Research Article

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FORMULATION, STANDARDIZATION AND SCREENING OF POLYHERBAL CHURNA FOR ANTACID ACTIVITY

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ABSTRACT

The aim of our study was to claim the antacid activity of a polyherbal formulation prepared by the combination of herbs such as ginger, garlic, eucalyptus, cinnamon, amla and to standardize the formulation. The polyherbal churna was prepared by mixing the raw drugs in accurate amount and then it was standardized. Polyherbal formulation of churna was analogized with sodium bicarbonate. The formulation when compared to standard drug highlighted the same acid neutralizing capacity. Through our present study, we concluded that the polyherbal formulation can be used as herbal antacid. The churna showed similar action as standard drug sodium bicarbonate. The formulation can be used to treat condition of gastro esophageal reflux disease, hyperacidity and GIT problems.

Keywords: Antacid, polyherbal formulation, acid neutralizing capacity, sodium bicarbonate, standardization.

INTRODUCTION

Acid secretion in stomach leads to breakdown of food during digestion. Excessive secretion of acid in stomach prompts irritative sensation, heartburn in stomach lining, GIT disturbances and discomfort[1]. The pH of stomach acid is 1-2. The acid in stomach is readily helpful in activation of digestive enzymes useful for breakdown of long chain amino acids. Acidity in stomach leads to a condition known as gastro esophageal reflux disorder. In the condition of GERD, the liquid contents in the form of mixed digestive juices drive back to the esophageal lining causing condition of heartburn and other irritation in gastrointestinal tract. Acidic food, alcohol, smoking, stress, drugs, less water intake, lack of fibers in diet, irregular routine, junk food and disturbed biological clock are the various reasons for causes of GERD[2]. Herbal antacids are the agents that are useful in decreasing the acidic secretion in case of hyperacidity by use of medicinal plants. World health organization estimated that approximately 80% of population uses herbal and traditional medicines for primary choice in healthcare. Herbal medicines are safe, easily available, with less or no side effects. Herbal antacids are used to treat the hyper acidic condition in stomach. Various herbal medicines and plant extracts were used to attain a condition to treat hyper acidic condition. As the synthetic antacids cause various side effects and drug interactions, the herbal medicaments have become a safer and efficacious option to treat acidity in stomach lining. Hence, in the present study we attempted to carry out biological standardization, phytochemical screening and evaluation for antacid activity of polyherbal formulation by evaluating the acid neutralizing capacity of the formulation by the help of titration[3].

MATERIAL AND METHODS

Plant Materials

Herbal antacid was formulated in the form of churna by combination of a few effective herbs that have a potential to treat GERD. Some herbs were selected with the tendency to neutralize acid in the stomach to formulate the churna. The plant materials such as dried rhizomes of *Zingiber officinale,* fresh fruits of *Emblica officinalis,* ripe bulbs of *Allium sativum* and dried inner bark of *Cinnamomum zeylanicum* were procured from local market, Ghaziabad and the fresh leaves of *Eucalyptus globulus* were collected from the medicinal garden, KIET School of Pharmacy, Ghaziabad. All these herbs were authenticated by microscopic methods in Pharmacognosy Lab.

Preparation of Polyherbal Churna

All the plant materials were thoroughly washed, dried and finely powdered. The finely powdered raw materials were passed through sieve number 40 and 1g of each of the individual drugs were weighed and mixed in appropriate ratio (1:1:1:1:1). Black salt was added to enhance the taste and acceptability to consumer. The churna was packed in airtight container.[4] The formula composition of the polyherbal churna is mentioned in Table 1.

Standardization of Polyherbal Churna[5]

Determination of pH

The pH of 1% solution of formulated polyherbal churna was identified by pH meter.

Determination of Ash Values

Total Ash Value

2g of churna was weighed accurately in a previously ignited silica crucible. The material was ignited at temperature of 500-600°C until it turns white indicating the absence of carbon. It was then cooled and total ash in mg per gram was calculated.

Acid Insoluble Ash Value

Using 25 ml of dilute hydrochloric acid, the half of the ash from the dish used for total ash washed into a 100 ml beaker. A wire gauge was placed over a Bunsen burner and boiled for five minutes. Filtered through an ash less filter paper, the residue was washed twice with hot water. Crucible was ignited in the flame, cooled and weighed. The acid insoluble ash of the crude drug was calculated with reference to the air-dried sample of the crude drug.

Water Insoluble Ash Value

To the crucible containing the other half of the total ash content, 25ml of hot water was added to it. Then, the whole material was filtered through ashless filter paper. The filter paper along with insoluble matter was transferred to crucible and ignited to constant weight. The residue was then allowed to cool and weighed.[6]

Determination of Extractive Value

Water Soluble Extractive Value

5g of churna was accurately weighed in conical flask. 25ml of water was added to it and kept for 24 hours shaking the flask occasionally. The contents were then transferred to china dish and evaporated to dryness on water bath, cooled and finally weighed.

Ethanol Soluble Extractive Value

5g of churna was accurately weighed in conical flask. 25ml of ethanol was added to it and kept for 24 hours shaking the flask occasionally. The contents were then transferred to china dish and evaporated to dryness on water bath, cooled and finally weighed.

Chloroform Soluble Extractive Value

5g of churna was accurately weighed in conical flask. 25ml of chloroform was added to it and kept for 24 hours shaking the flask occasionally. The contents were then transferred to china dish and evaporated to dryness on water bath, cooled and finally weighed.

Petroleum Ether Soluble Extractive Value

5g of churna was accurately weighed in conical flask. 25ml of petroleum ether was added to it and kept for 24 hours shaking the flask occasionally. The contents were then transferred to china dish and evaporated to dryness on water bath, cooled and finally weighed.

Moisture Content (Loss on Drying)

The churna was placed in a weighing bottle. It was dried at 105˚C in hot air oven and weighed after 15 minutes. When the weight of the formulation became constant, then percentage of water loss on drying was calculated.

Swelling Index

1g of formulation was placed in a stoppered measuring cylinder containing 9 ml water and kept aside for 24 hours. The swelling in the formulation was noticed and swelling index was calculated.

Preliminary Phytochemical Screening

The crude petroleum ether, chloroform, ethanol and aqueous extracts were tested for the presence of alkaloids, steroids, tannins, saponins and glycosides using the standard procedures for preliminary phytochemical screening.[7, 11, 12] The qualitative results are expressed as (+) for the presence and (-) for the absence of phytochemicals.

Evaluation of Antacid Activity

The acid neutralizing capacity test was conducted at temperature 37±3°C. The pH meter was standardized using potassium dihydrogen phosphate, which is a standardized buffer. Magnetic stirrer was used to produce stirring rate of 300±30 rpm. 2 gm of formulation and 2 ml of standard solution (sodium bicarbonate solution) were separately added to 70 ml distilled water in separate 250 ml volumetric flasks respectively. The solutions were stirred for 1 minute on magnetic stirrer. pH of both solutions was recorded. 30 ml of 0.1 N HCl were added in both the solutions and kept for stirring on magnetic stirrer for 15 minutes. The pH was recorded. 20 ml of conc. HCl was added in both the solutions and their pH was recorded. 0.5 N NaOH was titrated in the solutions for attaining a stable pH of 3.5.[4, 8, 9 10]

RESULTS AND DISCUSSIONS

Standardization of Herbal Churna

The formulated churna was a perfect blend of fine powder of herbs with antacid potential. The pH was determined so that the formulation itself does not produce any gastric irritation and 6.5 was the estimated pH of formulated churna. Since ashing process involves the complete oxidation of components of product, an increase in ash value indicates contamination, substitution and adulteration. The total ash value is an indicative of total amount of inorganic material after complete incineration.[5] The Ash Values were calculated as: Total Ash Value-17.1%, Acid Insoluble Ash-3.40% and Water Insoluble Ash-13.70%. The extractive values aid in estimating the nature of phytoconstituents and also helps in establishing the number of active constituents present in a medicinal plant material. The extractive values were calculated as: Water Soluble Extractive Value-7.20%, Ethanol Soluble Extractive Value-9.7%, Chloroform Soluble Extractive Value-2.40%, and Ether Soluble Extractive Value-1.60%. Thus, ethanol was the best solvent for extracting the phytoconstituents of the formulated churna. The moisture content was determined to establish any increase in weight caused by moisture absorption. Loss on Drying or moisture content of the formulated churna was 0.33%. The swelling index test was negative indicating the absence of the mucilaginous substances in the polyherbal churna.

The results for standardization of churna are depicted in Table 2

Table 1: Formula Composition of Polyherbal Churna

Drug	Biological Source	Part Used	Quantity
Ginger	*Zingiber officinale*	Dried rhizomes	1g
Amla	*Emblica officinalis*	Fresh Fruits	1g
Garlic	*Allium sativum*	Ripe Bulb	1g
Eucalyptus	*Eucalyptus globulus*	Fresh Leaves	1g
Cinnamon	*Cinnamomum zeylanicum*	Dried Inner Bark	1g

Table 2. Standardization of Polyherbal Churna

S. No	Parameters	Polyherbal Churna
1	pH	6.5
2	Total Ash Value	17.1%
3	Acid Insoluble Ash	3.40%
4	Water Insoluble Ash	13.70%
5	Water Soluble Extractive Value	7.20%
6	Ethanol Soluble Extractive Value	9.7%
7	Chloroform Soluble Extractive Value	2.40%
8	Ether Soluble Extractive Value	1.60%
9	Moisture Content	0.33%
10	Swelling Index	Negative

Table 3: Preliminary Phytochemical Screening of Polyherbal Churna

S. No	PC	IT	WE	AE	CE	PEE
1	Carbohydrate	Molish test	+	+	+	-
		Fehling's test	+	+	+	-
		Tollen's phloroglucinol test for galactose	-	-	-	-
		Benedict's test	-	-	-	-
2	Starch	Iodine Test	+	+	-	-
3	Mucilage	Ruthenium Test	+	+	+	-
4	Protein	Xanthoprotein Test	-	-	-	-
		Millons test	-	-	-	-
5	Amino acids	Ninhydrin Test	+	-	-	-
6	Steroids	Salkowski reaction	+	-	-	+
7	Cardiac Glycosides	Legal test	-	-	+	-
		Raymond's test	-	-	-	-
		Test for deoxysugar (Keller-kilani test)	+	+	-	-
8	Anthraquinone glycosides	Borntrager's test	-	-	-	-
9	Saponin glycosides	Foam test	-	-	-	-
10	Alkaloids	Mayer's test	-	+	-	-
		Wagner's test	+	+	+	-
		Tannic acid test	+	+	-	+
11	Tannins	Lead acetate test	+	+	+	-
		5% $FeCl_3$ test	+	+	-	-
		Acetic acid test	-	+	-	-
		Dil. HNO_3 test	-	+	-	-
		Dil. NH_4OH test	-	+	-	-
12	Acidic Compounds	Sodium bicarbonate test	+	+	-	-
		Litmus paper test	+	+	+	-

PC: Phytoconstituents, IT: Identification Tests, WE: Water Extract, AE: Alcohol Extract, CE: Chloroform Extract, PEE: Petroleum Ether Extract

Table 4: Comparative antacid activity of Polyherbal Churna and Sodium Bicarbonate

Steps	Test drug (Polyherbal Churna)	Standard drug (Sodium Bicarbonate)
1	Churna + 70 ml distilled water.	Sodium Bicarbonate + 70 ml distilled water.
	pH- 6.5	**pH- 6.8**
2	Churna + 70 ml distilled water + 30 ml 0.1 N HCl and stirred for 15 minutes.	Sodium Bicarbonate + 70 ml distilled water + 30 ml 0.1 N HCl and stirred for 15 minutes.
	pH- 3.5	**pH- 3.7**
3	20 ml conc. HCl added to the above solution.	20 ml conc. HCl added to the above solution.
	pH- 2.4	**pH- 2.5**
4	The solution was titrated with 0.5 N NaOH for attaining **pH- 3.5**	The solution was titrated with 0.5 N NaOH for attaining **pH- 3.5**
	Volume of **0.5 N NaOH** required- **50 ml**	Volume of **0.5 N NaOH** required- **46 ml**

Preliminary Phytochemical Screening

The results of the preliminary phytochemical screening are mentioned in Table 3. These identification tests led us to conclude that as the alcoholic extract responded positively to most of the chemical tests, thus maximum number of phytoconstituents is present in the alcoholic extract, followed by water, chloroform and petroleum ether extracts.

Evaluation of Antacid Activity

The equal ratio of each constituent herb in churna assisted it to attain the antacid activity similar to that of the standard drug: Sodium Bicarbonate. The formulated churna exhibited pH 6.5 in 70ml distilled water while pH 6.8 was attained with sodium bicarbonate and 70ml water. The pH was lowered to 3.5 and 2.4 respectively by addition of 30 ml of 0.1 N HCl with stirring for 15 minutes and then by adding 20 ml conc. HCl to churna and 70 ml water. Similarly, the pH of the standard was lowered respectively to 3.7 and 2.5. On titration with 0.5N NaOH the pH-3.5 was attained with both the test drug (formulated churna) as well as with the standard. Thus, it was concluded that the formulated polyherbal churna was as effective as the standard drug, i.e. sodium bicarbonate. Thus this churna can also provide relief from gastric problems.

CONCLUSION

Through this study it was found that Ginger, Garlic, Amla, Cinnamon and Eucalyptus powders formed a perfect harmonious combination in the form of churna where each drug acted in a synergistic manner to provide the maximum therapeutic effect for antacid activity. The churna formulated in this study has similar action as widely used antacid-sodium bicarbonate. This herbal churna could be used by patients having problems of GERD for improvements of physiology of GIT and digestive system to overcome the side effects of the synthetic medicines.

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