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Research Article

To Study the Antacid Property of Classically Known Edibles

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Abstract

Objective of performing this research is to provide scientific studies for validating edibles in their relieving property against hyperacidity which is mainly resulting from medication side effects, alcohol, stress, smoking, eating habit, pregnancy, obesity, aging, fasting and many more.

Hyperacidity is highly common problem among all ages, classes, and community which is mentioned in Hindu texts on medical profession that survived from ancient India. In this research paper, we try to verify antacid activity of classically known edibles in the traditional Indian literatures of herbal plants in naturopathy or under the known knowledge of alternative medicine. These foods help to restore the natural gastric balance and function, curb acid reflux, aid digestion, reduce the burning sensation due to hyperacidity and soothe the inflamed mucosa of the stomach. The valuation was carried out by performing pH determination, Acid neutralization capacity determination as per USP and the neutralizing capacity of test sample which was determined *in vitro* using the classical titration method of Fordtran. During this study, ENO was considered as standard for comparison. This research also covered cow urine, ganga jal and on water (other than the known common edibles) as a sample for analysis. During determination of initial pH values of cow urine, ginger juice, mint juice, corn juice, tulsi juice, wheatgrass juice, it was observed that there pH was identified to be more then standard's pH value. It was also observed from results of Acid neutralization Capacity that some of the test samples for ex. cow urine, moong Juice, beal leaves juice, green tea, lady finger juice, sprouted chana juice, aarbi Juice, sprouted moong juice and green onion juice had shown comparable Total mEq value with standard (i.e. 8.70). During artificial gastric acid neutralization using fordhtran model, we also noted that samples like cow urine sprouted moong juice, spinach juice, kabuli chana juice, red Onion juice, arbi juice, carrot juice, potato juice and curd had shown comparable mmol H+ result with standard (i.e. 15.585).

It is concluded from the study that investigation of edible for their antacid activity are found more promising upcoming therapy against hyperacidity.

Keywords: *Hyperacidity; Acid Neutralization Capacity (ANC); Fordtran Model; Milliequivalent; mmMolH+*

Abbreviations

NaOH: Sodium Hydroxide; HCl: Hydrochloric Acid; ANC: Acid Neutralization Capacity; NIST: National Institute of Standard and Technology; SD: Standard Deviation

Introduction

The verses from Sushruta Samhita gives definition of health (Sushrut Samhita, Sutrasthan, Ch. 15, Shloka 10).

This definition of health closely resembles to that given by World Health Organization (WHO). Thus, Ayurveda has said thousands of years ago what WHO (World Health Organization) states today [1].

समदोषः समाग्निश्च समधातुमलक्रियाः।

प्रसन्नात्मेन्द्रियमनः स्वस्थ इत्यभिधीयते ॥

The shloka: (1)

सम-दोषः (1) सम-अग्निः (2) च (3) सम-धातुः (4) (सम)मलं (5) (सम)क्रियाः (6) ।

Sama-doṣaḥ (1) sama-agniḥ (2) ca (3) sama dhātuḥ (4) (sama) malaṃ (5) (sama) kriyāḥ (6) |

प्रसन्न आत्म (7) (प्रसन्न) इन्द्रिय (8) (प्रसन्न) मनः (9) स्वस्थः (10) इति (11) अभिधीयते (6) ||

Prasanna ātma (7) (prasanna) indriya (8) (prasanna) manaḥ (9) svasthaḥ (10) iti (11) abhidhīyate (12) ||

Meaning of this shloka

The human, is described (abhidhīyate (12)) as (iti (11)) healthy (svasthaḥ (10)) when the patho-physiological bio-elements/life-forces (doṣa (1)), bodily combustion (agni (2)), fundamental constituents (dhātu (4)), excreta (mala (5)) functions (kriyā (6)), are in optimum balance (sama (1)) and (ca (3)) exuberance (prasanna (7)) of self (ātma (7)) sensory/action organs (indriya (8)) and mind (manaḥ (9)).

The major causative factors as explained in the classical literature are mainly vitiating the Agni and its functions related with digestion and metabolism. The problem is very common in the general population, and in all age group exclusively.

Amlapitta is becoming burning issue in today's world which can be cured by the antacids, but it has its own unavoidable associated side effects as well. To treat hyperacidity, we can find holistic approach which can be pharmacological or non-pharmacological, both can be applied in finding the treatment.

Below specified is a section of noteworthy news from global antacid market:

- MarketResearch.biz delivers in-depth insights on the global antacid market in its upcoming report titled, "Global Antacid Market Trends, Applications, Analysis, Growth, and Forecast: 2018 to 2027". Which tell that World Health Organization 2017, more than $10 billion is being spent worldwide each year on antacids and also tell about how today's world accentuates Natural plants extract to combat stomach acidity are now-a-days used to manufactured antacid drug formulations. The extracts from herbal plants are being used worldwide for treatment of acidity related problems. According to World Gastroenterology Organization, the prevalence of GERD is increasing worldwide and ranges from nearly 2.5% to 6.6% in Eastern Asia and nearly 13.8% to 25.8% in North America [2].
- Antacid market on fast track of growth: This time, the fire in the belly could be a detriment to success! No wonder, the Rs. 220-crore antacid market is registering a compounded annual growth rate (CAGR) of 9.3% over the past three years [3].
- Global Antacid market is a growing market in Pharmaceuticals Healthcare sector at present years. The Antacid has covered rapid development in the current and past years and is probably going to proceed with a continuing development in the upcoming years [4].

History

For the complete understanding of any topic, it is necessary to hint out its ancient context, to get a real representation in the development of the science from time to time. This seems more appropriate to the most ancient health care system of the world which is called Ayurveda. The progress this system has attained in the ancient period itself, makes the study of its history thought-provoking and educational as well. Here the references we are receiving about the disease Amlapitta, has been mentioned with detail [5]:

- Amlapitta This is greater triad of three texts (Charak Samhita, Sushrut Samhita and Ashtang Hrudaya). Although there are few indirect hints at this concept. However, Kashyap Samhita and Laghu Trayi (Madhav Nidana, Sharangdhar Samhita and Bhavprakash), have explained amlapitta in detail. Madhav Nidana contains one full chapter on amlapitta.
- Chakrapani in his commentary on Charak Samhita defines "Amlapittam Cheti amlagunoundriktam pittam" - the augmented or increased amla guna of p:itta is known as Amlapitta.
- Shrikanthadutta in his Madhukosha vyakhya defines "Vidahadhyamla gunaoundrikta pittam amlapittam" i.e. the pitta becomes augumented or vidagdha because of excessive increase of amla guna of pitta and "Amlam vidagdham cha tat pittam amlapittam" the pitta which attains amla guna and vidagdhata is called as amlapitta [6].

Definition

Hyperacidity (Amlapitta) is one of the most common disease seen in the society. Hyperacidity refers to a set of symptoms caused by an imbalance between the acid secreting mechanism of the stomach, proximal intestine and the protective mechanisms that ensure their safety. The stomach normally secretes acid that is essential in the digestive process. When there is excess production of acid in the stomach, it results in the condition known as Hyperacidity or acidity [7].

Hyperacidity Symptoms

Initially hyperacidity is complained with restlessness belching, sour taste and stiff stomach:

- Most know complication of hyperacidity is the damage of mucosal layer which is painful and if not attended causes ulceration.
- After this if untreated it further damages the mucosal layer ultimate with perforation and patient complains with constipation and indigestion.
- Beyond this if not treated then it causes cancer and could be fatal as a result hyperacidity required prior attention and treatment [8].
- Acidity is linked with medication side effect, alcohol, stress, smoking, eating habit, pregnancy, obesity, aging, fasting and many more [9].

Most patients diagnosed with hyperacidity do not have chronic peptic ulcer (defined as a break in the mucosa that extends through the muscularis mucosae) or any recognized anatomic pathologic entity.

Relief in symptoms and prevention of relapses are the primary aims of treatment for most patients:

- Lifestyle and dietary recommendations, together with antacids, have long been the mainstay of treatment. Epidemiological studies have shown that antacids are often used successfully as self-treatment by people with reflux who do not seek medical help and marketed antacid have potential to cause side effect and drug interaction. This is the reason people prefer to use natural juices as antacid.
- Natural Cure for hyperacidity has been a popular search phrase these days. Thousands of people are searching for simple remedies to cure their acid reflux and it made to work on it with scientific approach. Ayurveda says that Everything you eat has an effect on your body, which Ayurveda (i.e. the traditional Hindu system of medicine, which is based on the idea of balance in bodily systems and uses diet, herbal treatment, and yogic breathing) categorizes in a simple and easy way, using gunas [10].
- Gunas are qualities that describe the effect of food or herb on your body. It made to design the core of study and guide to conduct a study base approach as per figure 2. Most of accessible edibles are analysed to know its effectiveness against the acidity.
- This study was firstly started by perceiving initial pH value further supplemented with investigation on scientific approach of:
  - Acid Neutralization Capacity and
  - Neutralizing artificial gastric juice under Fordtran's Model.
- Antacids are used for the symptomatic relief of dyspepsia which may be due to functional or associated with identifiable pathology as presented in figure 1 [11].

Figure 1: Hyperacidity associated complications [12,13].

Approach

- Traditionally known edibles listed in table 1 are commonly used for their antacid property since ancient times. Hence they have been chosen and studied to verify their properties by using *in vitro* titration method (Refer figure 2 experimental workflow).
- This study was also extended to include cow urine, cow-calf urine, marketed urine (distilled cow urine), ganga jal and water.
- Out of all studied samples as specified in table 1, 68 of them are common edibles.
- Remaining three are the commonly available antacid i.e. Bhasma, Marketed formulation and ENO.
- ENO is the standard used for comparison with all the studied samples. We considered it as the standard because it's one of the well-known, marketed, recognized and acceptable antacid.

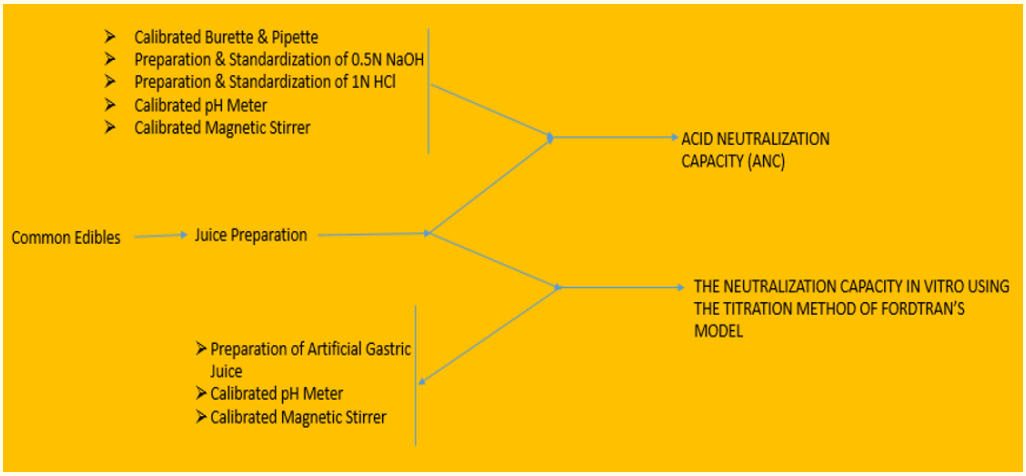

Figure 2: Experimental Workflow.

Material and Method

Preliminary Activity

- Preparation and standardization of 1N HCl.
- Preparation and standardization of 0.5N NaOH.
- Preparation of Artificial Gastric Acid Sodium chloride (2g) and pepsin (3.2 mg) were dissolved in 500 mL distilled water. Hydrochloric acid (7 mL) and adequate water were added to make a 1,000-mL solution. The pH of the solution was adjusted to 1.2 [14].
- Calibration of pH meter using NIST certified buffer.
- Artificial gastric buffer Preparation using Himedia pepsin and NaCl of fisher Scientific.
- Validated excel to calculate mean and standard deviation.
- Calibrated burette and pipette.
- Single Distillation Assembly validation and Distill water preparation (Make-Lab Sil Instrument).
- Magnetic stirrer calibrated for rpm [Make-1MLH, REMI].

Instruments

Below specified is the list of instruments used during this study:

- Standard pH meter (Digital pH MeterDP505).
- A magnetic stirrer with hot plate temperature controller (1MLH, REMI).
- pH electrode PE-03 of accuracy; 0.01 pH (ERMA INC. TOKYO JAPAN) with an adjustable electrode stand.

Collection of edibles

- Bottle gourd, kiwi, ridged gourd, spinach, banana, coconut, potato, apple, red onion, carrot, chikoo, coriander leaves, radish, cucumber, tindora, moringa leaves, pumpkin, beetroot, tulsi, aloe vera, pomegranate, elephant foot yam, capsicum, watermelon, corn, french beans, bitter gourd, mint, green onion, parwal, aarbi, broccoli, dates radish, tomato, kabuli chana, kadipata, moong and sprouted moong, papaya, ginger, brinjal, pineapple, pear, plums, Indian jujube, guava leaves bel leaves and fruit were purchased from Tarsali vegetable market of Vadodara, Gujarat-India.
- Cow urine, cow calf urine, curd was purchased from cow shed of Gujarat (Vadodara), India.
- Ganga jal was brought from Uttar Pradesh, India.

Preparation of test and standard solutions

All the listed edibles in table 1 were purchased (Appx. Quantity 250g each) from local market of Vadodara, Gujarat which was washed to remove adhering dirt, chopped and their juices were prepared in a juicer. Cow and calf urine were purchased from cow shed/bran near Makarpura of Vadodara-Gujarat and performed analysis within 30 minutes of its collection. Leaves in the analysis were purchased from market and prepared in juicer for analysis.

Curd (200 gm) was collected from farm yard and blended for analysis. The standard solution of ENO was prepared by adding a sachet containing 5g of the dispersible granules to 150 mL of water

and the resulting solution was used for determination. Marketed ayurvedic antacid suspension was purchased and 5 ml of same was diluted to 150 ml with water and analyzed.

Method

Determination of pH

The listed edibles in table 1 were determined for pH value.

Determination of Acid-Neutralizing Capacity [14,15]

In vitro acid-neutralizing capacity Determination of ANC was determined in accordance with the United States Pharmacopeia (USP) 30 and the National Formulary (NF) 25.13,14. In short, all tests were conducted at a temperature of 37°C ± 2°C.

A pH-meter was standardized using potassium biphthalate and potassium tetraoxalate (0.05M each) and standardized buffers. A magnetic stirrer was used to maintain a stirring rate of 300 ± 30 rpm.

Transfer an accurately weighed quantity of the juice, equivalent to the minimum dosage, to a 250-mL beaker, add water to make a total volume of about 70 mL, and mix on the Magnetic Stirrer for 1 minute.

Pipette 30.0 mL of 1.0N hydrochloric acid VS into the test preparation while continuing to stir with the magnetic stirrer for 15 minutes, accurately timed, after the addition of the acid, begin to titrate immediately, and in a period not to exceed an additional 5 minutes, titrate the excess hydrochloric acid with 0.5N sodium hydroxide VS to attain a stable (for 10 to 15 seconds) pH of 3.5. Calculate the number of mEq of acid consumed by the formula:

$$\text{Total mEq} = (30 \times N_{HCl}) - (V_{NaOH} \times N_{NaOH})$$

In which N HCl and N NaOH are the Normalities of the hydrochloric acid VS and the sodium hydroxide VS, respectively; and V NaOH is the volume of sodium hydroxide VS used for titration. Express the result in terms of mEq (in milliequivalents of acid consumed per g of the substance tested. Test solution (i.e. common edibles) were prepared in triplicate and analysed and calculated for Standard Deviation, Mean of total mEq.

Determination of the neutralization capacity *in vitro* using the titration method of Fordtran's Model [16-18]

Each test solution (90 mL) was placed in a 250-mL beaker and warmed to 37°C. A magnetic stirrer was continuously run at 30 rpm to imitate the stomach movement. The test solution was titrated with artificial gastric juice to the end point of pH 3. The consumed volume (V) of the artificial gastric juice was measured for each test solution. The H+ consumed by each test solution was calculated using the formula H+ consumed (mmol) = 0.063096 × V (mL) (Please refer table 1).

Test solution (i.e. Common edibles) were prepared in triplicate and analyzed and calculated for Standard Deviation, Mean and mmol of H+ consumed.

Results and Discussions

Investigation of pH results are represented in table 1.

Sr. No	Name of Edibles	Biological Source	Family	pH value	Mean ± SD (ml)	Total mEq	mmol of H^+	Mean ± SD (mmol of H^+)
1	Bottle gourd	*Lagenaria siceraria*	*Cucurbitaceae*	4.83	56.13 ± 0.25	1.93	0.8854	14.03 ± 0.12
2	Kiwi Juice	*Actinidia deliciosa*	*Actinidiaceae*	3.00	59.50 ± 0.50	0.25	0.2545	4.03 ± 0.15
3	Spinach Juice	*Spinacia oleracea*	*Amaranthaceae*	6.14	54.00 ± 0.20	3.00	3.8173	60.50 ± 0.50
4	Ridged gourd (Turai)	*Luffa acutangular*	*Cucurbitaceae*	5.88	55.50 ± 0.30	2.25	1.346	21.33 ± 0.31
5	Banana	*Musa acuminata*	*Musaceae*	5.21	54.60 ± 0.44	2.70	1.5143	24.00 ± 0.26
6	Coconut water	*Cocos nucifera*	*Arecaceae*	5.80	55.53 ± 0.21	2.23	2.3009	36.47 ± 0.06
7	Potato	*Solanum tuberosum*	*Solanaceae*	6.09	54.90 ± 0.36	2.55	3.975	63.00 ± 0.20
8	Apple Juice	*Malus pumila*	*Rosaceae*	4.78	56.40 ± 0.40	1.80	1.1483	18.20 ± 0.10
9	Honey	*Apis mellifera*	*Apideae*	4.53	56.00 ± 0.10	2.00	0.6015	9.53 ± 0.06
10	Red Onion	*Allium cepa*	*Amaryllidaceae*	5.16	56.40 ± 0.46	1.80	3.5313	56.97 ± 0.21
11	Carrot	*Daucus carota*	*Apiaceae*	6.34	55.50 ± 0.20	2.25	3.0917	49.00 ± 0.10
12	Chikoo (Sapodilla)	*Manilkara zapota*	*Sapotaceae*	5.80	55.50 ± 0.10	2.25	2.8393	45.00 ± 0.50

13	Coriander	*Coriandrum sativum*	*Apiaceae*	6.20	57.00 ± 0.20	1.50	1.5143	24.00 ± 0.26
14	Mully (Radish)	*Raphanus raphanistrum*	*Brassicaceae*	6.16	57.00 ± 0.26	1.50	1.5143	24.00 ± 0.20
15	Cucumber	*Cucumis sativus*	*Cucurbitaceae*	5.24	53.97 ± 0.50	3.02	1.3376	21.20 ± 0.36
16	Tindora (Ivy gourd)	*Coccinia grandis*	*Cucurbitaceae*	5.97	53.43 ± 0.40	3.28	2.3219	36.80 ± 0.10
17	Moringa Leave	*Moringa oleifera*	*Moringaceae*	5.35	54.00 ± 0.10	3.00	2.3976	38.00 ± 0.20
18	Pumpkin (squash)	*Cucurbita maxima*	*Cucurbitaceae*	4.58	54.60 ± 0.17	2.70	1.5143	24.00 ± 0.40
19	Beet root	*Beta vulgaris*	*Amaranthaceae*	5.81	53.70 ± 0.20	3.15	1.8298	29.00 ± 0.46
20	Tulsi(Holy Basil)	*Ocimum gratissimum*	*Lamiaceae*	6.79	54.60 ± 0.30	2.70	0.6983	11.07 ± 0.15
21	Tulsi (Shama)	*Ocimum tenuiflorum*	*Lamiaceae*	6.22	54.33 ± 0.25	2.83	0.6962	11.03 ± 0.06
22	Aloe vera	*Aloe vera*	*Asphodelaceae*	4.35	54.60 ± 0.26	2.70	1.3881	22.00 ± 0.20
23	Pomegranate	*Punica granatum*	*Lythraceae*	3.97	54.90 ± 0.20	2.55	1.0095	16.00 ± 0.10
24	Elephant foot yam (Suran)	*Amorphophallus paeoniifolius*	*Araceae*	5.50	54.90 ± 0.36	2.55	2.5259	40.03 ± 0.06
25	Capsicum	*Capsicum annum*	*Solaneaceae*	5.93	56.10 ± 0.10	1.95	1.0726	17.00 ± 0.10
26	Cabbage	*Brassica oleracea*	*Brassicaceae*	6.37	56.10 ± 0.36	1.95	1.5795	25.03 ± 0.25
27	Water melon	*Citrullus lanatus*	*Cucurbitaceae*	5.95	53.40 ± 0.53	3.30	2.385	37.80 ± 0.10
28	Corn juice	*Zea mays*	*Poaceae*	6.75	53.70 ± 0.53	3.15	2.6437	42.90 ± 0.10
29	Common Bean (French beans)	*Phaseolus vulgaris*	*Fabaceae*	5.57	53.40 ± 0.35	3.30	1.2935	20.50 ± 0.26
30	Karela (Bitter melon)	*Momordica charantia*	*Cucurbitaceae*	6.00	53.40 ± 0.26	3.30	1.5501	24.57 ± 0.06
31	Mint	*Mentha spicata*	*Lamiaceae*	6.83	54.27 ± 0.31	2.87	0.6499	10.30 ± 0.17
32	Green Onion (welsh Onion)	*Allium fistulosum*	*Amaryllidaceae*	6.28	53.07 ± 0.21	3.47	1.1505	18.23 ± 0.23
33	Parwal (Pointed gourd)	*Trichosanthes dioica*	*Cucurbitaceae*	6.52	53.10 ± 0.10	3.45	0.9591	15.20 ± 0.20
34	Arbi (Taro)	*Colocasia esculenta*	*Araceae*	5.85	51.90 ± 0.36	4.05	3.1422	49.80 ± 0.30
35	Hibiscus Leaves	*Hibiscus rosa sinensis*	*Malvaceae*	6.29	53.10 ± 0.17	3.45	1.5648	24.80 ± 0.36
36	Tomato	*Solanum lycopersicum*	*Solanaceae*	4.29	54.60 ± 0.20	2.70	1.6089	25.50 ± 0.53
37	Kabuli Chana (Chickpea)	*Cicer arietinum*	*Fabaceae*	4.83	54.00 ± 0.40	3.00	3.6596	58.00 ± 0.17
38	Kadipata (Curry leaves)	*Murraya koenigii*	*Rutaceae*	6.20	54.30 ± 0.36	2.85	0.6941	11.00 ± 0.20
39	Moong Sprouted (Mung bean)	*Vigna radiata*	*Fabaceae*	6.28	52.80 ± 0.44	3.60	4.0192	63.70 ± 0.62
40	Moong	*Vigna radiata*	*Fabaceae*	6.52	48.90 ± 0.20	5.55	7.6346	121.00 ± 0.46
41	Papaya	*Carica papaya*	*Caricaceae*	4.93	53.70 ± 0.26	3.15	2.8393	45.00 ± 0.40
42	Guava Leaf	*Psidium guajava*	*Myrtaceae*	5.80	54.F3130 ± 0.30	2.85	0.5048	8.00 ± 0.50
43	Ginger Juice	*Zingiber officinale*	*Zingiberaceae*	6.85	54.00 ± 0.40	3.00	0.5489	8.70 ± 0.44
44	Curd	*Bos taurus*	*Bovidae*	4.25	53.70 ± 0.44	3.15	3.0286	48.00 ± 0.20
45	Dates juice	*Phoenix dactylifera*	*Arecaceae*	5.62	54.57 ± 0.35	2.72	1.7667	28.00 ± 0.20
46	Brinjal Juice (Egg plant)	*Solanum melongena*	*Solanaceae*	5.23	53.40 ± 0.40	3.30	1.8298	29.00 ± 0.20
47	Bael fruit	*Aegle marmelos*	*Rutaceae*	3.41	54.90 ± 0.26	2.55	1.5774	25.00 ± 0.26

48	Bael leaves	*Aegle marmelos*	*Rutaceae*	6.27	51.00 ± 0.20	4.50	2.4923	39.50 ± 0.40
49	Lady finger (okra)	*Abelmoschus esculentus*	*Malvaceae*	5.98	51.60 ± 0.56	4.20	1.8298	29.00 ± 0.36
50	Rice starch	*Oryza sativa*	*Poaceae*	6.30	57.00 ± 0.17	1.50	0.3786	6.00 ± 0.50
51	Pineapple	*Ananas comosus*	*Bromeliaceae*	3.96	55.50 ± 0.30	2.25	1.2619	20.00 ± 0.56
52	Pears	*Pyrus communis*	*Rosaceae*	3.99	54.90 ± 0.35	2.55	2.0822	33.00 ± 0.46
53	Plums	*Prunus domestica*	*Rosaceae*	3.44	56.40 ± 0.46	1.80	0.8202	13.00 ± 0.46
54	Ber (Indian jujube)	*Ziziphus mauritiana*	*Rhamnaceae*	6.22	54.30 ± 0.26	2.85	0.8076	12.80 ± 0.30
55	Sprouted Chana juice	*Cicer arietinum*	*Fabaceae*	5.34	51.90 ± 0.20	4.05	3.4703	55.00 ± 0.30
56	Urine cow calf	*Bos taurus*	*Bovidae*	6.85	48.00 ± 0.20	6.00	9.4644	150.00 ± 0.30
57	Cow urine	*Bos taurus*	*Bovidae*	6.84	47.40 ± 0.46	6.30	6.4989	103.00 ± 0.46
58	Marketed cow urine	-	-	9.27	47.43 ± 0.45	6.28	9.7799	155.00 ± 0.46
59	Wheatgrass	*Thinopyrum intermedium*	*Poaceae*	6.65	53.40 ± 0.36	3.30	0.347	5.50 ± 0.36
60	Rose juice	*Rosa rubiginosa*	*Rosaceae*	5.21	54.00 ± 0.36	3.00	0.5111	8.10 ± 0.36
61	Fennel juice	*Foeniculum vulgare*	*Apiaceae*	5.66	56.10 ± 0.26	1.95	2.0822	33.00 ± 0.56
62	Coriander seed juice	*Coriandrum sativum*	*Apiaceae*	5.88	53.10 ± 0.17	3.45	1.956	31.00 ± 0.46
63	Ajwain Seed	*Trachyspermum ammi*	*Apiaceae*	6.21	53.40 ± 0.40	3.30	1.7667	28.00 ± 0.20
64	Cumin seed	*Cuminum cyminum*	*Apiaceae*	5.80	54..90 ± 0.26	2.55	0.9654	15.30 ± 0.53
65	Lemon (Rind)	*Citrus limon*	*Rutaceae*	3.10	59.70 ± 0.50	0.15	0.1577	2.50 ± 0.36
66	Green tea	*Camellia sinensis*	*Theaceae*	5.33	51.60 ± 0.53	4.20	0.9338	14.80 ± 0.30
67	Papaya raw fruit	*Carica papaya*	*Caricaceae*	5.74	56.10 ± 0.36	1.95	1.142	18.10 ± 0.36
68	Asafotida	*Ferula assa-foetida*	*Umbelliferae*	5.33	54.27 ± 0.50	2.87	0.2208	3.50 ± 0.26
69	Marketed Herbal Formulation	-	-	8.85	27.20 ± 0.66	16.40	11.357	180.00 ± 0.36
70	Bhasma (Shankha Bhasma)	-	-	6.82	38.77 ± 0.38	10.62	0.7445	11.80 ± 0.30
71	ENO	-	-	6.47	42.60 ± 0.30	8.70	15.585	247.00 ± 0.56

Table 1: Represents the Names of edibles, Biological Source, Family pH value, total mEq, 0.5N NaOH Consumed in ml, Total mEquivalent, Neutralization capacity in vitro using the titration method of Fordtran's model, Total mmolH^+ and Artificial gastric acid consumed in ml.

All of the samples with the pH > 6.00 is chosen for discussion. Specifically pH = 6.85 for cow calf urine, pH = 6.84 for Cow calf's mother, pH = 9.27 for marketed cow urine (distilled urine) which is more than pH = 6.47 for ENO.

We observed further pH values like ginger juice (pH = 6.85), mint juice (pH = 6.83), Corn juice (pH = 6.75), tulsi (pH = 6.72) and for local and sharma tulsi (pH = 6.74) respectively then comes wheatgrass (pH = 6.65), Parwal and Moong reported same values (pH = 6.52), Cabbage (pH = 6.37), Carrot juice (pH = 6.34), Boiled Rice starch (pH = 6.30), Sprouted Moong and Onion Green juice (pH = 6.28), Beal leaves (pH = 6.27), BER (Indian jujube) leaves juice (pH = 6.22) Ajwain juice (pH = 6.21),Coriander leaves juice and Kadipata (curry leaves) juice (pH = 6.20),Radish juice (pH = 6.16),Spinach juice (pH = 6.14) also Water and Gangajal were having (pH = 7.20 and pH = 7.50) respectively.

Graphical representation is done for all the listed edibles in table 1 in figure 3a and 3b.

During the investigation of Acid neutralizing capacity of commonly accessible edibles tabulated in table 1 was assessed and arranged in decreasing order of calculated mEq in comparison to ENO. The sequence is as specified below for quick reference:

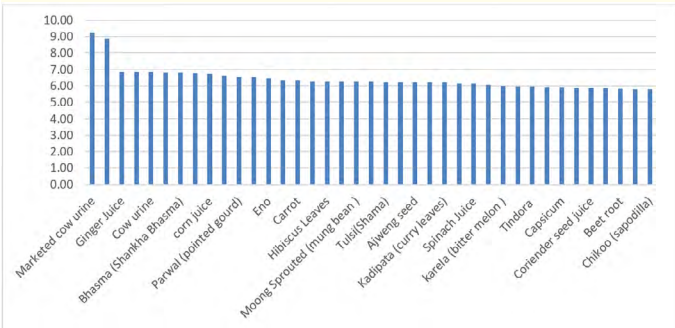

Figure 3a: Represents pH value comparison of edibles (Table 1: 1-40 row).

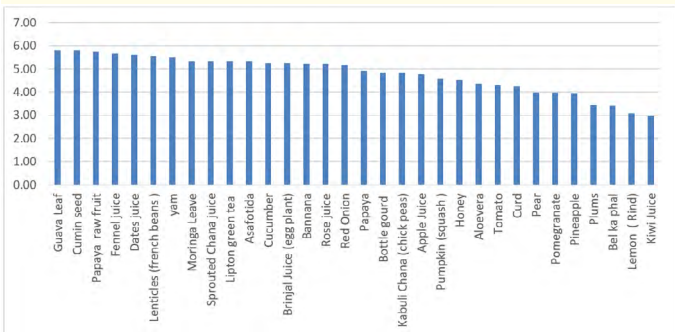

Figure 3b: Represents pH value comparison of edibles (Table 1: Row 40 onwards).

Figure 3a and 3b: Contains pH value comparison of edibles.

- Cow Urine > Marketed cow urine > Cow calf Urine > Moong Juice > Beal leaves juice > Green Tea > Lady Finger juice > Sprouted Chana juice/arbi having same mEq > Sprouted Moong juice > Green Onion juice > Parwal juice, Hibiscus leaves juice and Coriander leaves juice having same mEq value > Karela Juice, Ajwang juice, Watermelon Juice, Brinjal Juice and French bean juice having same mEq value > Tindora juice > Beetroot Juice, Papaya pulp juice and Curd having same mEq > Cucumber Juice > Ginger Juice, Spinach Juice and Rose petals Juice are shared with same value of mEq.

In artificial gastric Acid Neutralization using Fordtran's model obtained results are arranged in decreasing order of mmol H^+ consumed as listed in table 1 and graphically represented in figure 4a and 4b.

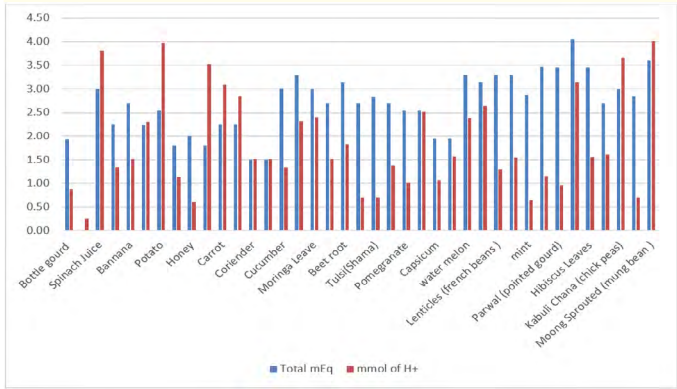

Figure 4a: Represents pH value comparison of edibles (Table 1: 1-40 row).

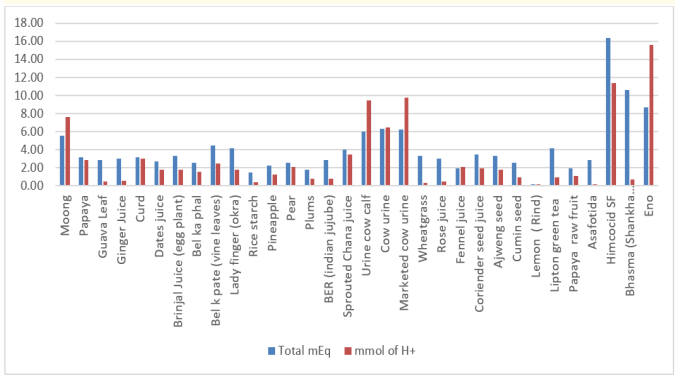

Figure 4b: Represents total mEq and mmol of H^+ (Table 1: Row 40 onwards).

Figure 4a and 4b: Represents Total mEq and mmol of H^+.

The sequence is as specified below for quick reference:

- Cow calf urine > Moong Juice > Cow urine > Sprouted Moong Juice > Spinach Juice > Kabuli Chana Juice > Red Onion Juice > Arbi Juice > Carrot Juice > Potato Juice > Curd.
- All the mmolH+ values coming above three are selected as they are coming one third to the value of ENO.

Conclusion

Investigation was carried out scientifically using invitro method to evaluate gastric acid neutralization action of some traditionally known edibles as tabulated in table 1. Initial pH value of marketed

cow urine reveals best alkalizing action followed by cow urine, cow-calf urine, mint juice, ginger juice, corn juice, tulsi Juice and wheat grass juice and kiwi Juice with the least pH value.

Under *in vitro* evaluation, common edibles are studied for various potencies and measured in terms of their ANC values. According to this fact, the ones with higher ANC will be having faster symptomatic relief against hyperacidity and reported ones are cow urine, marked cow urine, cow-calf urine followed by moong juice, bel leaves, lady finger and green tea.

In Fordtran's method, test solutions have been converted into antacid capacities (mmol H^+) taking into account the amount of artificial gastric acid consumed to get the pH of 3. All test solutions consumed significantly higher volumes of gastric acid which reveals the higher mmol of H^+ indicating good neutralizing capacities and it shows more comparative with *in vivo* results. Under this method, marketed Cow urine, cow-calf urine, cow urine are reported relatively with Eno, followed by sprouted moong juice, moong juice, kabuli chana juice, spinach juice, red onion juice and arbi. This research work will further help in designing and manufacturing new antacid formulation.

The research Paper attempts to experimentally present that few of the herbal remedies may not contain the antacid out come with the tool of back titration and by the neutralization capacity in vitro using the titration method of Fordtran's model.

These values may also differ according to the season and region. The herbal plants in these study have little acid fighting composition though this herbal plants continues to have acceptance by the common people, it is possible that the acid fighting property of such herbs may have biological blockers that prevent stomach from releasing acid which can only be suggested by *in vivo* animal studies. Further Investigation from *in vivo* perspective would be valuable.

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