Trace Elements Analysis in Some Herbal Medicines Available in Bangladesh

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Outline of the Presentation

- Herbal Medicines
- Advantages and Disadvantages of Herbal Medicines
- Concerned about the Herbal Medicines: Objective of this Study
- Methodology
- Results and Discussion
- Conclusion and Recommendation

Herbal Medicines

- Herbal medicines are plant-based medicines made from differing combinations of plant parts e.g. leaves, flowers or roots. Each part can have different medicinal uses and the many types of chemical constituents require different extraction methods. Both fresh and dried plant matter are used, depending on the herb.

- Herbal medicine is sometimes also used to refer to **Phytotherapy**, which is the alternative and pseudoscientific practice of using of extracts of plant as supposed medicines or health-promoting agents.

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Herbal Medicines

Fig 1: Some Key Ingredients and Available Herbal Products in Bangladesh.

Forms of Herbal Medicines

- Herbal Teas
- Herbal Tinctures
- **Capsules or Tablets**
- Juices
- Herbal Poultices
- Herbal Ointments
- Essential Oils

7 Advantages of Herbal Medicines

- ✓ They are cost-effective and less expensive than the medicines bought from an allopathic pharmacy.
- ✓ They can be bought without a prescription. They are available in any health store.
- ✓ They do not have negative side effects. If any, they are milder than allopathic medicine.
- ✓ Herbal medicine can help one deal with the problem of obesity very effectively without consuming much time and efforts.

Advantages of Herbal Medicines

- ✓ Herbs such as ginger, capsicum, garlic, and motherwort (mint) help to control the ailments related to blood circulation such as high blood pressure, ulcers and so on. Many of the herbal medicines are used to treat coronary artery disease, and to reduce cholesterol level in the bloodstream.
- ✓ They can be effectively used for body's natural detoxification process. Herbs such as aloe Vera, chlorella, carrot concentrate and garlic can be used to cleanse the colon, improve digestion and food absorption, and boost our immune system.

Disadvantages of Herbal Medicines

- Cure using herbal medicine and supplements would take some time. It would possess immense patience.
- They contain various ingredients, and it must be ensured that body agrees with the ingredients and is not allergic.
- Herbal medicines are known to be ineffective against serious ailments. Herbal medication cannot cure a broken hand, nor is it able to deal with heart attack related issues as effectively as an conventional doctor.

Disadvantages of Herbal Medicines

⁂ Herbal medicine has the very real risks of doing harm through self-dosing as there is lack of dosage interactions. So, it can cause the overdose or can interact with other medications due to the absence of proper dose rate.

⁂ As herbal products are not tightly regulated, consumers also run the risk of buying inferior quality herbs. Also the quality of herbal products may vary among batches, brands or manufacturers.

Concern about Herbal Medicines

Herbs may be contaminated with heavy metals during growing in the field, processing and handling. Heavy metals such as **Copper**, **Zinc**, etc. are essential metals since they play an important role in biological systems whereas metals like **Chromium**, **Cadmium**, **Lead** etc. are non-essential elements and widely considered as potential contaminants in environment. The contamination of heavy metals in herbal medicines is attribution of environmental pollution and can pose serious health issues to the consumer.

Objective of this Study

In Bangladesh the level of marketing as well as use of Herbal medicines and other natural health care products are increasing very rapidly. So, it is important to have quality medicinal herbs in order to protect consumers from contamination. It is of major interest to establish the levels of some metallic elements in some herbal medicine because, at elevated levels these metals are dangerous and toxic.

The aim of this study was to evaluate the trace metals content of some commercially available herbal medicine products (tablets and capsules) in Bangladesh.

Methodology

14 different tablet and capsule samples were collected from different pharmacies of Savar, Dhaka. The manufacturers were Hamdard Laboratories (WAQF) Bangladesh, Astro Pharmaceuticals Limited, Square Pharmaceuticals Limited, Ibn Sina Pharmaceutical Industry Limited and Sanj Bangladesh (Unani).

Fresh samples were oven dried at 80^0C for 6 hours. All samples were crushed, sieved and stored in plastic bags.

Methodology

- All the glasswares were cleaned with detergent and 5% nitric acid solution and rinsed thoroughly with deionized water before use.
- 1g of each sample was digested using concentrated Nitric acid and Perchloric Acid mixture (HNO_3:$HCLO_4$ = 4:1) on a digital hotplate at 90^0C. After the solution became transparent and volume reduced to 2-3 mL, it was kept for cooling. Then the solution was filtered using Whatman 42 filter paper and the final volume of each sample was 25 mL.
- This method was repeated for three times for each element to obtain an accurate and precised result.

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Methodology

- Flame Atomic Absorption Spectrophotometer (Shimadzu AA-6800) was used to quantify the heavy metals (Cu, Zn, Cd, Cr and Pb) in medicine samples.
- Before running the samples a standard calibration curve was prepared for each element ranging from 10-2000 ppb. And these standards were prepared from Certified standards of AAS (Manufacturer Wako, Japan).

Fig 2: Shimadzu AA-6800

Results and Discussion

Table-1: Operating Parameters of FAAS for the analysis of following metals.

Parameter	Cd	Pb	Cr	Cu	Zn
Wavelength(nm)	228.8	283.3	357.9	324.8	213.9
HCl current (mA)	8.0	10.0	10	6.0	8.0
Acetylene flow rate (L/min)	1.8	1.6	2.2	1.8	2.0
Slit(nm)	1.0	1.0	0.5	0.5	0.5

Table-2: Concentration of Heavy metals in different Herbal Medicines.

Sample code	(Cu) (µg/g)	(Zn) (µg/g)	(Cd) (µg/g)	(Cr) (µg/g)	(Pb) (µg/g)
T-1	1.52	1.89	0.39	16.76	N.D
T-2	1.33	3.42	0.35	19.63	N.D
T-3	4.05	6.46	0.21	16.63	1.14
T-4	5.23	7.57	0.20	22.83	N.D
T-5	4.00	16.68	0.42	35.18	3.06
C-6	3.01	10.39	0.18	15.59	0.43
C-7	0.37	6.81	0.37	17.27	N.D
C-8	1.10	5.01	0.63	17.18	N.D
C-9	1.18	5.23	0.41	15.49	0.56
C-10	2.23	10.04	0.58	17.26	0.51
C-11	6.24	52.37	1.03	22.24	0.57
C-12	2.59	16.98	0.54	21.08	N.D
C-13	0.41	4.26	0.63	14.98	N.D
C-14	1.79	11.3	0.67	18.62	N.D
Minimum	0.37	1.89	0.20	14.98	0.51
Maximum	6.24	52.37	1.03	35.18	3.06
Average	2.42	11.32	0.47	19.33	1.71

ND: Not Detected , Here, Limit of Detection of Pb is **0.005 ppm**

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Results and Discussion

Table-3: Acceptable Limits of Heavy Metals in Herbal Medicines.

	Cu (µg/g)	Zn (µg/g)	Cd (µg/g)	Cr (µg/g)	Pb (µg/g)
Canada			0.3	2.0	10
FAO/WHO	20	50	0.3	2.0	10
HSA Singapore	150		0.05		20
China Pharmacopoeia	20		1		10
US FDA/WHO	20	50	0.3		10

FAO: Food and Agricultural Organization
WHO: World Health Organization
HSA: Health Science Authority Singapore
US FDA: United States agency of Food and Drug Administration

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Results and Discussion

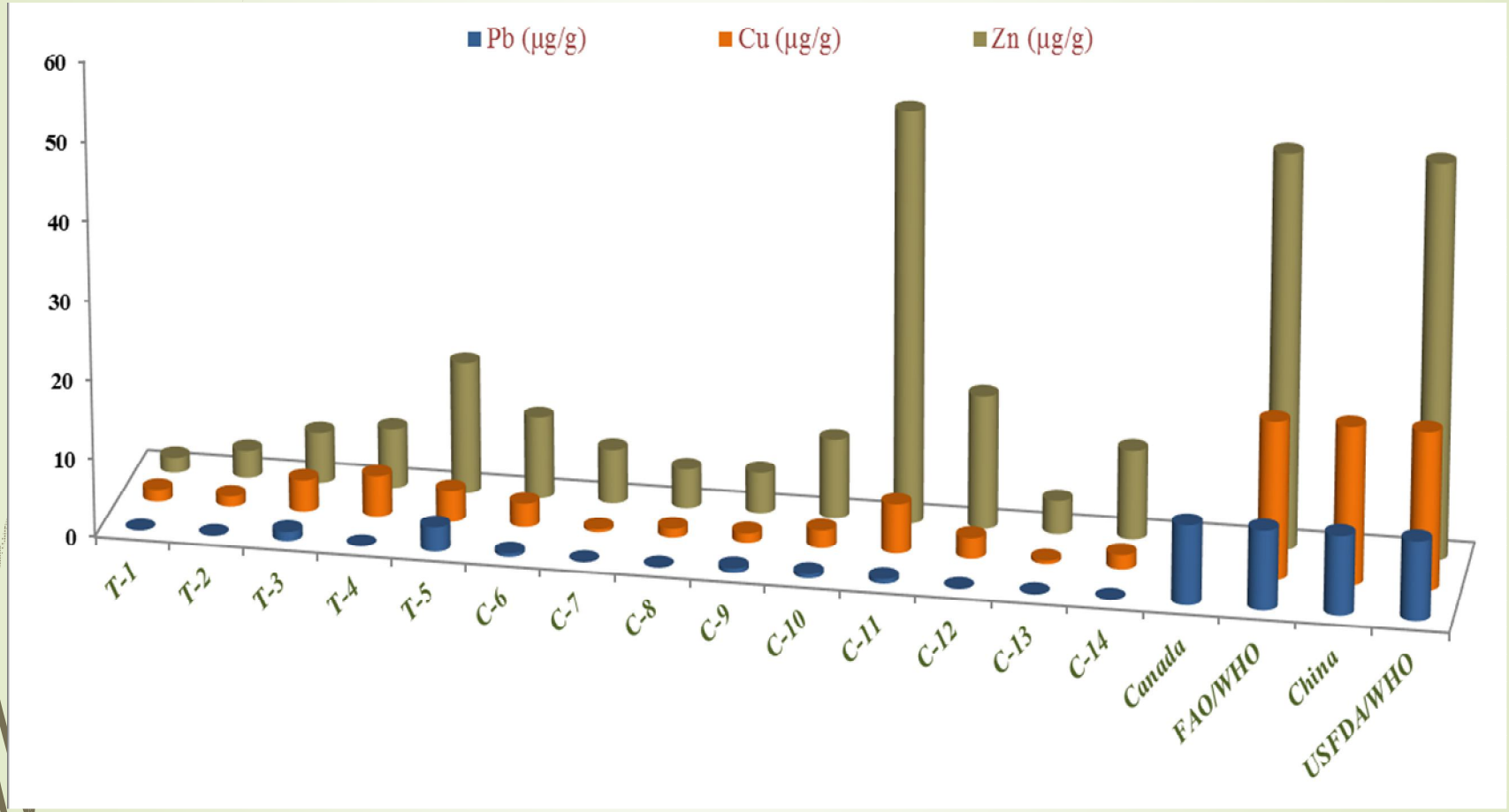

Fig 3: Comparison of Pb, Cu and Zn Concentration in Herbal Medicines with Some Standards.

Results and Discussion

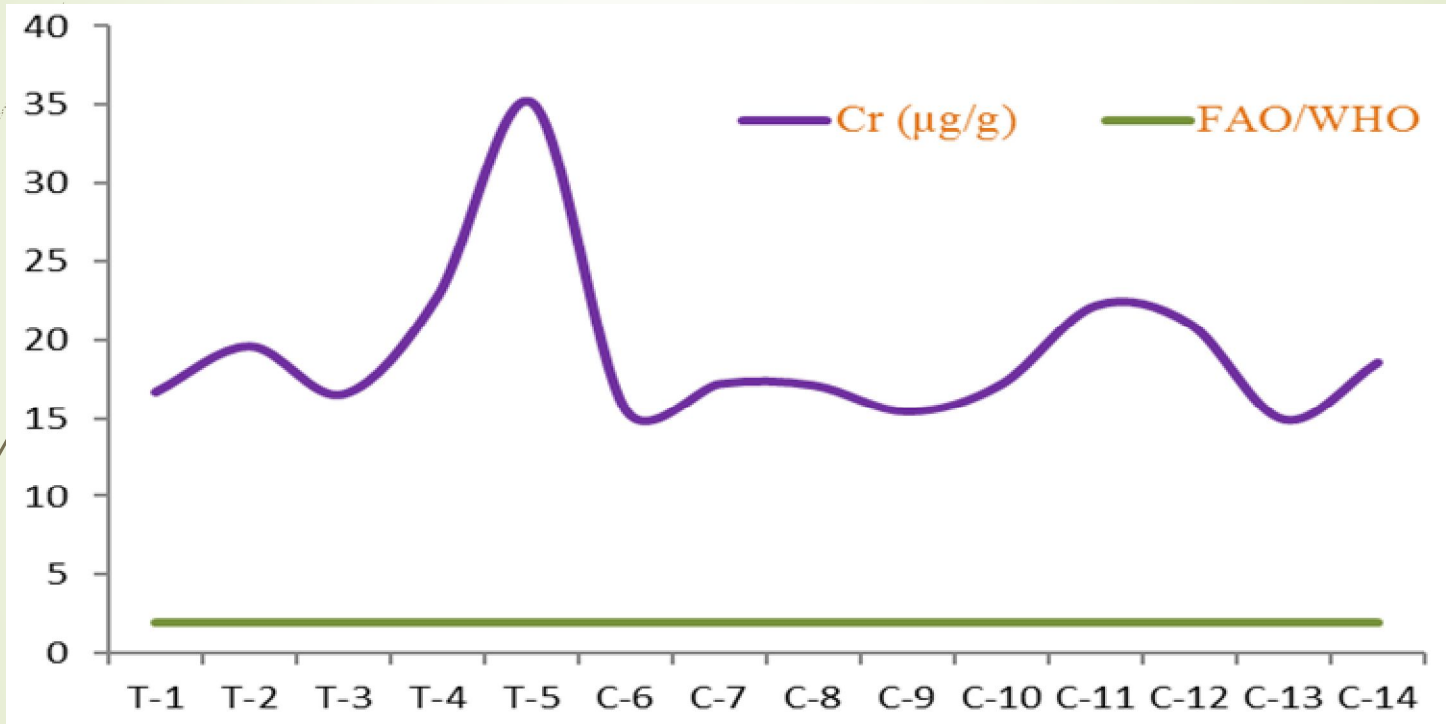

Fig 4: Chromium Concentration in Herbal Medicines in contrast to the FAO/WHO and USFDA Standards.

Results and Discussion

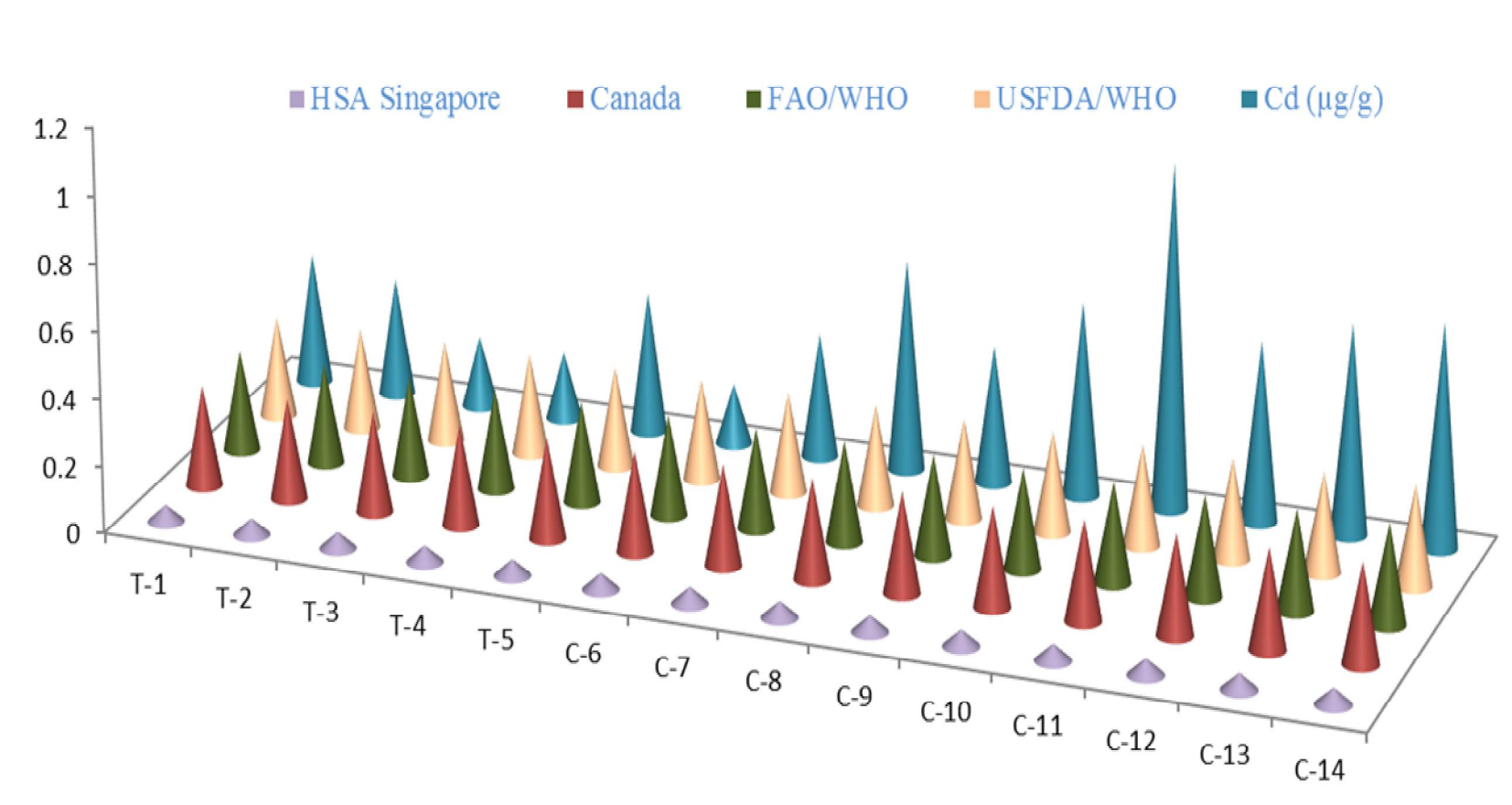

Fig 5: Cadmium (Cd) Concentration in Herbal Medicines

Results and Discussion

Table-4: Correlation Co-efficient Calculation of Cu, Zn, Cd, Cr and Pb in all samples.

	Cu	*Zn*	*Cd*	*Cr*	*Pb*
Cu	1				
Zn	0.69018	1			
Cd	0.09694	0.68622	1		
Cr	0.52072	0.37364	0.06446	1	
Pb	0.40362	0.21852	-0.0995	0.75439	1

Conclusion

- The concentration of Cu, Zn, Cd, Cr and Pb in all collected herbal medicine samples were measured using FAAS and the results were compared with different standards like WHO, FAO, USFDA, HSA Singapore, China Pharmacopoeia and Canada National Standard for finished herbal products.
- It has been seen that concentration of Cu, Pb and Zn (except one for zinc) in all medicine samples were well below the permissible limit of different standards.
- Chromium in all samples and Cadmium in most of the samples were far above the standards which is very alarming.

Conclusion

- Chronic exposure to cadmium affects the kidney, lungs, and bone. Other consequences of Cadmium exposure are anemia, yellow discoloration of the teeth, rhinitis and loss of the sense of smell etc.
- Chromium is an essential trace element required for the maintenance of normal glucose tolerance. Chronic poisoning can cause gastrointestinal irritation, nausea, vomiting, diarrhea, vertigo, fever, muscle cramps, renal failure, intravascular hemolysis,, liver damage and coma, and even death, depending on the dose.
- Correlation between Cu-Zn, Zn-Cd, Cr-Cu and Pb-Cr is more than +0.5 and indicate strong linear association between them.

Recommendation

- In Bangladesh there is no strict regulation for the quality control of herbal medicines or there is no permissible limit of heavy metals in these medicines. So, regular monitoring should be required to make a database of heavy metal constituents in herbal products.
- Public enlightenment should be organized on the harmful effects of excessive or extensive and unprescribed use of natural health care products.

Thank You All


Any
Question
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