Prout, W. (1824). 'On the nature of acid and saline matters usually existing in stomach of animals', *Phil Trans*,14: 45-49

[4]. Sung, J., Kim, N. and Kim J. (2016). 'Comparison of gastric microbiota between gastric juice and mucosa by next generation sequencing method', *Journal of Cancer Prevention*, 21(1):60-65
[5]. Nmaju, A.U., Joshua, I.E., Okon, U.E., Nwankwo, A.A. and Osim, E.E.(2017). 'Long-term consumption of *Capsicum annum* (chilli pepper) and capsaicin diets impairs visuo-spatial learning and memory in CD-1 mice', *Journal of Advances in Medicine and Medical Research*, 24(7):1-12
[6]. Clapham, D.E., Runnels, L.W., and Strubing, C. (2001). 'The TRP ion channel family', *Nat Rev Neurosci* 2:387–396.
[7]. Dedov,V.M, Tran, V.H, Duke, C.C. and Mark C. (2002). 'Gingerols: a novel class of vanolloids', *Br J Pharmacol*,136(6): 793-798.
[8]. Szallasi, A., and Blumberg, P.M. (1999). 'Vanilloid (capsaicin) receptors and mechanisms', *Pharmaco, Rev.* 51:159–212
[9]. Alnaqueeb, M.A. Thompson, M. Bordia, T. and Ali M. (1996). Histopathological effects of garlic on liver and lungs of rats. *Toxicol Lett*, 85, 157-164.
[10]. Ekwere M.R. and Udoh, D.E. (2016) Extraction and comparative analysis of moisture and capsaicin contents of capsicum peppers. *J pain Relief* , 5, 268.
[11]. Saito, A. and Yamamoto, M.(1996). Acute oral toxicity of capsaicin in mice and rats. *J Toxicol Sci* , 21(3), 195-200.
[12]. Ibu, J.O. Nwokediukko S.C. and Okpara, E. 1986). The nature of stimulation of gastric acid secretion by cola nitida using antimuscarinic drugs. *Proceeding West Soc Gastroent* ,1, 7-8.
[13]. . Ibu JO, *Synopsis of medical physiology* (Manchester, Amazon Press, 1987).
[14]. Nndunno Akwaras., Julie Ibu., Christian Onahinon., Emmanuel Eru (2018). Aqueous Extract of Capsicum Frutescens Exhibits Saturation Phenomenon in Gastric Acid Secretion (*International Journal of Innovative Research and Development 7 (4) :7-13*
[15]. Holzer, P. (1998). 'Neural emergency system in the stomach', *Gastroenterology*, 114: 823–839.
[16]. Imatake, K., Matsui, T. and Moriyama, M. (2009). 'The effect and mechanism of action of capsaicin on gastric acid output, *Journal of Gastroenterology*, 44(5):396-404
[17]. Mozsik, G. I., Vincze, A., and Szolcsanyi J. (2001). 'Four response stages of capsaicin-sensitive primary afferent neurons to capsaicin and its analog: gastric acid secretion, gastric mucosal damage and protection', *J Gastroenterol Hepatol*, 16(10): 1093-1097

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