

Nutritional and phytochemical analysis of *Prunus brahuica* – A native wild fruit of Balochistan, Pakistan

Bakht Zareen Rahim¹, Rahmatullah Qureshi², Mehmooda Munazir³, Syed Sabir Hussain Shah², Saba latif²,
Ayesha Siddiq²

¹Department of Botany, Balochistan University, Quetta, Balochistan, Pakistan

²Department of Botany, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Pakistan

³Department of Botany, Government College Women University Sialkot, 51310, Pakistan

Abstract

Prunus brahuica (Boiss) Aitch. & Hemsl locally known as *Zarga* or *Zari* is belonged to Rosaceae family. This plant species is a native to Pakistan and Afghanistan. Ethnobotanically, its seed is given as nutritional supplement. This paper reports nutritional and phytochemical screening of wild fruits of *P. brahuica*. For this purpose, fruits were collected from Ziarat, Balochistan and various parameters such as proximate and mineral analysis was done from the standard protocols. Result showed that the fruit possesses highest percentage of dry matter (92.3%), followed by crude fibre (36.75%), carbohydrates (35.45%), crude protein (7.98%), moisture content (7.9%), crude fat (6.89%) and total ash (2.97%). Similarly, the minerals composition of the studied fruit revealed the highest amount of phosphorus (19.15%) and iron (2.98%), followed by zinc (0.97%), manganese (0.78%), potassium (0.23%), copper (0.17%). All solvents detected alkaloids. Saponins were detected only by an aqueous extract and tannins were detected in acetone and aqueous; while phenols were detected through four solvents such as aqueous, acetone, petroleum ether. The flavonoids were expressed only by methanol. Results suggest that the fruit possessed essential dietary, nutritional components coupled with secondary metabolites that necessitate carrying out further research investigation for human consumption.

Index Terms- Solvent extracts, Mineral analysis, Nutritional components, Secondary metabolites, Phytochemical analysis.

I. INTRODUCTION

Fruits are the chief source of food supplements and are used in lessening diseases and leading to a healthy life. Those plant resources which are traditionally used by the local communities are required to be identified and standardized before their utilization. These food supplements contain antioxidants and may have great value in the market to be used as a nutraceutical. Antioxidant compounds such as flavonoids and phenolic acids are favored because of their protective and therapeutic nature [1,2].

Plum or *Prunus*, a genus of the family Rosaceae deemed a fruit that is fit for the consumption by humans, as referred dried plum and in its dehydrated state. *Prunus* genus contains approximately 200 species which are cultivated for the purpose of edible seeds and fruits [3]. The leaves are anthelmintic, insecticidal, astringent, diuretic, expectorant, germicidal, laxative, parasiticide, febrifuge, and demulcent and are used in piles and leucoderma. These are internally used for the treatment of whooping cough, bronchitis, and gastritis [4]. The paste of the leaf is used to kill fungal infections and worms in wounds [5]. The seeds are used in traditional medicine to treat rheumatoid arthritis and amenorrhea [6].

Fruits of *Prunus brahuica* have low amount of fat source of calories and sodium whereas fruits with dried containing a well-defined quantity of minerals and protein content. This species is a deciduous with ranging of tree height from 9 to 13m. Its

flowers in the month of April and ripens of seeds occurs during July to November. Suitable Indian terrain for the fruit is Himachal Pradesh (750 hectares) and Nilgiris (61-79 hectares) with production of plums in 2010 nationally reaching 210,000 metric tons. Fruit containing various beneficial products have a globally health importance through recognition in the Indian medicine. Such benefits which reduce the poisoning of food and searching the nitrite inhibition have a high potential of anti-oxidant potential as compared to apples [7]. Moreover, this fruit acts against oxygen-derived free radicals like peroxy and hydroxyl radicals [8].

II. MATERIAL AND METHODS

Study Area

District Ziarat is the northern region of Balochistan. It ranges at altitude between 2100 to 3100m that is bordered on the south by Sibi District, on the north by the District Pishin and on the east by District Loralai. Geographically, it is located at the range of 30° 21' North; 67° 55' East surrounded by mountains (Fig.1).

Climate

The study area is typically considered a dry temperate and in winter has an extreme cold weather whereas the weather is pleasant in summer. In the month of December and March snow falls occurs mostly and the mean annual precipitation rate is 280 mm per year during winter in the form of snow falls. Temperature of the study area which is ranged between 30°C to 10°C the maximum temperature is received by the month of July and August and minimum temperature is received by the month of January. The maximum humidity about 68 % was recorded in December whereas, the lowest of 21% in October [13].

Field sampling and data collection

Prunus brahuica fruits were collected in various areas of District Ziarat, Balochistan, during August and September, 2018 (Table 1). The plant species was identified by Dr. Rasool Bakhsh Tareen, Department of Botany, University of Balochistan, Quetta and also prepared the voucher specimens for record which were deposited in the herbarium of Botany Department University of Baluchistan.



Fig. 1. Map of study area and sampling site of plant materials.

Table No.1. Collection of plant specimens and fruits from various localities of Ziarat District, Balochistan.

S. No	Location	Site code	Elevation (m)	Altitude (N)	Longitude (E)
1	Baba Kharwari Zone	BKZ	2610	30°.13'	67°.24'
2	Top Tangi Zone	TTZ	2800	30°.19'	67°.45'
3	Zaziri Zone	ZZ	2490	30°.10'	67°.39'

Ethnobotanical investigation

Knowledge of traditional was recorded about *Prunus brahuica* by the method of questionnaire according to Qureshi & Bhatti [14]. Field trips were arranged regularly for the collection of knowledge about plants.

Mineral analysis method

By the help of sample of dried powdered the analysis of proximate was carried and used the method of standard AOAC [15]. The samples of powdered were examined for fat, proteins, carbohydrates, ash and moisture. The method of Atomic Absorption Spectrophotometer was used for the analysis of mineral components (Technologies of Agilent Mod. No. 200

series) at the Department of Botany, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi, Pakistan.

Fruit extract

The collected fruits were washed through tap water and dried under shade and obtained into fine powder (80 mesh) by using grinder (Model No. MX1100XT21CE). The same was preserved in the airtight bottle and placed in refrigerator. The powder was soaked in six (06) solvents such as, aqueous, acetone, methanol, ethyl acetate, n-hexane and petroleum ether and then shaken for 24 h at 37°C. Similarly, these were sieved by a Whatman filter paper (No. 1) and then concentrated on reduced pressure at 40°C by employing rotary evaporator [16]. These extracts were applied for the phytochemical screening.

Extracts yield

The yield of individual solvent extracts was obtained by following the methodology of Rahim [16] and Dellavalle [17] and crude extracts yield percentage was obtained.

Phytochemicals screening

Analysis of chemicals was carried about six different solvents on the basis of extracts of fruit of the *Prunus brahuica* by applied the standard protocols and to detected the phytochemicals according to Egwaikhide and Gimba [18].

Alkaloids analysis

The extracts of fruit with (0.2 mg) and the concentration of sulphuric acid of 2% which is warmed for 2 min. After these filtrates was mixed in a few drops of Dragendorff's reagent. There is appearance on orange red precipitate showed the presence of alkaloids described by Rahim [16], Egwaikhide and Gimba [18].

Tannins analysis

Fruit extracts with a small quantity dissolved in water and heated on water bath. After, it was filtered and mixed with some drops of ferric chloride. As a result, it was appeared dark green colour due to presence of tannins sample [18].

Saponins analysis

The extracts with a 0.2 g was taken in shaken and used a distilled water of 5 ml then boiled. Thus, the appearance of bubble described the occurrence of saponins [18].

Flavonoids analysis

The extracts of fruit about 0.2 g was mixed with sodium hydroxide diluted and some hydrochloric acid drops were dispensed in it. The solution of these substances was firstly converted into yellow colour and then after a few minutes becomes colourless. It showed that flavonoids in the test sample [18].

Phenolic analysis

Firstly, solvent extracts with a 50 mg of a single solvent was mixed with distilled water of 5 ml and for a minute shaken forcefully. Then, added a solution of ferric chloride with 5% of five drops. After this mixture result was appeared dark green colour known as ferric chloride test. Secondly, the solvent of each extracts of 50 mg and added with a 300 ml of distilled water and for a minute shaken forcefully. Then, added 3 ml of 10% lead acetate. Thus, the mixture appeared in white precipitates and its presence showed the phenolic compounds [19].

III. RESULTS

Extract yield

Solvent extract in a different based extract displayed extract yield range in a term of ratios and amount (Fig. 2). In the study, the methanol showed a maximum quantity of extract yield with a5.11%, followed by n-hexane 0.79%, petroleum ether0.69%, water 0.5%; whereas, ethyl acetate and acetone yielded less quantity (Fig. 2).

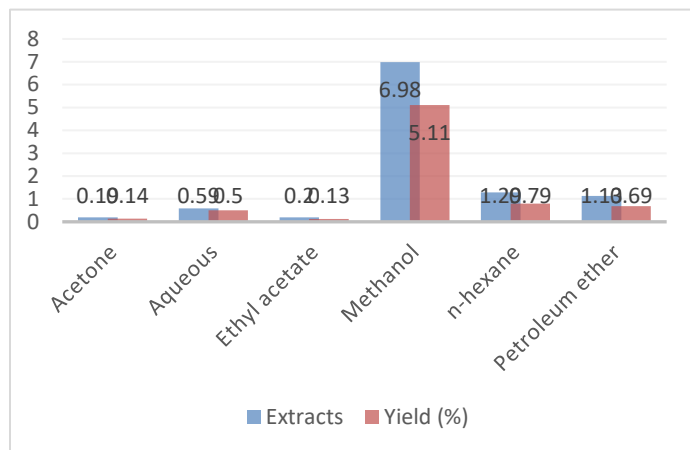


Fig.2. Extract Yield of different solvent-based extracts from *Prunus brahuica*.

Nutrition and Mineral composition

The analysis of proximate of the wild fruits of *Prunus brahuica* was studied (Table 2). The study of fruit possesses exhibited with the highest percentage of dry matter (92.3%), followed by crude fibre (36.75%), carbohydrates (35.45%), crude protein (7.98%), moisture content (7.9%), crude fat (6.89%); while, total ash was low (2.97%). This described that the fruit has a beneficial elements with substantial quantity. Similarly, the minerals composition of the studied fruit has highest amount of phosphorus (19.15%) and iron (2.98%), followed by zinc (0.97%), manganese (0.78%), potassium (0.23%), copper (0.17%); whereas, lesser amount (0.007%) was recorded for sodium (Table 3).

Table 2. Nutritional analysis of wild fruit of *Prunus brahuica*.

Nutritional Constituents	Contents
Dry matter	92.3%
Moisture content	7.9%
Crude fat	6.89%
Crude fibre	36.75%
Crude protein	7.98%
Carbohydrates	35.45%
Total ash	2.97%

Table 3. Mineral content in wild fruit of *Prunus brahuica*.

Analyte	Concentration (ppm)
Cu	0.17%
Mn	0.78%
Fe	2.98%
Zn	0.97%
P	19.15%
Na	0.007%
K	0.23%

Phytochemical analysis

The fruit extracts of *Prunus brahuica* were screened for the determination of some selected secondary metabolites such as, saponins, alkaloids, phenols, tannins and flavonoids and results are provided in (Fig.3). The maximum compounds of phytochemical were noticed via aqueous extract, followed by acetone (4), followed by methanol (3 each), ethyl acetate and petroleum ether (2 each); whereas, n-hexane only detected single phytochemical. The five solvents such as aqueous, acetone, n-hexane, petroleum ether and methanol were showed by alkaloids. Saponins were noticed only by an aqueous extract and tannins were detected in acetone and aqueous; while, phenols were detected through four solvents such as aqueous, acetone, petroleum ether and flavonoids were noticed only by the methanol.

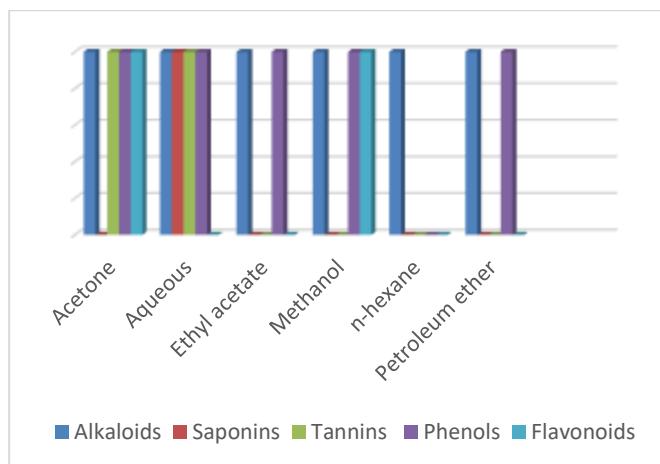


Fig. 3. Analysis of phytochemicals of *Prunus brahuica* by using various solvent extracts.

IV. DISCUSSION

The local people used the wild fruits in different ways of life especially used in case of food nutrition and in medicine. Being a developing country Pakistan has been facing the problems of food insecurity therefore, wild fruits improve the nutrition deficiency of the native. For such issues, the current studied was described the compositional of nutrition and phytochemical screening of wild fruit of *Prunus brahuica*.

The analysis of minerals was recorded by the methodology of the Association of Official Analytical Chemists [15]. This is described that the fruit holds a sustainable number of essential elements and nutrition. In the present study, fruit possesses exhibited with the highest percentage of dry matter 92.3%, followed by crude fibre (36.75%), carbohydrates (35.45%), crude protein (7.98%), moisture content (7.9%), crude fat (6.89%) and the proportion of total ash was slightest (2.97%). Protein is one of the essential diets and its deficient causes different disease [20].

The present described wild fruits of *Prunus brahuica* showed a remarkable quantity of protein. This plant species contains higher values than the species reported by Abbasi [21] like in case of *Grewia optiva*, *Prunus domestica*, *Morus nigra*, *Juglans regia*, etc. Similarly, the fruit of *Prunus brahuica* possessed crude fat with an amount of crude fat 6.89% from that could be considered a well source of lipids. Moreover, in the fruits of *Prunus brahuica* contains a remarkable amount of crude fibres about 36.75%. The fibres of crude regularly can be decreasing the disease of cardiovascular and also diabetes, breast cancer and hypertension described by Ishida [22]. In the present study, the wild fruits clearly showed that it has sustainable amount of dietary fibres which could control the malnutrition of human. The moisture content of the study area was fairly low in the fruit that was tested which means the soil in a drier condition. The tree of *Prunus brahuica* is particularly growing in severe environmental conditions which are poor in soil nutrition and low occurrence of moisture in the mountainous areas. In such

climatic situations lead to retained the quantity of moisture. The present research work showed lower percentage of moisture content as compared to work which was reported by Abolaji [23] from the *Xylopia aethiopia* 16.04% and *Acalypha hispida* 11.91% which was described by Iniaghe [24]. From this observation it is cleared that with content of low moisture is beneficial in case of safeguard from spoilage after a long term. The contents of ash indicated the occurrence of minerals in the sample of plants according to Mammen [25]. *Prunus brahuica* fruit contains ash content about 2.97%. The same result about ash content was reported by Abbasi [21] with a low value from the traditional fruits.

The current result of proximate analysis of the research fruits contain with a maximum quantity of nutrition that can be a best source of nutrition for usage. On the basis of literature, it is assessed that the proximate composition of wild fruits was either balance (or) higher from earlier research [26]. It may be differences appeared in values due to variations of soils, climate, nutrients uptake and seasonal collection. Similarly, the minerals composition of the studied fruit has highest amount of phosphorus 19.15% and iron 2.98%, followed by zinc 0.97%, manganese 0.78%, potassium 0.23%, copper 0.17%; whereas, lesser amount was found in the sodium 0.007%. The same balance data was reported by Gani [27] in the difference essential fruits as like Cherry. The contents of minerals might be lesser due to change of cultivars selected for rapid growth, yields, herbivore resistance, pest resistance according to Davis [28]. They were also described that variations of climate and in types of soils can disturb the composition of nutrients in food plants.

The present study was also described the screening of impotence phytochemicals such as, flavonoids, alkaloids, phenols, tannins and saponins, on the basis of six solvent extracts polarity of wild fruits of *Prunus brahuica*. Alkaloids were noticed in all of solvents. Overall phytochemicals are good appearance to have curative characteristics [29]. Out of them, alkaloid was reported the main beneficial agent [30].

The group of flavonoids is the natural antioxidants that play an essential role in fighting the danger of weakening cells reported by Okwu & Okwu [31]. Such compounds produce by plants to inhibit the infection of microbial [32]. In the current study flavonoids showed in methanol and acetone. It is one of the essential components of phytochemicals contains in various medicinal plants[33] that is decrease the development of carcinogenic, contain antimicrobial and anticancer and anti-inflammatory happenings [34].

In this study, tannins were noticed in acetone and aqueous extract and saponins were detected only in aqueous. Such type of phytochemicals is having anti-fungal, anti-diarrheal, anti-oxidant and anti-hemorrhoidal properties [35]. Other than, similar compounds contain unpleasant principle of foods and drinks [36]. In addition, these secondary metabolites grip anti-inflammatory effects [37]. These are also answerable for the coagulating of Red Blood Cells (RBCs) which comprise of foams in water solutions, cholesterolbinding activity, haemolytic properties and unpleasantness [38].

V. CONCLUSION

The present study exposed that the wild fruits of *Prunus brahuica* contain a suitable amount of beneficial nutrients such as, carbohydrates, proteins, fats, fibre, zinc, iron, manganese, potassium, copper, sodium and different essential phytochemicals. Locally, this fruit is used for different purposes and therefore it is essential to carry out further research on this fruit for commercial production and also to introduce in the market. In addition, it is essential to increase such type of fruit which fulfills the dietary requirements and to minimize malnutrition issues in the country. Besides, the fruit possesses different secondary metabolites which can be used as plant-based antioxidant and antimicrobial agents in mitigating health issues.

REFERENCE

[1] Fan, J., Ding, X., Gu, W. (2007): Radical-scavenging proanthocyanidins from sea buckthorn seed. *Food Chemistry*; 102:168-177.

[2] Siddhuraju, P., Becker, K. (2003). Antioxidant properties of various solvent extracts of total phenolic constituents from three different agro-climatic origins of drumstick tree (*Moringa oleifera* Lam.) leaves. *Journal of Agriculture and Food Chemistry*; 51:2144-2155.

[3] Rheder, A. (1940): Manual of Cultivated Trees and Shrubs Hardy in North America, Macmillan Company, New York, pp. 425-481.

[4] Narayan Das Prajapati, D. U. K. (2005). Agro's Dictionary of Medicinal Plants. *Agrobios (India) Jodhpur, reprinted-2005 P, 274*.

[5] Kritkar, K.R. and Basu, B.D. (1984): Indian Medicinal Plants, Bishen Singh Mahendra Pal Singh, *Dehradun, vol. I, p. 954*.

[6] Santamour, F.S. (1998): *Phytochemistry*, 47, 1537.

[7] Ahn, S.I, Heung, B.J., Son, J.Y. (2007): Antioxidative activities and nitrite-scavenging abilities of some phenolic compounds. *Korean Journal of Food Cookery Science*; 23:19-24.

[8] Murcia, M. A., Jimenez, A.M., Martı'nez, T.M.(2001): Evaluation of the antioxidant properties of Mediterranean and tropical fruits compared with common food additives. *Journal of Food Protection*; 64:2037-2046.

[9] Potter, D. (2011). *Prunus. Wild crop relatives: Genomic and breeding resources: Temperate fruits*, 129-145.

[10] Tiwari, C., Chubey, S., Kurele, R., & Nautiyal, R. (2016). A Review on Padmaka (*Prunus Cerasoides* D. Don): Different Species and Their Medicinal Uses. *An International Journal of Research in AYUSH and Allied Systems*; 4: 2393-9591.

[11] Abbasi, A. M., Khan, M. A., Ahmed, M., & Zafar, M. (2010). Herbal medicines used to cure various ailments by the inhabitants of Abbottabad district, North West Frontier Province, Pakistan. *Indian Journal of Traditional Knowledge*, 9(1), 175-183.

[12] Kim, G. J., Choi, H. G., Kim, J. H., Kim, S. H., Kim, J. A., & Lee, S. H. (2013). Anti-allergic inflammatory effects of cyanogenic and phenolic glycosides from the

- seed of *Prunus persica*. *Natural product communications*, 8(12), 1934578X1300801221.
- [13] Ahmed, M., Naqui, E., Wang, E. L. M. (1990): Present state of juniper in Roadhmullazi forest of Baluchistan, Pakistan. *Pak. J. For.* 227-236.
- [14] Qureshi, R., & Bhatti, G. R. (2008). Ethnobotany of plants used by the Thari people of Nara Desert, Pakistan. *Fitoterapia*, 79(6), 468-473.
- [15] AOAC, *Official Method of Analysis*. 18th ed. 2005: Association of Officiating Analytical Chemists, Washington DC.
- [16] Rahim, G., Qureshi, R., Arshad, M., Gulfraz, M. (2013): Phytochemical analysis and antioxidant properties of *Teucrium stocksianum* flower from Malakand Division, Pakistan. *International Journal of Agriculture & Biology* 15(2): 377-381.
- [17] Dellavalle, P. D., Cabrera, A., Alem, D., Larrañaga, P., Ferreira, F., Rizza, M. D. (2011): Antifungal activity of medicinal plant extracts against phytopathogenic fungus *Alternaria* spp. – Chilean *Journal of Agricultural Research* 71(2): 231-239.
- [18] Egwaikhide, I., Gimba, C. E. (2007): Analysis of phytochemical content and antimicrobial activity of *Plectra thus glandulosis* whole plant. Middle-East *Journal of Scientific Research* 2(3-4): 135-138.
- [19] Munazir, M., Qureshi, R., Munir, M. (2015): Preliminary phytochemical screening of roots and aerial parts of *Leptadenia pyrotechnica*. *Pakistan Journal of Botany* 47(2):659-664.
- [20] Pearson, J. (1976): Determination of Phytic Acid and Phosphorus Content of Biological Materials. – Cambridge University Press, London.
- [21] Abbasi, M. A., Naqvi, S. S. H., Rehman, A. U., Tareen, R. B. (2013): *Berberis baluchistanica*: Assessment of natural antioxidants to relieve from oxidative stress. *International Research Journal of Pharmacy* 4(5): 101-105.
- [22] Ishida, H., Suzuno, H., Sugiyama, N., Innami, S. Todokoro, T. (2000): National evaluation of chemical component of leaves stalks and stem of sweet potatoes. *Ipomea batata* Poir. *Food Chemistry* 68: 359-367.
- [23] Abolaji, O. A., Adebayo, A. H., Odesanmi, O. S. (2007): Nutritional qualities of three medicinal plant parts (*Xylopi aethiopica*, *Blighia sapida* and *Parinari polyandra*) commonly used by pregnant women in the western part of Nigeria. *Pakistan Journal of Nutrition* 6(6): 665-668.
- [24] Iniaghe, O. M., Malomo, S. O., Adebayo, J. D. (2009): Proximate composition and phytochemical constituents of leaves of some *Acalypha* species. *Journal of Nutrition* 8(3): 256-258.
- [25] Mammen, D., Daniel, M., Sanert. (2010): Variations in values of proximate analysis in *Aerva lanata* Juss. ex Schultes, *Hedyotis corymbosa* (L.) Lam. and *Leptadenia reticulata* (Retz.) W. & A. *International Journal of Pharma and Bio Sciences* 1(4): 629-636.
- [26] Imran, M., Talpur, F. N., Jan, M. I., Khan, A., Khan, I. (2007): Analysis of nutritional component of some wild edible plant. *Journal of Chemical Society of Pakistan* 29(5): 500-508.
- [27] Gani, M., Jabeen, A., Majeed, D., Mir, S. A., Dar, B. N. (2018): Proximate composition, mineral analysis and antioxidant capacity of indigenous fruits and vegetables from temperate region of Indian Himalayas. *Journal of Food Measurement and Characterization* 12: 1011-1019.
- [28] Davis, D. R., Epp, M. D., Riordan, H. D. (2004): Changes in USDA food composition data for 43 garden crops, 1950 to 1999. *Journal of the American College of Nutrition*, 23(6): 669-682.
- [29] Rabe, K. F., Vermeire, P. A., Soriano, J. B., & Maier, W. C. (2000). Clinical management of asthma in 1999: the Asthma Insights and Reality in Europe (AIRE) study. *European Respiratory Journal*, 16(5), 802-807.
- [30] Njoku, P. C., & Akumefula, M. I. (2007). Phytochemical and nutrient evaluation of *Spondias mombin* leaves. *Pak. J. Nutr*, 6(6), 613-615.

- [31] Okwu, D. E., Okwu, M. E. (2004). Chemical composition of *Spondias mombin* Linn. Plantparts. – *J. Sustain. Agric. Environ.* 6(2): 140-147.
- [32] Dixon, R. A., Dey, P. M., & Lamb, C. J. (1983). Phytoalexins: enzymology and molecular biology. *Advances in enzymology and related areas of molecular biology*, 55(1), 69.
- [33] Singh, R., Singh, S. K., Arora, S. (2007): Evaluation of antioxidant potential of ethyl acetate extract/fractions of *Acacia auriculiformis*. *Food Chem. Toxicol.* 45(7): 1216-23.
- [34] Cushnie, T. P., Lamb, A. J. (2005). Antimicrobial activity of flavonoids. *Int. J. Antimicrob. Agents* 26(5): 343-356.
- [35] Asquith, T. N., Butter, L. G. (1986): Interaction of condensed tannins with selected proteins. *Phytochem.* 25(7): 1591-1593.
- [36] Chikezie, P. C., Agomuo, E. N., Amadi, B. A. (2008): Biochemistry: Practical Research Method. A fundamental approach. Vol. 2. – Mega Soft Publishers, Owerri, pp. 51-53.
- [37] Just, M. J., Recio, M. C., Giner, R. M., Cuéllar, M. J., Máñez, S., Bilia, A. R., & Ríos, J. L. (1998). Anti-inflammatory activity of unusual lupane saponins from *Bupleurum frutescens*. *Planta medica*, 64(05), 404-407.
- [38] Okwu, D. E. (2004): Phytochemicals and vitamin content of indigenous species of southeastern Nigeria. *J. Sustain. Agric. Environ.* 6(1): 30-37.

AUTHORS

First Author–Bakht Zareen Rahim, PhD, Department of Botany, Balochistan University, Quetta, Balochistan, Pakistan

Second Author – Rahmatullah Qureshi, PhD, Department of Botany/Directorate of Hemp Project, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Pakistan.

Third Author – Mehmooda Munazir, PhD, Department of Botany, Government College Women University Sialkot, 51310, Pakistan.

Fourth Author –Syed Sabir Hussain Shah, M. Phil., Department of Botany, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Pakistan.

Fifth Author – Saba Latif, M. Phil., Department of Botany, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Pakistan.

Sixth Author – Ayesha Siddiqa, M. Phil., Department of Botany, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Pakistan.

Correspondence Author – Rahmatullah Qureshi,