

# CHAPTER 9

## TOXIC METALS

Beside essential metals few toxic metals were also selected to study in these samples. Lead, cadmium and nickel were the principal toxic metals checked quantitatively and aluminum as a side metal was checked qualitatively. Following were the results obtained.

### 9.1 ESTIMATION OF LEAD

In acid digested samples a detectable amount of Pb was found. The range was in between 0.00050 mg/g to 0.020 mg/g. The maximum amount was observed in TF that was 0.0155 mg/g. HR, and CI also showed a reasonable amount (Table 9.1 & Fig 9.1).

Water extract of ACV and CI also showed high lead contamination. For EJ, it was interested to note that highest soluble Pb was found in this specie that is  $1.607E-03$  mg/g, most of the Pb was found water soluble (Table 9.2, Fig 9.1).

It was noted that ACV might be a rich source of lead, specially if a daily use of its water extract is continued. The toxic limit for Pb is 0.9-1.4 mg/g in blood. Continuous use may result in the accumulation of Pb in the tissue upto toxic limit.

### 9.2 ESTIMATION OF CADMIUM

It was observed that a significant amount of cadmium (0.006 mg/g) was found in ACV. Among anti-diabetic species GS, EJ and MC also had some cadmium content (the range of 0.025 mg/g – 0.006 mg/g).

EJ showed most of its cadmium content water soluble similar to the case of lead (Table 9.4 & Fig, 9.2). Toxic limit of cadmium is 0.1-3.0 mg/lit in human blood. Reasonable amount of water soluble cadmium was present in GS, EJ and ACV in

reasonable amount. In acid digested sample of MC cadmium content was (0.003 mg/g) but in water extract it was only 0.00025 mg/g.

In anti-diabetic species the minimum amount of cadmium was observed in PG and TF, however the later showed very high amount of lead in acid digested sample. The sample other than anti-diabetic herbs showed high contents of cadmium (upto 0.01 mg/g). AS showed low contents of cadmium and lead as well.

ACV was found to be a rich source of cadmium in either cases i.e. acid digested samples or water extracts.

### 9.3 ESTIMATION OF NICKEL

ACV showed very high amount of nickel in acid digested samples. Similar is the case in and PG of acid digested samples but decreasing to reasonable amount in their water extract. No appreciable amount of Ni was found in garlic and EJ. TF also showed no nickel in water soluble form. Presence of nickel was indicated in both types of extracts of MC (Table 9.5, Fig 9.3).

ACV showed very high contents of cadmium (about 0.020 mg/g) in acid digested, which decreased to 0.0010 mg/g in water extract.

Beside lead amount of nickel in ACV was also very near to toxic limit.

### 9.4 DETECTION OF ALUMINUM

Aluminum was detected qualitatively and found in all samples except PG but high in other than anti-diabetic and low in anti-diabetic herbs. Aluminum is generally non-toxic for a short time limit but its continuous use may result in the deposition of alumina in brain cell as it is lipid soluble and this can produce alzheimer's disease in older age.

## DISCUSSION

Among the selected herbs, other samples as well as ACV showed high concentration of toxic metals like Pb, Cd, Ni. These metals were found in acid digested and water extract. Pb is high in TF also but it does not have Cd and Ni in a reasonable amount. GS and EJ also contained Pb and Cd.

**TABLE 9.1****Estimation of Lead in Acid Digested Samples**

Sample ID	Quantity found mg/g	Quantity found mg/g $\times 10^3$	SD	RSD %
ACV	0.0060	6.00	0.63	0.50
MC	0.0035	3.50	0.25	4.90
EJ	0.0033	3.25	0.16	1.00
GS	0.0045	4.50	0.49	3.10
AS	0.0003	0.30	1.85	1.50
TF	0.0155	15.50	0.64	1.74
PG	0.0008	0.75	0.47	2.35
SH	0.0043	4.25	0.10	4.10
CI	0.0050	5.00	0.72	2.20
EC	0.0020	2.00	0.45	4.50
PL	0.0038	3.75	1.97	3.90
HR	0.0063	6.25	0.06	1.20

**TABLE 9.2****Estimation of Lead in Water Extract Samples**

Sample ID	Quantity found mg/g	Quantity found mg/g $\times 10^3$	SD	RSD %
ACV	0.00071	0.71	8.70	0.63
MC	0.00050	0.50	4.90	0.25
EJ	0.00161	1.61	1.00	0.16
GS	0.00052	0.52	9.40	0.49
AS	0.00073	0.73	1.85	0.20
TF	0.00075	0.75	17.40	0.64
PG	0.00021	0.21	23.70	0.47
SH	0.00045	0.45	4.10	0.10
CI	0.00018	0.18	22.20	0.72
EC	0.00014	0.14	4.50	0.45
PL	0.00037	0.37	3.90	1.97
HR	0.00049	0.49	1.20	0.06

**TABLE 9.3****Estimation of Cadmium in Acid Digested Samples**

Sample ID	Quantity found mg/g	Quantity found mg/g $\times 10^3$	SD	RSD %
ACV	0.0060	6.00	0.01	1.70
MC	0.0030	3.00	0.00	2.90
EJ	0.0025	2.50	0.01	1.20
GS	0.0033	3.30	0.02	1.30
AS	0.0015	1.50	0.00	2.50
TF	0.0002	0.20	0.00	0.20
PG	0.0003	0.30	0.01	1.10
SH	0.0008	0.80	0.01	1.30
CI	0.0010	0.95	0.01	1.30
EC	0.0035	3.50	0.03	0.80
PL	0.0066	6.60	0.04	2.10
HR	0.0095	9.50	0.00	0.90

**TABLE 9.4****Estimation of Cadmium in Water Extract of Samples**

Sample ID	Quantity found mg/g	Quantity found mg/g $\times 10^3$	SD	RSD %
ACV	0.00120	1.20	0.01	1.90
MC	0.00025	0.25	0.00	1.30
EJ	0.00190	1.90	0.01	0.60
GS	0.00060	0.60	0.02	0.70
AS	0.00062	0.62	0.00	0.60
TF	0.00001	0.01	0.00	0.90
PG	0.00000	0.00	0.01	1.20
SH	0.00020	0.20	0.01	2.80
CI	0.00020	0.20	0.01	1.20
EC	0.00011	0.11	0.03	1.50
PL	0.00040	0.40	0.04	0.50
HR	0.00050	0.50	0.00	0.30

**TABLE 9.5****Estimation of Nickel in Acid Digested of Samples**

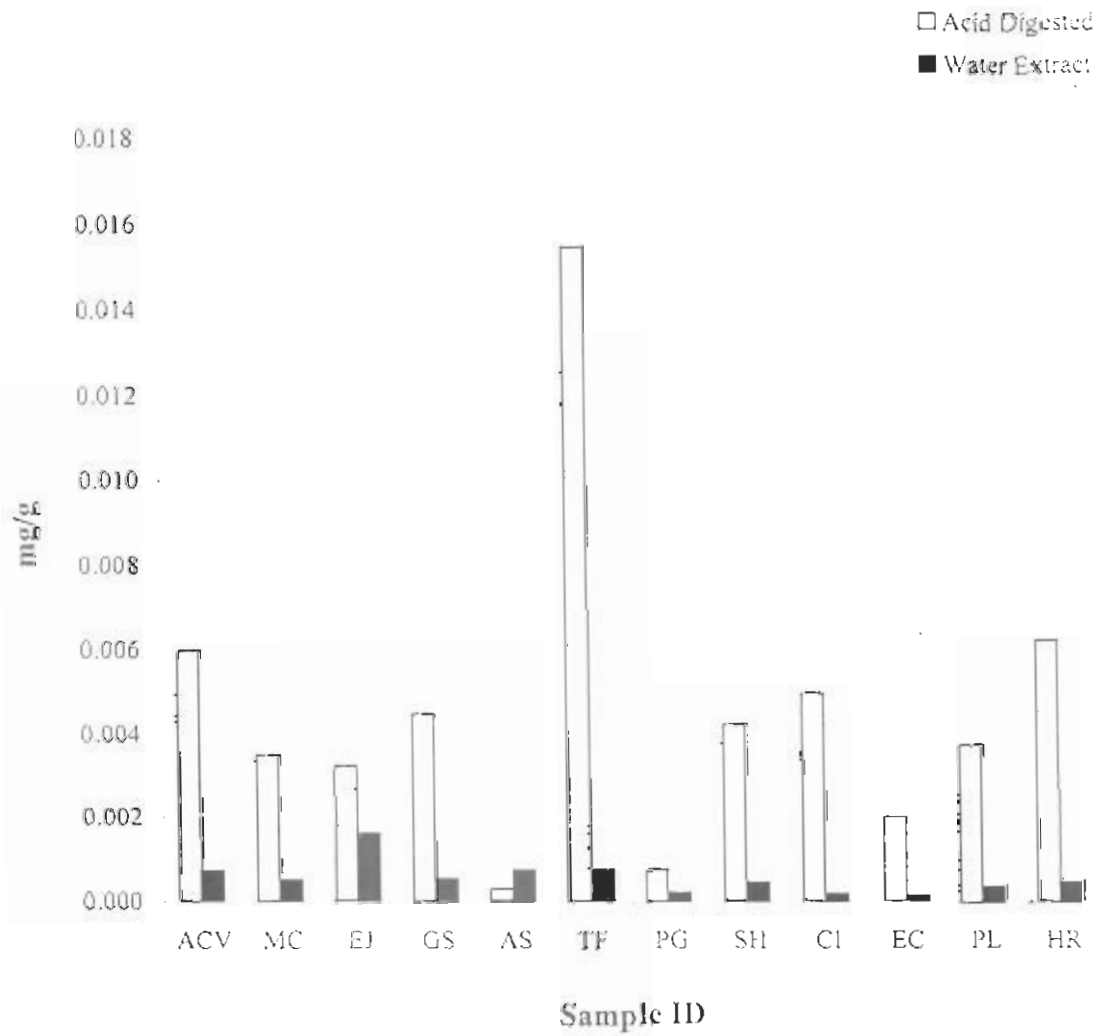
Sample ID	Quantity found mg/g	Quantity found mg/g $\times 10^3$	SD	RSD %
ACV	0.0183	183.00	0.63	0.50
MC	0.0078	77.75	0.25	4.90
EJ	0.0003	2.75	0.16	1.00
GS	0.0026	26.00	0.49	3.10
AS	0.0003	3.00	1.85	1.50
TF	0.0020	20.00	0.64	1.74
PG	0.0108	108.00	0.47	2.35
SH	0.0071	70.75	0.10	4.10
CI	0.0081	81.00	0.72	2.20
EC	0.0063	62.75	0.45	4.50
PL	0.0049	48.75	1.97	3.90
HR	0.0028	28.25	0.06	1.20

**TABLE 9.6****Estimation of Nickel in Water Extract of Samples**

Sample ID	Quantity found mg/g	Quantity found mg/g $\times 10^3$	SD	RSD %
ACV	0.00071	7.12	8.70	0.63
MC	0.00050	5.00	4.90	0.25
EJ	0.00161	16.07	1.00	0.16
GS	0.00052	5.18	9.40	0.49
AS	0.00073	7.25	1.85	0.12
TF	0.00075	7.54	17.40	0.64
PG	0.00021	2.14	23.70	0.47
SH	0.00045	4.51	4.10	0.10
CI	0.00018	1.83	22.20	0.72
EC	0.00014	1.39	4.50	0.45
PL	0.00037	3.72	3.90	1.97
HR	0.00049	4.91	1.20	0.06

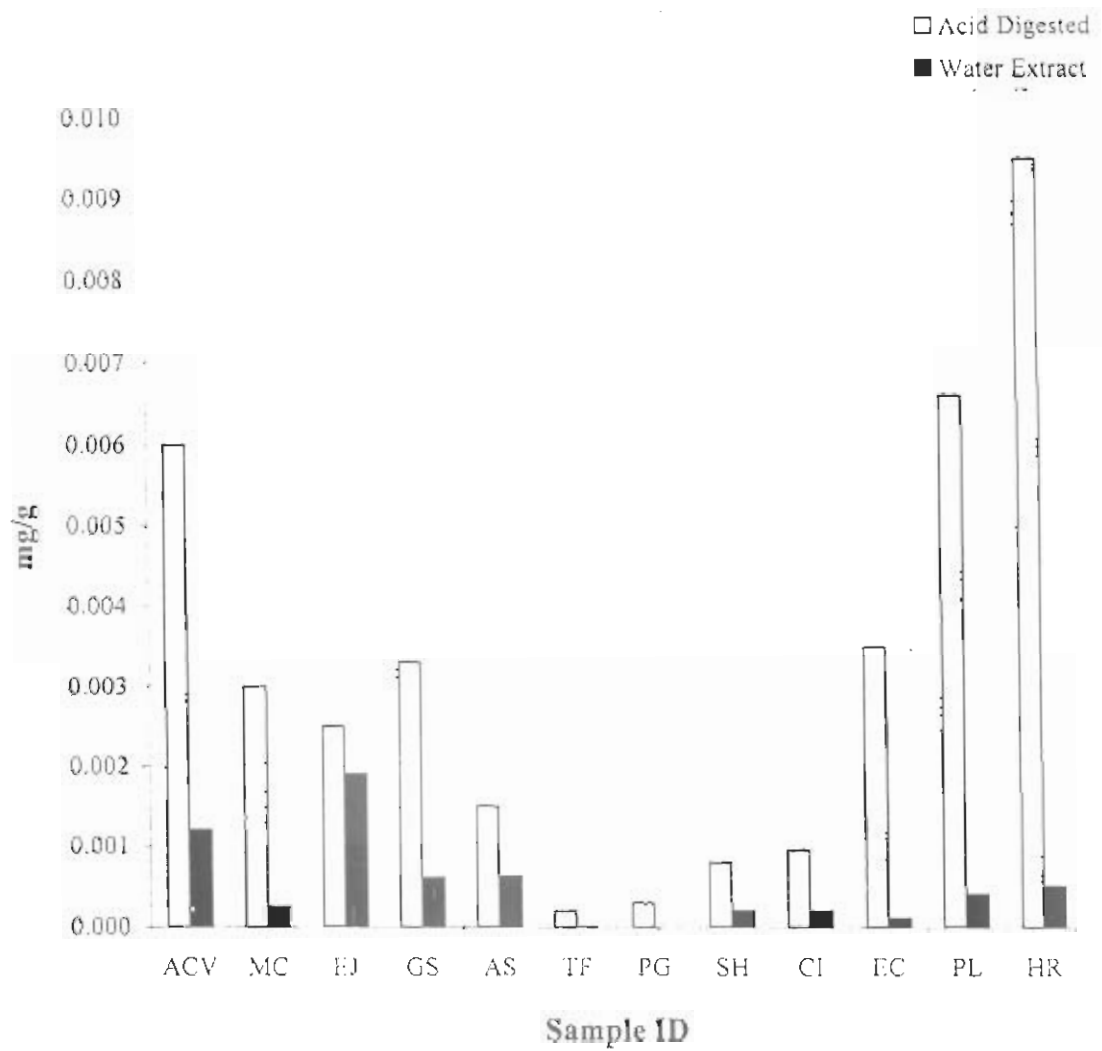
**FIGURE 9.1**

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



**FIGURE 9.2**

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



**FIGURE 9.3**

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

