Project Title: Reducing the Toxicity of Heavy Metals

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Introduction

Water covers about 70% of the earth's surface and is essential for life (Wang et al., 2020), out of which only 3% is fresh and only 0.5% drinkable. Water is single largest component of human body and comprises nearly 60% of it. (Zhou & Chen, 2018). Its excessive and ever increasing use in all fields of life has made Fresh water shortage a global threat. Only 33% of the world's total population has access to standard-quality freshwater.

Water is being polluted from a variety of sources, from domestic to industrial level. Contaminants in this polluted water involve heavy metals as well that leads to serious adverse effects on the lives to which the water is being served (Obinna & Ebere, 2019).

Considerable fraction of this polluted water is being used as untreated in irrigation (Sarwar et al., 2020).This contaminated water has high concentration of Nitrogen and Phosphorus , and that's why its use in irrigation is increasing gradually (Zhang & Shen, 2019) . As this waste water is contaminated with heavy metals including; Arsenic (As), Cadmium (Cd), Nickel (Ni), Mercury (Hg), Chromium (Cr), Zinc (Zn), and Lead (Pb) and has become a serious health issue for men, plants and animals. (Rehman et al., 2018).

These heavy metals present in waste water are not only toxic but are non-biodegradable which make their presence even worse. When this heavy metals containing water is used for irrigation, they enter into the plants and vegetables, where they do not have any significant biological role but causes various adverse effects to them (Chaoua et al., 2019). Their bioaccumulation in plants has reported to inhibit the growth of the plants (Kamran et al., 2020)

Bioaccumulation of various heavy metals such as arsenic, mercury, lead and chromium will tear down the metabolic processes involved in the human body.

These fruit based absorbents act as precursor of activated carbon and contain other functional groups that helps to adsorb the heavy metals from water. These functional groups (- COOH, -OH, - NH2) present in bio absorbents make a thin film of heavy metals on them (Mallampati et al., 2015) 2011).

In this study, peels of different plants i.e Bitter Apple, Cucumber, Persimmon, unripe orange and activated carbon from used dry cell were used. Organic functional groups present in them adsorb the heavy metals and reduces their concentration. Moreover, Activated Carbon which has proved to be a versatile adsorbent and a potential candidate in treatment of waste water was also used. Results from all above materials were separately obtained and comparatively analyzed which was very helpful in explaining their efficiency.

Literature Review

Requirement of fresh water is increasing gradually due to its excessive use in domestic, industrial and agricultural purposes. (Qadir et al., 2008).The used water from above mentioned sector becomes polluted. Owing to this excessive use, we have to face water shortage problems (Adilov, Sarikulov et al. 2021). The waste are produced by industries, human and animals but there is no proper way to deposit them, so they also contribute to pollute the drinkable water.

This polluted water is not only one of the prime global challenges for various ailments and casualties, but it is also contributing to the incessant shortage of the available freshwater worldwide (Bolisetty et al., 2019). Purification of this polluted water has become very necessary (Chaturvedi & Dave, 2019) and exists as a major problem in many under developed parts of the world (Kausley et al., 2018).

This polluted water contain many heavy metals in it, namely; Arsenic(As), Cadmium (Cd), Nickel (Ni), Mercury (Hg), Chromium (Cr), Zinc (Zn), and Lead (Pb) and has become a serious health issue for men of 21st century(Rehman et al., 2018).es (Rehman et al., 2018). The mechanism in toxicity induced by heavy metal is found to be the generation of highly reactive oxygen species that cause oxidative damage that leads to above mentioned disorders. Their non- biodegradable nature makes them more difficult to deal for purification of water (Varghese et al., 2019).

This polluted water seeps down and affect the fresh ground water, and presence of these heavy metals results in damage of aquatic life (Griebler et al., 2019). Official data tells that about 4.36 billion m^3 (BCM) wastewater is produced annually, which consist of 1.30 BCM industrial wastewater and 3.06 BCM domestic water (National Agricultural Research Centre).A huge fraction of this waste water is being used untreated in irrigation in Pakistan(ur Rehman et al., 2019). There is quite essential need to treat wastewater to alleviate the pollutant content, before we dispose it the agricultural lands or natural ecosystem. Wastewater is being treated through a variety of methods using biological, physical, chemical and thermal means, involving stages like primary, secondary and tertiary treatments (Meruvu, 2021). Cost has always been the problem in most of the methods being applied to treat the polluted water, as they are very expensive and cumbersome. (Sarode et al., 2019). Peels of various fruits has been used as source of bio sorbents and proved highly efficient in up taking the toxic heavy metals (Akpomie & Conradie, 2020).

Aims and Objectives

- Removal of heavy metal by low cost and cheapest
- method Utilization of non-biological waste to adsorb
- heavy metal Utilization of waste of fruits in a productive way.
- To control water pollution
- Explain the severity of toxicity of heavy metals

Materials and Method

Different Biological and Non-Biological substances were used for the treatment of heavy metals present in sewage water. Peels of Bitter Apple, Cucumber, Unripe orange, Persimmon and Activated carbon from dry cell were used.

Preparation of bio sorbent/Activated Carbon

For preparing the Bio-sorbent, peels of Bitter apple, Cucumber, Persimmon and unripe orange were used in the Chemistry Laboratory of Punjab Daanish School Boys Mianwali for analysis. After sun drying them, electrical furnace was used at 1000°c for half an hour to dry the peels completely. These completely dried substances were further grinded to make a fine powder of the peels. Activated Carbon from dry cell source was also used for absorption of heavy metals present in sewage water.

Accumulation of waste water (Samples)

Sewage water was obtained from two major drains of the city at district-Mianwali which had been utilized by farmers for irrigation purposes. This sewage water was analyzed by using Atomic Absorption spectroscopy (AAS) .Different values of heavy metals (Chromium, Lead etc) in parts per million were obtained.

Treatment of sewage water for removing heavy metals

Sewage water from both Drains was treated with already prepared fine powder of Bitter apple, Persimmon and Cucumber and Unripe Orange peels with three different doses; 1g, 2g and 3g to make the effect of concentration in count as well. Other samples were treated with Activated Carbon obtained from non- biomass sources. To check the effect of time factor for their actions and samples were analyzed after different time spans; 24 hours and 48 hours.

Same time period was given to samples being treated with the other Activated Carbon sources.

- **Analyzing the treated water**

  Treated water from both materials was analyzed again with the help of different analyzing techniques.

Different graphs are made for data handling so that we can easily compare the data.

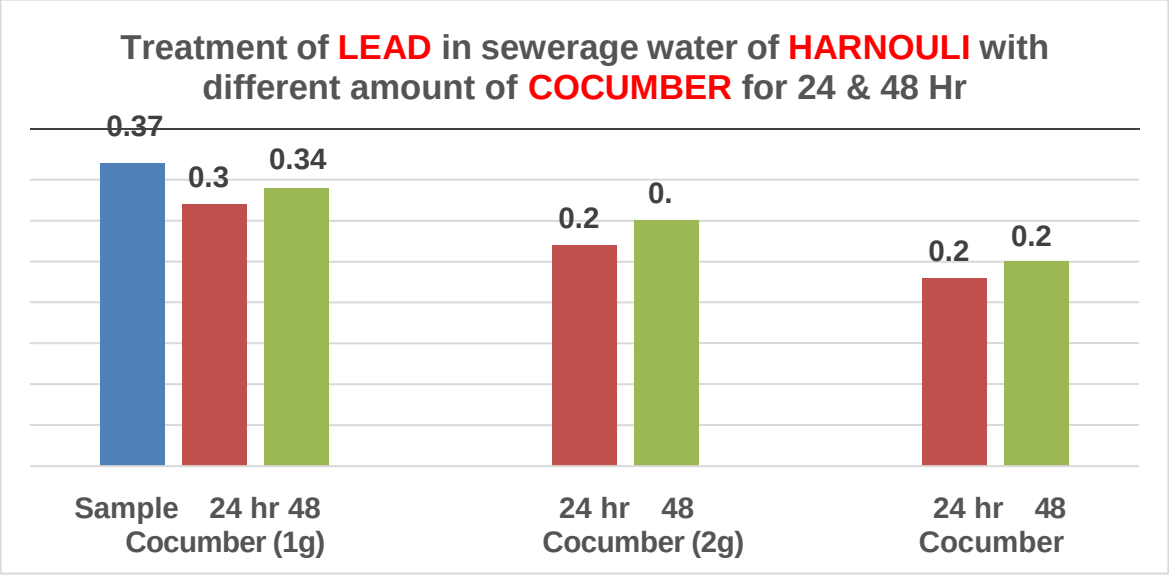
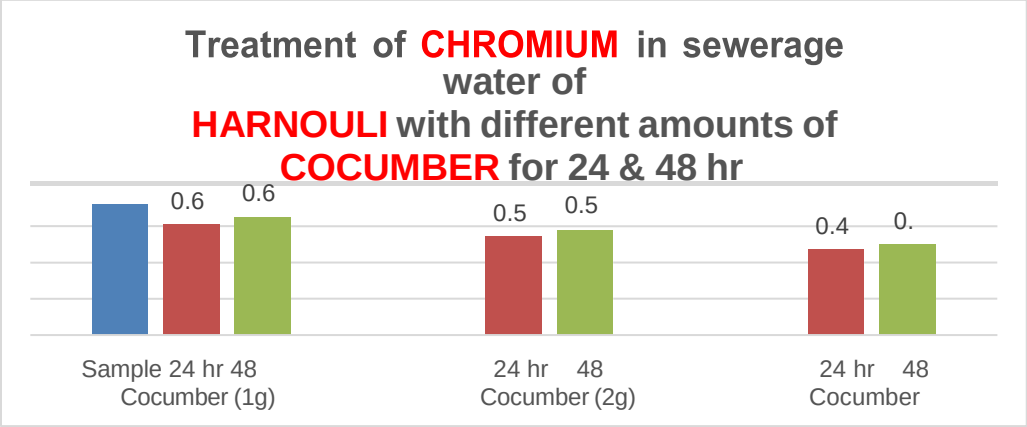


Fig-2: Effect of treatment of lead in sewerage water by different amount of cucumber peels

It is (Fig-3) the result of treatment of Harnouli sewage water having heavy metal (Chromium) treated with 1g, 2g and 3g doses of Cucumber extract respectively. It can be seen that 3g dose of Cucumber extract has removed a considerable amount of heavy metal (Chromium) from water sample treated for 24 hours



- **Comparing the results**

  Data obtained from all the samples was compared according to different concentration and time given. Moreover results from both materials were inter-compared. Results and compared data was elaborated with the help of graphs as well.

Crude sewage water was taken from two different areas of Mianwali to find out the concentration of three heavy metals Cadmium, Lead and Chromium. It was observed from the data that cadmium was not present in the sewage water samples. However atomic absorption spectroscopy results indicated that both lead and chromium are present in the samples in reasonably high concentrations.

Results and Discussion

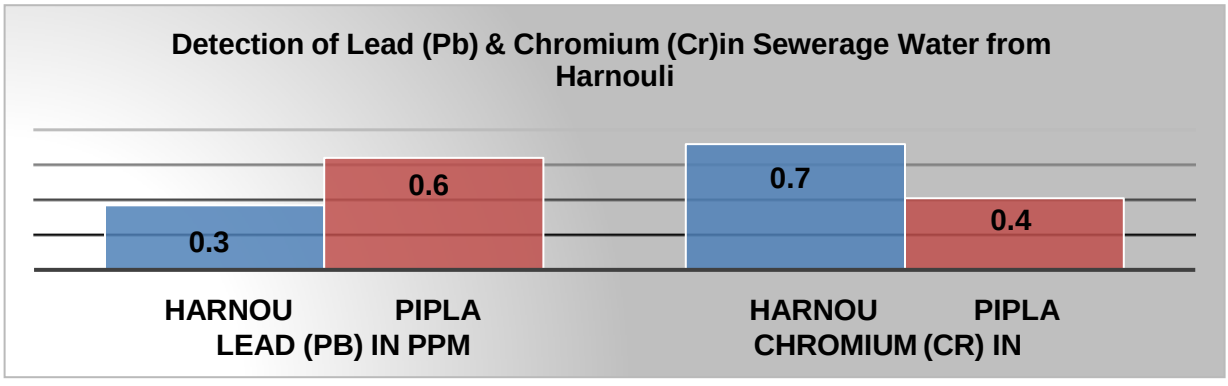


Fig-1: Detection of Lead (Pb) & Chromium (Cr) in Sewage Water from Harnouli (Mianwali) &Piplan (Mianwali)

Data further depicted that concentration of lead is low at harnouli while it is high at Piplan. Similarly, concentration of chromium is high at Harnouli and considerably low at Piplan.

Concentration of these heavy metals in sewage water is quite alarming. Sewage water is drained in river water so it may damage aquatic life and ultimately may damage human health. When this contaminated water is used for irrigation, due to the presence of heavy metals in this type of water growth of plants retard.

We planned to treat sewage water with three different types of peals. i.e.

i. Bitter Apple Peels

ii. Persimmon Peels

iii. Cucumber Peels

Unripe orange peels and activated carbon powder have treated with sewage water samples and sent for analysis (AAS) at Gujranwala in laboratory. Results are in pending stage and will receive soon.

The results of analysis have shown that all peels Bitter apple, Cucumber and persimmon natural products have tremendous effects in treatment of these heavy metals. These natural products adsorbed the heavy metals. Here are the results.

It is (Fig-2) the result of treatment of Harnouli sewage water having heavy metal (Lead) treated with 1g, 2g and 3g doses of Cucumber extract respectively. It can be seen that 3g dose of Cucumber extract has removed a considerable amount of heavy metal(Lead) fromwater sample treated for 24 hours.

We have classified our water samples according to concentration used (Biological/non Biological Bio-sorbents) and time factor i.e 24 Hours and 48 Hours. Samples sent to Pesticide Residue Laboratory Kala Shah Kaku for Atomic Absorption Spectroscopy. Samples are labeled and each sample has unique sample ID and Customer ID. Report attached as an Annexure A.

HEAVY METALS ANALYSIS PERCENTAGE WISE

We have taken water samples from two different localities of district Mianwali i.e Harnouli and Piplan. Biosorbents of different plants are used for purification of water from heavy metals. Different quantities of Biosorbents i.e 1g/L,2g/L,3g/L with the time factor of 24Hours and 48 Hours are used for heavy metals analysis.

Results obtained from "OFFICE OF THE AGRICULTURE CHEMIST PESTICIDE RESIDUE LABORATORY KALA SHAH KAKU" are in comparison form to see the affectivity of the Biosorbents. Table 1.1,1.2,1.3.

POWDER OF BITTER APPLE PLANT (USING 1 LITRE OF WATER SAMPLES)

Sr. No	Quantity of Biosorbent used	Sample Taken	Heavy Metal	Time	Treated Value in ppm	Untreated Value in ppm	%age dropped
1.	1gm	Harnouli	Lead(Pb)	24hrs	0.23	0.37	62.16216
2.	1gm	Harnouli	Lead(Pb)	48hrs	0.2	0.37	54.05405
3.	2gms	Harnouli	Lead(Pb)	24hrs	0.13	0.37	35.13514
4.	2gms	Harnouli	Lead(Pb)	48hrs	0.11	0.37	29.72973
5.	3gms	Harnouli	Lead(Pb)	24hrs	0.09	0.37	24.32432
6.	3gms	Harnouli	Lead(Pb)	48hrs	0.05	0.37	13.51351
7.	1gm	Piplan	Lead(Pb)	24hrs	0.47	0.64	73.4375
8.	1gm	Piplan	Lead(Pb)	48hrs	0.41	0.64	64.0625
9.	2gms	Piplan	Lead(Pb)	24hrs	0.36	0.64	56.25
10.	2gms	Piplan	Lead(Pb)	48hrs	0.29	0.64	45.3125
11.	3gms	Piplan	Lead(Pb)	24hrs	0.22	0.64	34.375
12.	3gms	Piplan	Lead(Pb)	48hrs	0.14	0.64	21.875
13.	1gm	Harnouli	Chromium (Cr)	24hrs	0.43	0.72	59.72222
14.	1gm	Harnouli	Chromium (Cr)	48hrs	0.37	0.72	51.38889
15.	2gms	Harnouli	Chromium (Cr)	24hrs	0.25	0.72	34.72222
16.	2gms	Harnouli	Chromium (Cr)	48hrs	0.2	0.72	27.77778
17.	3gms	Harnouli	Chromium (Cr)	24hrs	0.14	0.72	19.44444
18.	3gms	Harnouli	Chromium (Cr)	48hrs	0.11	0.72	15.27778
19.	1gm	Piplan	Chromium (Cr)	24hrs	0.28	0.41	68.29268
20.	1gm	Piplan	Chromium (Cr)	48hrs	0.23	0.41	56.09756
21.	2gms	Piplan	Chromium (Cr)	24hrs	0.18	0.41	43.90244
22.	2gms	Piplan	Chromium (Cr)	48hrs	0.14	0.41	34.14634
23.	3gms	Piplan	Chromium (Cr)	24hrs	0.13	0.41	31.70732
24.	3gms	Piplan	Chromium (Cr)	48hrs	0.1	0.41	24.39024

Table 1.1

POWDER OF CUCUMBER PLANT (USING 1 LITRE OF WATER SAMPLE)

Sr. No	Quantity of Biosorbent used	Sample Taken	Heavy Metal	Time	Treated Value in ppm	Untreated Value in ppm	%age dropped
1.	1gm	Harnouli	Lead(Pb)	24hrs	0.32	0.37	86.48649
2.	1gm	Harnouli	Lead(Pb)	48hrs	0.34	0.37	91.89189
3.	2gms	Harnouli	Lead(Pb)	24hrs	0.27	0.37	72.97297
4.	2gms	Harnouli	Lead(Pb)	48hrs	0.3	0.37	81.08108
5.	3gms	Harnouli	Lead(Pb)	24hrs	0.23	0.37	62.16216
6.	3gms	Harnouli	Lead(Pb)	48hrs	0.25	0.37	67.56757
7.	1gm	Piplan	Lead(Pb)	24hrs	0.57	0.64	89.0625
8.	1gm	Piplan	Lead(Pb)	48hrs	0.62	0.64	96.875
9.	2gms	Piplan	Lead(Pb)	24hrs	0.49	0.64	76.5625
10.	2gms	Piplan	Lead(Pb)	48hrs	0.53	0.64	82.8125
11.	3gms	Piplan	Lead(Pb)	24hrs	0.43	0.64	67.1875
12.	3gms	Piplan	Lead(Pb)	48hrs	0.48	0.64	75
13.	1gm	Harnouli	Chromium (Cr)	24hrs	0.61	0.72	84.72222
14.	1gm	Harnouli	Chromium (Cr)	48hrs	0.65	0.72	90.27778
15.	2gms	Harnouli	Chromium (Cr)	24hrs	0.54	0.72	75
16.	2gms	Harnouli	Chromium (Cr)	48hrs	0.58	0.72	80.55556
17.	3gms	Harnouli	Chromium (Cr)	24hrs	0.47	0.72	65.27778
18.	3gms	Harnouli	Chromium (Cr)	48hrs	0.5	0.72	69.44444
19.	1gm	Piplan	Chromium (Cr)	24hrs	0.35	0.41	85.36585
20.	1gm	Piplan	Chromium (Cr)	48hrs	0.38	0.41	92.68293
21.	2gms	Piplan	Chromium (Cr)	24hrs	0.3	0.41	73.17073
22.	2gms	Piplan	Chromium (Cr)	48hrs	0.33	0.41	80.4878
23.	3gms	Piplan	Chromium (Cr)	24hrs	0.27	0.41	65.85366
24.	3gms	Piplan	Chromium (Cr)	48hrs	0.29	0.41	70.73171

Table 1.2

POWDER OF PERSIMMON PLANT (USING 1 LITRE OF WATER)

Sr. No	Quantity of Biosorbent used	Sample Taken	Heavy Metal	Time	Treated Value in ppm	Untreated Value in ppm	%age dropped
1.	1gm	Harnouli	Lead(Pb)	24hrs	0.27	0.37	72.97297
2.	1gm	Harnouli	Lead(Pb)	48hrs	0.24	0.37	64.86486
3.	2gms	Harnouli	Lead(Pb)	24hrs	0.19	0.37	51.35135
4.	2gms	Harnouli	Lead(Pb)	48hrs	0.17	0.37	45.94595
5.	3gms	Harnouli	Lead(Pb)	24hrs	0.15	0.37	40.54054
6.	3gms	Harnouli	Lead(Pb)	48hrs	0.12	0.37	32.43243
7.	1gm	Piplan	Lead(Pb)	24hrs	0.54	0.64	84.375
8.	1gm	Piplan	Lead(Pb)	48hrs	0.5	0.64	78.125
9.	2gms	Piplan	Lead(Pb)	24hrs	0.41	0.64	64.0625
10.	2gms	Piplan	Lead(Pb)	48hrs	0.37	0.64	57.8125
11.	3gms	Piplan	Lead(Pb)	24hrs	0.29	0.64	45.3125
12.	3gms	Piplan	Lead(Pb)	48hrs	0.24	0.64	37.5
13.	1gm	Harnouli	Chromium(Cr)	24hrs	0.58	0.72	80.55556
14.	1gm	Harnouli	Chromium(Cr)	48hrs	0.54	0.72	75
15.	2gms	Harnouli	Chromium(Cr)	24hrs	0.42	0.72	58.33333
16.	2gms	Harnouli	Chromium(Cr)	48hrs	0.36	0.72	50
17.	3gms	Harnouli	Chromium(Cr)	24hrs	0.34	0.72	47.22222
18.	3gms	Harnouli	Chromium(Cr)	48hrs	0.29	0.72	40.27778
19.	1gm	Piplan	Chromium(Cr)	24hrs	0.34	0.41	82.92683
20.	1gm	Piplan	Chromium(Cr)	48hrs	0.29	0.41	70.73171
21.	2gms	Piplan	Chromium(Cr)	24hrs	0.28	0.41	68.29268
22.	2gms	Piplan	Chromium(Cr)	48hrs	0.25	0.41	60.97561
23.	3gms	Piplan	Chromium(Cr)	24hrs	0.19	0.41	46.34146
24.	3gms	Piplan	Chromium(Cr)	48hrs	0.16	0.41	39.02439

Table 1.3

Treated samples of unriped orange peels and activated carbon have been sent for analysis by Atomic Absorption Spectroscopy (AAS), but results are not arrived yet and will be provided soon.

Fig-3: Effect of treatment of Chromium in sewage water by different amount of cucumber peels.

It is (Fig-4)the result of treatment of Piplan sewage water having heavy metal (Lead) treated with 1g, 2g and 3g doses of Cucumber extract respectively. It can be seen that 3g dose of Cucumber extract has removed a considerable amount of heavy metal (Lead) from water sample treated for 24 hours.

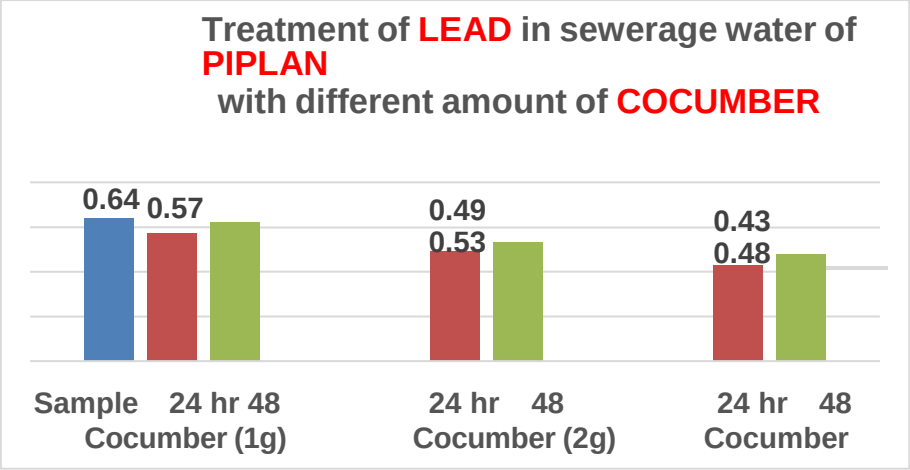


Fig-4: Effect of treatment of Lead in sewage water by different amount of cucumber peels

It is (Fig-5) the result of treatment of Piplan sewage water having heavy metal (Chromium) treated with 1g, 2g and 3g doses of Cucumber extract respectively. It can be seen that 3g dose of Cucumber extract has removed a considerable amount of heavy metal (Chromium) from water sample treated for 24 hours.

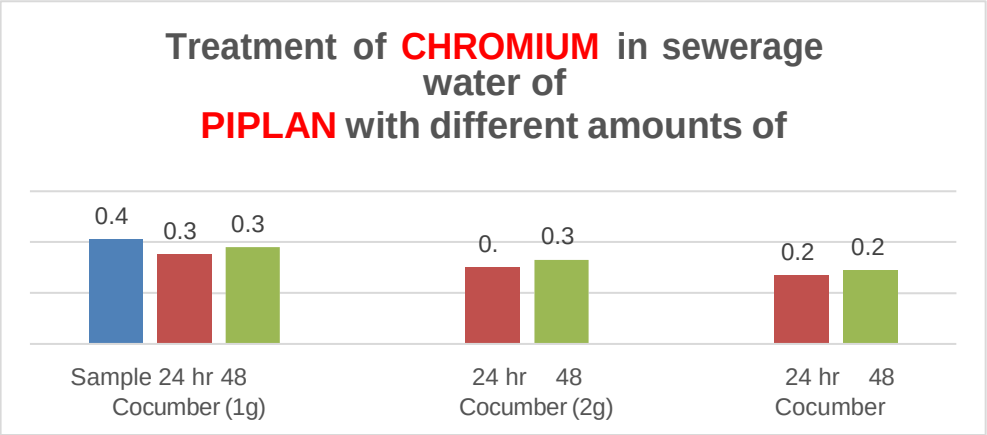


Fig-5: Effect of treatment of Chromium in sewage water by different amount of cucumber peels

It is (Fig-6) the result of treatment of Harnouli sewage water having heavy metal (Lead) treated with 1g, 2g and 3g doses of Persimmon extract respectively. It can be seen that 3g dose of Persimmon extract has removed a considerable amount of heavy metal (Lead) from water sample treated for 48 hours.

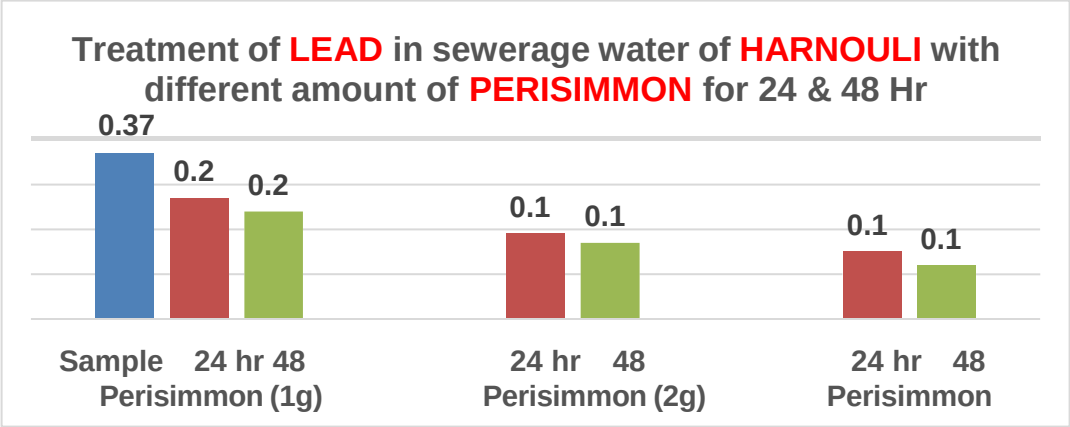


Fig-6: Effect of treatment of Lead in sewage water by different amount of cucumber peels

It is (Fig-7) the result of treatment of Harnouli sewage water having heavy metal (Chromium) treated with 1g, 2g and 3g doses of Persimmon extract respectively. It can be seen that 3g dose of Persimmon extract has removed a considerable amount of heavy metal (Chromium) from water sample treated for 48 hours.

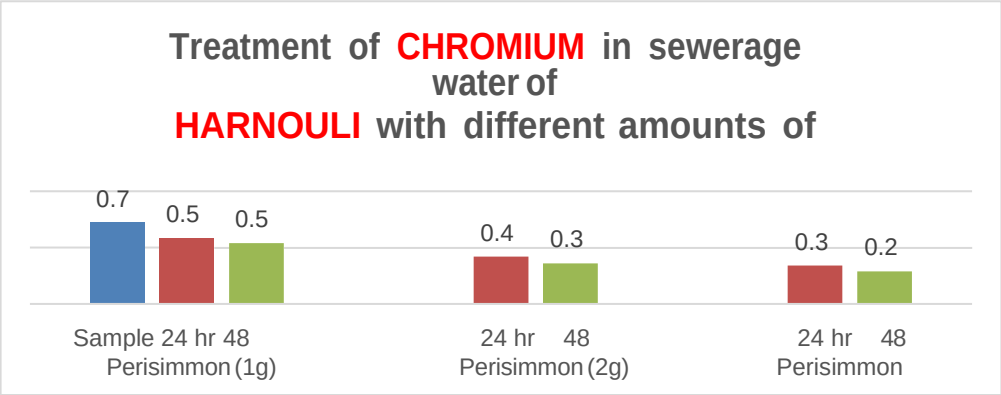


Fig-7: Effect of treatment of Chromium in sewage water by different amount of cucumber peels

It is (Fig-8) the result of treatment of Piplan sewage water having heavy metal (Lead) treated with 1g, 2g and 3g doses of Persimmon extract respectively. It can be seen that 3g dose of Persimmon extract has removed a considerable amount of heavy metal (Lead) from water sample treated for 48 hours.

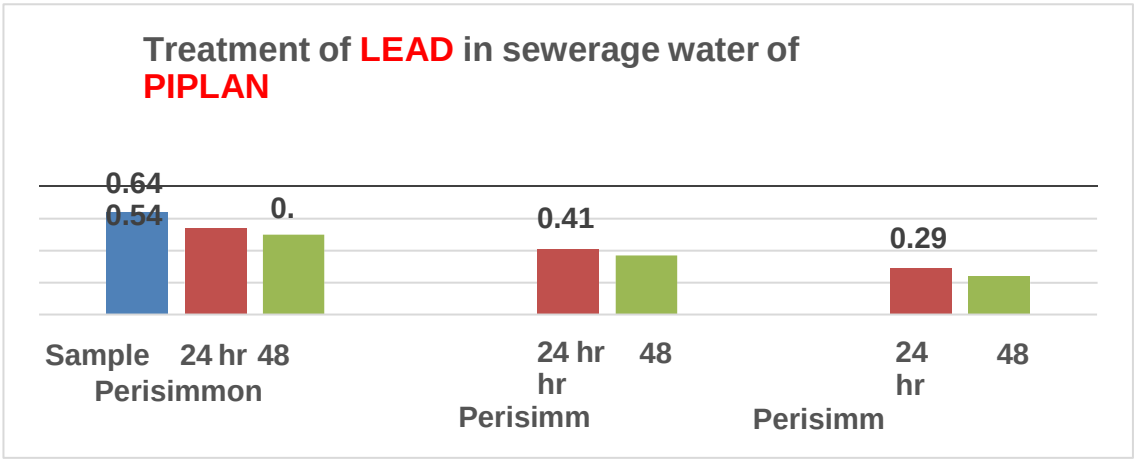


Fig-8: Effect of treatment of Lead in sewage water by different amount of cucumber peels

It is (Fig-9) the result of treatment of Piplan sewage water having heavy metal (Chromium) treated with 1g, 2g and 3g doses of Persimmon extract respectively. It can be seen that 3g dose of Persimmon extract has removed a considerable amount of heavy metal (Chromium) from water sample treated for 48 hours.

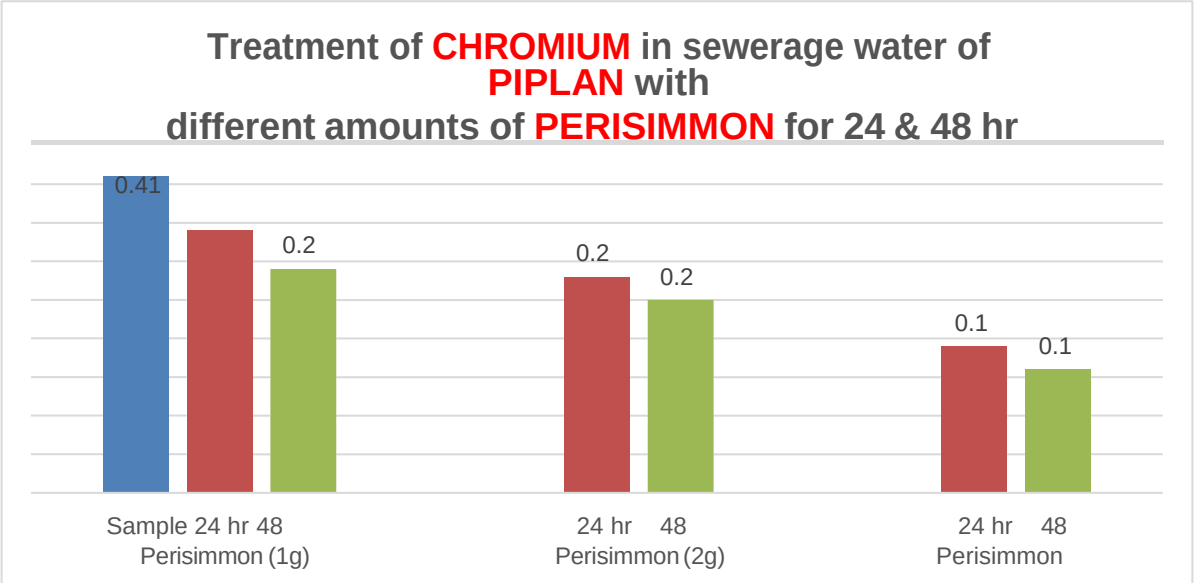


Fig-9: Effect of treatment of Chromium in sewage water by different amount of cucumber peels

It is (Fig-10) the result of treatment of Harnouli sewage water having heavy metal (Lead) treated with 1g, 2g and 3g doses of Bitter apple extract respectively. It can be seen that 3g dose of Bitter apple extract has removed a considerable amount of heavy metal (Lead) from water sample treated for 48 hours.

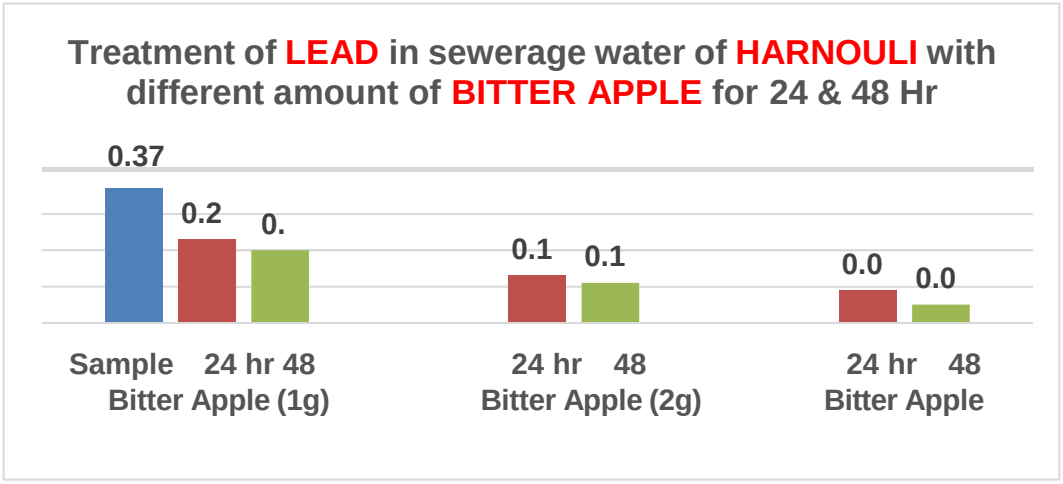


Fig-10: Effect of treatment of Lead in sewage water by different amount of cucumber peels

It is (Fig-11)the result of treatment of Harnouli sewage water having heavy metal (Chromium) treated with 1g, 2g and 3g doses of Bitter apple extract respectively. It can be seen that 3g dose of Bitter apple extract has removed a considerable amount of heavy metal (Chromium) from water sample treated for 48 hours.

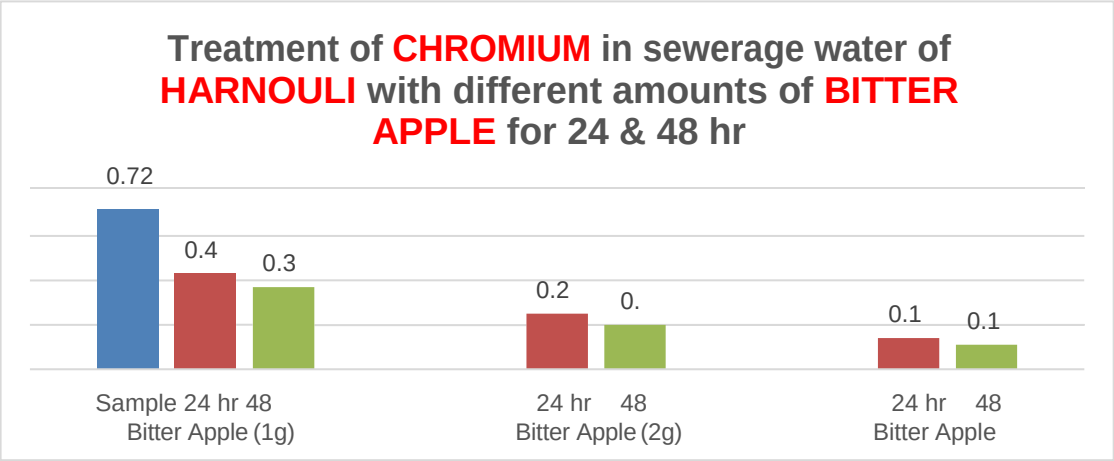


Fig-11: Effect of treatment of Chromium in sewage water by different amount of cucumber peels

It is (Fig-12) the result of treatment of Piplan sewage water having heavy metal (Lead) treated with 1g, 2g and 3g doses of Bitter apple extract respectively. It can be seen that 3g dose of Bitter apple extract has removed a considerable amount of heavy metal (Lead) from water sample treated for 48 hours.

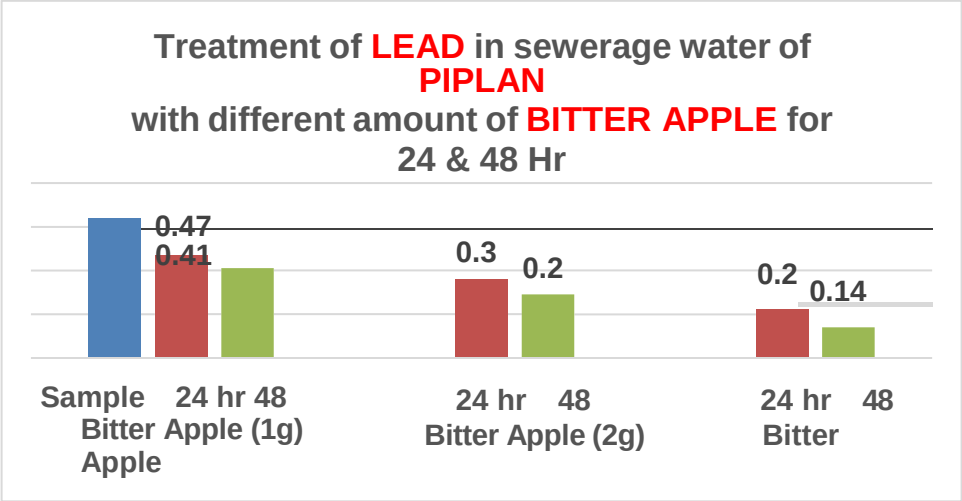


Fig-12: Effect of treatment of Lead in sewage water by different amount of cucumber peels

It is (Fig-13) the result of treatment of Piplan sewage water having heavy metal (Chromium) treated with 1g, 2g and 3g doses of Bitter apple extract respectively. It can be seen that 3g dose of Bitter apple extract has removed a considerable amount of heavy metal (Chromium) from water sample treated for 48 hours.

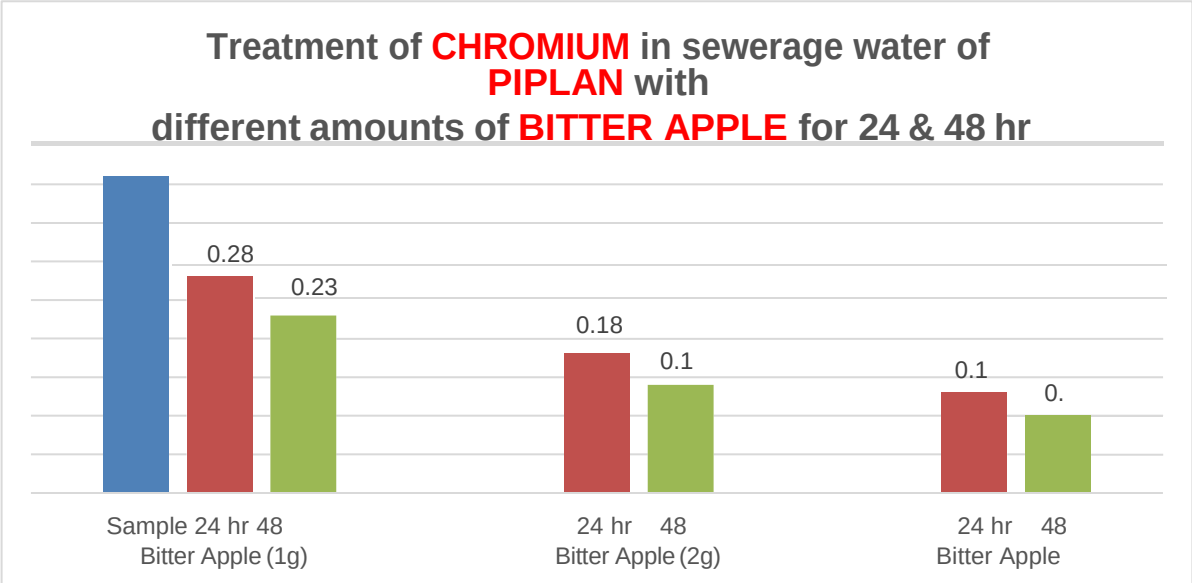
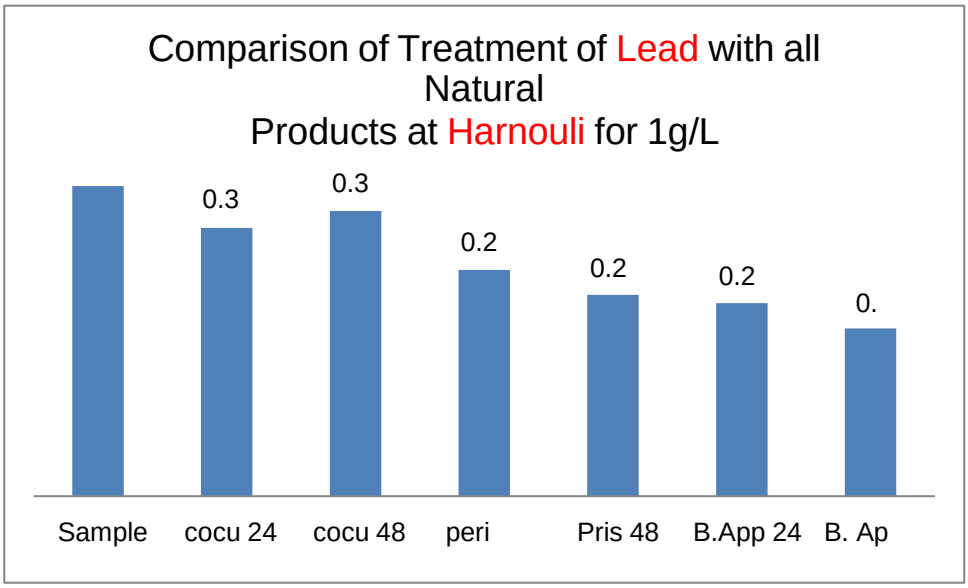
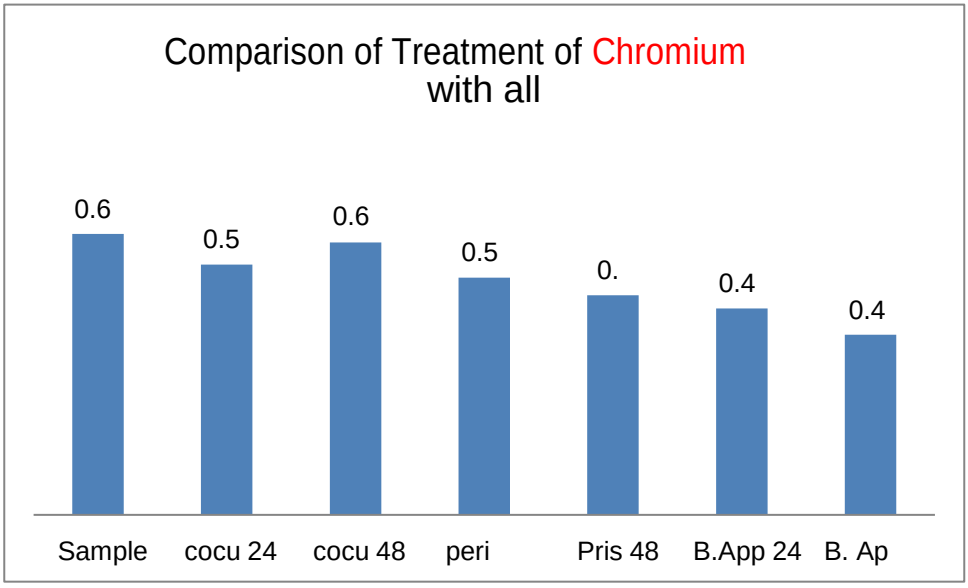
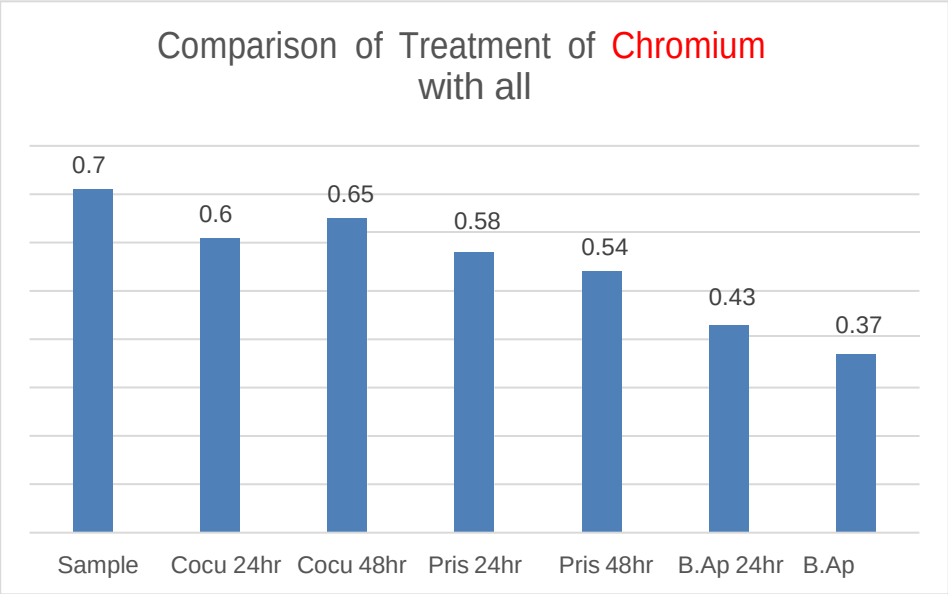


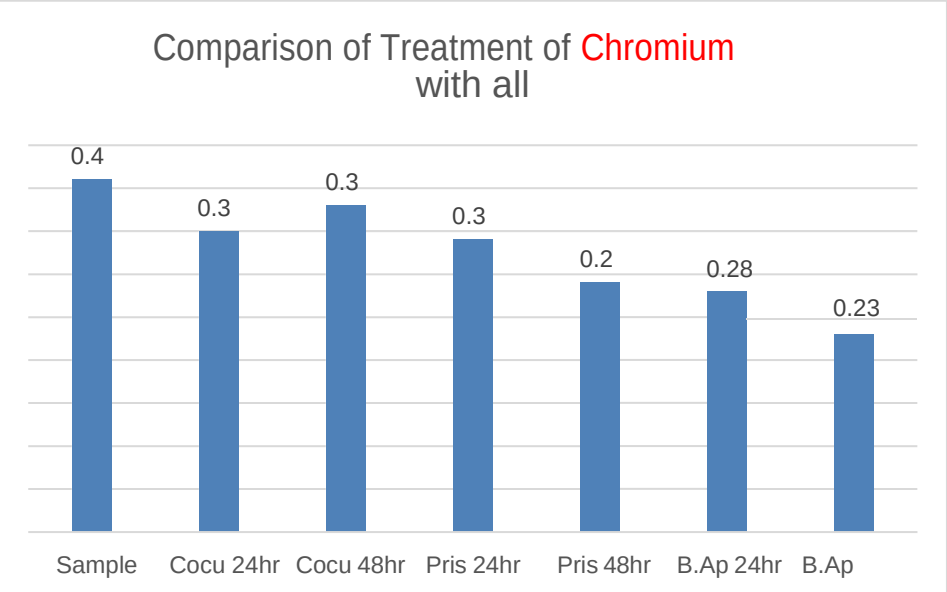
Fig-13: Effect of treatment of Chromium in sewage water by different amount of cucumber peels

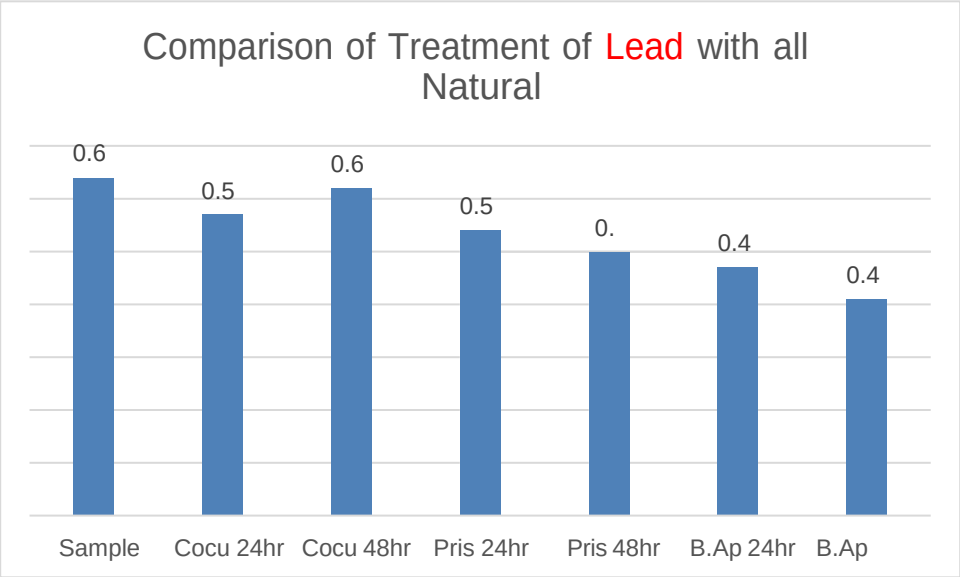
Comparison of all bio-sorbents in all samples

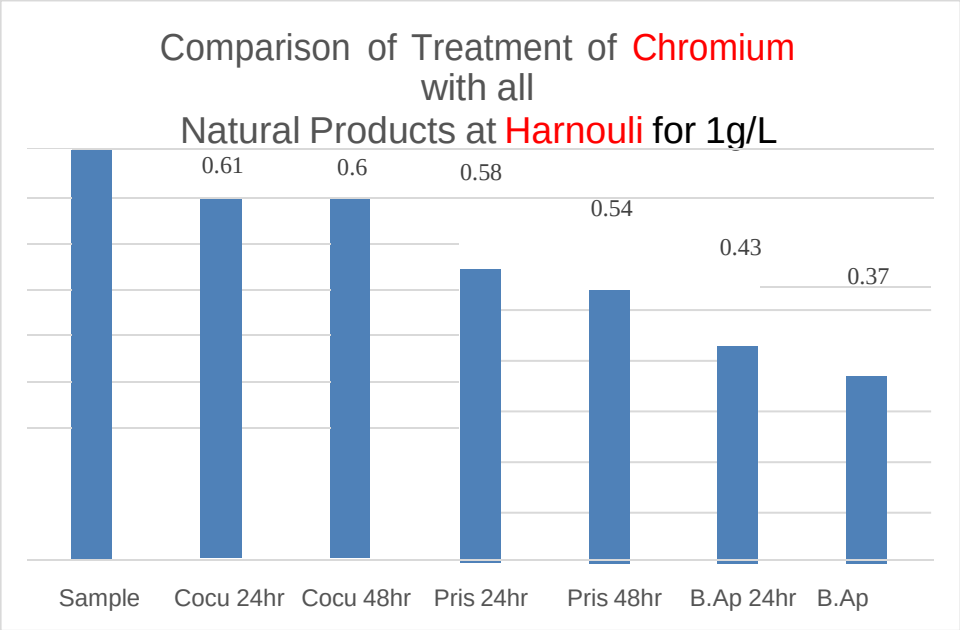


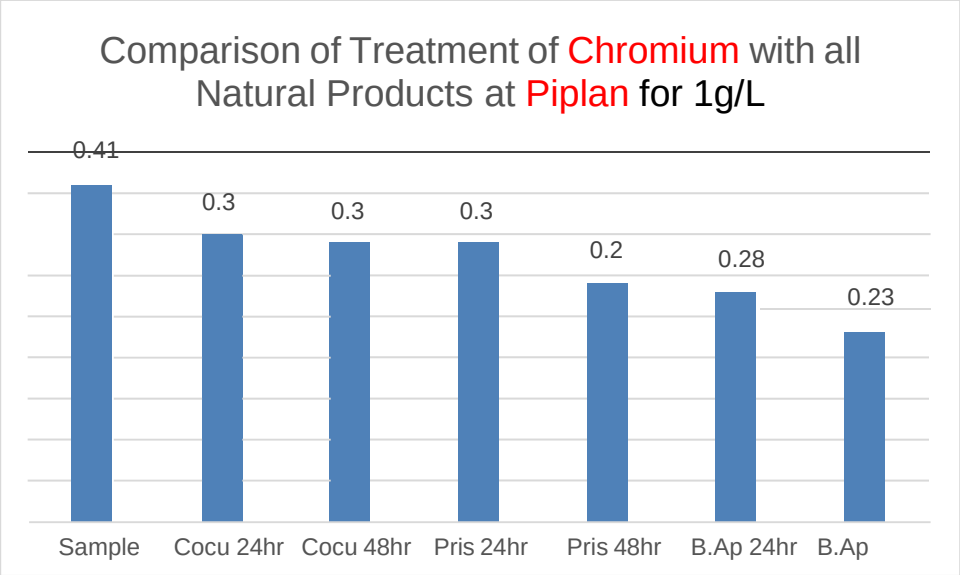












Some glimpses from experimental work in laboratory of Punjab Daanish School Boys Mianwali

Chemistry Laboratory Work (Sample Analysis)

Mechanism of Bio sorbent with Sample

Actually binding mechanism of Bio sorbent is based upon Bio sorption mechanism which is a complex process. Metal ions and natural product substance may occur through bio sorption i.e physical interaction and Vander Waals forces or any other type of association may occur.There are many functional groups present in these Biosorbents which are effective for adsorption phenomena for heavy metals.

FLOW SHEET DIAGRAM

- COLLECTION OF PLANTS TO MAKE EFFECTIVE BIOSORBENT
- DRIED PEELS TO MAKE THEIR POWDER
- COLLECTION OF SEWAGE WATER SAMPLES
- UNTREATED WATER SAMPLES SENT TO LABORATORY FOR ATOMIC ABSORPTION SPECTRPSCOPY (AAS)
- CLASSIFICATION OF WATER SAMPLES ACCORDING TO BIOSROBENT CONCENTRATION USED AND TIME
- ADDITION OF BIOSORBENT TO WATER SAMPLES
- FILTERATION
- TREATED SAMPLES SENT TO LABORATORY FOR ATOMIC ABSORPTION SPECTRPSCOPY(AAS**)**
- HANDLING AND ANALYSIS OF DATA
- GRAPHICAL ANALYSIS
- CONCLUSION
- RECOMMENDATIONS AND APPLICATIONS

Conclusion

As we have discussed that our extract consists of three Bio-sorbents i.e Peels of Bitter apple, Persimmon and Cucumber. Through these experimental results, we conclude that by increasing amount of Bio-sorbents (1g,2g,3g) ,heavy metals are reduced effectively in given samples. Bitter apple shown too much positive and effective results as compared to Persimmon and Cucumber. Cucumber is the least effective material as compared to others.

48 hours treated sewage water samples of Bitter apple are most effective to reduce/remove heavy metals than 24hours.Persiomn also showed positive results to remove/reduce heavy metals from sewage water(as explained above in table and graph).

Cucumber has shown strange property to remove/reduce heavy metals from sewage water. Results show that powder of peel of cucumber has reduced heavy metals more in short time period. It means by increasing the time duration of cucumber powder with sewage water, less absorption of heavy metals take place.

Recommendation

From the results of experiments, we conclude that if we want to remove heavy metals from sewage water or any type of water. We can use powder of peels of Bitter apple, Persimmon and Cucumber. Actually this is a low cast method to purify water from toxic heavy metals. So, it is recommended that large amount of these bio-sorbents should be used to remove more heavy metals from water at large scale to safe the aquatic life or to make waste water safe for irrigation.

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603-609. https://doi.org/10.3881/j.issn.1000-503x.10661

Report received from Laboratory is attached as an ANNEXURE A.

ANNEXURE A

OFFICE OF THE AGRICULTURAL CHEMIST
PESTICIDE RESIDUE LABORATORY KALA SHAH KAKU
Phone: 042-37951857, E-mail: prlabksk@gmail.com

No. 1451/B-17
Dated. 09-09-2021

HEAVY METALS ANALYSIS REPORT

Name of Customer: Muhammad Yasin (Science Teacher at Danish School)

Commodity: Water Samples

Receiving Date: 20-11-2019

Sample ID	Customer ID	Sample History	Result		
			Lead (Pb) ppm	Cadmium (Cd) ppm	Chromium (ppm)
1054	Piplan Untreated	Unknown History	0.64	ND	0.41
1055	Harnouli Untreated	Unknown History	0.37	ND	0.72
1056	BP*1a	Unknown History	0.47	ND	0.28
1057	BP*1b	Unknown History	0.41	ND	0.23
1058	BP*2a	Unknown History	0.36	ND	0.18
1059	BP*2b	Unknown History	0.29	ND	0.14

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PEST| 8IOERESIOUE LABORATORY KALASHAH KqKg

Phone: 042-37951857, E-mail: prlabksk@gmail.com

Dated. _____

l0f60	BP*3a	Unknown History	0.22	NIJ	0.13
foaf	BP*3b	Unknown History	0.14	NIJ	0.10
1062	H2a	UnK'io»'n I lislory	0.27	ND	0.58
1063		In*e*n llisiog	0.24	NI3	0.54
I0G4	PH2a	Unknown History	0.19	ND	0.42
065	PH2b	Unknown Hist•	0.17	ND	0.36
i0G6	PH3a	Unknown history	g 1$	ND	0.34
J067	PH36	Unknown *History*	a.12	ND	0.29
1068	PP*3a	Unknown HiSIO/	0.54	ND	0.34
069	rr•ib	tJnknoim History	0.50	ND	0.29

OFFICE OF THE AGRICULTURAL CHEMIST
PESTICIDE RESIDUE LABORATORY KALA SHAH KAKU
Ph^^e 042-37951857, E•mail: nrlabksk /'maiI.com

No. _____
*Dated.*_____

l07u	PP*2a	Unknown History	0.41	NI3	0.28
1071	”**	**\ñno›vn /listen	0.37	ND	0.25
f072	”’ *	Unknown History	*Q yq*	ND	0.19
073	”3b	Unknown I-lisioy	0.24	ND	0.16
J 074	CHIa	Unknown I-Tislury	0.32	NU	0.61
1075	CH1h	Unknown History	g yg	NU	0.65
1076	CH2a	Unknown I-ttStOr\	0.27	ND	0.54
i 077	CH2b	Unknown l1istoy	0.30	ND	0.58
	cH3a	Unknown History	0.23	ND	0.47
	CH3b	Unknown History	0.25	ND	0.50

OFFICE Ofi 7HE AGRICULTURAL CHEMIST
PESTICIDE RESIDUE LABORATORY KALA SHAH KAKU
Phone: 042-37951857, E-mail: prlabksk@gmail.com

Dated. _____

	CP*1a	Unknown History	0.57	ND	0.35
	CP*1b	Unknown History	0.62	ND	0.38
	CP”za	Unkno\\z His\oq'	0.49	ND	0.30
1083	CP*2b	Unknown History	0.53	ND	0.33
	CP*3a	Unknown History	0.43	ND	0.27
1085	Cf•3b	Ufinouz Histoq'	p.kg	MD	
	BHIa	Unkno\n History	a.23	ND	0.43
	8Hlb	Unknown History	o.20	ND	0.37
	BH2a	Unknown History-	0.t3	ND	0.25
	BH2b	UnkOOWD History	0.11	WD	0.20

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f/afeg

BH3a	Unknown History	O.O9	ND	Q.14
BH3b	Unknown History	*Q,05*	ND	0.11

- Unsealed sample received from customer, its authenticity rests upon him

Sample *Prepared* By:_____ Sample Analyzed By:_____.

Agricultural officer
Pesticide Residue Laboratory
Kala Shah Kaku

Agricultural Officer
Pesticide Residue laboratory
Kala Shah Kaku

Report Reviewed By :_____ Report Issued By:_____

Agricultural officer
Pesticide Residue Laboratory
Kala Shah Kaku

Agricultural Officer
Pesticide Residue laboratory
Kala Shah Kaku