

CHAPTER 8

ESTIMATION OF BIOAVAILABLE BULK METALS

Metals which are required in bulk quantity for human body were also detected in the selected herbs. Calcium, magnesium, sodium and potassium were chosen for this purpose. Methods applied for these detections were atomic absorption and flame photometry.

8.1 ESTIMATION OF SODIUM

Total soluble contents of sodium from both types of samples were checked. According to the results PL, EC and AS showed very small amount of sodium. All metal content was water soluble in EC and AS (Table 8.1, Fig 8.1). Highest amount, but insoluble in water was found in HR, MC and CI.

It is found that *Adiantum capillus veneris* has very small sodium content but highly water soluble so it does not retain in roots and stems. Therefore highest sodium is gradually found in leaves samples.

8.2 ESTIMATION OF POTASSIUM

A high amount of potassium was found in GS, SH and MC (Table 8.2 Fig 8.2). MC showed the maximum water soluble potassium. GS and SH has high content of potassium in which only 20% were water soluble. PG, CI and PL showed about 40.0 mg/g in the sample and about 10mg/g in water extract. EC showed 20.0 mg/g of sample and about 100% was water soluble.

Adiantum capillus veneris showed least concentration of potassium (8.0 mg/g) as compared to other samples and about 50% of it was water soluble.

8.3 ESTIMATION OF MAGNESIUM

Results for magnesium in the acid digested samples, showed that GS had very large amount of the said metal (9.0 mg/g) from which 12 to 13% was found to be water soluble. SH, MC, CI, PL and HR also showed high concentration of magnesium due to the reason that most of these sample selected were leaves (Table 8.3, Fig 8.3).

EJ, EC and AS were found to have very low concentration of this metal where as in EC whole of the magnesium was water soluble (Table 8.4, Fig. 8.3).

Adiantum capillus veneris showed low magnesium contents in the acid digested sample and comparatively lower amount in water extracts.

8.4 ESTIMATION OF CALCIUM

In acid digested sample of GS, ACV, MC and CI, large amount of calcium was found. Whereas slight excess, in SH and HR. In EJ, EC and AS there is very meager quantity of calcium was detected (Table 8.5, Fig. 8.4).

When water extracts of these samples were studied, slight traces of soluble calcium was found in SH, TF, CI and PL (Table 8.6, Fig. 8.4).

Adiantum capillus veneris has high calcium content but water extract does not have reasonable amount of this metal.

DISCUSSION

In *Adiantum capillus veneris* except calcium, other bulk metals were found very low in concentration, but its water extract does not have a reasonable amount of calcium. Therefore it is not a good source of these metals.

TABLE 8.1

**Estimation of Sodium in
Water Extract and Acid Digested Samples
by Flame Photometer**

Sample ID	Quantity Found in mg/g	
	Acid Digested	Water Extract
ACV	1.375	0.493
MC	19.375	5.419
EJ	3.125	1.219
GS	6.625	1.796
AS	0.400	0.278
TF	7.250	1.306
PG	4.875	1.676
SH	7.500	2.183
CI	21.250	6.775
EC	0.638	0.477
PL	4.500	0.245
HR	29.375	3.771

TABLE 8.2

**Estimation of Potassium in
Water Extract and Acid Digested Samples
by Flame Photometer**

Sample ID	Quantity Found in mg/g	
	Acid Digested	Water Extract
ACV	6.500	2.516
MC	52.500	20.689
EJ	18.750	6.340
GS	55.000	11.477
AS	24.375	8.936
TF	23.750	4.476
PG	39.375	12.434
SH	55.000	15.233
CI	39.375	12.583
EC	17.985	17.882
PL	36.250	8.836
HR	17.500	3.771

TABLE 8.3

**Estimation of Magnesium in Acid Digested Samples
by Atomic Absorption Spectroscopy**

Sample ID	Quantity found mg/g	SD	RSD %
ACV	2.3075	0.004	0.4
MC	3.9875	0.017	0.8
FF	0.5923	0.001	0.1
GS	9.0650	0.003	0.2
AS	1.3125	0.002	0.2
TF	2.5313	0.006	0.3
PG	2.3000	0.004	0.2
SH	4.1725	0.006	0.4
CI	4.6475	0.004	0.2
EC	1.9875	0.018	1.2
PL	4.4000	0.008	0.5
HR	5.0375	0.004	0.2

TABLE 8.4

**Estimation of Magnesium in Water Extract of Samples
by Atomic Absorption Spectroscopy**

Sample ID	Quantity found mg/g	SD	RSD %
ACV	0.1833	0.011	0.6
MC	1.0719	0.017	1.6
EJ	0.5735	0.000	0
GS	1.3832	0.011	0.8
AS	0.4031	0.002	0.5
TF	0.1533	0.002	0.2
PG	0.6649	0.004	0.7
SH	0.5910	0.006	1
CI	1.3348	0.001	0.1
EC	1.8935	0.003	0.2
PL	0.9248	0.005	0.5
HR	0.8946	0.008	0.8

TABLE 8.5

**Estimation of Calcium in Acid Digested Samples
by Atomic Absorption Spectroscopy**

Sample ID	Quantity found mg/g	SD	RSD %
ACV	9.7925	0.056	1.4
MC	3.0700	0.015	1.2
EJ	0.3015	0.006	1.8
GS	10.6400	0.006	0.3
AS	0.2950	0.006	2.9
TF	2.1505	0.008	0.9
PG	1.0700	0.006	0.7
SH	2.4825	0.005	0.5
CI	4.1250	0.003	0.2
EC	0.6215	0.002	0.3
PL	1.3375	0.001	0.2
HR	2.0925	0.008	1

TABLE 8.6

**Estimation of Calcium in Water Extract of Samples
by Atomic Absorption Spectroscopy**

Sample ID	Quantity found mg/g	SD	RSD %
ACV	0.0730	0.002	0.1
MC	0.1892	0.007	3.6
EJ	0.2907	0.004	1.3
GS	0.5758	0.004	0.7
AS	0.3882	0.007	1.8
TF	1.8838	0.016	1.6
PG	0.4563	0.010	2.4
SH	1.1089	0.013	1.2
CI	1.5351	0.016	2
EC	0.5285	0.001	0.2
PL	1.5070	0.021	1.4
HR	0.1131	0.001	0.8

FIGURE 8.1

**Comparison of Sodium in
Water Extract and Acid Digested Samples**

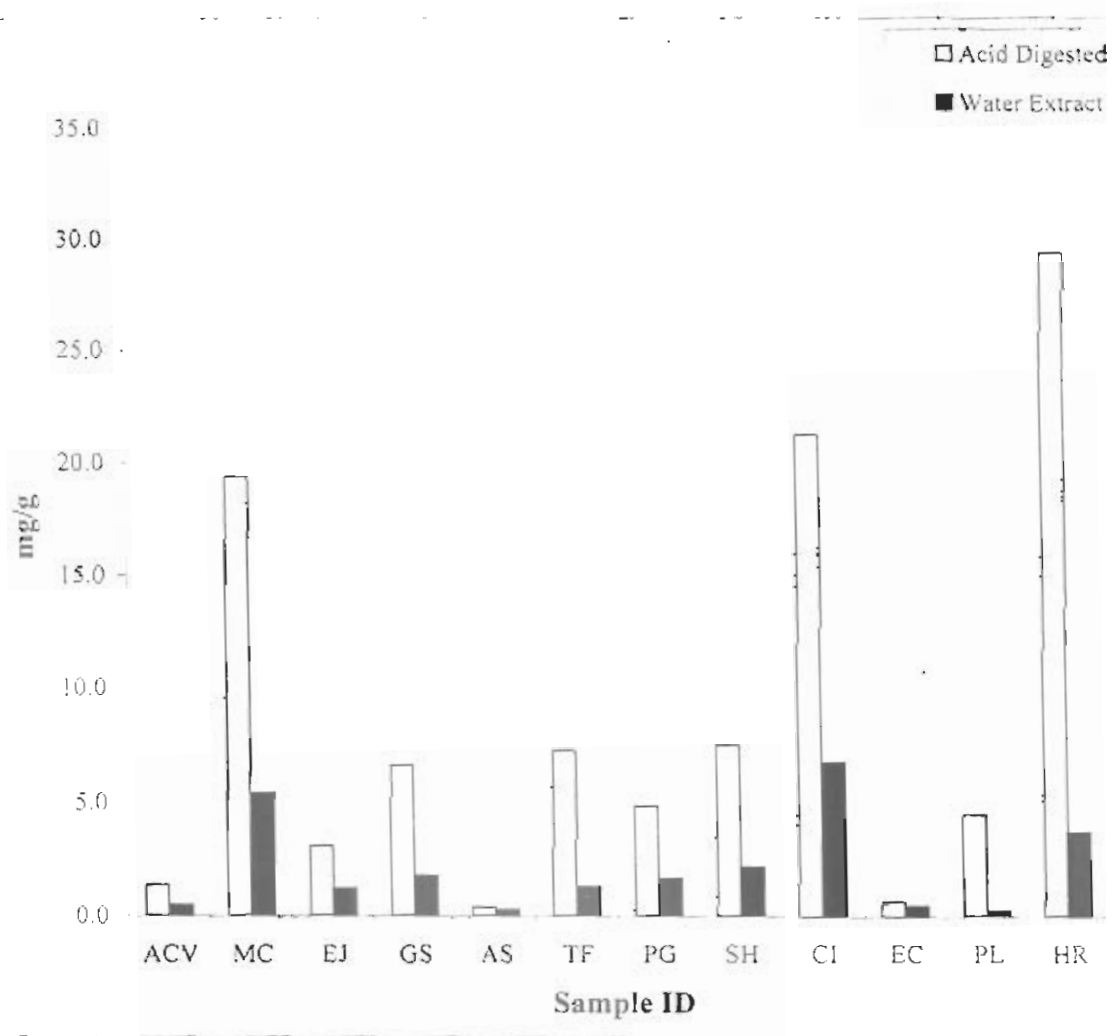


FIGURE 8.2

**Comparison of Potassium in
Water Extract and Acid Digested Samples**

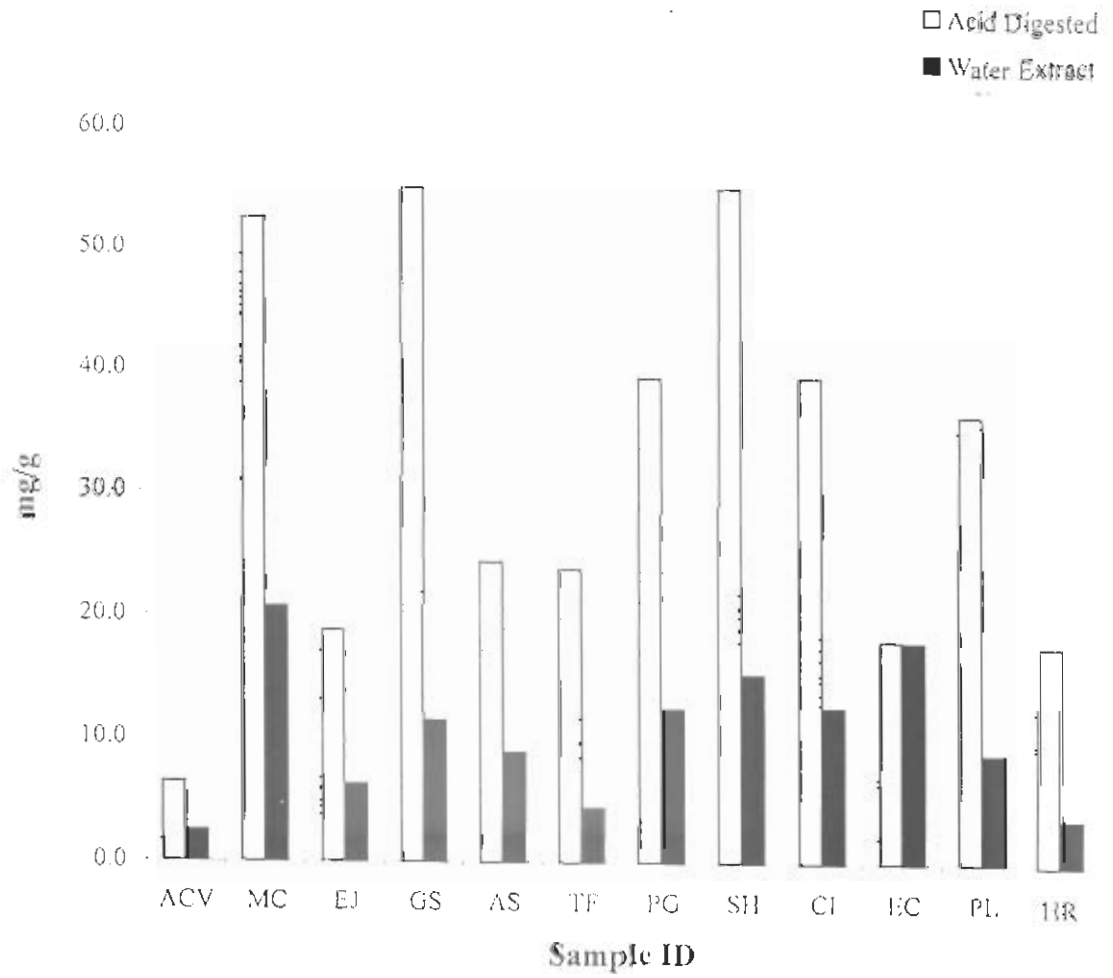


FIGURE 8.3

**Comparison of Magnesium in
Water Extract and Acid Digested Samples**

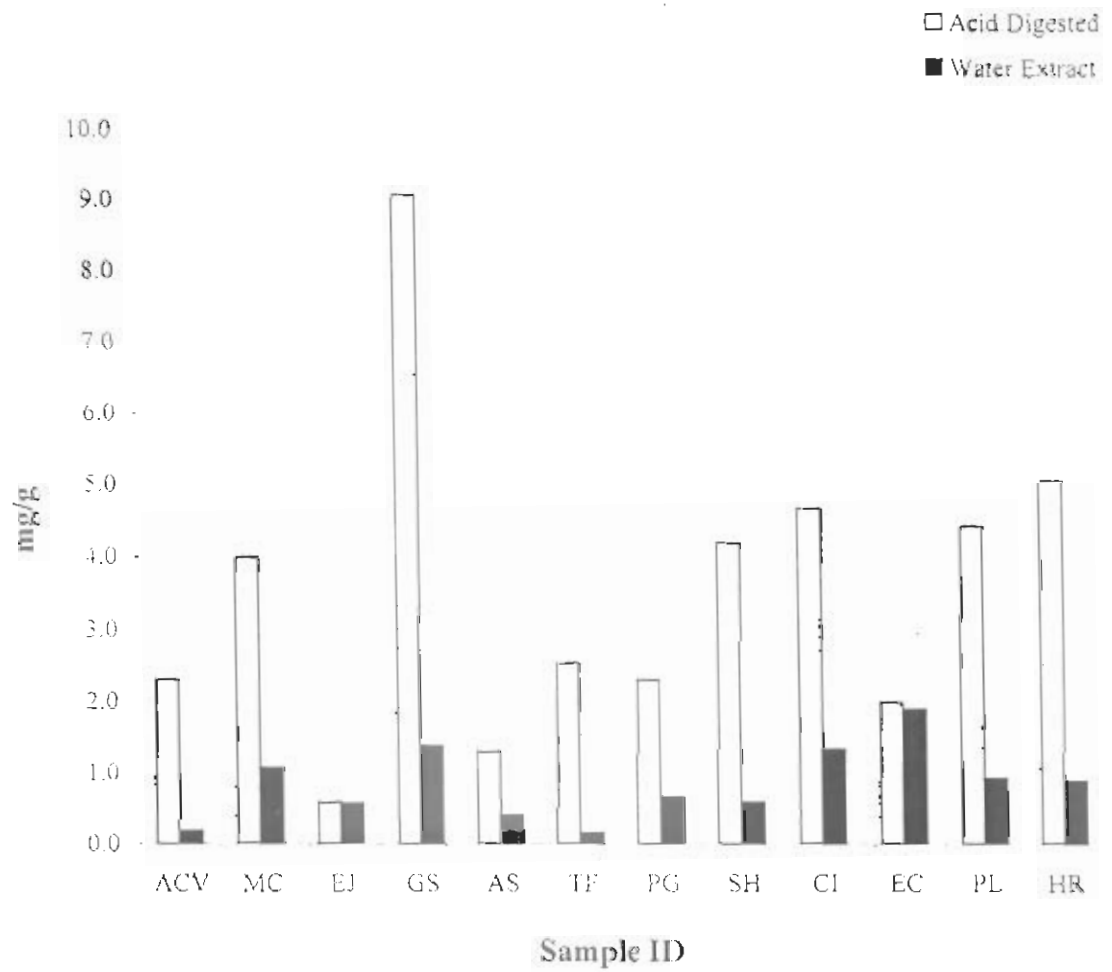


FIGURE 8.4

**Comparison of Calcium in
Water Extract and Acid Digested Samples**

