African Journal of Biotechnology Vol. 10(62), pp. 13491-13494, 12 October, 2011
Available online at http://www.academicjournals.org/AJB
DOI: 10.5897/AJB11.2001
ISSN 1684–5315 © 2011 Academic Journals

Full Length Research Paper

Estimation of inorganic constituents in the seeds of blue and white flowering capitulum of *Silybum marianum*

Farhat Ali Khan[1], Muneeb Ur Rehman Khattak[2]* and Muhammad Zahoor[3]

[1]Department of Pharmacy, Sarhad University of Science and Information Technology, Peshawar, Pakistan.
[2]Department of Chemistry, Kohat University of Science and Technology, Kohat, Pakistan.
[3]Department of Chemistry, Malakand University, Malakand, Pakistan.

Accepted 19 August, 2011

Silybum Marianum **commonly known as milk thistle contains flavonolignans, collectively known as silymarin. The main components of silymarin are silybine, isosilybine, silychristin and silydinine. This study was aimed to estimate inorganic constituents in blue and white capitulum's seeds from different areas of KPK. Concentration of Na was found to be high (6 mg/kg) in white capitulum seeds from Karak area, while K concentration was high (6 mg/kg) in the blue capitulum seeds from Khyber agency. High concentration of Ca (20 mg/kg) was seen in both white and blue capitulum's seeds of Khyber agency. Less concentration of NO_3 (0.09 mg/kg) was detected in white capitulum seeds from Kohat district and high concentration of SO_4 (22.14 mg/kg) was recorded in blue capitulum seeds collected from Peshawar.**

Key words: *Silybum marianum*, capitulum's seeds, inorganic profile.

INTRODUCTION

Herbal and traditional medicines have been used to cure variety of diseases like common cold, malaria, ulcers, body pain and infections across the world from old times (Chen et al., 1993). Recently processed natural products, primarily medicinal herbs are used in multiple combinations to relieve and cure many diseases. They are available in the mixtures of medicinal plants, extracts and capsule forms, therefore are easy to use (Obiajunwa et al., 2001). The increased scientific interest and consumer demand for alternative therapies have promoted the development of herbal products as dietary supplements for health outcome.

It is now well established that trace elements play a very significant role in assessing medicinal value of a plant and therapy in health and diseases. These elements take part in many biochemical and physiological processes in plants, animals and in human beings. For healthy life, the balance of trace elements or inorganic constituents is required (Dhar et al., 1973; Kleinschmidt et al., 1977; Jaffar et al., 2003). *Silybum marianum* commonly known as milk thistle is an annual or biennial herb, with stem (20 to 150 cm high), leaves (25 to 50 cm long and 12 to 25 cm wide) and fruit (15 to 20 mm long), and belongs to the family Asteraceae. It is indigenous to North America, Asia, Southern Europe, Russian Federation, naturalized to South and North, America, Australia, China, Central Europe and found wild in NWFP and the Punjab areas of Pakistan. As a medicinal herb, it is used in European traditional system of medicine (Kroll et al., 2007).

The extracts prepared from the roots and seeds have been used for liver diseases and disorders of bile duct and spleen (Sonnenbichler et al., 1998). The major active constituents of *S. marianum* are the flavonolignans (1.5 to 3.0%) collectively known as silymarin. The major components of the silymarin complex are the four isomers silybin and isosilybin, silychristin and silydianin. The three isomers: silybin, silychristin and silydianin differ only in the linkage of the taxifolin moiety to coniferyl alcohol. The other flavonolignans identified include 2,3-dehydrosilybin and 2,3-dehydrosilychritin. Taxifolin, 2,3-dihydroflavonol, may be regarded as the parent flavonol of the silymarin compounds. Seeds of *S. marianum* have been used for

*Corresponding author. E-mail: muneeb_chem@yahoo.com. Tel: +923009031731.

Table 1. Analytical results obtained from the blue capitulum seeds.

S/N	Area code	Na	K	Cl	Ca	HCO_3	NO_3	SO_4
1	C-Blue	4	2	6.85	8	30	0.22	5.74
2	P-Blue	5	5	6.85	12	50	0.18	22.14
3	N-Blue	4	4	20.6	12	80	0.31	14.78
4	M-Blue	2	1	6.85	8	10	0.22	18.96
5	S-Blue	4	2	6.85	8	40	0.32	8.30
6	K-Blue	3	6	13.7	20	70	0.16	5.74
7	Kt-Blue	1	1	6.85	16	50	0.16	4.51
8	Kk-Blue	5	4	13.70	12	40	0.14	5.84

C = Charsada; P = Peshawar; M = Mardan; N = Nowshehra; S = Swabi; Kk = Karak; Kt = Kohat; K = Khyber agency.

Table 2. Analytical results obtained from the white capitulum seeds.

S/N	AreaCode	Na	K	Cl	Ca	HCO_3	NO_3	SO_4
1	C-white	1.5	3.09	9.60	12	30	0.60	2.38
2	P-White	4.44	2.44	8.91	8	40	0.39	8.7
3	N-white	2	2	6.85	8	20	0.14	14.58
4	M-White	2	1	6.85	12	20	0.26	5.84
5	S- white	3	2.2	6.85	8	30	0.23	6.97
6	K-white	2	1	6.85	20	50	0.40	7.17
7	Kt-white	2	1	6.85	16	40	0.09	5.83
8	Kk-Whit	6	1	6.85	16	30	0.18	10.56

C = Charsada; P = Peshawar; M = Mardan; N = Nowshehra; S = Swabi; Kk = Karak; Kt = Kohat; K = Khyber agency.

more than 2000 years to treat liver and gallbladder disorders, including hepatitis, cirrhosis and jaundice, and to protect the liver against poisoning from chemical and environmental toxins, including snake bites, insect stings, mushroom poisoning and alcohol (Berardesca et al., 2008).

Keeping in view the importance of *S. marianum* seeds and their role in human body, this study was therefore undertaken to analyze inorganic constituents in the white and blue *S. marianum* seeds collected from different areas of KPK.

MATERIALS AND METHODS

All the reagents and chemicals used were of analytical grade procured from Sigma and E. Merck. All the solution of standard and samples were prepared in freshly prepared deionized water.

Plant sample preparation

The *S. marianum* seeds were cleaned visually to remove the dust particles, washed with tap water and then with deionized water and dried at 120°C to a constant weight. The dried seeds were grinded to fine powder and then used for drying ashing. The pre-cleaned silica crucible was heated at 600°C to a constant weight. The powdered seeds material in the crucible was heated in a muffle furnace at 600°C, until there was no evolution of smoke. The crucible containing seeds ash was cooled at room temperature and moistened with deionized waster to keep it over night. The undissolved particles were filtered and the volume was made up to 100 ml. This solution was used as sample solution (Kabata, 1986).

Inorganic constituents analysis

Sodium and potassium were determined by flame photometer model coning –40. Calcium and magnesium were determined by complexometric titration. Phosphate was determined by calorimetric method using ammonium dihydrogen phosphatase standard solution and molybodate as complexing agent. Sulphate and bicarbonate were determined by titrimetric method and chloride was determined by the standard agentometric method using potassium chromate indicator (Farhat et al., 2011).

RESULTS AND DISCUSSION

Sodium and potassium

As shown in Tables 1 and 2, the concentration of Na in blue capitulum seeds of *S. marianum* was higher than its concentration in the white capitulum's seeds. For example, its concentration was high in the seeds collected from Peshawar, that is, 5 mg/kg was found in the blue seed and 4.44 mg/kg was collected from Peshawar while low concentration of Na 1 mg/kg was seen in the blue capitulum of *S. marianum.*

In the case of K, high concentration (6 mg/kg) was

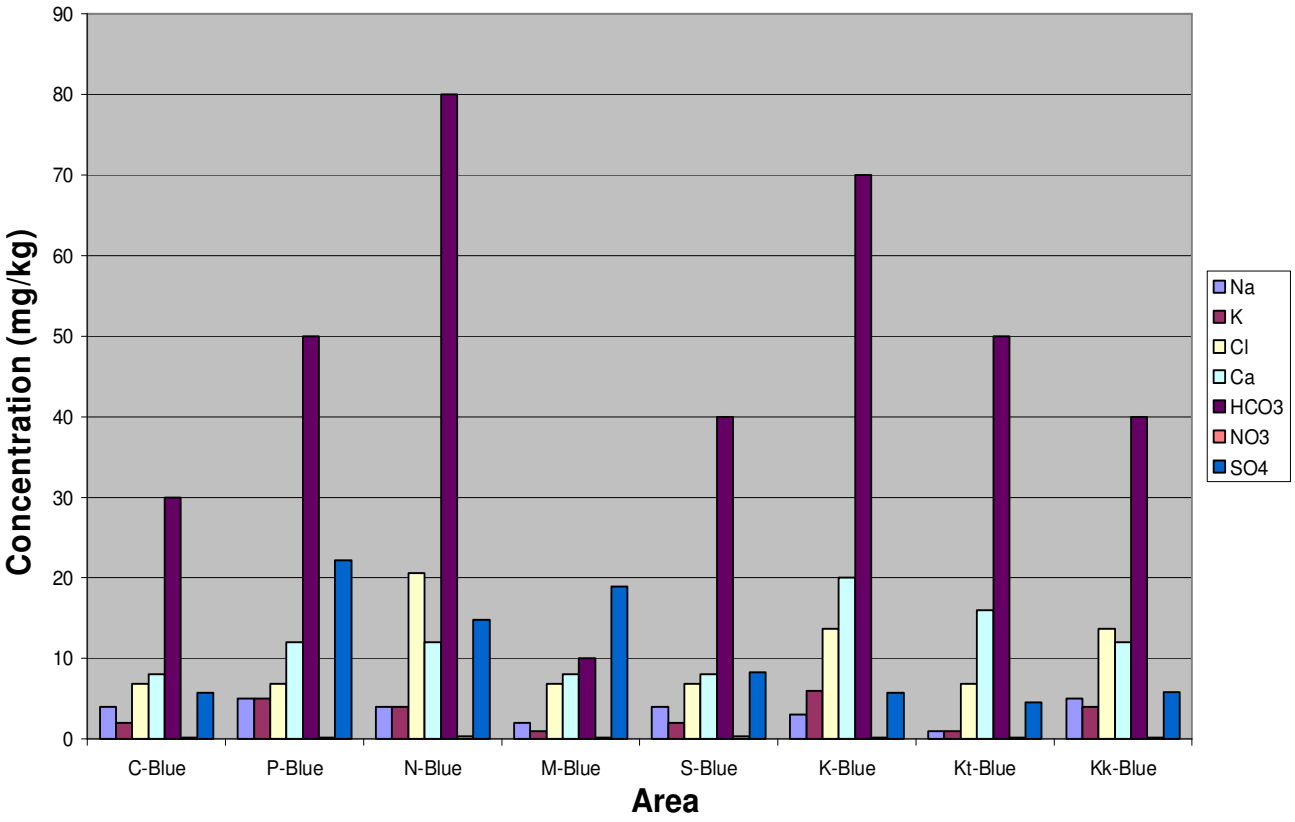

Figure 1. Analytical results obtained from the seeds of blue capitulum seeds.

found in the white capitulum seeds of *S. marianum* and low concentration (1 mg/kg) was found in both the blue and white capitulum of *S. marianum*.

Na and K are the electrolytes and Na is the major component of the cation of extra cellular fluid, while K is the cation of intracellular fluid. Na concentration of 139 meg/L and K 5 meg/L is present in the blood plasma of humans. High concentration of Na leads to hypertension, while high concentration of K leads to the dilation of arteries and normalize the blood pressure. Extensive level of K leads to the failure of heart (Farhat et al., 2011; Iqbal et al., 2011).

Calcium

The concentration level of Ca was also found to be variable in all the seeds of blue and white capitulum. For example, high concentration (20 mg/kg each), was found in both the blue and white capitulum seeds collected from Khyber agency. The rest of the samples had concentration between 8 and 16 mg/kg (Figures 1 and 2).

Ca is a very important constituent used in the synthesis of new cell walls. 5 meg/L of calcium is present in the blood plasma of humans (Farhat et al., 2011; Kabata and Pendias, 1986).

Chloride and bicarbonate

The concentration level of chloride (20 mg/kg) was high in the blue capitulum seeds collected from Nowshehra followed by blue capitulum seeds collected from Khyber agency (Figure 1). The rest of the samples had concentration of 9.69 to 6.85 mg/kg. High concentration of HCO_3 was seen in the blue capitulum seeds from Nowshehra (80 mg/kg) followed by its concentration of 70 mg/kg in the blue capitulum seeds collected from Khyber agency, while very low concentration (10 mg/kg) was recorded in the blue capitulum's seeds collected from Mardan. The rest of the samples had concentration level of 20 to 50 mg/kg.

Chloride is essential in water balance, osmotic pressure regulation as well as acid base equilibrium. It is mostly required for cell division in leaves and roots (Farhat et al., 2011).

Nitrate and sulphate

The concentration of nitrate was found to be lower in all the studied samples. The level of nitrate contents was from 0.10 to 0.60 mg/kg. However, phosphate was found to be high in all the samples as compared to NO_3. For

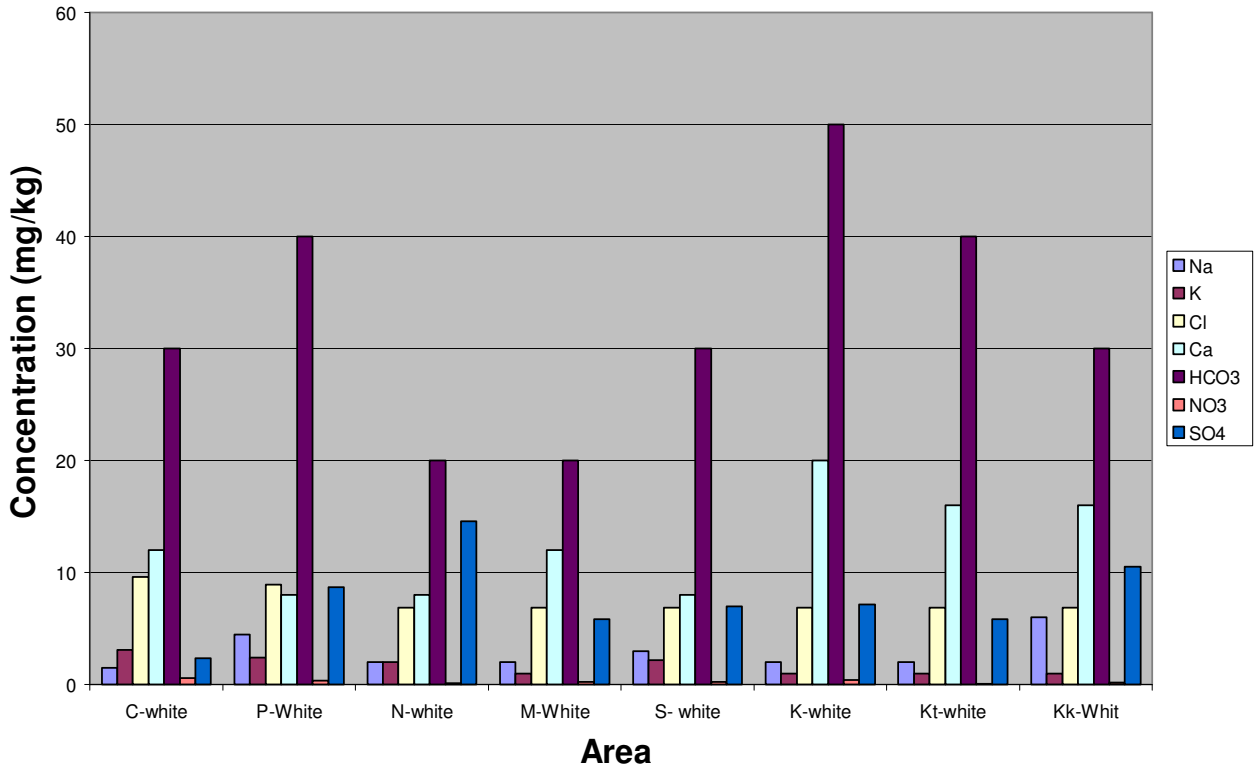

Figure 2. Analytical results obtained from the seeds of white capitulum seeds.

example, its concentration was found to be 22.14 mg/kg in the blue capitulum seeds collected from Peshawar. The rest of the samples had concentration of 2.38 to 70.4 mg/kg.

Phosphorus as phosphate is an integral component of a number of important compounds present in plant cells. It acts as a limiting element in soils and absorbed primarily as monovalent phosphate anion- H_2PO_4. The ability of the ions is controlled by soil pH, that is, mono-valent is favoured by pH below 7. Phosphorus remains as free phosphate or bound to organic compounds as esters in plants (Farhat et al., 2011).

Conclusion

This study clearly revealed that the trace elements were present in both the blue and white capitulum seeds of *S. marianum* collected from different environmental zones of KPK, in different concentrations. However, before collection and utilization, the seeds must be checked for other ingredients including micro organisms like bacteria, fungi, heavy metals and other toxic contaminants, in order to make them safe for human consumption.

REFERENCES

Berardesca E, Cameli N, Cavallotti C (2008). Combined effects of silymarin and methylsulfonylmethane in the management of rosacea: clinical and instrumental evaluation. J. Cosmet Dermatol.; 7:8-14.

Chen KS, Tseng CL, Lin TH (1993). Trace elements in natural drugs determined by INAA. J. Radio-anal. Nucl. Chem., 170, pp. 265.

Dhar DN, Singh RK (1973). The Eastern Pharmacist. The Chemistry of Clotropis Procera., 176, 99.

Farhat AK, Iqbal H, Muneeb UR (2011). Inorganic constituents of Blue and white flowering silybum marianum from different districts of Khyberpakhtoon khawa, Pakistan. Middle-East J. Sci. Res., 7 (6): 990-993.

Iqbal H, Farhat AK, Muneeb RK (2011). Evaluation of Inorganic Profile of Selected Medicinal Plants of Khyber Pakhtunkhwa Pakistan.World Appl. Sci. J., 12 (9): 1464-1468.

Sonnenbichler J, Sonnnenbichler I, Sealkera FS (1998). Influence of the flavonolignan silybinin of milk thistle on hepatocytes and kidney cells. ACS Symp Ser (Phytomedicines of Europe) 691, 263.

Kabata Pendias (1986). Trace Elements in Soils and Plants. CRC, Inc. Florida

Kleinschmidt HE, Johnson RW (1977). Weeds of Queensland. Queensland Dept. of Primary Ind. 147.

Kroll DJ, Shaw HS, Oberlies NH (2007). Milk thistle nomenclature: why it matters in cancer research and pharmacokinetic studies. Integr. Cancer Ther. 6:110-119.

Jaffar M, Masud K (2003). Selected toxic metal levels in seasonal fruits of Pakistan. Nutr. food Sci., 33: 9.

Obiajunwa EI, Adebajo AC, Omobuwajo OR (2001). Essential and trace element contents of some Nigerian medicinal plants. J. Radioanal. Nucl. Chem. 252 (3): 473-476.