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Comparative Study of Alkaloids in Selected Medicinal Plants of Mansehra District

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Abstract – Alkaloids were extracted and estimated from three medicinal plants of Mansehra. Three medicinal plants *Mentha arvensis, Parthemium hysterium* and *Colchina spp* were collected from different locations of Mansehra. The plant parts were dried and stored in powder form for extraction of different alkaloids. The extraction of alkaloids was done by Soxhlet method and Reflux method. It was found that maximum quantity of alkaloids was present in *Colchina spp* (251mg) followed by *Mentha arvensis* (213mg), *Parthemium hysterium* (195mg) by Soxhlet method while by Reflux method maximum alkaloids were present in *Mentha arvensis* (197mg) followed by *Colchina spp* (109mg) , *Parthemium hysterium* (67mg). The variations in total alkaloids present in different parts of selected plants were also obvious as in case of *Mentha arvensis* stem contained more alkaloids than leaves and roots, while in *Parthemium hysterium* roots showed more alkaloids than stem and leaves. It was also observed that different methods in present study also affect the total amount of alkaloids as Soxhelt method proved more effective in extraction of alkaloids from different parts of plants. The present study will be very helpful in determining the potent of local medicinal plants and their utilization on pharmaceutical industry.

Keywords – *Alkaloids, Mentha Arvensis, Parthemium hysterium, Colchina spp*

1. Introduction

The significance of medicinal plants is directly related to the wide range of chemical compounds synthesized by the various biochemical pathways. These compounds are classified as secondary plant products, because they are not much related to the plant's survival. One major category of such compounds is alkaloids. Although they vary greatly in their chemical structures, alkaloids have several common characteristics. They possess nitrogen (most are derived from a few common amino acids), and are alkaline (basic), but have no basic forms such as quaternary compounds and N-oxides. There is an urgent need to discover new antimicrobial agents for human and veterinary therapeutic uses, as resistance to current drugs increases in severity and extent. Alkaloids have diverse structures and many show a range of pharmacological activities including antimicrobial activity [1]. They are also normally readily separable from the other plant metabolites as a result of their basicity. The medicinal plants are useful for healing as well as for curing of human diseases because of the presence of phytochemical constituents [2]. Photochemical are naturally occurring in the medicinal plants, leaves, vegetables and roots that have defense mechanism and protect from various diseases. Phytochemicals are primary and secondary compounds. Chlorophyll, proteins and common sugars are included in primary constituents and secondary compounds have terpenoids, alkaloids and phenolic compounds [3]. Terpenoids exhibit various important pharmacological activities i.e., anti-inflammatory, anticancer, anti-malarial, inhibition of cholesterol synthesis, anti-viral and anti-bacterial activities. Alkaloids are used as anesthetic agents and are found in medicinal plants [4]. The *Momordica charantia* belongs to the Cucurbitaceous family and it has common names such as bitter melon, karela and bitter gourd. More than thousand herbal products of *Momordica charantia* are used for treatment of diabetic patients and also helpful in lowering of glucose level in the blood [5]. The present study would be helpful to locate, isolate, identify and evaluate novel bioactive alkaloids from plants traditionally used for medicinal purposes in Mansehra. This study will involve plant specimen collection, field screening for alkaloids, extraction, purification, structure elucidation, and later will include bioactivity testing.

2. Material and Methods

2.1. Preparation of Sample

Plants were collected that were *Mentha arvensis* , *Parthemium hysterium* and *Colchina spp* from local plant diversity of district Mansehra. After the collection of these medicinal plants, their main parts (leaves, roots, and stem) were separated. These parts of the plants were dried in shadow. These dried parts of each plant were powdered by mechanical grinder.

2.2. Extraction of Alkaloids

The powders of the each part of the plant were used for the extraction of alkaloids. 50 grams of powder of each

part of the plant were poured into flask and were soaked in NH_4OH (25%). Then 150 ml of methanol were added and the extraction was made using two methods; soxhlet, and reflux (Reflux) methods.

2.2.1. Soxhlet methods

The extraction was performed using of soxhlet apparatus in the normal way at the boiling point of the solvent used. The powdered sample (50g) was extracted with 500 ml of solvent on water both until the solvent become colorless. The extracts were concentrated to 1 ml under reduce pressure on a rotary evaporator. The extracts were stored in sealed vials at 4 ^{0}C and were used for the alkaloid analysis.

2.2.2. Reflux Method

50 grams of the each part of the plant powder was poured into a flask with 100 ml of NH_4OH (25%) were soaked Then 150 ml of methanol were added and connected to the fridge. The temperature was set at 80 ^{0}C, and reflux extraction method was used, also extract obtained was weighed.

2.3. Determination of Total Alkaloids Using Spectrophotometric Methods

2.3.1. Preparing a solution Bromocresol Green (BCG)

69.8 gram of BCG with 3 ml solution of NaOH (2 normal) and 5 ml of distilled water were added and the volume was made with distilled water 1 liter.

2.3.2. Preparation of Phosphate Buffer at pH 7.4

79.6 g Na_2HPO4 dissolved in one liter of distilled water, 0.2M of citric acid was also added and maintained the pH up to 4.7. In plants the alkaloids is take place in salt form, so for their extraction water or acidic water is used. In order to augment its solubility generally inorganic acidic extraction is used to substitute organic acidic alkaloids salt with inorganic acidic salt. Generally 0.1% to 1 % H_2SO_4, HCl, or CH_3COOH, tartaric acid solution used for their extraction. This extraction method is comparatively easy to handle and significant in converting molecules of alkaloids into small organic acidic salts of inorganic and its solubility in water increases. On the other hand, the disadvantage of such method is that it requires high amount of extracted solution, more water-soluble impurities etc.

3. Results and Discussion

3.1. Total Alkaloids in the Different Parts of the Selected Plants

It is cleared from the table.1 that alkaloids obtained from *Mentha arvensis* leaves through soxhlet method, and reflux method were, 87mg/100 mg for each process. At the same time *Mentha arvensis* roots were analyzed by alkaloids contents and obtained 83mg/100mg of alkaloids through soxhlet method and 76mg/100mg through reflux method. Similarly, from the stem of *Mentha arvensis* 43mg/100mg of alkaloid was obtained through soxhlet method, and 34mg/100mg was obtained through reflux method. The leaves of *Parthemium hysterium* produced 54mg/100mg of alkaloid through soxhlet method, 32 mg/100mg by reflux method. Similarly, from the stem of *Parthemium hysterium* 76 mg/100mg of alkaloid was obtained by soxhlet method, and 12 mg/100mg was obtained through reflux method. At the same time suxhlet method was given us 65mg/100mg of alkaloid, and reflux method produced 23 mg/100mg from the roots of *Parthemium hysterium*. Along with that the leaves of the *Colchina spp* produced 89mg/100mg through soxhlet method and 32mg/100mg through reflux method. At same time, the roots of *Colchina spp* produced 76mg/100mg by soxhlet method and 32mg/100mg by reflux methods, while through soxhlet method and reflux method from stem of *Colchina spp* produced 86 mg/100mg, 45 mg/100 mg of alkaloids respectively.

Table 1: Amount of total Alkaloids from different parts of three selected plants in mg/100mg.

Plants	Soxhlet method	Reflux method
Mentha arvensis Leaves	87	87
*Mentha arvensis*Roots	83	76
*Mentha arvensi*Stem	43	34
Parthemium hysterium Leaves	54	32
Parthemium hysterium Roots	65	23
Parthemium hysterium Stem	76	12
Colchina spp leaves	89	32
Colchina spp Roots	76	32
Colchina spp Stem	86	45

3.2. Total Alkaloids Extracted from Mentha Arvensis by Soxhlet Method

Table 2 shows that *Mentha arvensis* produced 50 mg alkaloids, among these 12 mg (24%) were produced from the leaves, 15 mg (30%) was obtained from the roots and 23 mg (46%) was obtained from the stem of this plant by using soxhlet method.

Table 2: Amount of total Alkaloids extracted from Mentha arvensis by Soxhlet method in mg/100mg.

Plant organs	Amount in mg	Total alkaloids	Parecentage (%)
LEAVES	12	50	24
ROOTS	15	50	30
STEMS	23	50	46

3.3. Total Alkaloids Extracted From Parthemium Hysterium by Soxhlet Method

It is obvious from table 3, that total 50 mg of alkaloids were obtained from the *Parthemium hysterium* plant through soxhlet method. This 50 mg of alkaloids was constituted with 10 mg (20%) of leaves, 32mg (64%) of roots and 8 mg (16%) of the stem of the *Parthemium*

hysterium plant.

Table 3: Amount of total Alkaloids extracted from Parthemium hysterium by Soxhlet method in mg/100 mg

Plant organs	Amount in mg	Total alkaloids	Parentage (%)
LEAVES	10	50	20
ROOTS	32	50	64
STEMS	8	50	16

3.4. Total Alkaloids Extracted From Colchina Spp by Soxhlet Method

Table 4 tells about the total alkaloids obtained from the *Colchina spp* through soxhlet method which was 50mg. This 50 mg was the collection of alkaloids obtained from the leaves roots and stem which were 10 mg (20%), 14 mg (28%) and 26 mg (52%) respectively.

Table 4: Amount of total Alkaloids extracted from Colchina spp by Soxhlet method in mg/100 mg

Plant organs	Amount in mg	Total alkaloids	Percentage (%)
LEAVES	10	50	20
ROOTS	14	50	28
STEMS	26	50	52

3.5. Total Alkaloids extracted from Mentha arvensis by Reflux Method

Table 5 shows, that Mentha arvensis produced 50 mg alkaloids, among these 15 mg (30%) were produced from the leaves, 15 mg (30%) was obtained from the roots and 20 mg (40%) was obtained from the stem of this plant.

Table 5: Amount of total Alkaloids extracted from Mentha arvensis by Reflux method in mg/100 mg.

Plant organs	Amount in mg	Total alkaloids	Percentage (%)
LEAVES	15	50	30
ROOTS	15	50	30
STEMS	20	50	40

3.6. Total Alkaloids Extracted From Parthemium Hysterium by Reflux Method

It is obvious table no. 6 that total 25 mg of alkaloids was obtained from the *Parthemium hysterium* plant through refux method. This 25 mg of alkaloids was constituted with 6 mg (24%) of leaves, 12 mg (48%) of roots and 7 mg (28%) of the stem of the *Parthemium hysterium* plant.

Table 6: Amount of total Alkaloids extracted from Parthemium hysterium by Reflux method in mg/100mg.

Plant organs	Amount in mg	Total alkaloids	Percentage (%)
LEAVES	6	25	24
ROOTS	12	25	48
STEMS	7	25	28

3.7. Total Alkaloids Extracted From Colchina Spp by Reflux Method

Table 7 shows, that *Colchina spp* produced 25 mg alkaloids, among these 6 mg (24%) were produced from the leaves, 13 mg (52%) was obtained from the roots and 6 mg (24%) was obtained from the stem of this plant by using reflux method.

Table 7: Amount of total Alkaloids extracted from Colchina spp by Reflux method in mg/100 mg.

Plant organs	Amount in mg	Total alkaloids	Percentage (%)
LEAVES	6	25	24
ROOTS	13	25	52
STEMS	6	25	24

4. Conclusion

It is concluded from my research work that maximum alkaloids were obtained from the different parts of these plants (*Mentha arvensis, Parthemium hysterium, Colchina spp*) through soxhlet method, while there was fluctuation among the alkaloids produced through reflux methods. It is also assumed from this study that maximum quantity of alkaloids were found in *Parthemium hysterium, Colchina spp* and *Mentha arvens*

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