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The pH estimation of decoction of hingu (*Ferula foetida* Regel), chitraka (*Plumbago zeylanica* Linn), dhataki (*Woodfordia fruticosa* kurz), shatavari (*Asperagus racemosus* willd), shunthi (*Zingiber officinale* Rosc), maricha (*Piper nigrum* Linn), gokshura (*Tribulus terrestris* Linn) and Chandana (*Santalum album* Linn)

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Abstract

The pH is measured on a scale of 0-14 with lower values indicating high H⁺ which is more acidic and higher values indicating H⁺ ion activity which is less acidic. The pH of 7 is considered as neutral. The acids are the substances that produce free hydrogen ions(H⁺) when dissolved in water. Bases are substances that produce hydroxyl ions(OH⁻) when dissolved in water. Acidic solutions are rich in hydrogen ions and basic solutions are poor in hydrogen ions. Some acids dissociate only partly, releasing large amounts of H⁺ ions, and are called as strong acids. In same way, bases that dissociate partly are called weak bases and those that dissociate completely are called as bases. The acidic or basic property of substances is measured in terms of pH. It is a measurement of the hydrogen ion concentration. pH is defined as the negative logarithm(Base 10) of hydrogen ion concentration.

$$\text{pH} = -\log[\text{H}^+]$$

If the hydrogen ion concentration is very high, the pH value is very low. This is determined using a scale ranging from 0-14 called the pH scale. It was introduced by a Danish chemist Soren Peder Lauritz Sorensen. Substances with pH lower than 7 are acidic, those with pH equal to 7 are neutral and those with pH greater than 7 are basic in nature. The pH of water is 7. In the present work the decoction of Hingu(*Ferula foetida* Regel), Chitraka(*Plumbago zeylanica* Linn), Dhataki(*Woodfordia fruticosa* kurz), Shatavari(*Asperagus racemosus* willd), Shunthi(*Zingiber officinale* Rosc), Maricha(*Piper nigrum* Linn), Gokshura(*Tribulus terrestris* Linn) and Chandana(*Santalum album* Linn) were subjected for experimentation. The observed values were tabulated. The pH estimation helps to determine the acidic and basic strength of acids and bases.

Keywords: Hydrogen ion concentration; Acid and base; Neutral; pH meter; pH values; Medicinal plants

1. Introduction

The pharmacological actions of the drugs viz; Hingu(*Ferula foetida* Regel), Chitraka(*Plumbago zeylanica* Linn), Dhataki(*Woodfordia fruticosa* kurz), Shatavari(*Asperagus racemosus* willd), Shunthi(*Zingiber officinale* Rosc),

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Maricha(*Piper nigrum* Linn), Gokshura(*Tribulus terrestris* Linn) and Chandana(*Santalum album* Linn) are stated as follows;

- **Hingu**(*Ferula foetida* Regel.)^{[1][2]} is *Ushna* (Heat), *Katu*(Pungent), *Pachana*(Digestive), *Ruchya*(Promotes taste), *Teekshna*(Penetrating), *Laghu*(Light), *Snigdha*(Demulcent). It subsides *Vata* and *Kapha* and increases *Pitta* Dosh. It cures *Ajeerna*(Indigestion), *Shoola*(Colic), *Gulma*(Intestinal growth), *Udara*(Abdominal disorders), *Krimi*(Worms), *Vibandha*(Constipation).
- **Chitraka**(*Plumbago zeylanica* Linn)^{[3][4]} is *Katu*(Pungent in taste), *Katu Vipaka*(Pungent in post digestive effect), *Dipana*(Appetizer), *Pachana*(Digestive), *Laghu*(Light), *Rooksha*(Drying), *Ushna*(Heat), It cures *Grahani*(Sprue syndrome), *Kustha*(Skin diseases), *Shotha*(Edema), *Arsha*(Haemorrhoids), *Krimi*(Worms), *Vata-Shleshma Hara*(Alleviates *Vata* and *Kapha Doshas*), It is *Grahi*(Absorbent). Alleviates *Vata-Pitta-Kapha*. *Chitraka Moola Panchanga Choorna* is given with butter or Cow's milk cures all types of diseases, especially *Kritrima Visha*(Poisoning), *Jalodara*(Ascites), *Kustha*(Skin diseases). *Chitraka Moola* with *Gomutra*(Cow's urine) cures *Arsha*(Haemorrhoids).
- **Dhataki**(*Woodfordia fruticosa* kurz)^[5] is *Katu*(Pungent), *Ushna Virya*(Hot in potency), *Madakaraka*(Causes intoxication), alleviate *Visha*(Poison), *Atisara*(Diarrhea), *Krimi*(Worms), *Rakta Dosh*(Blood disorders)
- **Shatavari**(*Asperagus racemosus* willd)^[6]- It is *Guru*(Heavy), *Sheeta Veerya*(Cold in potency), *Tikta*(Bitter) in taste, *Rasayana*(Tissue vitalizer), *Medhya*(Brain tonic), *Dipana*(Appetizer), *Balya*(Tonic), *Snigdha*(Demulcent) *Netrya*(Good for vision), *Gulma*(Intestinal growths), *Arsha*(Haemorrhoids). *Shukrala*(Promotes semen) and *Sthanya*(Breast milk), improves muscle tone and reduces *Vata*, *Pitta*, *Kapha* and *Rakta*.
- **Shunthi**(*Zingiber officinale* Rosc)^[7]- It is *Ruchya*(Promotes taste), *Amavatagna*(Cure rheumatoid arthritis), *Pachani*(Digestive), *Katuka*(Pungent in taste), *Laghu*(Light), *Snigdha*(Presence of volatile oils), *Ushna*(Heat producing), *Madhura Paka*(Sweet after post digestive effect), alleviates *Kapha-Vata*, *Vibandha*(Constipation). It is *Vrushya* (Aphrodisiac), cures *Swarya*(Improves voice), *Vami*(Vomiting), *Shwasa*(Dyspnoea), *Shoola*(Colic), *Kasa*(Cough), *Hridayamaya*(Heart diseases), *Shleepada*(Filariasis), *Shotha*(Edema), *Arsha*(Haemorrhoids), *Anaha*(Distention of abdomen), *Udara Maruta*(Flatulence). It is *Agni Guna* dominant(Qualities of fire), *Toyamsha Parishosha*(Water absorbent), *Sangrahi*(Hardens the stool).
- **Maricha**(*Piper nigrum* Linn)^[8]- *Maricha* is *Katu*(Pungent in taste), *Teekshna*(Penetrating), *Dipana*(Appetizer), *Kapaha-Vatahara*(Alleviates *Kapha* and *Vata*), *Ruchikaraka*(Tasty), *Ushna*(Hot in potency), *Pittakara*, *Rooksha*(Drying), cures *Shwasa*(Dyspnoea), *Shoola*(Colic), *Krimi*(Worms), *Shukra Nashaka*(Decreases semen), *Agnijanaka*(Improves appetite). *Ardra Maricha*(Wet Pepper) is *Madhura Vipaka* (Sweet after end of digestion), *Natiushna*(Not much heat), *Kinchit Teekshna Guna*(Mild penetrating action), *Shleshma Praseki*(Mucogenic), *Apittalam*(Does not increase *Pitta*).
- **Gokshura**(*Tribulus terrestris* Linn)^[9] is *Brimhana*(Nourishing), *Shukravardhaka*(Boosts semen), *Agnidipaka*(Appetizer). It alleviate *Vata*, *Pitta* and *Kapha Doshas*, *Shoola*(Pain), *Hridroga*(Cardiac ailments), *Mutrakrichra*(Dysuria), *Prameha*(Urinary disorders including diabetes).
- **Chandana**(*Santalum album* Linn)^[10] is *Swadu*(Sweet), *Tikta*(Bitter) in taste, yellow in colour when rubbed, light red in colour when broken, and white in colour from outside. The best quality of *Chandana* is *Granthi Yukta*(Glandular), and *Kothara*(Hollow) in the heart wood. *Chandana* is *Sheetala*(Cooling), *Ruksha*(Drying), *Tikta*(Bitter), *Alhadana*(Pleasing), *Laghu*(Light). It alleviates *Shrama*(Tiredness), *Shosha*(Emaciation), *Visha*(Poisonous effects), *Shleshma*(*Kaphaja* diseases), *Trishna*(Thirst), *Pitta* diseases, *Rakta* disorders, *Daha*(Burning sensation), Burning micturation, Acne (Pimples), *Vyanga*(Pigmentation of the skin).

2. Materials and methods

- The pH of a solution is measured using by pH meter.
- The powders of Hingu(*Ferula foetida* Regel.), Chitraka(*Plumbago zeylanica* Linn), Dhataki(*Woodfordia fruticosa* kurz), Shatavari(*Asperagus racemosus* willd), Shunthi(*Zingiber officinale* Rosc), Maricha(*Piper nigrum* Linn), Gokshura(*Tribulus terrestris* Linn) and Chandana(*Santalum album* Linn)

2.1. Method / procedure

The pH meter is an electronic instrument consisting of a special bulb that is sensitive to hydrogen ions that are present in the test solution. The signal produced by the bulb is amplified and sent to an electronic meter connected to the bulb, which measures and display the pH reading. For very precise measurement, the pH meter should be calibrated before each measurement.

Aims and objectives

- To evaluate the acid base and neutral values of Hingu(*Ferula foetida* Regel), Chitraka(*Plumbago zeylanica* Linn), Dhataki(*Woodfordia fruticosa* kurz), Shatavari(*Asperagus racemosus* willd), Shunthi(*Zingiber officinale* Rosc), Maricha(*Piper nigrum* Linn), Gokshura(*Tribulus terrestris* Linn) and Chandana(*Santalum album* Linn).
- The objective is to determine the pH of the samples of Hingu(*Ferula foetida* Regel), Chitraka(*Plumbago zeylanica* Linn), Dhataki(*Woodfordia fruticosa* kurz), Shatavari(*Asperagus racemosus* willd), Shunthi(*Zingiber officinale* Rosc), Maricha(*Piper nigrum* Linn), Gokshura(*Tribulus terrestris* Linn) and Chandana(*Santalum album* Linn).

3. Results

Table 1 Drugs and their pH value

Sl. No	Drugs	Ph values
1.	Hingu(<i>Ferula foetida</i> Regel,)	6.42
2.	Chitraka(<i>Plumbago zeylanica</i> Linn)	6.69
3.	Dhataki(<i>Woodfordia fruticosa</i> kurz)	5.97
4.	Shatavari(<i>Asperagus racemosus</i> willd)	6.96
5.	Shunthi(<i>Zingiber officinale</i> Rosc)	4.91
6.	Maricha(<i>Piper nigrum</i> Linn)	5.9
7.	Gokshura(<i>Tribulus terrestris</i> Linn,)	6.2
8.	Chandana(<i>Santalum album</i> Linn)	5.9

4. Discussion

The calibration^[11] should be performed with at least two buffer solutions with known pH. For general purposes, buffer solutions with pH 4 and pH 10 are used. For more precise measurement three buffer solution calibrations are preferred. After each single measurement, the bulb is rinsed with distilled water or de-ionised water to remove any traces of solution being measured. Then the bulb is blotted with blotting paper to remove remaining water that could dilute the sample and alter the reading. When not in use, the bulb must be kept wet at all times to avoid dehydration of the pH sensing membrane. The obtained results were tabulated. The decoction of the all drugs showed acidic in nature while in classical texts except *Maricha*(*Piper nigrum* Linn), *Shunthi*(*Zingiber officinale* Rosc) *Chitraka*(*Plumbago zeylanica* Linn), *Hingu*(*Ferula foetida* Regel,) are *Katu*(Pungent) in taste, *Katu Vipaka*(Pungent at post digestive effect), and *Ushna Virya*(Hot in potency). These drugs can be interpreted as acidic in nature. While the other drugs like *Shatavari*(*Asperagus racemosus* willd), *Gokshura*(*Tribulus terrestris* Linn) *Chandana*(*Santalum album* Linn), *Dhataki*(*Woodfordia fruticosa* kurz) are base in nature. It can be interpreted as *Madhura*(Sweet) in taste, *Madhura Vipaka*(Sweet at post digestive effect), and *Sheeta Virya*(Cold in potency). But the drugs collected from the experimentation showed all the drugs are almost acidic in nature.

5. Conclusion

By the above discussion all the selected drugs have shown the acidic in nature. By calibration of pH values helps us to acquire the skill to classify the samples as acidic, basic, or neutral based on the pH values. And also to acquire skill to measure the concentration of H⁺ and OH⁻ ions present in a solution . The above mentioned drugs viz; *Hingu*(*Ferula foetida* Regel,), *Chitraka*(*Plumbago zeylanica* Linn), *Dhataki*(*Woodfordia fruticosa* kurz), *Shatavari*(*Asperagus racemosus* willd), *Shunthi*(*Zingiber officinale* Rosc), *Maricha*(*Piper nigrum* Linn), *Gokshura*(*Tribulus terrestris* Linn) and *Chandana*(*Santalum album* Linn) shown acidic in nature.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

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