

Multielemental Studies of Polluted Water of Peshawar Valley (N.W.F.P.) Pakistan

¹M. S. KHAN*, ¹S. KHAN, ¹I. KHAN, ¹AMINURRAHMAN AND ²Y. IQBAL

¹National Centre of Excellence in Physical Chemistry
University of Peshawar, Pakistan

²Department of Chemistry
University of Peshawar, Peshawar, Pakistan

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Summary: Studies were undertaken to analyze different water samples of industrial states such as (i) Hayat Abad (ii) Gadoon Amazai and (iii) drinking water of Peshawar city and its adjacent areas in the NWFP, Pakistan. Collected samples were analyzed for different heavy metals (Pb, Zn, Cu) etc. Seasonal variations were checked by sampling in winter and summer seasons. Various concentrations of heavy metals showed seasonal changes. The concentrations of metals were evaluated and their implications discussed.

Introduction

Environmental pollution is a world wide problem. The developed nations are increasingly adding informations to the bank data knowledge of environmental pollution. Modern instrumentation and sophisticated methods of investigations are the gadgets to solve environmental problems. In Pakistan, however, strenuous efforts are required to analyse the increasingly deteriorating environmental issues.

Allah says " that We have created all the things living from water [1]." Water is life blood. The quality of water varies widely and one type suitable for one purpose may be unsuitable for another one [2]. About 97%of water is consumed in irrigation for agriculture. The surface water is contaminated with run off water from agricultural fields containing

pesticides, fertilizers, soil particles. Water polluted with human activities may contain disease germs, viruses and is not safe for drinking, swimming etc. [3]. Water pollutants from industries like acids, bases, heavy metals etc. are toxic to environment and is unfit for consumption [4].

The impact of heavy metals on drinking water containing traces of these metals is dangerous for health in the long run. The metals Pb, Cd, Hg etc. are particularly deemed to be undesirable which enter into water through different sources [5]. The above mentioned facts show the importance of the water quality assessment especially in terms of heavy metals.

Different workers have studied water pollution of this area, but a systematic study is lacking,

*To whom all correspondence should be addressed.

This research paper is dedicated in honor of great scientist of Pakistan and Muslim World, Prof. Dr. Atta-ur-Rahman, on his birthday.
Dr. M. Saleem Khan

furthermore Gadoon Amazai area in the Peshawar valley has not been studied [6,7,8,9 and 10].

We feel that metals are increasingly entering to the water of Peshawar valley due to industrial states in the area as well as the urbanization of the valley. This emphasises to check the water quality for heavy metals and an urgent need is required to study the present status of water quality for elemental assessment and to know the concentration of heavy metals.

The present investigation was undertaken to analyse and assess the amount of various heavy metals in the water of Peshawar valley, which has a population of about 4-5 million. Industrial effluents from industrial areas adjoining the valley were also included in the present study. The effect of changing season on the quality of these metals was also desired.

Project Location and Flow Area

Two main industrial sites (i) Hayat Abad, (Peshawar) and (ii) Gadoon Amazai (district Swabi) and drinking water of the valley were selected for study. Fiftyfour water samples were collected from the selected areas. The water samples were collected in polyethene bottles from the main streams and protected by covers tightly. The temperature and pH of the samples were measured on the spot. The samples collected were kept in three groups (i) Hayat Abad industrial state sample, number 1-9 (ii) drinking water of Peshawar city and its adjacent areas sample number 10-34 and (iii) Gadoon Amazai industrial state sample number 35-54.

The water flow of Hayat Abad is from South-West to North-East, crossing Hayat Abad town, Kacha Garhi (Refugees camp), West of Peshawar University area, Peshawar City and at last is discharging to River Kabul. Both the river Kabul and Indus joins at Attock (Kund).

The effluent of Gadoon Amazai are flowing from Northern mountainous area to Southern residential and agricultural area. The effluent at last discharge into river Indus crossing some big towns, like Topi and Kotha. (Fig. 1 for project area and table 2 for details). Topi and Kotha. (Fig. 1 for project area and table 2 for details).

Results and Discussion

Heavy Metals

The concentration of the different heavy metals of the different zones are shown in the bar graphs, with the names of the samples and comparison of national environmental quality standards (NEQS) for water

The concentration of Pb, Ag, Co and Cd is less than 0.05 ppm in all the samples of the three zones in both the seasons of winter and summer, so they are not a cause of concern now.

Copper

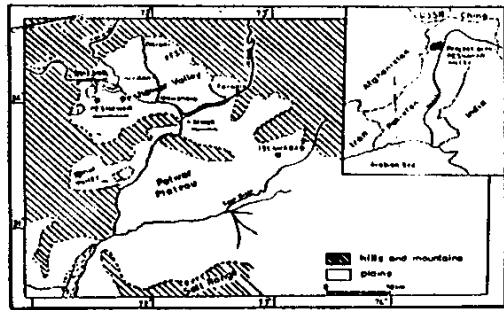
The concentration of Cu is less than 0.05 ppm in almost all of the samples. Only sample number 31 of Spin jumaat of zone (ii) of Peshawar city and its adjacent area has 0.08 ppm Copper concentration, samples numbers 37, 38, 41 and 43 of Hayat steel, Sarhad iron and steel, crank shaft and Majid soap in (iii) of Gadoon Amazai industrial area show Copper concentration of 0.1, 0.11 and 0.12 ppm respectively. Sample number 37, Hayat steel, show higher concentration due to metal handling,

The winter concentration of sample number 40 and 41 of mixed crank shaft and 10 meter forward is 0.3 and 0.5 ppm respectively and is higher than the summer season's samples.

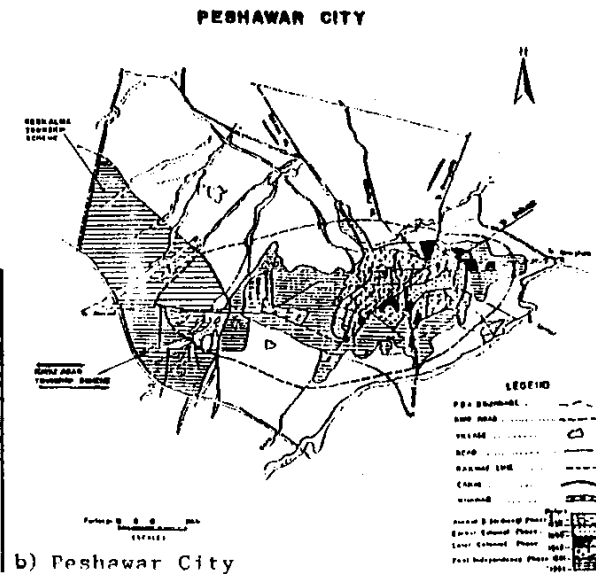
Manganese

Samples number 3, 4, 7 and 9 of Kohi Sufed marble factory, Spinzar absorbant cotton factory, combined stream towards residences and main stream out side Hayat Abad in zone (i) have manganese concentration from 0.1 to 0.18 ppm. In zone (ii) of Peshawar region samples bearing numbers 14, 22 and 32 of civil quarter chowk, new bus stand canal and Kabul river at Michini rest house show 0.23, 0.24, and 0.3 ppm concentration of manganese respectively. And in zone (iii) of Gadoon Amazai samples number 41 and 44 of mixed crank shaft and Jani's petrochemicals have 0.14 0.16 ppm manganese concentration. The remaining samples show less than 0.05 ppm concentration.

The concentration of manganese in winter season is maximum as compared its concentration in the summer season probably due to the less dilution of effluents

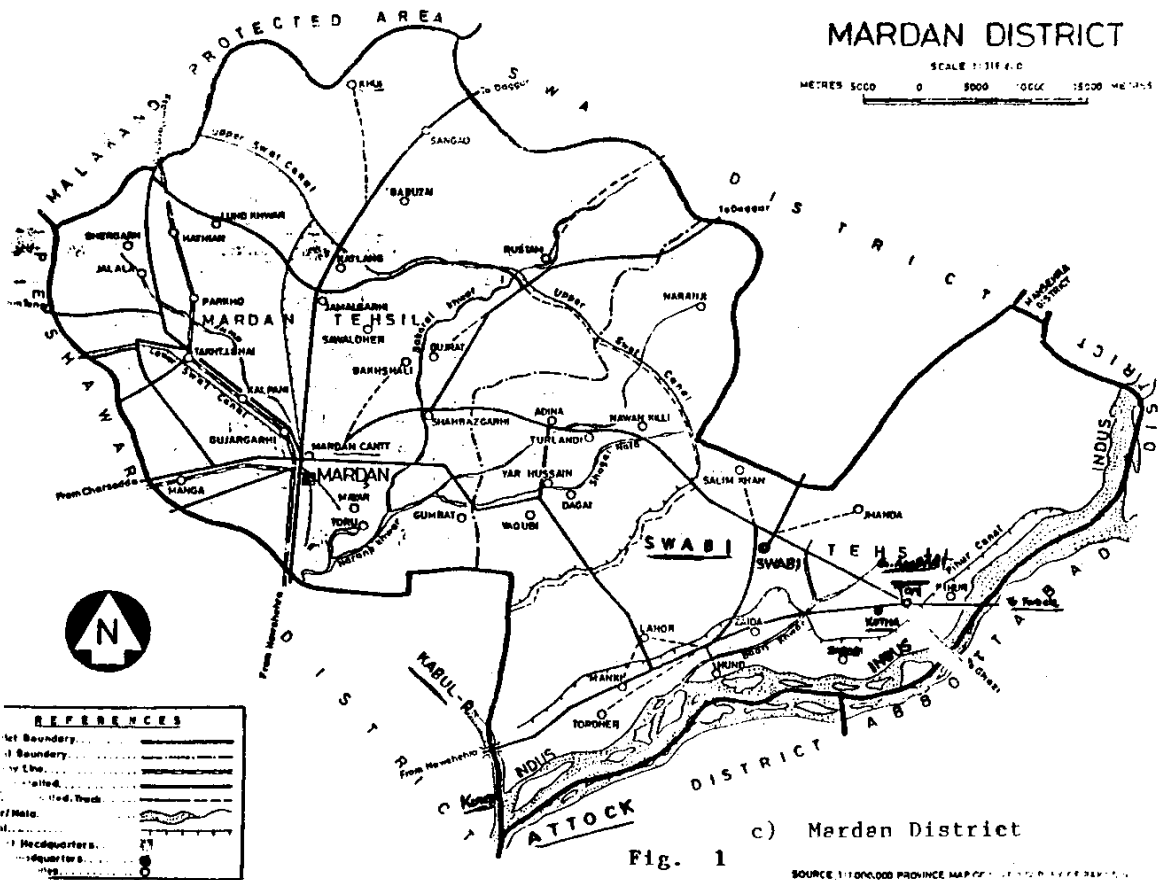


a) Peshawar Valley



b) Peshawar City

ANNEXURE - 1



c) Mardan District

Fig. 1

SOURCE: 1:100,000 PROVINCE MAP OF PAKISTAN, 1977, DEPT. OF SURVEY

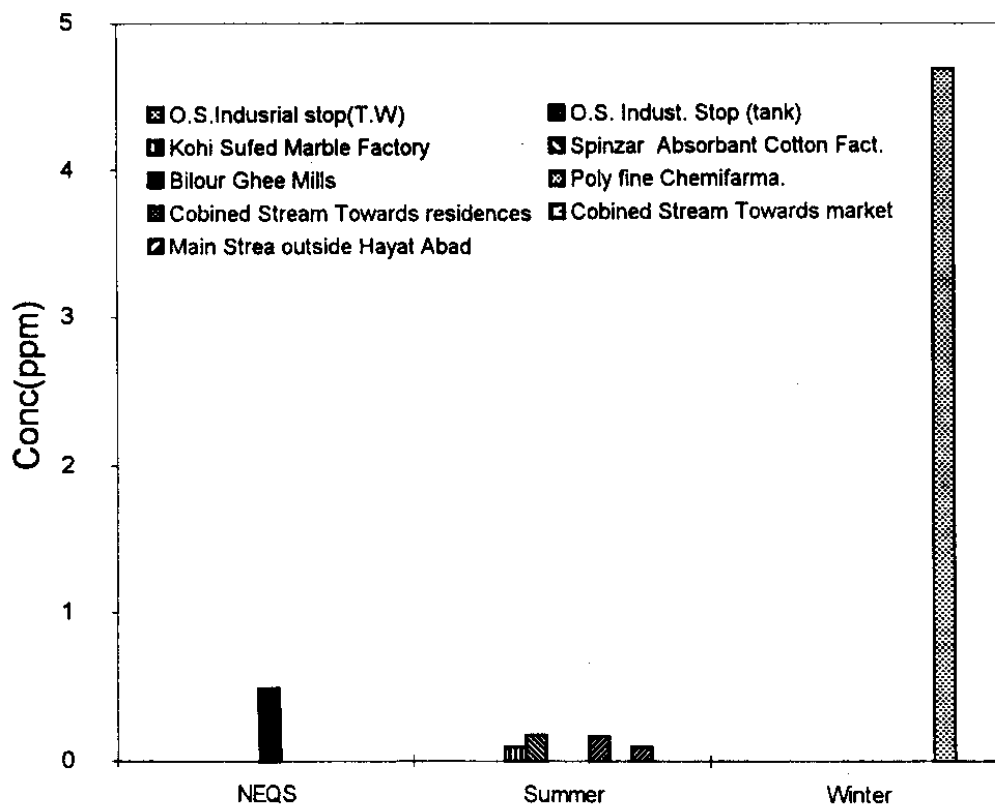


Fig. 2: Zn Comparison Hayatabad Ind. State Peshawar

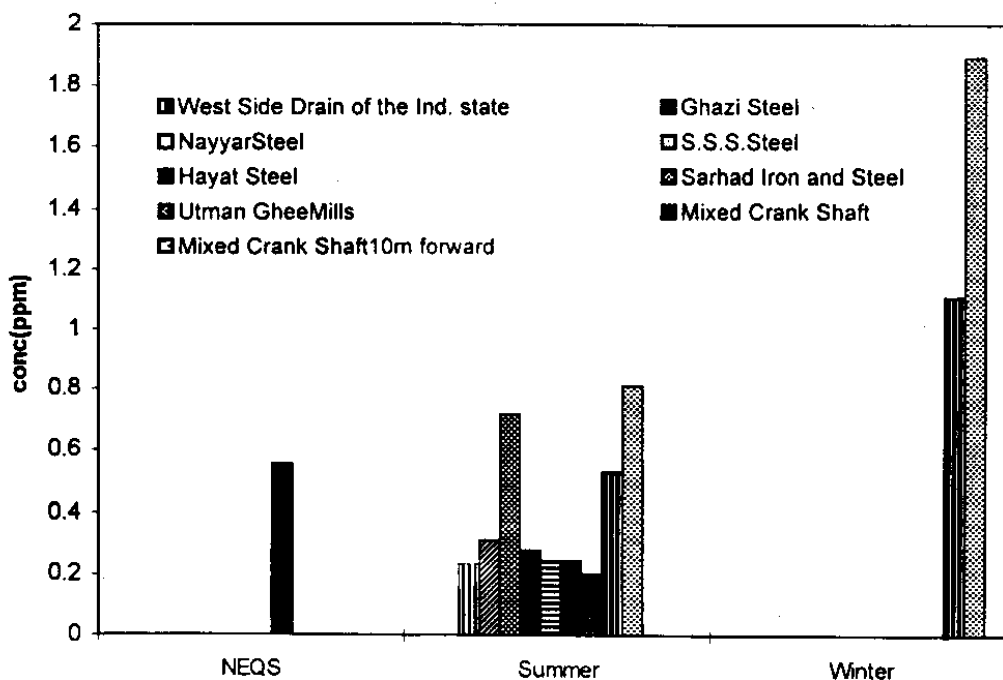


Fig. 3: Zinc comparison Ind. State Godoon Amazai

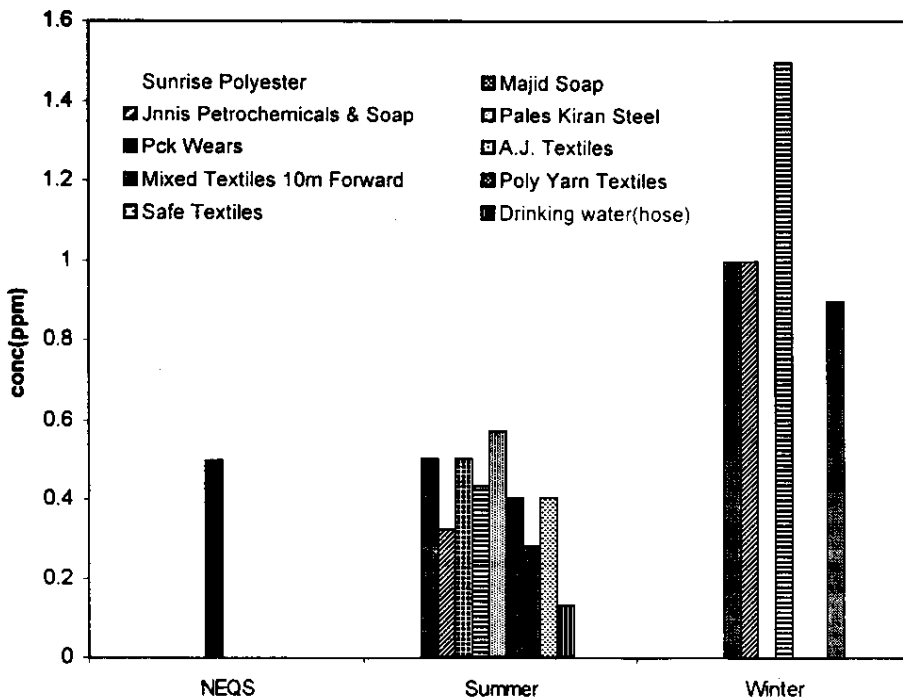


Fig. 4: Zinc Comparison Ind. State Gadoon Amazai

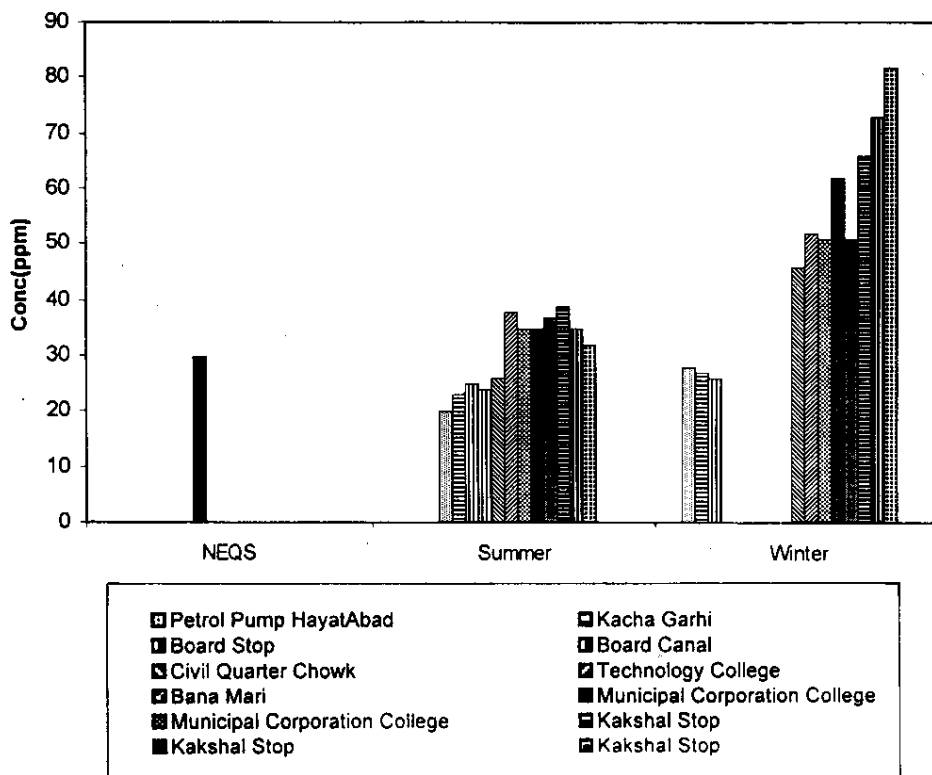


Fig. 5: Mg. Comparison Peshawar city and adjacent areas.

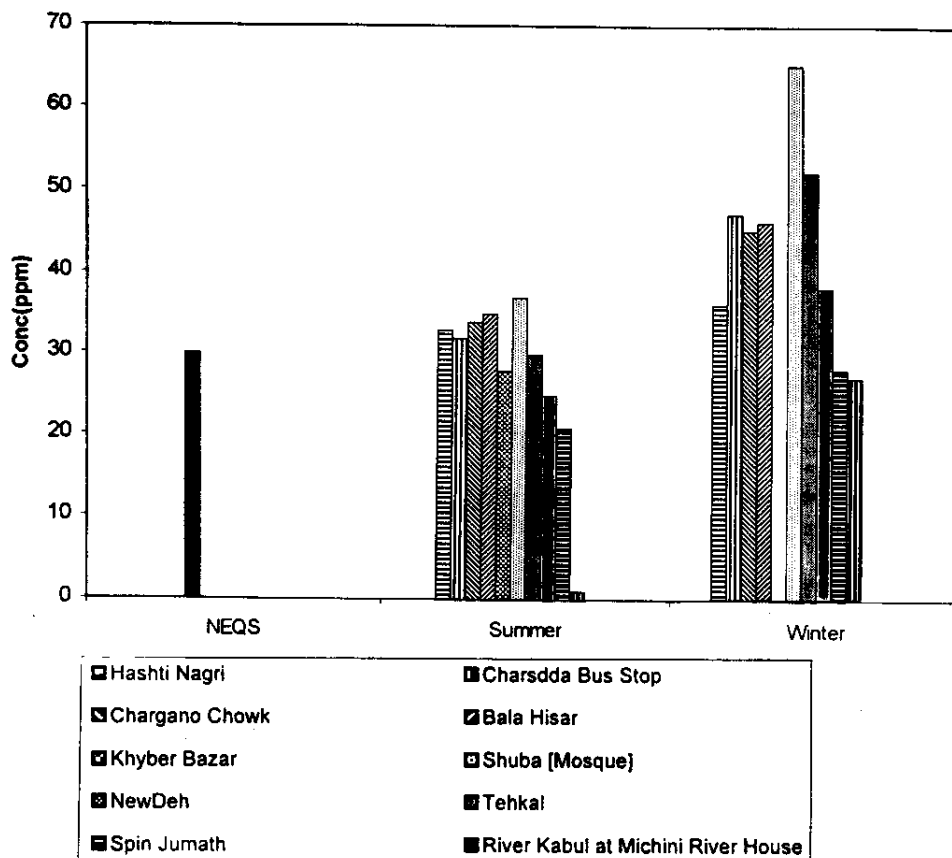


Fig. 6: Mg Comparison Peshawar city and adjacent areas.

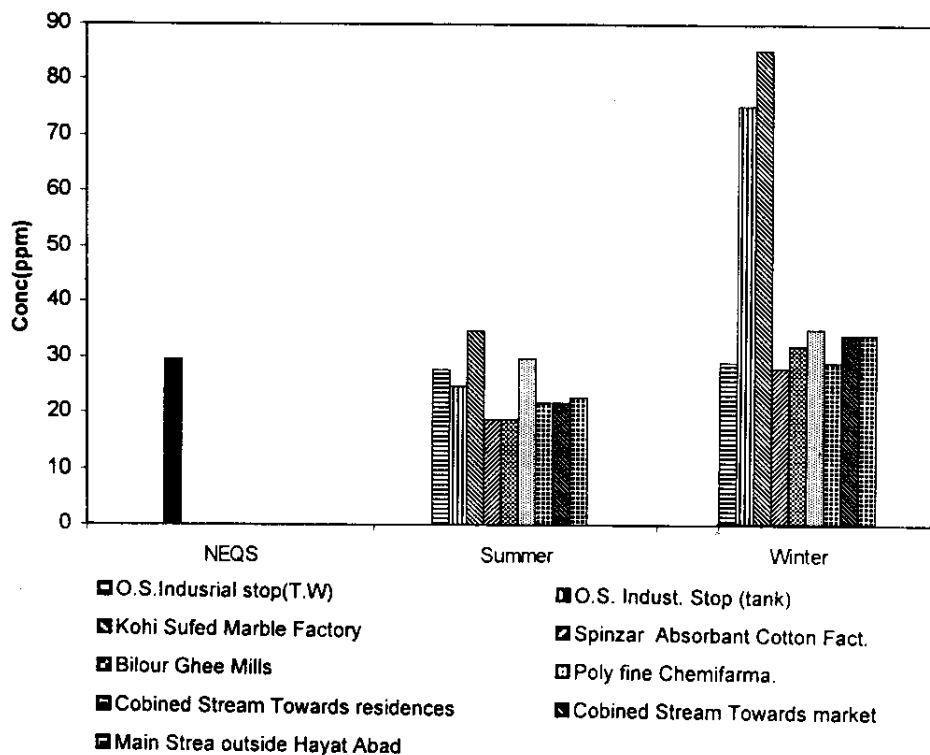


Fig. 7: Mg Comparison Havatabad Industrial State Peshawar.

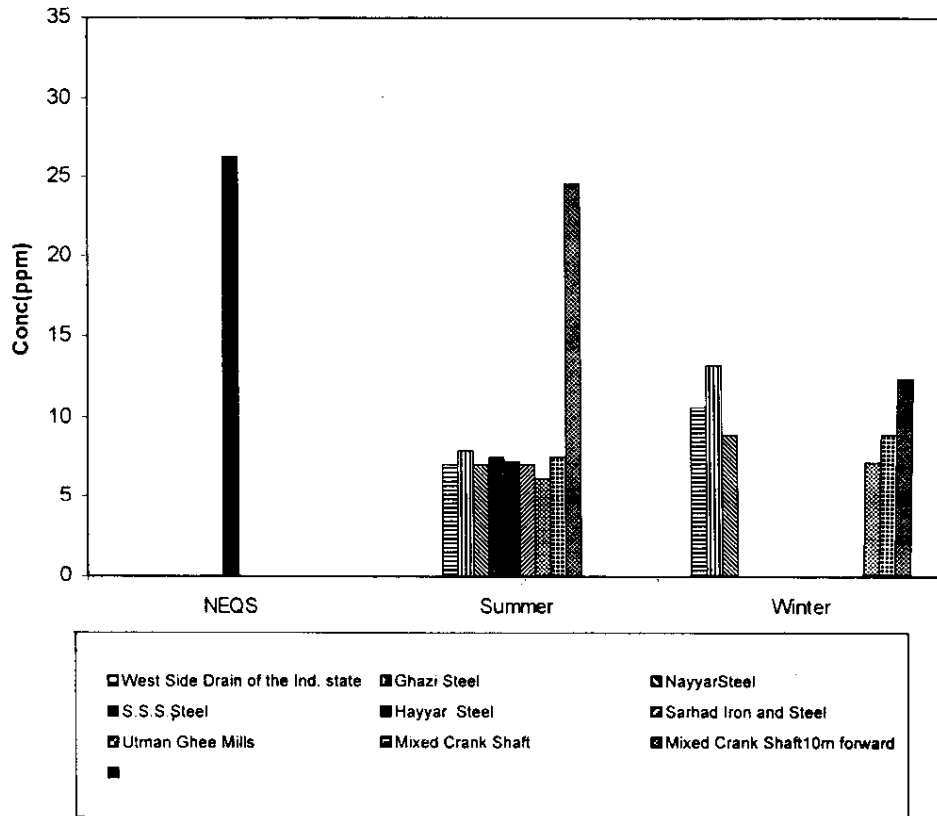


Fig. 8: Comparison Ind. State Gadoon Amazai

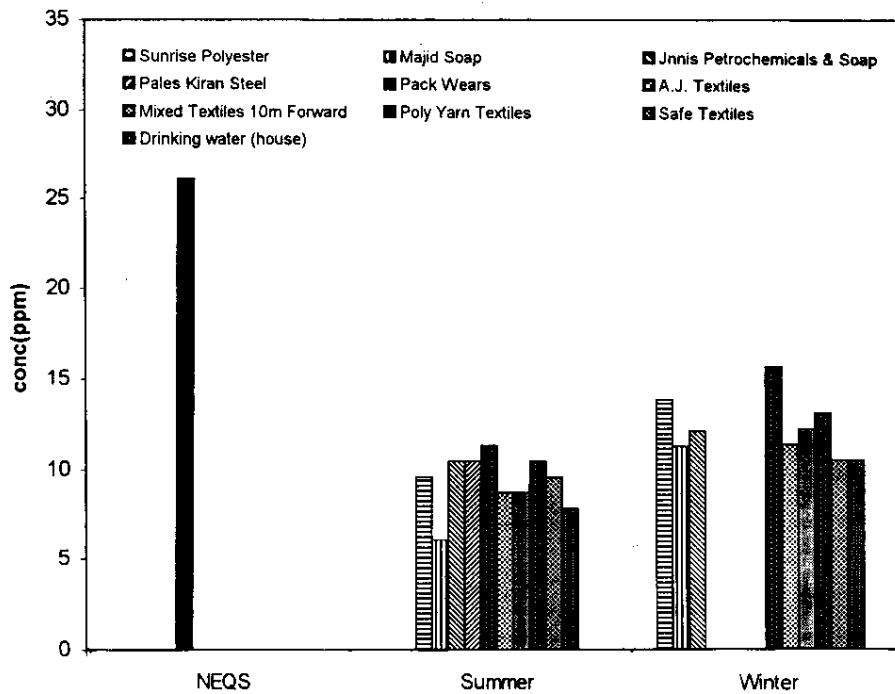


Fig. 9: Mg-Comparison Ind. State Gadoon Amazai

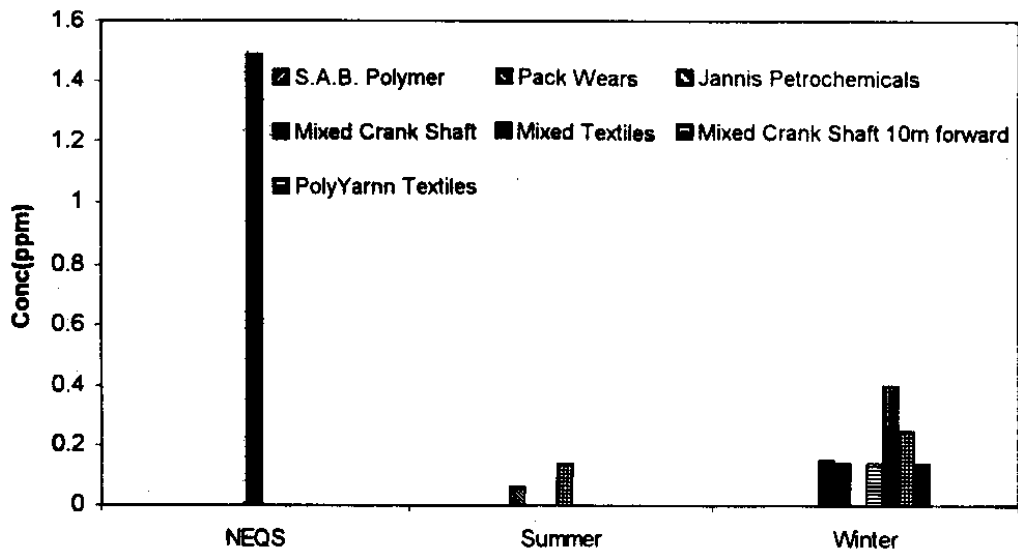


Fig. 10: Mg Comparison Ind. State Gadoon Amazai.

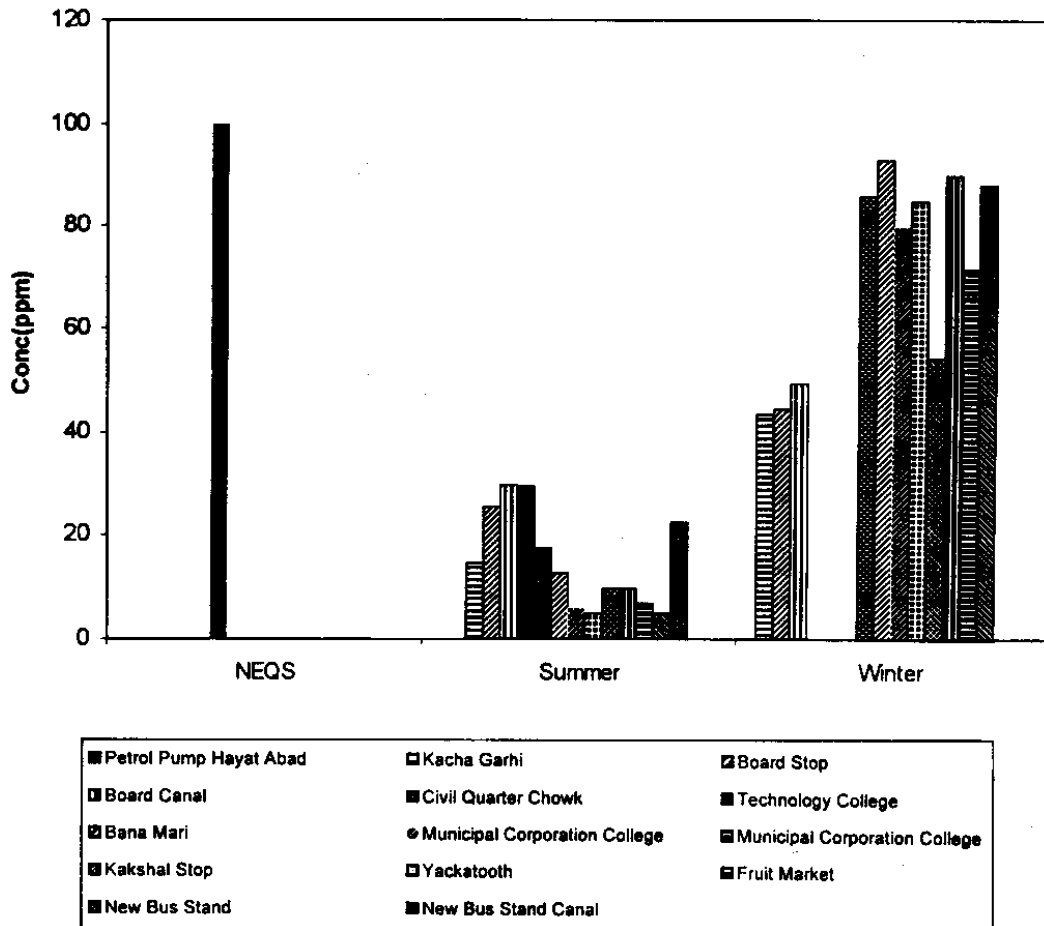


Fig. 11: Ca. Comparison Peshawar city and adjacent areas.

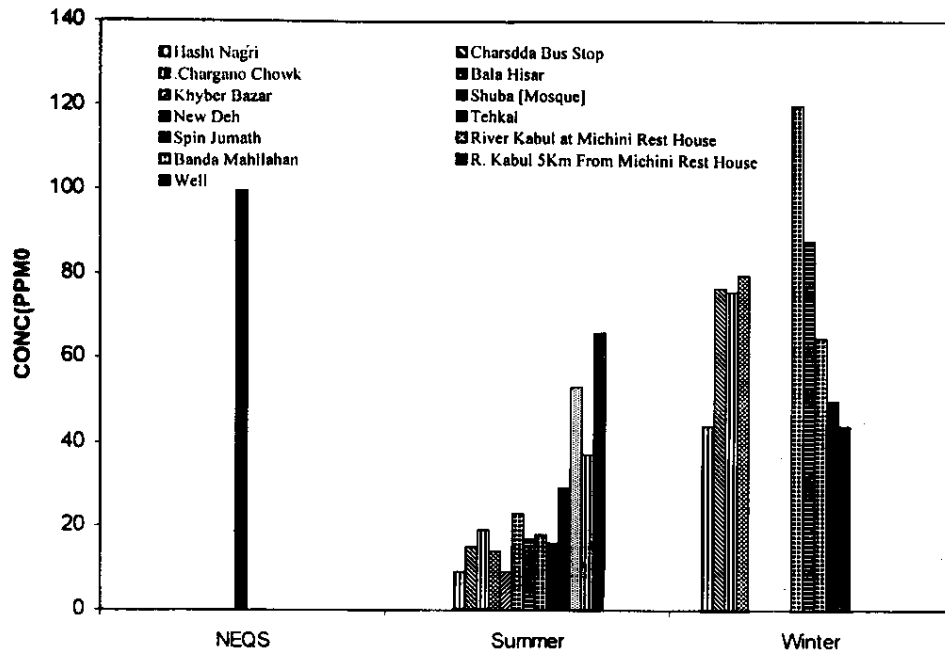


Fig. 12: Ca Comparison Peshawar city and adjacent areas.

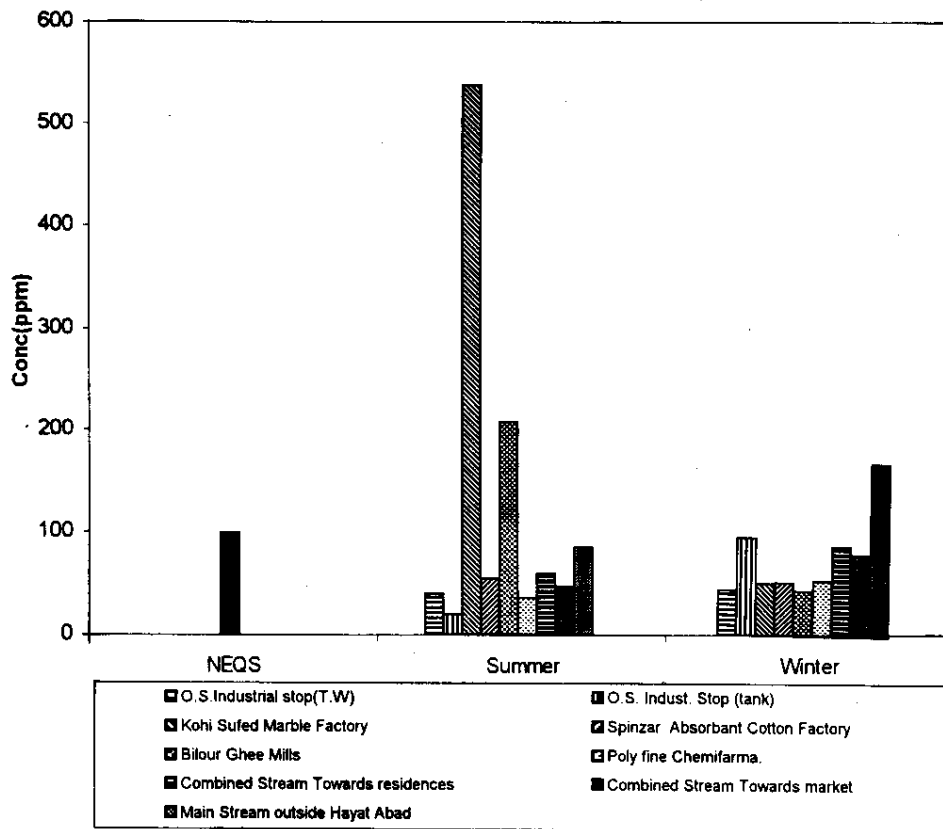


Fig. 13: Ca cComparison Havatabad Industrial state Peshawar

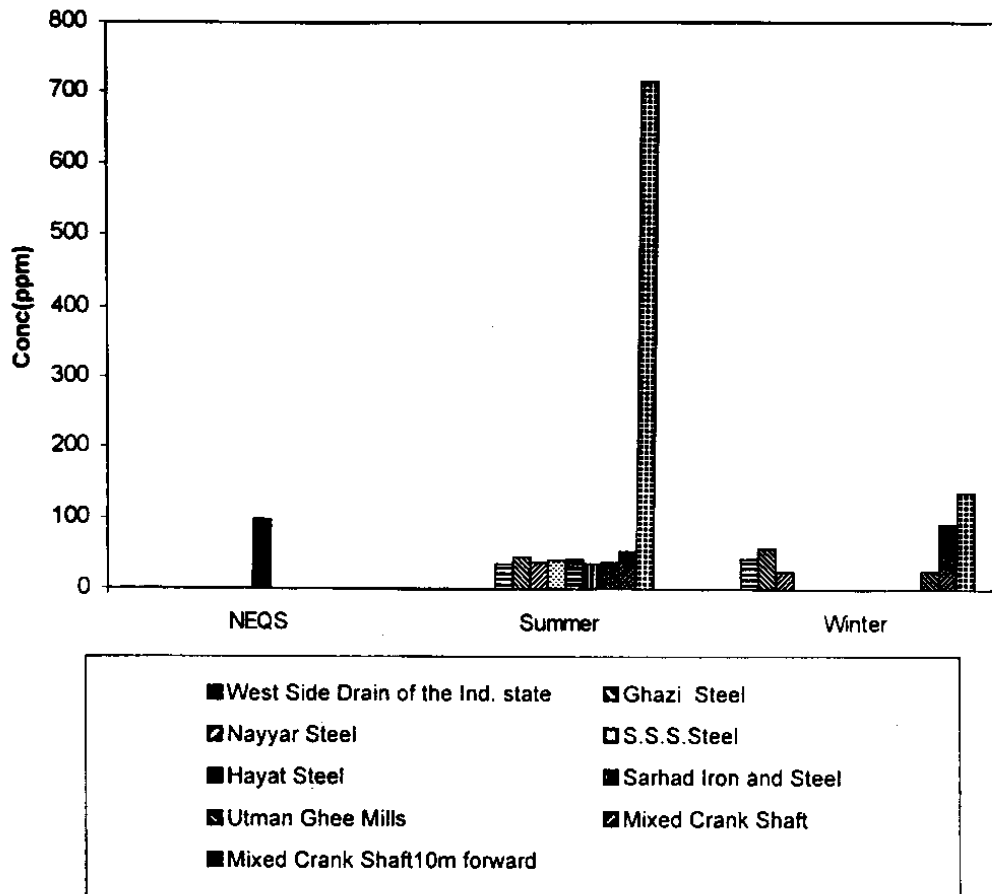


Fig. 14: Ca Comparison Ind. State Gadoon Amzai.

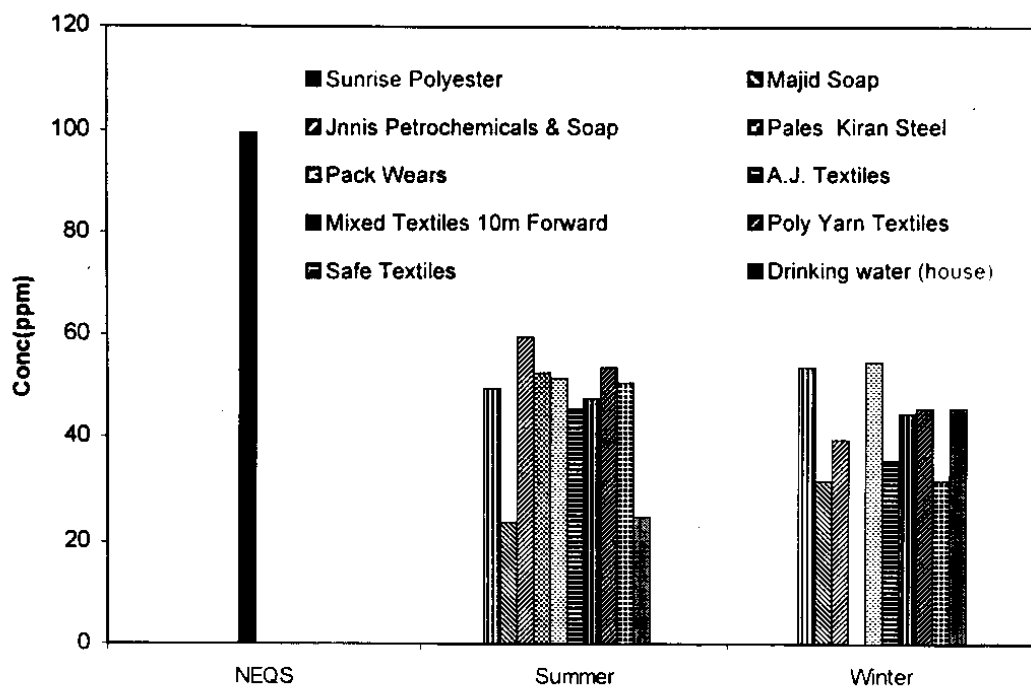


Fig. 15: Ca. Comparison Ind. State Gadoon Amzai.

Nickle and Chromium

Nickle and Chromium is less than 0.05 ppm in all the samples of the three zones, only sample number 14 of civil quarter of Peshawar region has Chromium and Nickle concentration 0.1 and 1.3 ppm concentration respectively in summer season.

In winter season sample number 8 of the combined stream towards market of Hayat Abad zone (i) show 4.5 ppm chromium while all the other samples show less than 0.05 ppm concentration.

Zinc

Zinc concentration of all the samples in zone (i) Hayat Abad is less than 0.5 ppm, which is within the permissible range. Majority of samples of zone (iii) also show lower concentration than permissible range. Only sample number 35, 41, 43 and 47 of Nayyar steel industry, mixed crank shaft, Majid soap and A. J. Textile show 0.65, 0.73, 0.5 and 0.75 ppm concentration in this zone.

Winter samples of zone (i) Hayat Abad show less than 0.05 ppm in all except sample number 8 combined stream towards market show 4.7 ppm Zn, the reason of higher concentration may be the pharmaceutical industrial effluents. In zone (ii) of Peshawar region sample number 10 of petrol pump Hayat Abad show 1.2 ppm and sample number 19 Yacka Thooth show 1.7 ppm. The remaining samples show less than 0.05 ppm concentration. (Fig. 2-4)

Table -1

Element	Principal Line	Maximum Current	Band Pass
Lead	217.00nm	10 mA	0.5 nm
Silver	328.1 nm	4 mA	0.5 nm
Zinc	213.9 nm	10 mA	0.5 nm
Nickle	232.00 nm	15 mA	0.2 nm
Copper	324.8 nm	5 mA	0.5 nm
Cadmium	288.8 nm	8 mA	0.5 nm
Cobalt	240.7 nm	15 mA	0.2 nm
Manganese	279.5 nm	10.5mA	0.5 nm
Chromium	357.9 nm	10 mA	0.5 nm
Magnesium	285.2 nm	4 mA	0.5 nm

Table-2: Number and locations of various samples studied

Sample No.	Location	Sample Number	Location	Sample Number	Location
1	Out Side Industrial Stop (TW)	9	Yacka Thooth	33	West Side Drain of the State
2	Out Side Industrial Stop (tank)	0	Fruit Market	34	Ghazi Steel
3	Kohi Sufed Marble Factory	1	New Bus Stand	35	Nayyar Steel
4	Spinzar Absorbant Cotton Factory	2	New Bus Stand Canal	36	S.S.S. Steel
5	Bilour Ghee Mills	3	Haahti Nagri	37	Hayat Steel
6	Poly Fine Chemi Farma	4	Chasadda	38	Sarhad Iron and Steel
7	Combined Stream Towards (residences)	5	Bus Stop	39	Utman Ghee Mills
8	Combined Stream Towards (Market)	6	Chargano	40	Mixed Crank Shaft
9	Main Stream Out Side Hayat Abad	7	Bala Hisar (Firdous)	41	Mixed Crank Shaft 10 m forward
10	Petrol Pump Hayat Abad	8	Khyber Bazar	42	Sunrise Poly ester
11	Kacha Garhi	9	Shuba (Mosque)	43	Majid Soap
12	Board Stop	0	New Deh	44	Janni's Petrochemicals and soap
13	Board Canal	1	Tehkal	45	Pales Kiran Steel
14	Cival Quarter Chowk	2	Spin Jumaath River Kabul at MichiniR.House	46	Pack Wears
15	Techonlogy College	2	Banda Mallahan R.Kabul5KmFromMichi ni R.house	47	A.J Textiles Mixed Textile 10 m forward
16	Bana Mari Municipal Corpora tion College	3	Well (as above)	48	Poly Yarn
17	KakShal Stop	4		49	Textiles
				50	Safe Textiles
				51	Drinking Water (house)

Magnesium

Fig. 5- 10 show that in zone (i) Hayat Abad the concentration of magnesium is in the permissible range, its range is from 19 - 28 ppm, only sample 3, Kohi Sufed marble factory show 35 ppm and sample number 6, polyfine chemifarma shows 30 ppm. Zone (ii) of Peshawar region show concentration higher than permissible one, the highest concentration of magnesium is 52 ppm of sample number 52. In zone (iii) of Gadoon Amazai majority of the samples are in the range of 7 - 13 ppm.

The concentration of Mg has increased in almost all of the samples in zone (I) Hayat Abad and zone (ii) Peshawar region are above the permissible range in sample numbers 20, 21, collected from outside industrial stop tubewell and from the tank show higher values of 73 ppm and 82 ppm, while those of zone (iii) show low values and are below the permissible range.

Calcium

Majority of the samples of zone (i) and Zone (iii) are below the permissible range of 100 ppm and have range between 40 and 60 in almost all of the samples. Only sample number 3 of Kohi Sufed marble factory show 540 ppm and sample number 41, mixed crank shaft show 750 ppm the reason is that these samples are of marble based industries which have Ca as a major component whereas zone (ii) of Peshawar region almost all of the samples show

concentration below 30 ppm. All the three zones have shown increase in concentration in winter season.

Experimental

Instrument

Atomic Absorption spectrometer model PU 9100 X atomic spectrometer. Phillips, Great Britain, was used for heavy element analysis.

The Table-1 for principal line, current and band pass.

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