



## ANALYTICAL AND COMPARATIVE ANTIPYRETIC STUDIES OF CHIRAYATA [Swertia chirata] AND NEELKANTHI [Ajuga bracteosa]

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### ABSTRACT

**Chirayata** is mentioned in *Charak Samhita* in *Tiktskand* and *Jwarghan Mahakasaya*. Decoction and *Churna* of the herb is effective to cure fever, burning sensation and itching. The herb act as a blood purifier and also support the good health of digestive system relieve the constipation and also improve the appetite. **Neelkanthi** a well known bitter ethnomedicinal herb of Himalayan region, local people used to treat many disease but most commonly used to treat fever in the form of *swarasa*. In *Ayurvedic* literature, it is mentioned that *tikta rasa* has *Jwaraghna* properties. (*tikta rasa* has *srotosodhan* property and mostly drugs of *tikta rasa* are used to treat *jwara*). The perception of the present study “**Analytical and Comparative Antipyretic studies of Chirayata [Swertia chirayita] and Neelkanthi [Ajuga bracteosa]**” is that out of these two which one is more effective in the treatment of Pyrexia. In this study, all aspects about *Chirayata* (*Swertia chirayita*) and *Neelkanthi* (*Ajuga bracteosa*) have been taken like natural habit, literature review, Macroscopy, Microscopy, Physicochemical, Phytochemical (Qualitative, Quantitative) Chromatographic, and in experimental study their efficacy in the Antipyretic model. In quantitative analysis both test sample have found Alkaloid and Glycoside. **In experimental study on the basis two way analysis of variance (ANOVA) Neelkanthi is found more therapeutic active than Chirayata in the experimental model of pyrexia.**

**KEYWORDS:** *Chirayata*, *Neelkanthi*, Pyrexia, Phytochemical, Experimental

### INTRODUCTION

Good health is achieved when your mind, body and spirit are in harmony with the universe. A disruption of this harmony can lead to poor health and sickness.

Today, it is an unique, indispensable branch of medicine and a complete naturalistic system as the herbs are prominently used to cure disease and to maintain life style and these herbs are obtained from nature itself. In all cultures, the humanity always believed the God while creating the human life also created the plant kingdom as the source of nutrition and medication and hence the use of herbs and plants as medicine is as old as the origin of man himself.

**1-Chirayata (Swertia chirayita (Roxb Buch Ham.))** The plant is an erect annual herb about 2-3 ft long stem. The stem are orange brown or purplish in colour. Leaves Ovate or lanceolate, entire acuminate 5-7 prominent lateral veins The flowers occur in large panicles are greenish yellow tinged with purple.<sup>[1]</sup>

**2- The second plant taken for the study is Neelkanthi [Ajuga bracteosa (Wall. ex Benth)]** a ethnomedicinal herb. It is low perinnial herb 10 to 20 cm in length covered with soft hairs with erect ascending stems which arise from the root stock. It is found in the sub-Himalayan tract, plains of Punjab and upper Gangetic plain.<sup>[2]</sup>

### MATERIAL AND METHODS

#### Collection of drug

The genuine sample of *Swertia chirayita* (Roxb) Buch. Ham. & *Ajuga bracteosa* (Wall Ex Benth.) were collected from-

1-*Swertia chirayita* (Roxb) Buch. Ham. Deoban, Uttarakhand - At an altitude of 9,500 feet Approx. above sea level. (Fig 1.1)

2-*Ajuga bracteosa* (Wall Ex Benth.) Uttarkashi, Uttarakhand - At an altitude of 3,799 feet approx. above sea level. (Fig 1.2)

**OBSERVATION AND RESULT****A) PHARMACOGNOSTICAL STUDY****ORGANOLEPTIC STUDY**

S -1 *CHIRAYATA* (*Swertia chirayita* (Roxb.) Buch.Ham.)<sup>3</sup>, S -2 *NEELKANTHI* (*Ajuga bracteosa* (Wall ex Benth.)<sup>4</sup>

| Character | S-1                                                                  | S-2                                                                                |
|-----------|----------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Shape     | Ovate or lanceolate, entire acuminate<br>5-7 prominent lateral veins | Leaves 2.5-10cm.long,<br>Oblanceolate or subspathulate, obtuse, sinuate – toothed. |
| Size      | Length-10 cm Width- 3.8 cm                                           | Length-2-3.5 cm. Width- 0.2cm.                                                     |
| Surface   | Smooth                                                               | Smooth                                                                             |
| Odour     | No odour                                                             | No odour                                                                           |
| Colour    | Dark Green                                                           | Dark Green (purple at back side )                                                  |
| Taste     | Bitter taste                                                         | Acrid, bitter and disagreeable                                                     |
| Fracture  | Smooth                                                               | Smooth                                                                             |

**MICROSCOPIC STUDY**

Microscopic characters of S-1 & S-2 in transverse section.

- **Leaf of) *Swertia chirayita* (Roxb.) Buch.Ham.** The transverse section of leaf through midrib region of showed the presence of epidermis, cortex, mesophyll, vascular bundles, stoma, medullary rays, pith.(Fig 1.3A)
- **Leaf of *Ajuga bracteosa* (Wall Ex. Benth).**- Upper and Lower **Epidermis**: Single Layered covered with thick, endodermis . xylem, phloem, starch grains, trichomes. (Fig 1.3B)

**A) POWDER MICROSCOPY STUDY**

Features seen in the Powder microscopy of S-1( Fig 1.4 ) and S-2. (Fig 1.5)

| Features         | S -1 | S-2 |
|------------------|------|-----|
| Xylem vessel     | +    | +   |
| Starch grain     | +    | +   |
| Palisade cells   | +    | -   |
| Parenchyma cells | +    | -   |
| Fibres           | +    | +   |
| Stomata          | -    | +   |
| Calcium oxalate  | +    | +   |
| Trichomes        | -    | +   |

**B) PHYSICOCHEMICAL STUDY**

S1 – *Swertia chirayita* (Roxb.) Buch.Ham S2 – *Ajuga bracteosa* (Wall Ex Benth).

| S. No | Test                          | S -1   | S-2    |
|-------|-------------------------------|--------|--------|
| 1.    | Foreign Matter                | 0 %    | 0 %    |
| 2.    | Moisture content              | 4.086% | 7.35 % |
| 3.    | Alcohol Extractive Value      | 17.65% | 11.47% |
| 4.    | Aqueous Extractive Value      | 20.56% | 26.32% |
| 5.    | Hydroalcohol Extractive Value | 18.78% | 26.52% |
| 6.    | Total Ash                     | 4.68%  | 5.57 % |
| 7.    | Acid Insoluble Ash            | 0.63 % | 1.28%  |
| 8.    | Water Soluble Ash             | 1 %    | 2.93%  |

**C) PHYTOCHEMICAL STUDY****A. CARBOHYDRATE TEST - Sample ( S-1) *Swertia chirayita* (Roxb.) Buch.Ham.**

| S.No | Name of test         | Aqueous Extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone Extract | Cholor-Oform extract | N-hexane extract |
|------|----------------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Molish test          | -               | -                     | -                | +                     | +               | -                    | -                |
| B    | Fehling test A and B | -               | -                     | +                | +                     | +               | -                    | -                |
| C    | Bendict test         | +               | +                     | +                | +                     | +               | -                    | -                |
| D    | Iodine test          | -               | -                     | -                | -                     | -               | +                    | +                |

**B. ALKALOID TEST**

| S. | Name of test      | Aqueous Extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone Extract | Cholor-Oform extract | N-hexane extract |
|----|-------------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A  | Mayer test        | -               | +                     | -                | -                     | -               | +                    | +                |
| B  | Dragondrof-f test | +               | +                     | +                | +                     | -               | -                    |                  |

**C. AMINO ACID TEST**

| S.No | Name of test   | Aqueous Extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone Extract | Cholor-form extract | N-hexane Extract |
|------|----------------|-----------------|-----------------------|------------------|-----------------------|-----------------|---------------------|------------------|
| A    | Ninhydrin Test | -               | -                     | +                | -                     | -               | -                   | -                |

**D. PROTEIN TEST**

| S.No | Name of test | Aqueous Extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone Extract | Cholor-Oform extract | N-hexane extract |
|------|--------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Biuret test  | -               | -                     | -                | -                     | -               | -                    | -                |
| B    | Millons Test | +               | +                     | +                | -                     | -               | -                    | -                |

**E. FLAVONOID TEST**

| S.No | Name of test | Aqueous Extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|--------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Shinoda test | +               | +                     | +                | -                     | +               | -                    | -                |

**F.1 CARDIAC GLYCOSIDE TEST [Table No. 3.17]**

| S.No | Name of test        | Aqueous extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|---------------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Killer killeni test | -               | -                     | -                | -                     | -               | +                    | +                |

**F.2 ANTHRAQUINONE GLYCOSIDE TEST**

| S.No | Name of test    | Aqueous Extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|-----------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Borntrager test | +               | +                     | -                | -                     | +               | -                    | -                |

**F 3 SAPONINE GLYCOSIDE TEST**

| S.No | Name of test | Aqueous extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|--------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Foam test    | +               | +                     | -                | -                     | -               | -                    | -                |

**G. TANINS PHENOLIC TEST**

| S.No | Name of test         | Aqueous Extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|----------------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Ferric chloride test | +               | +                     | +                | -                     | +               | -                    | -                |
| B    | Acetic acid test     | +               | +                     | -                | -                     | -               | -                    | -                |
| C    | Lead acetate test    | +               | +                     | +                | -                     | -               | -                    | -                |

**H. STEROIDS TEST**

| S.No | Name of test     | Aqueous Extract | Hydro-alcohol extract | Methanol extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|------------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Salkow-aski test | -               | -                     | -                | -                     | -               | +                    | +                |

**I. FATS AND FIXED OILS TEST**

| S.No | Name of test     | Aqueous Extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|------------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Greecy spot test | -               | -                     | -                | +                     | -               | +                    | +                |

**J. TERPINOID TEST**

| S.No | Name of test   | Aqueous Extract | Hydro-alcohol extract | Methanol extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|----------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Terpinoid test | -               | -                     | -                | -                     | -               | -                    | +                |

**K. DETECTION OF QUINONE**

| S.No | Name of test | Aqueous Extract | Hydro-alcohol extract | Methanol extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|--------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Quinone test | +               | +                     | -                | -                     | -               | -                    | -                |

**A. CARBOHYDRATE TEST – Sample B *Ajuga bracteosa* (Wall Ex Benth.)**

| S.No | Name of test         | Aqueous extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|----------------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Molish test          | -               | -                     | -                | +                     | -               | +                    | +                |
| B    | Fehling test A and B | -               | +                     | +                | -                     | -               | -                    | -                |
| C    | Bendict test         | -               | +                     | +                | -                     | -               | -                    | -                |
| D    | Iodine test          | -               | -                     | -                | -                     | -               | -                    | -                |

**B. ALKALOID TEST**

| S.No | Name of test     | Aqueous Extract | Hydro-alcohol extract | Methanol extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|------------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Mayer test       | -               | -                     | -                | -                     | -               | -                    | -                |
| B    | Dragondr-Of test | -               | -                     | +                | -                     | +               | +                    | -                |

**C. AMINO ACID TEST**

| S.No | Name of test   | Aqueous Extract | Hydro-alcohol extract | Methanol extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|----------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Ninhydrin Test | +               | +                     | +                | -                     | -               | -                    | -                |

**D. PROTEIN TEST**

| S.No | Name of test | Aqueous Extract | Hydro-alcohol extract | Methanol extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|--------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Biuret test  | -               | -                     | -                | -                     | -               | -                    | -                |
| B    | Millons Test | +               | +                     | +                | -                     | -               | -                    | -                |

**E. FLAVONOID TEST**

| S.No | Name of test | Aqueous Extract | Hydro-alcohol extract | Methanol extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|--------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Sinora test  | +               | +                     | -                | -                     | -               | -                    | -                |

**F.1 CARDIAC GLYCOSIDE**

| S.No | Name of test        | Aqueous Extract | Hydro-alcohol extract | Methanol extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|---------------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Killer killeni test | -               | -                     | -                | -                     | -               | -                    | +                |

**F.2 ANTHRAQUINONE GLYCOSIDE TEST**

| S.No | Name of test    | Aqueous Extract | Hydro-alcohol extract | Methanol extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|-----------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Borntrager test | +               | +                     | +                | -                     | -               | -                    | -                |

**F 3 SAPONINE GLYCOSIDE TEST**

| S.No | Name of test | Aqueous Extract | Hydro-alcohol extract | Methanol extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|--------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Foam test    | +               | +                     | -                | -                     | -               | -                    | -                |

**G .TANINS AND PHENOLIC TEST**

| S.No | Name of test         | Aqueous Extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|----------------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Ferric chloride test | +               | +                     | +                | -                     | -               | -                    | -                |
| B    | Acetic acid test     | +               | +                     | -                | -                     | -               | -                    | -                |
| C    | Lead acetate test    | +               | +                     | +                | -                     | -               | -                    | -                |

**H. STEROIDS TEST**

| S.No | Name of test     | Aqueous Extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|------------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Salkow-aski test | +               | +                     | -                | -                     | -               | +                    | -                |

**H. FATS AND FIXED OIL TEST**

| S.No | Name of test     | Aqueous extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|------------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Greecy spot test | -               | -                     | -                | +                     | +               | +                    | +                |

**H. DETECTION OF QUINONE**

| S.No | Name of test | Aqueous extract | Hydro-alcohol extract | Methanol Extract | Ethyl Acetate extract | Acetone extract | Cholor-Oform extract | N-hexane extract |
|------|--------------|-----------------|-----------------------|------------------|-----------------------|-----------------|----------------------|------------------|
| A    | Quinone test | +               | +                     | -                | -                     | +               | +                    | -                |

**QUANTITATIVE ANALYSIS****A. Estimation of Total Alkaloid content [Table No. 1].**

| S. No | Name of Sample                            | % of Alkaloid |
|-------|-------------------------------------------|---------------|
| 1     | <i>Swertia chirayita</i> (Roxb) Buch.Ham. | 1.05 %        |
| 2     | <i>Ajuga bracteosa</i> Wall.Ex Benth      | 0.18%         |

**B. Estimation of Total Glycoside content [Table No. 2]**

| S. No | Name of Sample                            | % of Glycoside |
|-------|-------------------------------------------|----------------|
| 1     | <i>Swertia chirayita</i> (Roxb) Buch.Ham. | 1.77%          |
| 2     | <i>Ajuga bracteosa</i> Wall.Ex Benth      | 1.94%          |

**TLC Profile of samples on Silica Gel [Table No. 3.]**

| Samples                                  | Visualization       | No. of spots | R <sub>f</sub> Value          |
|------------------------------------------|---------------------|--------------|-------------------------------|
| <i>Swertia chirayita</i> (Roxb) Buch.Ham | Conc sulphuric acid | 06           | 0.26,0.31,0.38,0.43,0.68,0.93 |
| <i>Ajuga bracteosa</i> (Wall.Ex Benth)   | Iodine Vapour       | 02           | 0.7, 0.75                     |
|                                          | Conc sulphuric acid | 04           | 0.7, 0.75, 0.8, 0.85          |



(Fig 1.1): Collection of *Swertia chirayita* (Roxb Buch Ham.).



(Fig 1.2): Collection of *Ajuga bracteosa* (Wall Ex Benth.).

**T.S of *Swertia chirayita* (Roxb Buch Ham. )(Leaf)**



Fig 1.3A: T.S of *Swertia chirayita*.

### T.S of *Ajuga bracteosa*(Wall ex Benth .)(Leaf)

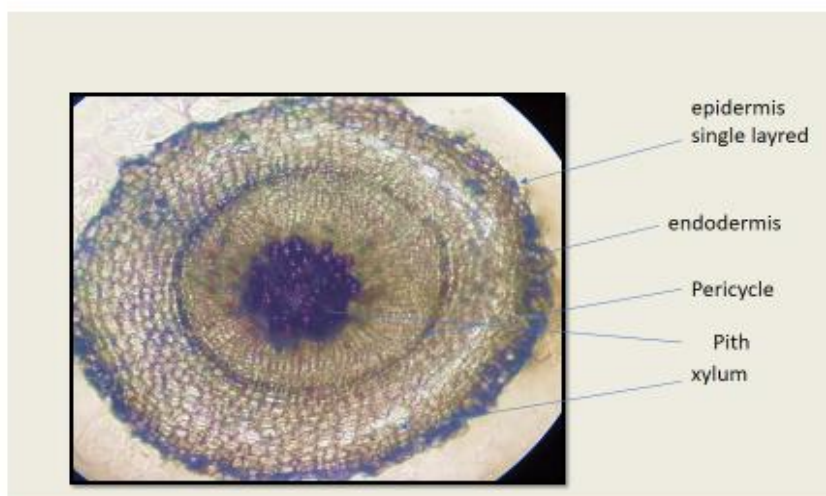


Fig 1.3B: T.S of *Ajuga bracteosa*.

### Powder microscopy of Chirayata

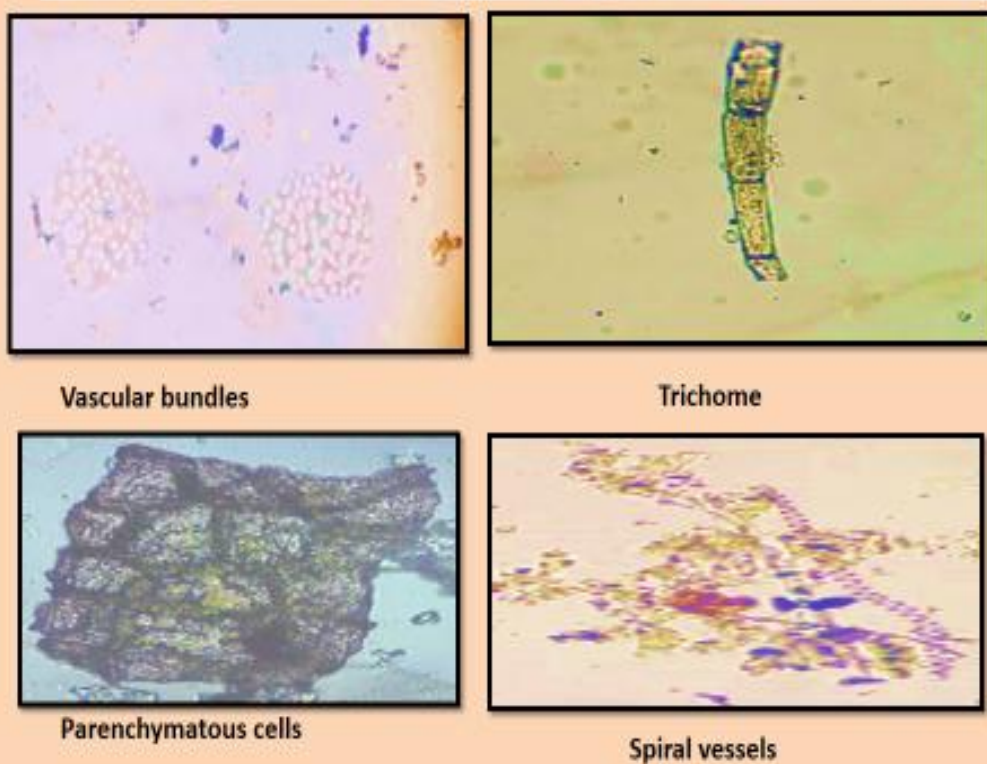
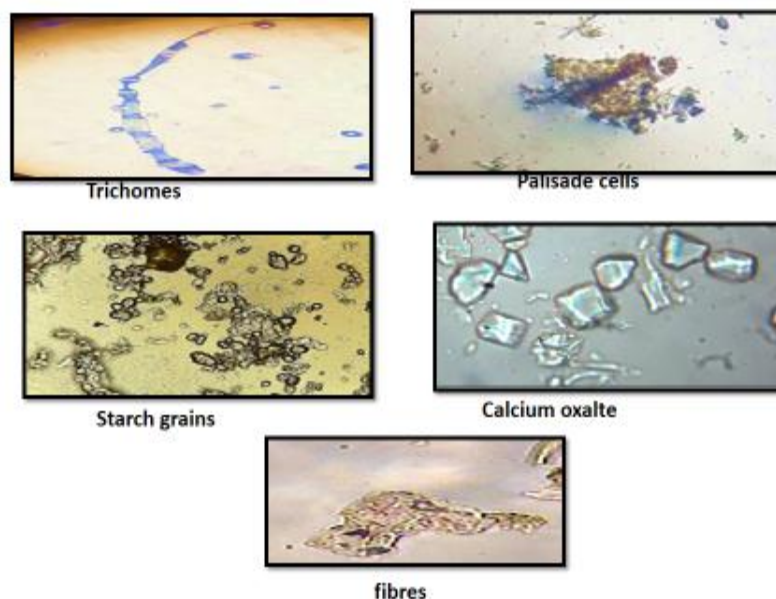


Fig 1.4: Powder microscopy of Chirayata.

## Powder microscopy of *Ajuga bracteosa*



**Fig 1.5: Powder microscopy of *Ajuga bracteosa*.**

### ❖ CONCLUSION

Preliminary phytochemical tests of Chirayata (*Swertia chirayita*) and Neelkanthi (*Ajuga bracteosa*) have showed positive result for different bioactive molecules, in which alkaloid and glycoside constituent are responsible for antipyretic activity.

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