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# Phytochemical Composition and Heavy Metals Contents of *Xanthium strumarium* and *Solanum xanthocarpum*

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**Abstract:** *Xanthium Strumarium* and *Solanum Xanthocarpum* are very important medicinal plants. These were collected from three different areas including Mardan, Peshawar and Kohat and were examined for the quantitatively determination of alkaloids, saponins, flavonoids and heavy metals like lead, iron, cadmium, copper and zinc. These medicinal plants are utilized in tradition system of medicine. The study is of particular importance to know the amount of crude phytochemicals and heavy metals and will provide a data base for herbal practioners use them in traditional system of medicine for different types of ailments.

**Key words:** Medicinal plants · Alkaloids · Saponins · Flavonoids

## INTRODUCTION

Medicinal plants are used as herbs or traditional medicines for various types of diseases since ancient times. Recently the use of phytoterapics is considered to be more safer and congenial to the human body. Medicinal plants are used for the preparation of various modern drugs or used as the principle sources of raw materials. Phytochemical progresses have been aided enormously by the development of rapid and accumulate methods of screening medicinal plants for particular chemicals. The medicinal values of these plants lies in bioactive phytochemical constituents that produce specific physiological action on the human body [1. Some of the most important bioactive constituents are alkaloids,saponins, flavonoids, tannins, terpenoids, phenolic compounds, essential oils, steroids, glycosides, phenolic compounds [2]. These naturaaly occurring compounds form the backbone of the modern medicine or drugs [3].

Phytochemicals are natural compounds that are found in medicinal plants, vegetables, fruits, flowers, leaves, roots, stem bark and work together with nutrients and fibers to act as a defense system or to protect humans against diseases.

Phytochemicals are divided into two main groups that is primary and secondary constituents according to their function in the plant body. Primary constituents are sugars, amino acids, proteins and chlorophyll and secondary consist of alkaloids, terpenoids, saponins, flavonoids, tannins, terpenoids and phenolic compounds [4]. There is a great interest in trace and elements composition in medicinal science. It is believed that great majority of elements act as key components of essential enzymes systems or vital biochemical functions. The various minerals or inorganic nutrients are required for healthy life [5-6].

Xanthium, strumarium and Solanum Xanthocarpum are valuable medicinal plants. Due to their medicinal and economical values these plants were selected for their chemical analysis and to manifest the physiological effects on human beings by knowing the exact contents.

Xanthium strumarium is an annual herb with a short stout, hairy stem, Leaves broadly triangular ovate or suborbicular. Flower heads in terminal and axillary racemes.

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The flowering time is August- September. It can be propagated through seeds. This weed is easily dispersed through animals as the fruits have hooked bristles and two strong hooked beaks [7].

The aim of the present study is to evaluate the quantitative determination of crude phytochemicals and heavy profile in the two selected medicinal plants which m ay be very useful for different types of ailments and will have application in the pharmaceuticals as both these medicinal plants are used extensively by the local practionars and in the traditional system of medicine.

## MATERIALS AND METHODS

The medicinal plants *Xanthium strumarium* and *solanun xanthocarpum* were collected in August 2009, from three districts of NWFP including Mardan, Peshawar and Kohat areas. The plant materials were identified by an experienced Botanist Mr. Shahid Farooq Principal Scienctific Officer PCSIR Labs Complex Peshawar. The plant materials were washed with tape water and then with distilled water. The whole plant material was dried in shade, crushed and milled into powder with the help of an electrical grinder and finally stored in airtight bottle before use.

**Alkaloid Determination:** 5 g of the whole plant material of each sample was weight into a 250 mL beaker and 200 mL of 20% acetic acid in ethanol was added and covered to stand for 4hs. The mixture was filtered and the extract was concentrated to quarter of the original volume under reduced pressure. Concentrated ammonium hydroxide was added drop wise to the extract until complete precipitation. The whole solution was allowed to settle and the precipitate was collected by filtration, dried and weight [8-10].

**Determination of Flavonoids:** Five grams of each sample was taken in conical flask 50 mL of 80% aqueous methanol was added and the left the mixture for five hrs with mechanical shaking, it was then filtered and another 50 mL of 80% of aqueous methanol was added and again filtered then the same procedure was repeated thrice, the combine extracts were then evaporated in vacuum to give crude amount of flavonoids in each sample the weight and percentage was calculated for each sample [11].

**Determination of Saponin:** 5 g of each sample was taken in a flask and dissolved it in 50mL of 20% ethanol. The suspension was heated over a hot water bath for 4 hrs with continuous stirring at about $55^0$c. The mixture was filtered and the residue was re-extracted with another 50 mL of 20%ethanol.The combined extracts were reduced to 40 mL over water bath at about $90^0$c.The concentrates were transferred into a 250 mL separating funnel and 20 mL of diethyl ether was added and shaken vigorously. The aqueous layer was recovered while the ether layer was discarded. This purification process was repeated. 60 mL of n-butanol was added. The combined n-butanol extracts were washed twice with 10 mL of 5% aqueous sodium chloride. The remaining solution was heated in a water bath after evaporation each sample was dried in the oven to a constant weight. The weight and percentage of saponin contents was calculated in percentage [12].

**Determination of Heavy Metals:** For heavy metals 1 g of each sample was taken in crucible and carry out the process of charing. The charing process took from 4-6 minutes for each sample. After charing, ashing was started.

**Ashing:** For ashing the crucibles having samples were kept in the furnace for 4 hrs at 600°C. After ashing the samples were cooled in the desiccator then 2.5mL of $6MHNO_3$ was added to dissolve the contents of the crucibles [13].

Then it was filtered through a whattman filter paper 42 and dilutes all the six samples up to 22.5 mL. The filtrates of the seven samples were putted in the plastic bottles. Samples were analyzed for heavy metals using flam less atomic absorption spectroscopy. By using this technique Cd, Fe, Pb, Zn, Cu were found as heavy metals in all the samples in different concentrations.

## RESULTS AND DISCUSSION

The crude alkaloids, flavonoids, saponins and heavy metals in plant-1 (X. strumarium) and plant-2 (S. xanthocarpum) were determined, the results are given in Table 1 and 2.

Tables 1, shows quantitative amount of crude phytochemicals constituents of X-strumarium and S-xanthocarpum. The plant samples collected from three different areas including Mardan, Peshawar and kohat.

Table 1: Crude Phytochmicals Composition (%) of *X strumarium* and *S. xanthocarpum*

| Plant code | Alkaloid | Saponin | Flavonoids |
|---|---|---|---|
| M1 | 14.8% | 6.2% | 6% |
| M2 | 9.4% | 3.08% | 6.8% |
| P1 | 8.4% | 3.8% | 6.25% |
| P2 | 2.4% | 5.46% | 8.8% |
| K1 | 3.6% | 4.2% | 9.4% |
| K2 | 7.6% | 6.4% | 10.4% |

M: Mardan, P: Peshawar, K: Kohat
1: Xanthium Strumarium, 2: Solanum Xanthocarpum

Table 2: Heavy metals contents (mg/kg) of *X. strumarium* and *S. xanthocarpum*

| S. No | Plant code | Zn | Cd | Pb | Fe | Cu |
|---|---|---|---|---|---|---|
| 1 | M1 | 4.157 | 0.150 | 1.807 | 1.5785 | 0.939 |
| 2 | M2 | 5.615 | 0.109 | 1.549 | 1.9620 | 1.003 |
| 3 | P1 | 2.585 | 0.132 | 1.462 | 3.1169 | 1.035 |
| 4 | P2 | 2.378 | 0.115 | 1.575 | 4.9775 | 0.512 |
| 5 | K1 | 3.649 | 0.136 | 1.574 | 2.2093 | 2.129 |
| 6 | K2 | 3.292 | 0.128 | 1.720 | 6.7510 | 1.010 |

M: Mardan, P: Peshawar, K: Kohat
1: Xanthium Strumarium, 2: Solanum Xanthocarpum

As can be seen from Tables 1, high percentages of crude alkaloids were found in *X.strumanium* followed S.xanthocarpum collected from Mardan region. The sample obtained from Peshawar region has 8.4% and 6.4%. High %age of alkaloid was found in *S. xanthocarpum* 7.6% and a very low yield was found in the *X. strumarium* 3.6%. Table 1 in case of saponin high yield 6.4% and 6.2% was obtained in the sample of *S-xanthocarpum* and *X-strumarium* collected from kohat and mardan region. Relatively low yield 3.8% was found in the samples of *X. strumarium* from Peshawar region. The content of crude flavonoid was found high 10.4% in *S.xanthocarpum* followed by *X. strumarium* 9.4% collected from kohat region.

The yield of the crude phytochemical obtained in the plant samples collected from different areas of N.W.F.P showed significantly differently amounts depending upon their environmental conditions in which these plants are grown. The result is of particular importance by comparing the effect of different environmental factors on the yield of their crude phytochemicals. Besides this, the alkaloids have analgesic, antispasmodic, antibacterial effects. Saponin has the property of precipitating and colligating red blood cells. Saponin also foams in aqueous solutions, hemolytic activity, cholesterol binding properties and bitterness, flavoniod on the other hand, are potent water soluble anti-oxidants properties which prevent oxidative cell damage, have strong anti-cancer activity.

**Lead:** As can be seen from Table 2, a relatively high 1.807 mg/kg concentration of Pb was found in the sample X. strumarium while in case of other samples the Pb contents are the same with a little difference Table 2. It is believed lead in plants is mainly due to deposition or absorption by their external parts. The maximum recommended limit of Pb is 10 mg/kg [14]. Thus concentration of Pb in all the studied samples is still very low.

**Iron:** The plant samples collected from three different areas have different amount of iron. i.e high concentration of Fe (6.75 mg/kg) was found in samples of $PK_2$ followed by $PP_2$ (44.89 mg/kg).low concentration of iron was found in the samples collected from Mardan areas.

**Cadmium:** The level of cadmium in all the samples ranging from 0.10 mg/kg to 0.15 mg/kg. Plants absorb Cd from roots. The maximum recommended limit of Cd is 0.3 mg/kg. The concentration of Cd in all the plants samples is well beyond the maximum recommended limits.

**Copper:** The concentration level of Cu found different among the plant samples collected from different areas. For example high concentration of cu was found in $Pk_1$ samples and the lowest amount was in $P_2$ Peshawar sample. The rest of samples were ranging from 1.04 mg/kg to 0.93 mg/kg.

**Zinc:** Zinc is another important enzymatic metal. Its concentration varies from 5.62 mg/kg to 2.38 mg/kg. High level of zinc concentration was observed in $pm_2$ Samples followed by pm1. The general trend of Cu contents in the studied areas is.

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