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Proximate and Mineral Constituents of Medicinal Herb *Fagonia arabica*

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Abstract: The research work was conducted to study the proximate and mineral concentration of *Fagonia arabica*. Results revealed that leaves and seeds have maximum moisture content (58.51 ± 0.50) followed by shoots and roots (43.29 ± 0.42, 29.45 ± 0.28 respectively). Ash and protein (1.85 ± 0.12, 0.64 ± 0.01 respectively) increased in different parts in descending order i.e. roots< shoots< leaves and seeds, whereas fat and fiber contents (1.33 ± 0.05, 56.80 ± 0.23 respectively) decreased in ascending order i.e. roots> shoots> leaves and seeds. When concentration of different minerals was taken into an account, it was revealed that Zn (33.28 μg g $^{-1}$) and Na (1705.00 μg g $^{-1}$) were maximum in roots and minimum in leaves and seeds (21.99 μg g $^{-1}$, 138.00μg g $^{-1}$ respectively). Concentration of Mn, Fe, P, K, and Ca decreased in order of leaves and seeds> shoots> roots.

Key words: Proximate, minerals, medicinal, wild herb, *Fagonia arabica*

Introduction

Plants and herbs have provided natural remedies for human aliments from time immortal. As knowledge progressed, man selected different herbs for the cure of different diseases and aliments. Following the advent of modern medicine, herbal medicine suffered a setback, however, advances in phytochemistry and identification of plant compounds, which are effective in curing certain diseases have renewed the interest in herbal medicines. The World Health Organization (WHO) estimated that about 80 % of the world's population relies on traditional medicines for their primary health care (Farnsworth and Morris, 1976). Most of the plants, which are used for various aliments, have not been properly investigated. About 30% of the pharmaceuticals are prepared from plants world wide (Anwar *et al.*, 1979).

Fagoina arabia is amongst the widely used medicinal plants in Pakistan. It is known by common names "Azghakhi" or "Damiya" in the rural areas of NWFP. *Fagoina arabica* belongs to the family Zygophyllaceae (Hooker, 1882). Generally the plant is found on dry calcareous rocks distributed throughout the Mediterranean region to South Africa, Afghanistan, India, Pakistan especially Sindh, Punjab and NWFP (Rizvi *et al.*, 1996). It is the chief and popular fever remedial source of people in the hilly areas. Its infusion is effective in sore mouth and for cooling mouth in stomatitis and also purifies the blood and acts as a deobstruent (Said, 1996). People of NWFP specially used it for skin diseases, small pox and for endothermic reaction in the body (Watt, 1972). The twigs of the plant are used as remedy to snakebite and also applied externally as paste on tumors and for the swellings of neck (Rizvi *et al.*, 1996; Said, 1996).

Materials and Methods

The selected medicinal herb *Fagonia arabica* was collected from Peshawar and its suburbs particularly from Palosi, 2-3 km away from NWFP Agricultural University, Peshawar, in the month of April 2000. The chemical and mineral analysis was carried out at NWFP Agricultural University, Peshawar and Nuclear Institute for Food and Agriculture (NIFA), Tarnab, Peshawar. The chemical analysis included crude protein, crude fat, crude fiber, ash, moisture content and vitamin C (Ascorbic acid) of the whole plant and different parts were performed in accordance with AOAC (1990), vitamin C was determined titrimetricaly while Na, K, Ca, Zn, Cu, Mn, Fe and P was determined by Flame Photometer, Atomic Absorption Spectrophotometer and Spectrophotometer respectively.

Results and Discussion

Fagonia arabica known to be beneficial in the treatment of a number of diseases have been investigated for chemical and mineral constituents of possible pharmological interest.

Analysis of the data (Table 1) revealed that maximum (58.51 %) moisture content was noted in leaves and seeds followed by concentration of whole plant. The minimum moisture content was observed in root (29.45 %). The possible reason for more moisture content in the leaves and seed could be that, this plant grows in the rocky and desert areas and thus the plant store moisture to avoid desiccation. These results are contrary to those represented by El-Habibi *et al.* (1990). Mean values of the data indicated that leaves and seeds contained maximum (7.17 %) ash content compared to other parts of the plant. It is also clear from the data that minimum (1.85 %) ash content was noted in root. This could be probably due to more photosynthetic activities of the leaves, which might have resulted in maximum ash content. Similar results are also reported by El-Habibi *et al.* (1990). Maximum (1.33 %) fat content was noted in roots followed by fat concentration of whole plant, whereas minimum (0.81 %) fat content was observed in root.

Mean values of the data (Table 1) regarding crude fiber content revealed that maximum (56.80 %) fiber was observed in root followed by that of shoots and whole plant, respectively. The possible reason could be that the main function of root is to anchor the plant in the soil firmly, for which it needs more fiber for strength. Thus it can be concluded from these results that root contained more fibers compared to other plant parts. Mean values of the data (Table 1) revealed that leaves and seeds collectively contained higher (1.43 %) amount of protein content followed by that of whole plant, while minimum (0.64 %) protein content was noted in the root. These results are contrary to those reported by El-Habibi *et al.* (1990). Likewise data regarding nitrogen free extract (NFE) showed that highest (12.92 %) amount of NFE was noted in leaves and seeds collectively, whereas lowest NFE was observed in shoots (8.95 %). The possible reason for high contents of protein and NFE in the leaves could be due to more photosynthetic activities of the leaves, which might have resulted in maximum protein and NFE synthesis. Data (Table 1) also revealed that vitamin C (ascorbic acid) content was 8.13 mg 100 g^{-1} in the whole plants. These results agree with those reported by Nag *et al.* (1986).

A number of macro element and micro element are constituents of enzymes and they act as enzyme activators (Simon *et al.*, 1990). Analysis of the data (Table 2) shows that *Fagonia arabica* contained Ca, Na, P, Cu, Fe, Mn and Zn. Root of *Fagonia arabica* contained 33.28 μg g $^{-1}$ of Zn followed by shoots and leaves. A comparative decrease was observed in Zn content from root to leaves and seeds. It has been reported that Zn plays an important role as an antioxidant in animal (Bray and Betterger, 1990) as

Table 1: Proximate composition of *Fagonia arabica* (% age)

Plant/parts	Moisture	Ash	Fat	Fiber	Protein	NFE	Vit. C
Roots	29.45 ± 0.28	1.85 ± 0.12	1.33 ± 0.05	56.80 ± 0.23	0.64 ± 0.01	9.93 ± 0.45	-
Shoots	43.29 ± 0.42	5.69 ± 0.44	0.82 ± 0.03	40.41 ± 0.02	0.84 ± 0.01	8.95 ± 0.81	-
Leaves/seeds	58.51 ± 0.22	7.17 ± 0.08	0.81 ± 0.01	19.48 ± 0.10	1.43 ± 0.01	12.92 ± 0.40	-
Whole Plant	45.12 ± 0.50	4.59 ± 0.06	1.22 ± 0.02	38.46 ± 0.07	1.05 ± 0.02	9.57 ± 0.60	8.13 ± 0.05

Table 2: Elemental composition in various parts of *Fagonia arabica* ($\mu g\ g^{-1}$)

Plant parts	Zn	Mn	Fe	Cu	P	K	Na	Ca
Roots	33.28	18.78	451.64	26.44	450	7643	1705	517
Shoots	29.93	42.15	569.15	53.59	496	141195	347	6902
Leaves/seed	21.99	45.32	912.39	37.67	1351	16454	138	11153
Mean	28.4	35.42	644.39	39.23	766	55097	730	6190

well as in plant membrane (Cakmak and Marschner, 1988) in controlling the level of oxygen radicals. The results are in agreement with those reported by Saeed (1996). In case of Mn, it was observed that maximum amount was obtained from leaves and seeds (45.32 $\mu g\ g^{-1}$) followed by that of shoots and roots. In case of iron (Fe), maximum amount was found in leaves (912.39 $\mu g\ g^{-1}$) followed by that of shoots (569.1 $\mu g\ g^{-1}$) and root (415.64 $\mu g\ g^{-1}$) respectively. Minimum amount of copper (Cu) was investigated in root (26.44 $\mu g\ g^{-1}$), while maximum amount in shoots (53.59 $\mu g\ g^{-1}$). Mean values of the data (Table 2) revealed that all heavy metals (Zn, Cu, Mn) were found in small amount ranging from 18.78-53.59 $\mu g\ g^{-1}$. The possible reason for low concentration of heavy metal could be due to the fact that this herb is found mostly in desert and dry calcareous rocks where industrial pollutions are near to negligible, which might have resulted in least amount of heavy metal. Whereas the macro-elements (P, K, Na, Ca) were found to maximum. Phosphorus is mainly involved in the process of energy transfer and it is the inorganic phosphate that appears as an intermediate product during photosynthesis and respiration pathways of metabolism. Phosphorus contents were found to be in maximum amount in leaves and seed (1351.00 $\mu g\ g^{-1}$) but minimum amounts were found in root (450.00 $\mu g\ g^{-1}$) of *Fagonia arabica*. Potassium contents of shoots showed maximum amount in comparison to that of leaves and seeds collectively and root. In shoots the investigated value for K was confirmed as 141195.00 $\mu g\ g^{-1}$) and root (7643.00 $\mu g\ g^{-1}$). Root contained the maximum content of sodium (1705.00 $\mu g\ g^{-1}$). While minimum Na was found in leaves and seeds collectively (138.00 $\mu g\ g^{-1}$). Leaves and seeds collectively had maximum calcium (11153.00 $\mu g\ g^{-1}$) followed by shoots (6902.00 $\mu g\ g^{-1}$) and roots (517.00 $\mu g\ g^{-1}$). El-Habibi *et al*. (1990) and Fatima *et al*. (1990) analyzed *Fagonia arabica* for different mineral concentration.

Unlike other nutrients, living organisms can't synthesize minerals elements. Only small fraction of the Ca, Mg, and P and most of the Na, K, and Cl are present as electrolytes in the body fluids and soft tissues. Electrolytes present in blood or cerebrospinal fluid maintain acid -base and water balance, and osmotic pressure. They regulate membrane permeability and exert characteristic effects on the excitability of muscles and nerves (Nielsen, 1987; Bukhari *et al*., 1987). Though F*agonia arabica* cannot be considered as a sole source of macro or micro elements, but can be considered as potential source for providing a reasonable amount of the elements other than diets. *Fagonia arabica* contains a fair amount of potassium (55097.00 $\mu g\ g^{-1}$) and Na (730.00 $\mu g\ g^{-1}$). Potassium deficiencies are more commonly seen as a result of several dehydration, diarrhea, burns or other fluid losses and as a result of surgery (Witney, 1984). This could be probably due to fair amount of these minerals in said plant, is mostly used in disease like diarrhea, stomatitis and deobstruent (Dey *et al*., 1980). Whereas Cu, Zn, Mn and Fe are considered as trace elements due to their relatively minute quantity that is essential to the body. Copper is important for red blood cell formation, mitochondria function and a component of ribonucleic acid, whereas Zn, Mn and Fe are necessary for the development of bones and connected tissues (Nielsen, 1987).

In conclusion since *Fagonia arabica* contains a fair amount of Na, K, Ca, Mn, P, Zn, Cu and Fe so the usage of *Fagonia arabica* other than diet is beneficial for the treatment of urinary discharge, typhoid, diarrhea and reducing tumors.

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