



## HIBISCUS SABDARIFFA L A RICH SOURCE OF SECONDARY METABOLITES

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### ABSTRACT

*Hibiscus sabdariffa* is known for delicacy and also for medicinal properties. The present paper deals to study the phytochemical screening of *Hibiscus sabdariffa* for various medicinally important compounds and their quantification. In the present investigation it was found that phenols, alkaloids, tannins, flavanoids, Saponin are present in leaves, stem and root of the plant. TLC analysis also confirmed these results. Quantitative analysis of stem leaves and root shows best results in which phenolics have been found to be present more in leaf of the plant. However, alkaloids are present in all parts of the plant.

**Keywords:** Phytochemicals, *Hibiscus sabdariffa*, secondary metabolites.

### INTRODUCTION

Progress in medicinal plant research has undergone a phenomenal growth during last two decades. Worldwide trend towards the utilization of natural plant remedies has created an enormous need for information about the properties & uses of medicinal plant as antitumor, anti-analgesic, insecticides. Besides medicines, plants provides thousand of novel compounds, such as fragrance, flavorings, dyes, fibers, foods, beverages, building materials etc.

*Hibiscus sabdariffa* is known for delicacy and also for medicinal properties. Tender young leaves and stems - raw or cooked use in salads, as a pot-herb and as a seasoning in curries, they have an acid, rhubarb-like flavor. Fresh calyx (the outer whorl of the flower) is eaten raw in salads, is cooked and used as a flavoring in cakes etc and is also used in making jellies, soups, sauces, pickles, puddings etc. The calyx is rich in citric acid and pectin and so is useful for making jams, jellies etc. It is also used to add a red colour and to flavor to herb teas.

Roselle is an aromatic, astringent, cooling herb that is much used in the Tropics. It is said to have diuretic effects, to help lower fevers and is antiscorbutic<sup>1</sup>. The leaves are antiscorbutic, emollient; diuretic, refrigerant, and sedative. The plant is also reported to be antiseptic, aphrodisiac, astringent, cholagogue, demulcent, digestive, purgative and resolvent. It is used as a folk remedy in the treatment of abscesses, bilious conditions, cancer, cough, debility, dyspepsia, fever, hangover, heart ailments, hypertension, and neurosis.

Among other uses, strong fiber obtained from the stem (called rosella hemp) is used for various household purposes including making sackcloth, twine and cord. A yellow dye is obtained from the petals. It is used in medicines etc. The seed yields 20% oil<sup>1</sup>.

The main aim of the present investigation was to study the preliminary phytochemical screening of *Hibiscus*

*sabdariffa* and Qualitative and Quantitative analysis of some secondary metabolites.

### MATERIALS AND METHODS

#### Plant Material

In the present investigation, *Hibiscus sabdariffa* L was selected for the study. Moreover, the medicinal importance of this species is also documented by several workers.

The healthy plants material like leaves, stem and root were collected. Referring the standard morphological characteristic features provides in the floras for the identification of the species.

#### Plant collection

In the present investigation, initially the plant was collected from their natural habitat from different region of the Nagpur district.

#### Preliminary phytochemical analysis.

Preliminary phytochemical screening of plant was done following the standard procedures adapted by the various workers<sup>1,2,3,4</sup>.

#### Preparation of extracts:

Fresh leaves, stem, root and seeds were washed thoroughly under running tap water, shade dried and used for extraction. Dried leaves stem and seeds were homogenized to a fine powder and stored in airtight bottles. 10gm of leaves stem and seeds powders were extracted with 100ml of solvent (petroleum ether, absolute alcohol, acetone and distilled water) for 24 hr. by using soxhlet apparatus. Extracts were used for different tests.

#### Quantitative and Qualitative Phytochemical screening

Quantitative and Qualitative Phytochemical screening of plant was done according to standard procedures. Qualitative analysis of some phytochemicals such as



alkaloids, flavonoids, phenolics, saponins, steroids, glycosides were done by employing Thin Layer Chromatographic technique<sup>5,6</sup>. Whereas quantitative chemical analysis of Alkaloids, Phenolics, Flavonoids and Saponins were done by different methods<sup>7,8</sup>.

## RESULTS AND DISCUSSION

The screening of plants for medicinal value has been carried out by number of workers with the help of preliminary phytochemical analysis<sup>9, 10, 11</sup>. Phytochemical screening is of paramount importance in identifying new source of therapeutically and industrially valuable compound having medicinal significance, to make the best and judicious use of available natural wealth. A number of medicinal plants have been chemically investigated by several workers<sup>12, 13</sup>. The selection of plant part which yields maximum secondary metabolites is the prime or prerequisite step in this investigation. For this, different phytochemicals from different parts of the plants were extracted in different solvent; their presence (+) or absence (-) is shown in table 1.

Different types of solvent plays an important role in extractability of different phytochemical. In the present investigation alkaloids are found to be better extracted by alcohol and water.

Flavonoids were found to be extractable in all the solvent system, such as petroleum ether, methanol and water<sup>14, 15, 16</sup>. In present investigation Alcohol and water are favored solvent system while petroleum ether and acetone extract the flavonoids from leaf and seeds only.

In the present investigation phenolics were extracted in water and petroleum ether. Steroids were extracted in all types of solvent except water. Several workers reported the isolation of steroids by using petroleum ether as a solvent system<sup>1</sup>. Saponins were found to extractable only in water.

Alkaloids were found to be present in all part of the plants. Cardiac glycosides were present only in leaf and root of *Hibiscus sabdariffa*. Similarly the anthracene glycosides are present only in root of *H. sabdariffa*.

Flavonoids are well known for their anti-viral, anti-inflammatory, antioxidant activity, cytotoxic and also used in the treatment of hypertension, diabetes, rheumatic fever etc. *Hibiscus sabdariffa* shows the presence of flavonoids in its all parts, it can be of use to cure above mentioned disorders and as antioxidant agent.

**Table 1: Distribution of various phytochemicals in different parts *Hibiscus sabdariffa* L plant.**

Solvent	Compound/ Part	Stem	Leaf	Root	Seeds
Petroleum ether	Flavonoids	-	+	-	+
	Emodins	-	-	-	-
	Carotenoid	+	-	-	+
	Steroids	-	-	-	+
	Triterpenoid	-	+	-	-
	F.acids	+	+	+	+
	Alkaloids	-	+	-	-
	Phenolic	+	+	+	+
Acetone	Flavonoids	-	+	-	+
	Steroids	+	-	+	-
	Triterpenoid	+	-	+	-
	Alkaloids	+	+	-	-
Alcohol	Anthrcene glycosides	-	-	+	-
	Flavonoids	+	+	-	+
	Tanins	+	+	+	+
	Steroids	+	+	+	+
	Triterpenoids	-	-	-	-
	Alkaloids	+	+	+	+
	Anthocyanin and Anthocynadin	+	+	-	-
Water	Saponins	+	+	+	+
	Flavonoids	+	+	+	+
	Tanins	+	+	+	+
	Cynogenic Glycosides	-	+	+	-
	Polyuronoids	-	-	-	-
	Gum and Mucilage	+	+	+	+
	Chlorogenic acid	+	-	+	-
	Triterpenoids	-	-	+	+
	Alkaloids	+	+	+	+
	Phenolic	+	+	+	+



**Table 2: Quantitative data of various phytochemicals in different plant parts.**

Plant →	<i>Hibiscus sabdariffa</i>		
	Leaf	Stem	Root
Flavonoids (mg/g)	0.230	0.131	0.75
Phenolics (mg/g)	0.125	ND	0.107
Saponins (mg/g)	0.130	0.165	0.145
Alkaloids (mg/g)	0.120	0.745	0.854
Tannins (mg/g)	0.170	0.881	0.187

**ND – Not Determined**

**Table 3: TLC analysis of some phytochemicals in different plant parts of *Hibiscus sabdariffa***

Chemical name	Plant part	No. of bands	Rf values
Alkaloids	Leaves	2	0.86,0.94
	Stem	2	0.86, 0.98
	Root	3	0.30,0.86,0.94
Flavonoids	Leaves	5	0.08,0.14,0.55,0.76,0.97
	Stem	3	0.08,0.55,0.97
	Root	2	0.55,0.97
Phenolics	Leaves	7	0.03,0.05,0.36,0.63,0.74,0.85,0.90
	Stem	4	0.03,0.05,0.36,0.63
	Root	6	0.03,0.05,0.36,0.63,0.74,0.85
Saponins	Leaves	2	0.57,0.70
	Stem	2	0.55,0.65
	Root	2	0.55,0.65
Steroids	Leaves	3	0.67,0.78,0.86
	Stem	1	0.45
	Root	3	0.62,0.74,0.83
Glycosides	Leaves	2	0.34,0.43
	Stem	3	0.44,0.48,0.58
	Root	2	0.26,0.38

In the present study, phenolics were detected in all the parts of the plant. Phenolics have attracted a great attention in relation to their potential for beneficial effects on health. Over the last few years, several experimental studies have revealed biological and pharmacological properties of phenolics compounds, especially their anti-inflammatory activity<sup>17</sup>, antiviral, anti-inflammatory and cytotoxic activity<sup>18</sup>. It is a well documented fact that most medicinal plants are enriched with phenolic compounds and bioflavonoids that have excellent antioxidant properties<sup>19</sup>. Phenolics are active in curing kidney and stomach problems as well as helpful as anti-inflammatory in action<sup>20</sup>.

In this study, steroids and triterpenoids were found to be present in all the parts of the plant studied, and triterpenoids was absent in seeds of *H. sabdariffa*. Steroids have been reported and shown that, it possesses anti-inflammatory activities<sup>21</sup>. Saponins were also found to be present in all samples of the taxa. Recent studies at Toronto, Department of Nutritional Sciences, Canada, have indicated that, dietary source of saponins offer preferential chemical preventive strategy in lowering the risk of human cancer. Saponins are found in many plants and animals. Rao *et. al.*, carried out an extensive

phytochemical analysis of plants for the presence of saponins. In their study they found saponins to be rare occurrence in the selected plants, while steroids, triterpenoids were present in all the plants parts of the species studied by them<sup>22</sup>.

Tannins are also found to be present in all the extracts of the plant parts. Tannins decrease the bacterial proliferation by blocking key enzymes at microbial metabolism. Tannins play important role such as potent antioxidant<sup>23</sup>. Herbs that have tannins as their main component are astringent in nature and are used for treating intestinal disorders such as diarrhea and dysentery<sup>24</sup>.

Anthocynins and anthocynidin were present in leaf and stem of the plant species. These compounds have the healing properties<sup>25</sup>. Results are supported by the worked carried out in *Hibiscus sabdariffa* and *Hibiscus rosasinensis* in which, anthocyanins, a group of phenolic natural pigments present in the dried flowers, have been found to cardioprotective, hypocholesterolemic<sup>26</sup>; antioxidative and hepatoprotective<sup>27</sup>.

After preliminary analysis of phytocompounds by chemical analysis, thin layer chromatographic study was

done for confirmation of exact chemical compound present in the plant. In present investigation, after preliminary investigation, TLC of the samples was carried out (Table 3). Thus, in all the species, the variation in number of various phytochemicals was observed. This variation was reflected in number of bands in the TLC plates. This might be due to the fact that different environmental conditions affect the synthesis of different chemical constitution of a species<sup>28</sup>. Different RF values suggest presence of large number of flavonoids and phenolics in all parts of the plants in comparison to alkaloids, saponins, steroids and glycosides.

Important phytochemicals (flavonoids, phenolic, saponin, alkaloids, and tannins) were quantified using spectroscopy. In all the parts flavonoid, saponin and alkaloids were detected. In leaf flavonoid content was found to be highest i.e., 0.230 mg/gm, followed by stem and then by root. Whereas phenolics are found to be more in leaf of i.e. 0.125 mg/g and followed by root. Saponin was well distributed in all parts of the taxa studied; highest saponin content (0.165 mg/gm) was reported in stem of *H. sabdariffa* however alkaloids content are present in all parts, 0.854 mg/gm in root, 0.745 mg/gm in stem and 0.120 mg/gm in leaf. Tannin was recorded comparatively more in stem than the other parts (Table 2).

### CONCLUSION

The medicinal plants are the source of innumerable chemical compounds which are synthesized by plants endogenously. Therefore, analysis of the plants for determination of phytoconstituents was carried out with the help of chemical analysis and thin layer chromatography. The chemical analysis of the plant material collected from the natural habitat shows the presence of most of the phytoconstituents tested. The Phytochemical analysis exhibited the medicinal potential of *Hibiscus sabdariffa*. In the present investigation it was found that phenols, alkaloids, tannins, flavonoids, Saponin are present in leaves, stem and root of the plant. TLC analysis also confirmed these results. Quantitative analysis of stem leaves and root shows best results in which phenolics have been found to be present more in leaf of the plant. However, alkaloids are present in all parts of the plant. Present investigation showed that, this plant is warehouse of chemo-diversity.

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