Phytochemical Analysis of Potential Medicinal Plants Located on Mountainous Area along Rasul Barrage, Mandi Bahauddin, Pakistan

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Abstract: Potential biochemical components of medicinal plants have a lot of medicinal value against many diseases. In this regard, a survey was conducted by the Department of Botany, University of Sargodha, to estimate the variations of the vital biochemical contents in the potential medicinal plants located on mountainous area along Rasul Barrage, Mandi Bahauddin. The data were compared among thirteen plants collected from two different sites. Different biochemical and physiological attributes of various plants were noted, such as, protein, amino acid, nitrate reductase activity, total sugar, reducing and non-reducing sugar, chlorophyll a, b, total chlorophyll and different mineral ions, such as, Na^+ , K^+ , Ca^{2+} and Cl^- . It was observed that maximum protein and amino acid contents were present, particularly, in those plants which have ability of biological nitrogen fixation. As the new flush of leaves of *Capparis aphylla* appeared in November–January and red conspicuous flowers appeared in March to April had the highest sugar and chlorophyll contents among all thirteen analyzed plant species. The results reported from the collected plants indicated that there was no variation in plants due to habitat difference but the variations in plants were observed due to species differences.

Key words: Medicinal plants, Mandi Bahauddin, rasul barrage, biochemical attributes, physiological attributes, chlorophyll, minerals, mountainous area

INTRODUCTION

Mandi Bahauddin is a district of Punjab province of Pakistan. It is situated at 32°34'60N 73°30'0E and is outlined in the North West by Jhelum river, in South East by Chenab River which distinguishes it from Gujranwala District and Gujrat District and on the South West by Sargodha District. The region has a place of 2673 km².

Rasul Barrage is located on River Jhelum in Mandi Bahauddin, District of Punjab province of Pakistan. It is situated 72 km downstream of Mangla Dam. Rasul Barrage is used to control water flow in River Jhelum for irrigation and flood control purposes. Mountainous regions along Rasul Barrage contain a lot of valuable medicinal plants. These plants are locally used against many diseases.

Vegetation dependent medication has already being used towards diverse illnesses for hundreds of years. The basic use of herbs as healing has a great importance because they are obtained quickly and cheaply. Hence, there is a requirement to discover medicinal plants and their uses for medical purpose (Ahmad *et al.*, 2009).

Pakistan has already been given with adequate prosperity of plant sources, which are fitted with healing qualities. More than 1,000 types have been discovered which have healing principles and used by minor places to treat many illnesses (Latif *et al.*, 2004).

In Pakistan, *Fagonia arabica* is amongst the commonly used healing vegetations. It has typical titles “Azghakhi” or “Damiya” in the non-urban places of NWFP (Hooker, 1882). Usually vegetation is found on calcareous stones allocated along the Mediterranean Sea area of Southern African-American, Afghanistan, India and Pakistan, especially, Sindh, Punjab and NWFP (Rizvi *et al.*, 1996).

Complete vegetation and parts are used for treating bronchial asthma, rheumatism, diabetic issues, paralysis, tooth ache, as anthelmintic, anti-allergic, snakebite solution, etc., however, it is mainly used for specific circumstances, like TB, melanoma, rheumatism or diabetic issues that is yet under comprehensive research. *Aerva javanica* from the *Amranthaceae* is a natural herb consistently woody with delightful flowers (Hussein, 2005). The experiment was conducted to determine the nutritional composition of potential medicinal plants and their uses, located along Rasul Barrage, Mandi Bahauddin.

MATERIAL AND METHODS

Different potential medicinal plants were collected from two mountain sites (Missri Morr and Pathar Chotti) along Rasul barrage (Mandi Bahauddin). The collected plants were frozen in sealed plastic bags and brought to

Department of Botany, University of Sargodha. The nutritional composition of potential medicinal plants was determined by analyzing the collected samples.

Biochemical and physiological attributes

Protein: Protein was determined by the method of Lowry *et al.* (1951).

Total amino acids: Total amino acids were determined as described by Hamilton and Vanslyke (1943).

Nitrate Reductase Activity (NRA): Nitrate Reductase Activity (NRA) was determined by the method as described by Sym (1984).

Total sugars: Total sugars were estimated by the method of Yemm and Willis (1954).

Reducing sugar: Reducing sugar was determined by the method of Yemm and Willis (1954).

Chlorophyll contents: The chlorophyll a and b concentrations were determined by the method of Arnon (1949).

Determination of ions (K^+ , Na^+ , Ca^{2+} and Cl^-)

Digestion: Dried ground material was digested according to the method of Wolf (1982).

RESULTS

Analysis of variance of protein indicated that there was significant variation among different plants, but there was no difference between two selected sites. However, among different plants maximum protein content was present in *Prosopis juliflora* and minimum in *Capparis aphylla*, while *Adhatoda vasica*, *Fagonia arabica*, *Acacia modesta*, *Aerva javanica*, *Ziziphus nummularia*, *Calotropis procera* and *Fagonia cretica* also showed high level of protein contents. However, *Solanum xanthocarpum*, *Cenchrus ciliaris*, *Crotalaria sp.* and *Cenchrus sp.* showed relatively low amount of protein contents (Fig. 1).

Analysis of variance of amino acids indicated that there was significant variation in different plant species but there was no difference between two selected sites. However, among different plants, maximum amino acid content was present in *Z. nummularia* and minimum was present in two plants, i.e., *C. aphylla* and *A. javanica*

Fig. 1: Protein variations in potential medicinal plants located on mountainous area along Rasul Barrage (Mandi Bahauddin)

Fig. 2: Amino acid variations in potential medicinal plants located on mountainous area along Rasul Barrage (Mandi Bahauddin)

while *S. xanthocarpum*, *C. ciliaris*, *A. modesta* and *Crotalaria* sp., had appropriate amount of amino acid content but *A. vasica*, *F. arabica*, *C. procerra*, *Crotalaria* sp. and *F. cretica* showed relatively less amount of amino acid content (Fig. 2).

Analysis of variance of nitrate reductase activity indicated that there was significant difference among various potential medicinal plants but there was no difference between two selected sites. However, maximum nitrate reductase activity was present in *Cenchrus* sp. and minimum in *C. procerra* while *C. ciliaris*, *C. aphylla*, showed sufficient amount of nitrate reductase activity but other plants had very little activity against the same enzyme (Fig. 3).

Analysis of variance of total sugar indicated that there was significant variation in plants but there was no difference between two selected sites. However, maximum value of total sugar contents was present in *C. aphylla* and minimum in *Cenchrus* sp., while *Crotalaria* sp., *F. cretica* and *P. juliflora* showed less amount of total sugar but other plants had relatively high total sugar contents, it means mostly plants had appropriate content of total sugar (Fig. 4).

Analysis of variance of reducing sugar indicated that there was significant difference among various plant species but no difference between two selected sites. However, the highest content of reducing sugar was present in *A. modesta* and the lowest in three plant species, i.e., *S. xanthocarpum*, *Crotalaria* sp. and *Cenchrus* sp., while *A. vasica*, *F. arabica*, *C. aphylla*, *A. javanica*, *Z. nummularia*, *C. procerra* had appropriate reducing sugar value but much less than maximum value. However, *C. ciliaris*, *F. cretica* and *P. juliflora* had lesser amount of reducing sugar (Fig. 5).

Analysis of variance of non-reducing sugar indicated that there was significant variation among different plant species but no difference between two selected sites. Present studies showed that the maximum content of non reducing sugar was present in *C. aphylla* and minimum in *Cenchrus* sp., while *S. xanthocarpum*, *C. ciliaris* and *A. vasica*, had relatively high non reducing content as compared to maximum value. However, *F. arabica*, *A. modesta*, *A. javanica*, *Z. nummularia* and *C. procerra* had sufficient non reducing sugar but *Crotalaria* sp., *F. cretica* and *P. juliflora* had much less amount of non reducing sugar (Fig. 6). Overall data showed that *Cenchrus* sp. had the least amount of all types of sugars.

Fig. 3: Nitrate reductase activity variations in potential medicinal plants located on mountainous area along Rasul Barrage (Mandi Bahauddin)

Fig. 4: Total sugar variations in potential medicinal plants located on mountainous area along Rasul Barrage (Mandi Bahauddin)

Fig. 5: Reducing sugar variations in potential medicinal plants located on mountainous area along Rasul Barrage (Mandi Bahauddin)

Fig. 6: Non-reducing sugar variations in potential medicinal plants located on mountainous area along Rasul Barrage (Mandi Bahauddin)

Fig. 7: Chlorophyll a variations in potential medicinal plants located on mountainous area along Rasul Barrage (Mandi Bahauddin)

Analysis of variance of chlorophyll a indicated that there was significant difference among various plant species but no difference between two selected sites. However, maximum content of chlorophyll a was present in *A. vasica* and minimum in *C. aphylla* while *S. xanthocarpum*, *Z. nummularia*, *C. procerra*, *Cenchrus* sp., *F. cretica* and *P. juliflora* had relatively high chlorophyll a value. However, *C. ciliaris*, *A. modesta* and *Crotalaria* sp. showed sufficient chlorophyll a value but *F. arabica* had very little amount of the same (Fig. 7).

Analysis of variance of chlorophyll b indicated that there was significant variation among various plant species but no difference between two selected sites. However, maximum content of chlorophyll b was present in *C. ciliaris* and minimum in *C. aphylla* while *A. vasica*, *A. modesta* and *Cenchrus* sp. had high chlorophyll b value as compared to maximum value. However, *S. xanthocarpum*, *A. javanica*, *Z. nummularia*, *C. procerra*, *Crotalaria* sp. *F. cretica* and *P. juliflora* showed relatively very little amount of chlorophyll b (Fig. 8).

Analysis of variance of total chlorophyll indicated that there was significant difference among various plant species but no difference between two selected sites. However, maximum content of total chlorophyll was

present in *A. vasica* and minimum in *C. aphylla* while *S. xanthocarpum*, *C. ciliaris*, *A. modesta* and *Cenchrus* sp. and *F. cretica* had high total chlorophyll values which were comparatively near to maximum value. However, *A. javanica*, *Z. nummularia*, *C. procerra*, *Crotalaria* sp. and *P. juliflora* had sufficient total chlorophyll (Fig. 9).

Overall data showed that all plants had appropriate amount of chlorophyll, which indicated that these plants could perform photosynthesis at high rate.

Analysis of variance of Na^+ ion indicated that there was significant difference among various plant species but no difference between two selected sites. However, maximum content of Na^+ ion was present in *C. procerra* and minimum in *Z. nummularia* while other plants showed intermediate value of these two plants (Fig. 10). Analysis of variance of K^+ ion indicated that there was significant difference among various plant species but no difference between two selected sites. However, maximum content of K^+ ion was present in *A. vasica* and minimum in *C. procerra*, while *Crotalaria* had low K^+ ion content but all other remaining plants had high K^+ ion (Fig. 11).

Analysis of variance of Ca^{2+} ion indicated that there was significant difference among various plant species but no difference between two selected sites. However,

Fig. 8: Chlorophyll b variations in potential medicinal plants located on mountainous area along Rasul Barrage (Mandi Bahauddin)

Fig. 9: Total chlorophyll variations in potential medicinal plants located on mountainous area along Rasul Barrage (Mandi Bahauddin)

Fig. 10: Na⁺ ion variations in potential medicinal plants located on mountainous area along Rasul Barrage (Mandi Bahaiddin)

Fig. 11: K⁺ variations in potential medicinal plants located on mountainous area along Rasul Barrage (Mandi Bahaiddin)

Fig. 12: Ca²⁺ ion variations in protein medicinal plants located on mountainous area along Rasul Barrage (Mandi Bahauddin)

maximum content of Ca²⁺ ion was present in *P. juliflora* and minimum in *A. modesta*. Data showed that *Z. nummularia* and *C. procerra* had relatively high Ca²⁺ values which were approximately near to maximum value but all other plants also had sufficient Ca²⁺ contents (Fig. 12).

Analysis of variance of Cl⁻ ion indicated that there was significant difference among various plant species but no difference between two selected sites. However, maximum content of Cl⁻ ion was present in *S. xanthocarpum* and minimum in *A. javanica*, while other plants showed intermediate value of these two plants (Fig. 13).

Overall data showed that all plants had a relatively high K⁺ ion value which was an important feature of mountainous medicinal plants.

DISCUSSION

The use of medicinal plant has persisted as a long standing tradition in Indo-Pakistan. In the recent years, one can notice a global trend for survival interest in the traditional system of medicines. Screening of medicinal plants has become a potential source of biodynamic compounds of therapeutic value. Ethnobotanical studies

have become increasingly valuable in the development of health care and conservation programmes in different parts of the world (Balick, 1996).

One of the objectives of ethnobotanical study is to record the indigenous knowledge about plants because people healed themselves with traditional herbal medicines long ago. The first ever constructed Rasul barrage, passing through different geographical regions, has never been explored ethnobotanically before. So, it was felt worthwhile to record the native use of plants in areas surrounding it before the information is lost. The ethnobotanical information aims to be used for the solution of several constraints and conservation of medicinal herbs in and around Rasul barrage. Inventory of medicinal herbs is urgent in this rapidly changing environment.

It is evident from the present study that two selected sites (Missri Morr and Pathar Chotti) from mountainous region along Rasul barrage have same environmental conditions. So the plants of same species, collected from these two sites, have uniform biochemical contents value, but different plant species showed remarkable differences among themselves. Results clearly showed that *P. juliflora* has the highest protein content among all observed thirteen species which is in agreement with the

Fig. 13: Cl⁻ ion variations in potential medicinal plants located on mountainous area along Rasul Barrage (Mandi Bahauddin)

results obtained by Boyd and Cotty (2001), who reported that almost in every type of habitat leguminous plants prepared a large amount of various types of protein, because these plants have capacity to fix nitrogen by biological nitrogen fixation. *Ziziphus nummularia* has maximum amino acids value, while *C. aphylla* and *A. javanica* had minimum protein and amino acid content; the same results had been shown by Hussain *et al.* (2010) that selected plant species from Parachinar Kurram Agency and Kohat division (NWFP), Pakistan, had least value of protein and amino acid due to various types of environmental stress.

However, total sugar, both reducing and non reducing sugar as well as chlorophyll analysis indicated that the levels of all these contents were maximum in *C. aphylla* and minimum in *Cenchrus sp.* Similar results of various scientist showed clearly that members of family Caparaceae have considerable nutritional value, i.e., fruit, is a rich source of vitamin C. the presence of oil content in seed and flower along with sugar substantiate the nutritional value. Whole plant contents of alkaloids, glycosides, reducing sugar, fats, resins and phenols justify its use as an important diet as well as medicinal supplements (Myers *et al.*, 2000). *Adhatoda vasica* also has maximum chlorophyll contents as it was also

observed by Lakshmi *et al.* (2005). *Adhatoda vasica* is a crude plant drug, which was highly valuable in clearing phlegm and lung problems was found that it had a large amount of both chlorophyll a and b value.

Overall, minerals content analysis showed that maximum K⁺ was observed by Noor *et al.* (1995), who stated that level of K⁺ in mountainous trees was quite high as compared to that in peripheral soil. This means that nature has designed plant cells in such a way that these plants had a tendency to absorb more K⁺ than other minerals. High K⁺ concentration of medicinal plants leads to the chelating of arteries and normalizes blood pressure.

CONCLUSION

Medicinal plants are important to cure different types of human diseases. Present study was conducted to determine different types of physiological components in the medicinal plants located along Rasul Barrage, Mandi Bahauddin, Pakistan. These physiological components may help us to screen the medicinal plants for the preparation of drugs and for commercial importance in pharmaceuticals industries. The medicinal plants located along Rasul Barrage may also be helpful to cure human diseases in local area.

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