Micro evolution of bitter taste domain drugs

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ABSTRACT
Ayurveda classified the drugs in various ways and one of which the classification is based on Rasa (taste) dominancy. Rasa is essential to identify drugs and to know its therapeutic application. In this study the drug has been selected according to Charaka classification of Tikta Rasa (bitter taste) drugs with an aim to find out the similar characters among all the drugs having bitter Rasa dominancy. Till date there is no data available regarding the pharmacognostical evaluation in concern bitter taste. For the first time selected five bitter drugs are subjected to various pharmacognostical evaluation, result reveals that Organoleptic characters of all five drugs give bitter taste, microscopic evaluation revealed that presence of starch grain, vessels, fiber, brown content are dominant in all five raw drug and all the five powder subjected to alkaloid test by using dragondroff reagent and give positive result for alkaloids

Introduction
Ayurveda, the science of life, stands on its own fundamental principles. Ayurvedic pharmacology known as Dravyaguna vijnana is based on biophysical, experiential, inferential and intuitional mechanisms [1]. Taste (rasa) is essential to identify drugs and to know its therapeutic application. In various ancient books the drugs has been classified on the basis Rasa dominancy in Charaka Samhita, Sushrut Samhita, Ashtang Hridaya, etc. Rasa is an important quality manifested at the level of tongue and is the only principle or quality, among the Rasapanchaka which can be directly perceivable [2]. The taste perception and taste sensibility are complex bio-physical and psychological events and translation of Rasa cannot be exactly evaluated without the help of tongue. According to Charaka substances are mostly composed of many tastes. Drugs having only one taste so as to be unquestionably included under one of the six groups are very rare [3]. There may be possible if the group of drugs belonging to the same Rasa (taste) may show the same characteristics. The biology of bitter-taste perception is poorly understood. The long-term challenge has been to explain how so many structurally unrelated compounds can give rise to a uniform bitter taste. Among bitter-tasting compounds are amino acids and peptides, sulfamides (saccharin), ureas and thioureas [6-n-propylthiouracil (PROP) and phenylthiocarbamidine (PTC)], esters and lactones, terpenoids, and phenols and polyphenols [4].

In this study the drug has been selected according to Charaka classification of Tikta Rasa (bitter taste) drugs with an aim to find out the similar characters among all the drugs having bitter Rasa dominancy, evaluate a pharmacognostical pattern for bitter taste domain drug and Find out the powder characters responsible for bitter taste.

Materials and methods
Collection & authentification of raw drug
All the bitter taste domain drugs like Kiratikta, Punarnava, Nimba Kutaj and Ativisha were collected from Gujarat Ayurved University’s pharmacy, Jamnagar. Authentification was done in pharmacognosy laboratory of IPGT & RA. The botanical name, family and chemical constituents of the raw drugs are depicted in table No.1. [5, 6, 7]

| Name           | Botanical name        | Family        | Chemical constituents                                                                 |
|----------------|-----------------------|---------------|---------------------------------------------------------------------------------------|
| Kiratikta      | *Swertia chirayita* Karst. | Gentianaceae  | swerchirine, 7-o methylswertianine, swertianine, weroside, chiratanine, amarogentine,  |
|                |                       |               | swertone, swertenol, chiratrol, decussating, chiratol, picherenol, β-amyrin.            |
| Ativisha       | *Aconitum hetrophylum* Wall. | Apocynaceae  | atisine, atisenol, benzoyeheteratisine, F-dihydroatisine, heteratisine, hetisine      |
|                |                       |               | heterophyllidine, heterophylline, hetidine, , hetisinone, β-sitosterol                  |
| Punarnava      | *Boerhavia diffusa* Linn. | Nyctaginaceae | Alkaloid punarnavine, c-methylflavone, rotenoid analogues, beravionone A,B,C,D,E,F, amino acid |
|                |                       |               | Fatty acid, β-sitosterol, crystalline acid                                            |
| Kutaj          | *Holarrhena antidisenterica* (L.) Wall. | Apocynaceae  | Alkaloid- conessine, concurrence, kurchimine, kurchlessime, comine, concurrence, conessidine, holarrhinine, holafrine, holarrhetine, hollarrtfine, regnolarrhenine D.E &F, kurchessine, holedeineine, triterpine, β-sitosterol |
| Nimba          | *Azadirachta indica* A. Juss. | Meliaceae     | Gedunin-c, tannin, bitter principle nimbine, nimbidine, nimbose, nimbinol, margosinone, maragosolone, nimbisonol, methyl nimbol, methyl nimbonine, margalone, iso margalone & oil |

**Macroscopic**

The collected samples were identified and authentified by their morphological characters; observed as such with naked eyes, studied systematically as per the methods described in the textbooks of pharmacognosy [8].

**Organoleptic characters of the powder**

Evaluation of the powder samples were done by their various characters like: colour, texture, odour, taste etc [9].

**Microscopic study**

**Powder microscopy**

For powder microscopy, slides were prepared by using water, chloral hydrate as a clearing agent, stained with phloroglucinol and conc. HCl for lignified tissues, glycerin as mountant. To locate the region for certain constituent of the drug few histochemical tests were also performed. For the presence of lignified elements, treat the section with phloroglucinol and conc. HCl [10].

**Dragondroff test for alkaloid**

Dragondroff reagent is poured on the slide contain powder of the selected drug and observed under microscope [11].

**Results**

Organoleptic characters- colour, odour, taste and touch of all the respected powder drugs are scientifically studied by using sensory organs, result are depicted in table no.2.

| Name of drug | Color      | Odor          | Touch   | Taste |
|--------------|------------|---------------|---------|-------|
| Kiratikta    | Brown      | Characteristics | Rough   | Bitter|
| Ativisha     | Greyish white | Aromatic     | Rough   | Bitter|
| Punarnava    | Brown      | Characteristic | Rough   | Bitter|
| Kutaj        | Creamish brown | Characteristic | Rough   | Bitter|
| Nimba        | Brown      | Characteristic | Rough   | Bitter|
Powder microscopy- The powder of concern raw drugs were subjected to powder microscopy, the results observed are as follow-

Kiratikta – Diagnostic characteristics of Kiratikta Powder showed the parenchyma cells, Epidermal cells, Trichomes, Prismatic crystal, Brown content, pollen grain, Fragments of pitted vessel, fragments of spiral vessel, starch grains with hilum, stone cell, and simple fiber. **Plate-1**

| Plate-1: Microphotographs of Kiratikta |
|---------------------------------------|
| ![Fig A: Brown content](image1)       |
| ![Fig B: Simple fibre](image2)       |
| ![Fig C: Stone cell](image3)         |
| ![Fig E: Prismatic crystal](image4)  |
| ![Fig F: Starch grain](image5)       |
| ![Fig G: Spiral vessel](image6)      |
| ![Fig H: Tetra hedral Pollen grain](image7) |
| ![Fig I: Fragments of pitted vessel](image8) |
| ![Fig J: Fragments of Border pitted vessel](image9) |

Kutaj – Diagnostic characteristics of Kutaj Powder showed the cork in surface view with brown content, prismatic crystal, Rhomboidal crystal, brown content, fragments of Border pitted vessel, Simple starch grain with yellow content and simple fiber. **Plate-2**

Ativisha – Diagnostic characteristics of Ativisha Powder showed the prismatic crystal, Brown content, Fragments of pitted vessel, Simple and compound starch grains with hilum, and simple fiber. **Plate-3**

Nimba- Diagnostic characteristics of Nimba Powder showed Cork in surface view, prismatic crystal, crystal fiber, brown and yellow contents, starch grains with hilum, stone cell, and simple fiber. **Plate-4**
### Plate 2: Microphotographs of Kutaj

| Fig A | Fig B | Fig C |
|-------|-------|-------|
| Cork in surface view | Yellow content | Fragments of pitted vessel |
| Fig D | Fig E | Fig F |
| Brown content | Prismatic crystal | Fiber |
| Fig G | | |
| Rhomboidal crystal | | |

### Plate 3: Microphotographs of Ativisha

| Fig A | Fig B | Fig C |
|-------|-------|-------|
| Prismatic crystal | Simple compound Starch grain with hilum | Fragments of pitted vessel |
Punarnava – Diagnostic characteristics of Punarnava Powder showed the cork in surface view, acicular crystal, Brown content, and starch grains with or without hilum, lignified fiber, Fragments of pitted vessel. Plate-5

Alkaloid test the selected drug powders were treated with dragondroff reagent, when observed under microscope, all drugs shows the orange brown contents. Plate-6 Similarity and dissimilarity among the powder drug are depicted in table no.3
Plate 5: Microphotographs of Punarnava

Fig A: Cork in surface view
Fig B: Brown content
Fig C: Lignified powder
Fig D: Acicular crystal
Fig E: Starch grain with hilum
Fig F: Fragments of pitted vessel
Fig G: Pollen grain
Fig H: Oil globules

Plate 5: Alkaloid test for all drugs (Dragandroff reagent)

Fig A: Kiratikta
Fig B: Ativisha
Fig C: Punarnava
Table No. 3: Similarity and dissimilarity among all powder samples

| Name     | Cork  | Crystal | Brown content | Starch grain | Fiber | Vessel | Stone cells |
|----------|-------|---------|---------------|--------------|-------|--------|-------------|
| Kiratikta| -ve   | +ve     | +ve           | +ve          | +ve   | +ve    | +ve         |
| Kutaj    | +ve   | -ve     | -ve           | -ve          | -ve   | +ve    | +ve         |
| Ativisha | -ve   | +ve     | +ve           | +ve          | +ve   | +ve    | -ve         |
| Nimba    | +ve   | +ve     | +ve           | +ve          | +ve   | +ve    | -ve         |
| Punarnava| -ve   | +ve     | +ve           | +ve          | +ve   | +ve    | -ve         |

Discussion

In this study all the drugs are selected on the basis of their bitter taste as classified by Charaka. All drugs Kiratikta, kutaj, Ativisha, Nimba and Punarnava consist of bitter taste. On the basis of organoleptic characters it was found that kiratikta, Ativisha and Punarnava consisting of more bitterness as compare to Kutaj and Nimba i.e. more bitterness found in herbaceous plant as compare to tree. The reason behind this may be that the utilization of chemical constituent is more in tree as compares to that of herbaceous plant.

The table number 2 showed many convenient similar characters, these conflicts that most of the common characters may be reason for the bitter taste.

The test conducted for the detection of alkaloids showed positive results for all the five powders. This may be also responsible for the bitter taste.

All the plant material containing alkaloid as major chemical constituent like Kiratikta consist Sweritamarine, Kutaj consist Conessinone, Kurchemine, Ativisha consist atisine, heterotisine, Nimba consist Nimbin, nimbidine, and Punarnava consist punarnavine. Mostly alkaloid consists of bitter property.

Conclusion

Micro evaluation of bitter taste drugs is very difficult but this type of scientific study enlightens towards to convenient method to access the raw drug. This work may consider for further research purpose.

Conflict of interest statement

We declare that we have no conflict of interest.

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