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BIOCHEMICAL AND NUTRITIONAL EVALUATION OF *FICUS PALMATA* FORSSK. FRUITS FROM DIFFERENT ECOTYPE POPULATION

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Abstract

To study the biochemical and nutritional values in 25 selected Fig (*Ficus palmata*) ecotypes from variable locations in Azad Jammu and Kashmir, a research was conducted. Ascorbic acid was determined by indophenols dye method and oil contents from the berries were analyzed by using dye ethyl ether as solvent in Soxhlet apparatus for 6 hrs at 30 to 40ºC. The reducing and non-reducing sugars and proteins were estimated using spectrophotometer. The fruit-juice contains acidity to the extent of 6%. Most of the sugars are in the form of reducing sugars. The fruits are, however, not rich source of vitamin C and contain only 3.35 mg of vitamin C per 100 g of pulp. Ecotype 10 has maximum value of vit. C (3.333) but ecotype 15 has minimum value of vitamin C (0.250). The protein content of the fruit is 3.28%. Ecotype 17 has maximum value of protein (3.289) while ecotype 15 has minimum (0.480). Results have shown the value of oil content in the range of 14.3 to 42.5% in the berries of *Ficus palmata*. Ecotype 16 has maximum oil content (42.167) while ecotype 18 has minimum value (14.333). The study provides the evidence of the presence of genetically diverse ecotypes of *Ficus palmata i*n AJK with tremendous biochemical and nutritional values. The results of the present study provide justification for the usage of these fruits in daily diet for nutrition as well as for medicinal usage and in the treatment of different diseases.

Introduction

Mountain areas show distinct signs of unsustainability, decreasing soil fertility and a high degree of instability. There is a trend of abandoning agricultural land and this sharply contrasts with the decreases of land/man ratio in cultivated areas. The reduced flexibility and diversity of agriculture (i.e., complex of land based activities) and resource generative processes that helped to sustain natural resources use systems in low demand situation, are other visible manifestations of emerging scenario in most parts of mountain regions (Jodha *et al*. 1992).

Therefore, it is the need of time to explore the hidden potential of northern areas and Azad Kashmir so that the conventional agricultural system can be diversified and more economic opportunities can be discovered (Ahmad and Shah 1999). The flora of Azad Jammu and Kashmir due to its diverse climatic and soil conditions and many ecological regions, is rich in medicinal plants.

The figs (*Ficus* spp., Fam.: Moraceae) are among the biggest genera of angiosperms with more or less 750 types of trees, epiphytes and bushes in tropical and subtropical areas around the world. Frodin (2004) positioned them as the 20st biggest class of seed plants. *Ficus* is a standout amongst the most differing plant genera as to development propensity, with both deciduous and evergreen detached trees, little bushes, creepers, climbers, stranglers, rheophytes and lithophytes (Harrison 2005). The Asian-Australasian locale has the wealthiest and most different fig greenery with more than 500 species. By examination, the extravagance of *Ficus* in Africa and the Neotropics is lower, with pretty nearly 110 and 130 species, separately. Generally a large portion of the *Ficus* species are monoecious, and the rest are practically dioecious (Berg 2003, Berg and Corner 2005).

The organic products are succulent, containing 45.2% extractable juice and 80.5% dampness. The aggregate substance of solvent solids of the juice is 12.1%. The proteinecious substance of the natural product is 1.7% and the powder substance is 0.9%. A portion of the mineral components like phosphorus, potassium, calcium, magnesium and iron were found to be 0.034, 0.296, 0.071, 0.076 and 0.004% separately (Chopra *et al*. 1986).

In view of the possible biochemical/nutritional role and properties of *Ficus palmata* in the world and underutilization of its tremendous potential in Pakistan and Azad Kashmir this study was disigned. This might be helpful to explore the potential of *Ficus palmata* in Azad Kashmir and to introduce *F. palmata* as a vital tool to initiate the economic activity for its commercial exploitation on sustainable and international basis.

Materials and Methods

Ficus palmata grows extensively in Azad Kashmir. Different populations of *F. palmata* were selected and collected from different localities of Azad Kashmir areas in the 1st week of June when they were fully matured. These ecotypes were compared for different characters. The fruits were kept in plastic pots and transported to University of Azad Jammu and Kashmir and were subjected to deep freezer at –80^{o}C.

Determination of ascorbic acid was carried out under standard conditions using phenol indophenols dye method (Shah *et al*. 2007). Thawed fruit of (10 g) was blended with metaphosphoric acid extracting solution to homogenous slurry and 5 ml of the filtrate extract was then titrated with standard endophenol to pink end point. Three replications were taken for each determination. All the reagents were of analytical grade.

Oil of the fruit of different populations of *F. palmata* was extracted in Soxhlet apparatus (Shah *et al*. 2007). Samples were over dried at 105ºC for 6 - 12 hrs and 10 g of dried samples was used for extraction of oil in Soxhlet apparatus (30 - 40ºC) for 6 hrs using diethyl ether as solvent. The solvent was removed under vacuum and residual oil dried over anhydrous Na_2So_4.

Reducing and non-reducing sugar were estimated following Dubois *et al*. (1956). After incubation at room temperature concentrated H_2SO_4 was added. The absorbance of each sample was recorded at 420 nm. The concentration of unknown sample was calculated with reference to standard curve made of glucose.

The protein content from the samples was estimated by Bradford method (1976). To make the Bradford reagent, Coommassie Blue dye was dissolved in phosphoric acid and methanol. The amount of protein from samples was estimated by reading at 595 on spectrophotometer using standard curve for BSA (Boyer 1993).

Results and Discussion

Mean values and ANOVA table of *F. palmata* ecotypes showed significant variation in vitamin C. Highest value of vitamin C was shown by E10 which is 3.333 and lowest value of vitamin C was shown by E2 and E15. These results were depicted by graph (Fig. 1). ANOVA showed that data are highly significant. Yogesh *et al*. (2014) reported that the fruits are not the richest source of vitamin C and contain only 3.3 mg per 100 g of pulp. Our results are in agreement with those studies with vitamin C ranging from 0.850 to 3.333 mg/100 g. Our results did not match with Hegazy *et al*. (2013) which reported that 37 ml/100 g of vitamin C was present in fruit of *F. palmata*. Parmar *et al*. (1982) also reported that the vitamin C contents in *Ficus palmata* 3.35 mg/100 g of pulp and fruits were not rich in vitamin C. Our results also agreed with Parmar (1982).

The oil per cent of *F. palmata* fruit of diverse areas also varied in different ecotypes. Highest values of oil content in different ecotypes of *Ficus palmata* shown by E13, E14 and E15 which are 42.500% (Fig. 2). Lowest value of 14.333% was shown by E18. E22 also show the high value of 42.50%.Value of oil content in *Ficus palmata* ecotypes ranged from 14.333 to 42.500%. E1 and E2 also show close values to each other. Chandra and Saklani (2012) reported that oil content in *F. palmata* fruit is 4.7% while in our study high value of oil content was observed.

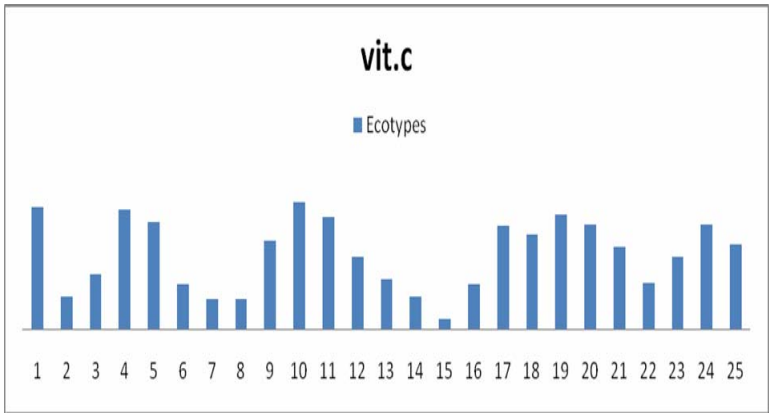

Fig. 1. Comparison of vitamin C among 25 ecotypes of *F. palmata.*

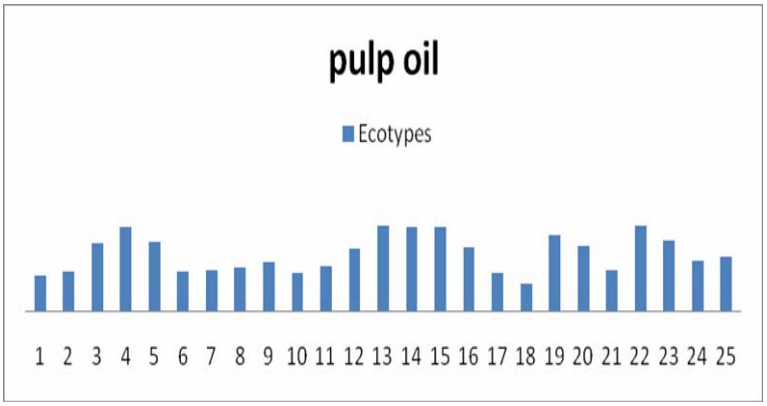

Fig. 2. Comparison of oil in pulp among 25 ecotypes of *F. palmata*.

Highest value of glucose in different ecotypes of *F. palmata* grown in AJK was 27.807 mg/l and shown by ecotype E3 while the lowest value was 4.737 mg/l shown by E1 (Fig. 3). E25 also show maximum value of 26.253 mg/l. All the ecotypes of *F. palmata* showed diversity in reducing sugar concentration. In non-reducing sugar (sucrose) ANOVA also showed that that of is highly significant (Fig. 4). The present study shows high values of carbohydrates than the Parmar's (1982) results. Hegazy *et al.* (2013) also reported that the total carbohydrates present in *Ficus palmata* fruits are 28.74%. Present result agree with Hegazy (2013) i.e. in apple 13.4% and banana 27.2%) Gupalan *et al.* (1985). Chandra and Saklani (2012) also reported that the carbohydrates in *F. palmata* fruit are 20.78%. Our results also agree with Chandra and Sakalani (1985).

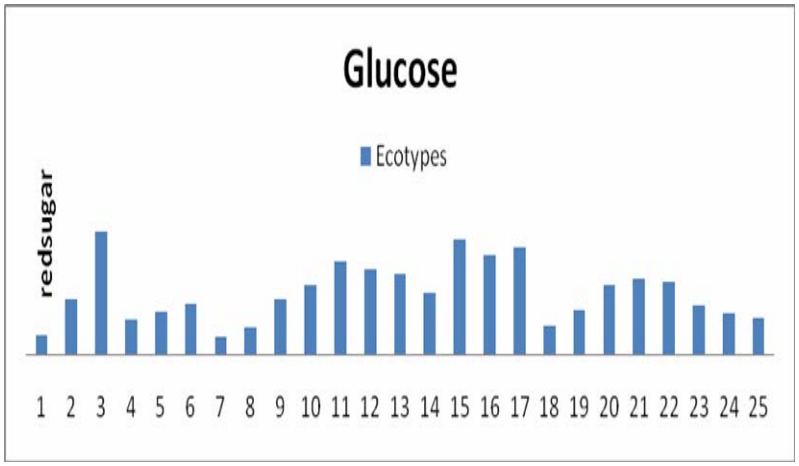

Fig. 3. Comparison of reducing sugar among 25 ecotypes of *Ficus palmata.*

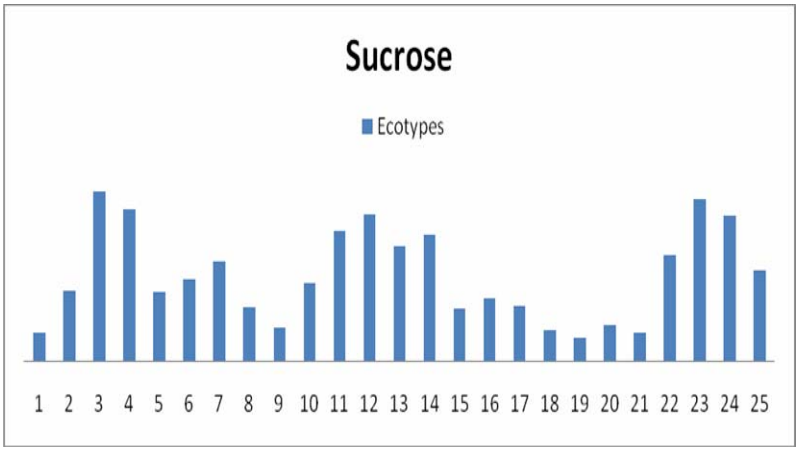

Fig. 4. Comparison of non-reducing sugar among 25 ecotypes of *Ficus palamata.*

Mean value of protein ranged from 0.313 to 3.289 mg/l. These results were also shown in the graph (Fig. 5). Highest value of protein content in *Ficus palmata* ecotypes grown in AJK was shown by ecotype E17 which is 3.289 mg/l and lowest value shown by ecotype E12 which is 0.313 mg/l .E17 and E22 also shows maximum values which is 3.289, 3.06 mg/l. All ecotypes show diversity in the value of protein contents. Parmar *et al.* (1982) reported that the protein content of fruit s 1.72%. Our results show some higher values but agree with the results of Parmar *et al.* (1982). Chandra and Sakalani (2012) found that the protein present in the fruit of *F. palmata* is 4.06% our study show similarity with these results. Hegazy *et al.* (2013) also reported that protein present in *F. palmata* is 2.17%, result also ranged from 0.313 to 3.33%.

pH ranged from 2.827 to 6.167 which mean *F. palmata* is highly acidic. These results were also presented by graph (Fig. 6). Highest value of 6.167 was shown by ecotypes E1, E3, E19, E18, E23 and E25 and lowest value was shown by E22 which is 2.827. Many ecotypes show

approximately same values. Parmar *et al.* (1982) reported that the fruit of *F. palmata* contain acidity to the extent of 6.71% while our result showed same values. It means our results agreed with Parmar *et al.* (1982).

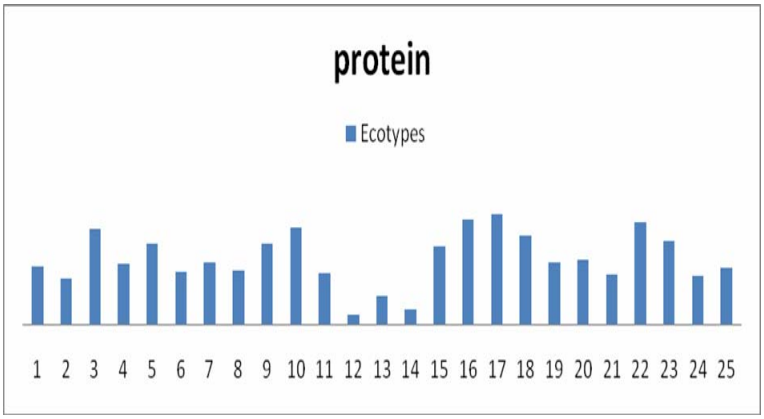

Fig. 5. Comparison of protein contents among 25 ecotypes of *Ficus palmata.*

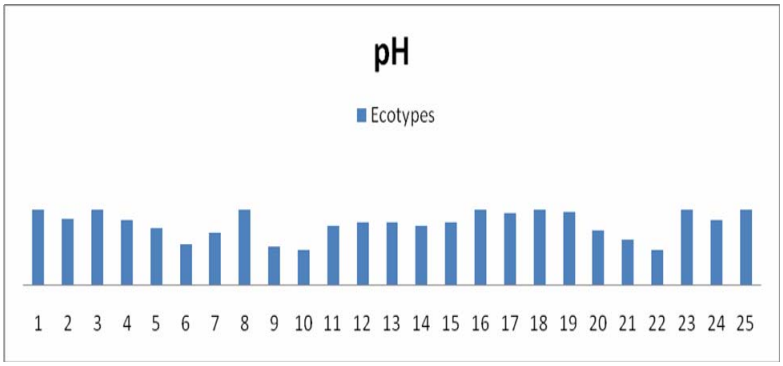

Fig. 6. Comparison of pH among 25 ecotypes of *Ficus palmata*

Cluster analysis of biochemical traits

Cluster 1

It consists of five groups (Fig. 7). The ecotype E8 and E17 were in the same group while E2 makes sister cluster with this group. The ecotype E10 and E21 form group 11 and showed 100% similarity to each other. Third group consist of E8 and E1while E24 and E25 form group fourth. The ecotypes E18 and E9 form a sister cluster with third and fourth group.

Cluster 2

Cluster 2 can be divided into two sub-clusters and sub-clusters also divided into groups. In sub-cluster 1 two groups were formed. The ecotypes E7 and E16 were located in the same group while the ecotypes E15 and E20 were in the same group. The ecotypes E2, E12 and E13 form the same group and E4 make sister cluster with this group. The ecotype E17 taken from Rara which is in district Muzaffarabad showed divergence from all other ecotypes and make sister cluster.

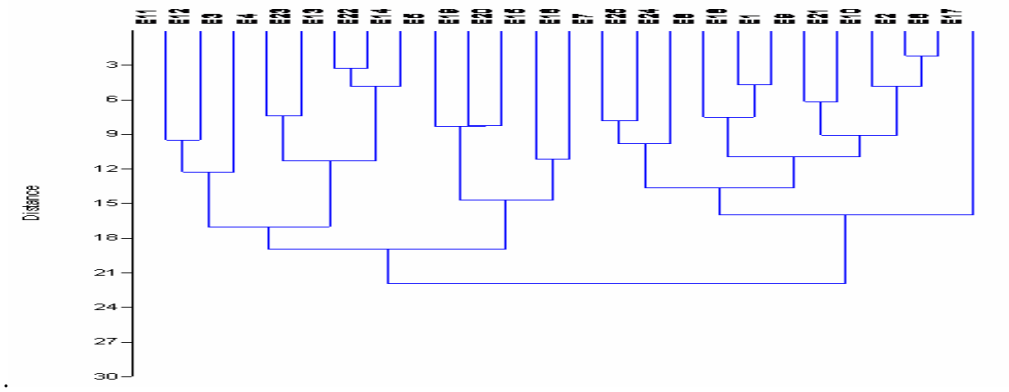

Fig. 7. Dendrogram based on average linkage distance for biochemical traits.

The present investigation suggests that *Ficus palmata* of different locations of Pakistan and specifically Azad Jammu and Kashmir is of diverse nature in biochemical and nutritional constituents due to diverse genetic makeup and establishment on variable attitudes. This diversity in *F. palmata* germplasm is a very good source for plant breeders to evolve more productive and commercial values of *F. palmata* which can bring a positive economic change with its commercial cultivation and management on large scale. The study also provided an insight about the importance of *F. palmata* ecotypes in Azad Jammu and Kashmir in relation to its medical, biochemical and nutritional aspects and indeed, in the line with these observations, more issues will be addressed in future studies.

References

Ahmad SD and Shah AH 1999. Evaluation of biological diversity in *Mentha* and *Rumex* spp. from Azad Jammu and Kashmir. NARC report.

Berg CC 2003. Flora Malesiana precursor for the treatment of Moraceae 1: The main subdivision of *Ficus*: The subgenera. Blumea **48**:167-178; http://dx.doi.org/10.3767/000651904X486278.

Berg CC and Corner EJH 2005. Moraceae-*Ficus. In:* Nooteboom, H.P. (ed.), *Flora malesiana*, Series I (Seed Plants), 17(2): National Herbarium Nederland, University Leiden branch, The Netherlands. 1-730.

Boyer RF 1993. Modern Experimental Biochemistry.2nd ed. The Benjamin/Cumming Pub. Co. Inc. Calif. USA.

Bradford MM 1976. Rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principal of protein-dye binding. Anal. Biochem. **72**: 248-254.

Chopra RN, Nayar SL and Chopra CI 1986. Glossary of Indian Medicinal Plants (Including the Supplement). Council of Scientific and Industrial Research, New Delhi.

Chandra S and Saklani S 2011. Evaluation of nutritional profile, medicinal value and quantitative estimation in different parts of *Pyrus pashia*, *Ficus palmata* and *Pyracantha crenulata*, JGTPS **2**: 350-354.

Dubois J, Smith MG and Miles GE 1956. Method for determination of total sugars. J. Agri. Food Chem. **23**: 866-870.

Frodin GD 2004. History and concepts of big plant Genera. Taxon. **3**(53): 753-776.

Gopalan C, Shastri BVR and Balsubramanian SC 1985. Nutritive value of Indian foods, National Institute of Nutrition (NIN), Technical Report, Indian Council of Medical Research, Hyderabad, India.

Hegazy 1AK, Al-Rowaily SL, Faisal M, Alatar AA, El-Bana MI and Saeed AMA 2013. Nutritive value and antioxidant activity of some edible wild fruits in the Middle East. J. Med. Plant Res. **7**(15): 938-946.

Harrison RD 2005. Figs and the diversity of tropical rainforests. Bioscience **55**: 1053-1064

Jodha NS, Banskota M and Partap M 1992. Sustainable Mountain Agriculture, Vol.1 New Delhi: ICMOD and IBH Oxford Publishing Co. Pvt. Ltd. pp. 2-5.

Kirtikar R and Basu D 1935. Indian medicinal plants international book distributor **111**: 2327.

Parmar C and Kaushal MK 1982. *Ficus palmata. In:* Wild Fruits. Kalyani Publishers, New Delhi, India. 31-34.

Shah AH, Ahmed SD, Sabir SM, Batool F, Arif S and Khaliq I 2007. Biochemical and nutritional evaluation of Sea buckthorn (*Hippophaerhamnoides* spp. Turkestanica) from different locations of Pakistan. Pak. J. Bot. **39**(6): 2059-2065.

Yogesh J, Joshi AK, Prasad N and Juyal D 2014. A review on *Ficus palmata* (Wild Himalayan Fig). The J. of Phytopharma. **3(**5): 374-377.

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