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PROXIMATE ANALYSIS AND MINERAL PROFILE OF THREE ELITE CULTIVARS OF *ROSA HYBRIDA* FLOWERS

M.I. JILANI[1], M.I. AHMAD[1], R. HANIF[1], R. NADEEM[1*], M.A. HANIF[1,2], M.A. KHAN[2], I. AHMAD[2] AND T. IQBAL[1]

[1]*Department of Chemistry and Biochemistry, University of Agriculture, Faisalabad (38040), Pakistan.*
[2]*Rose Laboratory, Institute of Horticultural Sciences, University of Agriculture, Faisalabad (38040), Pakistan.*
[*]*Corresponding author e-mail: raziyaanalyst@yahoo.com*

Abstract

In this study proximate and mineral composition of *Rosa hybrida* (cvs. Kardinal, Anjleeq and Maria shever) flowers were investigated. Minerals such as Fe, Mn, Zn, Cu, Pb, Ca, Cr, Ni, Mg, and Co were analyzed by atomic absorption spectrophotometer (AAS) whereas Na, K and Li were analyzed by Flame Emission Spectrometry. All varieties contained high amount of Na, K, Li, Cu, Ca, and Ni while Fe, Mn, Zn, Pb, Mg, and Co were found in low concentrations. All these metals were also analyzed in soil. The amount of metals present in the plant materials and soil were found strongly linked. All materials were high in moisture (21.42-23.42%), crude lipid (30.56-36.10%), carbohydrate (35.63-40.30%) and tannin (6.3-17.89 g/100g) contents while low in ash (5.9-6.6%) and crude protein (0.12-0.31%). This work attempts to contribute to knowledge of the nutritional properties of these flowers.

Introduction

Numerous health problems are narrated to diets. Many biochemical processes depend on micro nutrients and sufficient intake of micronutrients relates to the prevention of deficiency diseases (Kumari *et al*., 2004). In many developing countries malnutrition is a major problem. One third population of world affected by iron deficiency which cause anemia. Minerals are necessary for life of living organisms which activate hormones enzyme, and many other organic molecules that contribute in growth, maintenance and function of life processes. Minerals cannot be synthesized by body and must be taken from vegetables, plants, and mineral rich water (Prasad, 1998). Minerals play vital role in the function, effectiveness and absorption of certain vitamins. Calcium, copper, chromium, magnesium, selenium, zinc and sodium are vital minerals in nutritional intravenous therapy (Anon., 2006).

Minerals are vital part of plants and animals, performing different functions and are utilized in the preparation of protein, chlorophyll and phosphates, component of DNA and RNA and energy carrying coenzyme such as ATP (Pezzuto, 1996). Mineral composition of plants plays an imperative role in the plants medicinal values and their therapeutic effects on disease and health are well attributed (Kaneez *et al*., 2001). With the increased awareness of the crucial role of phytochemicals in human health, there is a revival of interest in the use of plants as source for conventional and complementary therapies (Choudhary & Rehman, 2002). A number of nutritionally important minerals and their bioavailability in plants has been a subject of numerous studies (Yesilada & Gurbuz, 2003). This has prompted the need to study the mineral composition of more and more edible and medicinal plants which could be used as a viable source of minerals. In this regard, present research was under taken to evaluate mineral content and proximate composition of medicinally important *Rosa hybrida* (cvs. Kardinal, Anjleeq and Maria shever) flowers.

Materials and Methods

Collection of material: Authentic samples of flowers of *Rosa hybrida* cvs. Kardinal, Anjleeq, Maria Shever flowers and soil were collected from Greenhouses of Rose Project, Institute of Horticultural Sciences, University of Agriculture Faisalabad, Pakistan. Each bed contained 10 plants and 3 flowers were collected from each plant randomly for each salinity level. Samples of *Rosa hybrida* cvs. Kardinal, Anjleeq and Maria Shever flowers were dried in an electrical oven (~105^{o}C) to constant weight. The dried samples were ground to fine powder. The ground samples were stored in polyethylene bags. Three samples of soil were also collected for each salinity level and then mixed for analysis.

Reagents: Authentic standards of Na, K, Mn Li, Zn, Fe, Cu, Pb, Ca, Ni, Mg, Cr and Co were purchased from Fluka chemicals. All the chemicals and reagents used were of analytical grade and obtained from E. Merck. Acid washed glassware and deionized water was used throughout the analysis.

Digestion of samples: The homogenous soil samples to a depth of 6 inches from the surface using a spade were collected in a clean bucket. The samples were oven dried till constant weight at 70 ± 1°C. Triplicate sets of 1g of each flower/soil samples were weighed in separate beakers and treated with 10mL concentrated nitric acid to oxidize the organic material. The flasks were covered with the watch glasses and heated to reflux on an electric hot plate at 80-100°C. After heating for one hour, the contents of flasks were treated with additional 5mL of nitric acid, following by 2mL of 30% hydrogen peroxide, and heating at gentle, reflux was continued for another hour. The watch glasses were removed from top of the flasks and heating was continued until the volume of contents was reduced to semi dried. The contents of the flasks were cooled, diluted and then filtered the solution twice through Whattman No. 42 filters paper into volumetric flasks and made up to volume of 50mL with distilled water. The blank assay was also run with samples (Leterme *et al*., 2006).

Determination of mineral contents: Na, K and Li were determined using flame photometric analysis (Anon., 1990) (410 Sherwood flame photometer). Fe, Mn, Cu, Zn, Pb, Ca, Cr, Ni, Mg, and Co were analyzed by atomic absorption spectrometry (Perkin Elmer, AAnalyst 300). All mineral elements were determined by adopting the method described by (Kaneez *et al*., 2001). All samples were analyzed in triplicate to ensure reproducibility. The water soluble minerals were determined as they can be taken up by plants. The total quantities of all metals were determined irrespective of their oxidation states.

Proximate composition: The percentage moisture, ash, crude protein, crude lipid and carbohydrates of the *Rosa hybrida* cvs Kardinal, Anjleeq and Maria shever flowers were determined using the (Anon., 1990). Tannin was estimated by the method described by (Macrae *et al*., 1993).

Statistical analysis: Three independent values for each variable were obtained and then calculated the standard deviation and mean except for total carbohydrate, which was simply obtained by difference.

Results and Discussion

The results of present study are shown in Tables 1-3. The concentration of Na in *Rosa hybrida* cv Kardinal, Anjleeq and Maria shever flowers were found in the range between 99.54–159.39 mg/kg. The highest levels of Na were found in Kardinal and lowest Anjleeq flowers. The concentration of Na was 312.25 mg/kg in soil.

Table 1. The content of minerals (Mean ± SD) in soil and *Rosa hybrida* cvs. Kardinal, Anjleeq and Maria Shever flowers.

Sample	Na (mg/kg)	K (mg/kg)	Li (mg/kg)	Fe (mg/kg)	Mn (mg/kg)	Zn (mg/kg)	Cu (mg/kg)
Kardinal	159.39 ± 0.45	224.48 ± 0.22	83.52 ± 0.33	69.23 ± 0.21	44.55 ± 0.36	47.14 ± 0.94	26.04 ± 0.23
Anjleeq	99.54 ± 0.98	203.3 ± 0.76	41.70 ± 0.45	40.7 ± 0.38	49.65 ± 0.78	44.50 ± 0.34	21.5 ± 0.05
Maria shever	133.20 ± 0.24	210.0 ± 0.95	27.80 ± 0.78	55.5 ± 0.57	53.25 ± 0.93	24.06 ± 0.45	29.55 ± 0.04
Soil	312.25 ± 0.71	565.71 ± 2.35	391.86 ± 0.83	86.88 ± 0.56	57.25 ± 0.9	50.11 ± 0.69	76.50 ± 0.39

Table 2. The content of minerals (Mean ± SD) in soil and *Rosa hybrida* cvs. Kardinal, Anjleeq and Maria Shever flowers.

Varieties	Pb (mg/kg)	Ca (mg/kg)	Cr (mg/kg)	Ni (mg/kg)	Mg (mg/kg)	Co (mg/kg)
Kardinal	19.55 ± 0.55	415.35 ± 0.32	71.53 ± 0.51	85.75 ± 0.39	136.05 ± 0.25	35.52 ± 0.38
Anjleeq	24.06 ± 0.46	458.65 ± 0.57	50.55 ± 0.37	119.15 ± 1.24	138.55 ± 0.24	60.53 ± 1.21
Maria shever	17.02 ± 0.02	486.6 ± 0.49	35.65 ± 0.35	56.75 ± 0.99	141.7 ± 0.41	37.0 ± 0.99
Soil	27.52 ± 0.31	563.27 ± 0.98	79.81 ± 0.83	127.36 ± 1.71	153.24 ± 0.71	63.34 ± 1.07

Table 3. Proximate composition (Mean ± SD) of *Rosa hybrida* cvs. Kardinal, Anjleeq and Maria Shever flowers.

Varieties	Percent moisture contents	Percent ash contents	Percent crude protein	Tannin g/100g	Percent lipid contents	Percent carbohydrates
Kardinal	22.42 ± 0.24	6.32 ± 0.22	0.3125 ± 0.08	17.892 ± 0.36	30.66 ± 0.51	40.30
Anjleeq	21.42 ± 0.21	6.65 ± 0.27	0.250 ± 0.16	13.06 ± 0.23	36.10 ± 0.42	35.63
Maria shever	23.42 ± 0.14	5.91 ± 0.32	0.1250 ± 0.23	6.03 ± 0.36	30. 56 ± 0.41	39.995

For proper growth and completion of the life cycle, plants must acquire not only macronutrients, but also essential micronutrients. Plants have highly specific mechanisms to take up, translocate, and store these nutrients (Akalin & Alpinar, 1994; Blaylock & Huang 1999). The higher Na contents in *Rosa hybrida* varieties clearly suggested that these varieties have efficient uptake system for Na ions. Na regulates the volume of blood and maintains the balance of fluid and pressure inside and outside the body cell. Minimum and Maximum levels of K were found in Maria shever and Kardinal flowers. The highest content of K was 224.48 mg/kg while the lowest was 210.05 mg/kg. K concentration in the soil was much higher in comparison to Na concentration. It was found to be 565.71 mg/Kg. Potassium helps plants in Turgot pressure, maintenance stomatal control and charge balance across root membranes during selective ion uptake. K is an important for reducing blood pressure and also increasing blood circulation, as well as preventive aid on general heart health in human. The metal uptake mechanism is very selective, plants preferentially uptake some ions over others. Li content was determined to be 27.80 mg/kg in Maria shever and 83.52 mg/kg in Kardinal flowers. The soil was found to have 391.86 mg/kg of Li. Membrane transporters properties and structures are responsible in ion uptake selectivity. These characteristics allow transporters to recognize, bind, and mediate the trans-membrane transport of specific ions.

Li is an essential element with many beneficial medicinal properties. Li is used effectively in manic depressive disorders treatment (Macrae *et al*., 1993). Minimum and Maximum values of Fe were 40.70 and 69.23 mg/kg. The highest and lowest levels of Fe were found in Kardinal and Anjleeq flowers. The total Fe content of the soil was 86.88 mg/kg. Adewusi *et al*., (1999) estimated the mineral contents in processed cassava products. Mg, Fe, Ca, and Zn were present in considerable amounts.

The highest content of Mn was 53.25 mg/kg in Maria shever, whereas the lowest Mn content was 44.55 mg/kg in Kardinal flowers. Mn is an antioxidant nutrient, important in energu production, amino acids breakdown and necessary in metabolism of vitamin E and vitamin B. Its amount in soil was found to be 57.25 mg/kg. Mn deficiency symptoms may result in dizziness, paralysis, loss of hearing, digestive problems, blindness and deafness in infants (Boyd & Martens, 1994). Zn levels were determined to be 24.06 mg/kg in Maria shever and 47.14 mg/kg in Kardinal flowers. Growth control hormones and protein synthesis in plants is regulated by zinc. Among the essential elements determined in the present study Zn level was found to be lowest in the soil sample. Zn concentration in the soil was 50.11 mg/kg. Barminas *et al*., (1999) studied the mineral composition of non conventional leafy vegetables. Zn content was highest in *M. oleifera, Adansonia digitata* and *Cassia tora* leaves. In this study, the highest Cu content was 29.55 mg/kg in Maria shever and the lowest was 21.52 mg/kg in Anjleeq flowers. Copper found mostly in the chloroplasts of leaves is an important enzyme activator. Cu plays an important role in enzymatic catalysis and is crucial to virtually all biochemical and physiological process for animal and human life (Pollard & Baker, 1997).

The amount of Cu present in the soil was 76.50 mg/kg. Metals as Mn, Zn, Ni, and Cu are essential micronutrients. Non-accumulator plants, does not accumulate these metals in excess of their metabolic needs (<10ppm). In contrast, metal hyper-accumulator plants can accumulate thousand of ppm of these metals (Reeves & Baker, 1999; Barminas *et al*., 1999). The Pb concentration was high in Anjleeq and ranged from 17.0-24.06 mg/kg. The amount of Pb was mg/kg in the soil. Lead is a toxic element accumulates in certain organic tissues of plants due to its complex formation with organic matter in the soil.In many plants Pb accumulate in roots, but Lead translocation to shoot is very low (Donsbachand & Ayne, 1982). Ca contents were between 415.35-486.6 mg/kg. Calcium ions were most abundant in the soil samples. The amount of calcium ions per kg of soil was found to be 563.27 mg. Calcium is used by plants to build their cell walls. The highest Ca content was found in Maria shever flowers. Ca helps in transporting of long chain fatty acid which helps in preventing of heart diseases, high blood pressure and assist bone and teeth development (Soylaka *et al*., 2005; Proctor, 2003). The free movement of metal ions across the cellular membranes, which are lipophilic structures, is restricted due to their charge (Akalin & Alpinar, 1994). Cr concentration was 35.65-71.53 mg/kg. The lowest and highest Cr values were observed in Maria shever and Kardinal flowers. Cr concentration in the soil samples was 79.81 mg/kg. Chromium is an essential element for plant growth in trace concentrations. Ahmad *et al*., (2008) worked on trace elements determination in some wild edible mushroom samples. Nine trace elements (Fe, Zn, Mn, Cu, Ni, Pb, Cr, Co, Cd,) were determined by flame and graphite furnace atomic absorption spectrometry after microwave digestion in eight mushroom species of Turkish origin. Maximum Ni level was 119.15 mg/kg in Anjleeq and minimum Ni level was 56.75 mg/kg in Maria shever flowers. Although nickel is essential element for many plant species, its high intracellular concentrations can be toxic (Akalin & Alpinar, 1994). Ni tolerance in plants is due to its complexation to low molecular weight organic compounds (<10 kD) (Ouchi *et al*., 1990). Ni concentration in the soil was 127.36 mg/kg. Ni is known to be an essential trace element for many species of animals. Low levels of Ni in bodies of some People cause liver and kidney diseases. Also, high amount of Ni in the body is associated with thyroid disease, cancer, high incidence of heart disease. The human body contains about 10 mg and a daily uptake of 100kg is recommended (Sahito *et al*., 2002). Maximum and Minimum values of Mg were 141.72 and 136.05 mg/kg in Maria shever and Kardinal flowers. Mg was present at a concentration of 153.24 mg/kg in soil. Magnesium is the central atom of the chlorophyll molecule and an important co-enzyme especially as an electron carrier in enzymes. Nitrogen fixation and chlorophyll formation is incomplete without iron.

Due to complex formation magnesium plays important role in photosynthesis, respiration, and nitrogen metabolism. Mg is an important mineral which control the circulatory diseases (Greenberg *et al*., 1992). The range of Co concentration was 35.52-60.53 mg/kg in Kardinal and Anjleeq flowers. The soil elements may be present in soil solution as ions or present in insoluble forms can move back and forth between several chemical forms within the soil. Minerals in ionic form are absorbed by the plants as they are important to the structural molecules of a plant, including cell walls, carbohydrates, chlorophyll, proteins, DNA, RNA, phospholipids and sugar phosphates. They are released upon plant decomposition. The concentration of the minerals in soil evaluated in the present study can be directly related to their concentrations in the plants. The proximate composition of *Rosa hybrida* (cvs Kardinal, Anjleeq and Maria shever) flowers is depicted in Table 3. The moisture content in *Rosa hybrida* (cvs Kardinal, Anjleeq and Maria shever) flowers were comparable i.e., 22.42, 21.42 and 23.42% respectively. The ash content was also comparable and found in low amount 6.32, 6.65 and 5.91% respectively. The percentage crude protein was ranged between 0.1250-0.3125% in Maria shever and Kardinal flowers. The Tannin content was lowest in Maria shever (6.03 g/100g) and highest in Kardinal flowers i.e., 17.892 g/100g. The lipid content and carbohydrates were found in high amount. The lipid content in *Rosa hybrida* (cv Kardinal, Anjleeq and Maria shevers was 30.66, 36.10 and 30.56% respectively while carbohydrate content was 40.30, 35.63 and 39.995%, respectively.

Conclusions

The *Rosa hybrida* cvs Kardinal, Anjleeq and Maria shever flowers is an excellent source of investigated minerals and thus could help in maintaining normal physiological functions of human body. In view of significantly high level of important minerals, *Rosa hybrida* cv Kardinal, Anjleeq and Maria shever flowers might be exploited for medicinal attributes and treatment of ailment in our folk remedial system.

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