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RESEARCH ARTICLE

EFFECTS OF URBAN WASTE DISPOSAL ON WATER QUALITY AT OPEN WASTE DUMPING SITES OF ASELLA CITY, ARSI ZONE, SOUTHEAST ETHIOPIA

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ABSTRACT

Settler and different organization in the city produce a large amount of refuses in several forms, frequently making our environments impure and unpleasant. The urban and Arsi University discarded solid and fluid waste disposal deteriorating water quality through decrease in quality indicators because of the undiscriminating dumping of different waste. Therefore, this study determine urban waste disposal effects on water quality at open waste dumping sites of Asella city, Arsi zone, southeast Ethiopia. To ratify the quality of water for public expenditure, recreation and irrigation purpose, the water quality index was performed in indicating the water quality in terms of index number. This water quality index was determined using the selected biological physical and chemical properties as pH, EC, BD, SMC, temperature, TDS, lead, chromium, cadmium, calcium, magnesium, potassium, sodium and total coliform. Composite water samples were collected from fluid waste disposal site and residue discarded from Arsi University to the watercourse along the watershed. Water sample was taken from Arsi university waste, Emipond and nursery site. A total of 9 samples were brought for laboratory analysis. Results of the mechanical analysis revealed that the problem of Arsi University discarded waste had significant effect on the water quality mainly at the nursery site which had been disturbing through toxification in excess presence than the critical value of pH at nursery site (8.53), Mg at Arsi university (36.01mg/l) and nursery site (30.78mg/l), K and Cr at nursery site (12.49mg/l and 0.053mg/l) respectively as well as total coli forming organism in Arsi University (161/100ml), Emipond (74/100ml) and nursery (108/100ml) site than the threshold value. Similarly, the mean value of Ec, Temp, TDS, Ca, Na , Cd and Pb are found less than the standard at all Arsi university, Emipond and nursery site whereas Mg at Emipond (23.09mg/l) and K at Arsi University (11.97mg/l) and Emipond (10.46mg/l) where found less than the standard. So, it was concluded that the average values of water from Ardu to Tulu dimtu watershed were found all biophysical-chemical indicators was contaminated at the nursery site according to World Health Organization standard for water quality. Therefore, management was required to undermine the cause of waste and treating the discarded material within the organization through recycling the use before release to the watershed community.

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INTRODUCTION

Contaminated water from inadequate wastewater management provides one of the greatest health challenges restricting development and increasing poverty through costs to health care and lost labor productivity. Worldwide, almost 900 million people still do not had access to safe water and some 2.6 billion, almost half the population of the developing world do not had access to adequate sanitation. At least 1.8 million children less than five years old die every year due to water related disease (Corcoran *et al.,* 2010). The waste was disposed directly into the soil, a number of contaminants including heavy metals readily penetrate and eventually they contaminate the soil and affect vegetation abundance (Syeda *et al.,* 2014). Human activity introduces heavy metals (cadmium, arsenic and mercury) to our soils through mining, smelting, industry, agriculture and burning fossil fuels. Our disposal of materials containing heavy metals – a long list which includes paint, electronic waste, and sewage, also contributes to the burden of heavy metal contamination. Soil contaminants may be responsible for health effects for millions of people. Health problems from cancers (arsenic, asbestos, dioxins), to neurological damage and lower IQ (lead, arsenic), kidney disease (lead, mercury, cadmium), and skeletal and bone diseases (lead, fluoride, cadmium) were serious issues (Bristol, 2013). Very low pH in water was a form of health treats to human. Water quality index (WQI) further revealed that the impact of the dumpsites was still minimal in groundwater around Solus dumpsite compared to Olusosun dumpsite. Almost all the groundwater collected around Olusosun dumpsite showed level of nitrate higher than that WHO permissible limit of 10 mg/L. This situation was of great health risk as nitrate pollution has been linked to mirth and sometimes death (Adeyi and Majolagbe, 2014). The pollutants, in the first place, hinder the normal metabolism of plants which was an invisible injury and owing to which the visible injury appears in the aftermath (Ahmed *et al.,* 1986). The population growth has put tremendous pressure on the quality of Environment of urban life. The residents generate various kinds of wastes of biodegradable and non-biodegradable categories. The impact created by these wastes on the environment was enormous, if proper disposal and management options were not applied (Upadhyay *et al.,* 2005). Direct use of domestic wastewater may not be healthy for agricultural purposes expect it undergoes certain wastewater treatment process. Poor quality water may affect irrigated crops by causing accumulation of salts in the root zone, thus affecting the permeability/uptake of water from the soil to the plants. Contaminants in irrigation water when it accumulates overtime in an agricultural soils renders such soils unfit because of the accumulation of salts and other heavy metals present in the soil; thus reducing arable crop farming in agricultural activities (Musa *et al.,* 2011). The waste disposal site for the city of India had become an overflowing landfill because of the indiscriminate dumping of waste at the site (Sruti *et al.,* 2014). The waste expresses highly diversified nature at physicochemical and biological aspects which was highly influenced by socioeconomic localities (Seema, 2007). The problem of mixed solid-liquid waste disposal come up from Arsi University at different discarded point had effect in different corner on the community. The insignificant efforts had been made to safe the waste collection and disposal services from Arsi University. So, still there was a problem of liquid waste disposal effect on the watershed since the disposal was directly released to the watershed without any cleaning, reflect bad odor and partially wilting or drying of tree. However, there was a limitation in study effect of urban waste disposal on water quality in Ardu to Tulu dimtu watershed of Arsi zone. Therefore, the present study has been conducted in order to examine urban and Arsi University discarded waste disposal effects on selected water quality indicators at Ardu to Tulu dimtu watershed of Asella city, Arsi zone, Southeast Ethiopia.

METHODS AND MATERIALS

Study area description: The study would be conducted in Ardu to Tulu dimtu watershed in Arsi zone, Oromia regional state. It had a latitude and longitude of 07°57′N 39°14′E, 8.13°N 39.23°E with an elevation of 2415 meters above sea level. The annual rainfall ranges from 750-1200mm with a mean daily maximum temperature was between 10^{o}C-25^{o}C. Study Ecological zone was cool sub-humid agro-ecological region. The soil was deep and rich in humus, but due to heavy rainfall, basic cations were leached out making the soil acidic. The life system and activities in the area include home waste removal from the settlement and industry activities which result to constant generation of wastes of different kinds. These wastes were dumped in selected dumpsites while some were dumped indiscriminately leading to environmental nuisance (Arsi zone agricultural office report, 2009).

Study area selection and research design : For this study, Ardu to Tulu dimtu watershed in near Arsi University was purposively selected from Arsi zone due to excess liquefied waste discarding from the compound to Ardu to Tulu dimtu watershed and environmental problem severity and less attention paid for its treatment in last few years. Prior to collect water samples, roughly a contact with local community nearby the watershed and discussions were made in order to acquire information about the wasting system and its influence. Then after, a reconnaissance field survey was carried out in order to have a general perspective of the waste dumping system in the study area.

Water sampling methods and sample size: A total of 9 water samples from three sites and three replications were taken at each reserving locations. Composite water samples were collected from the upper or inlet from Arsi University, middle (Emipond) and bottom (nursery site) along the watershed. Sampling sites for water were selected randomly which represents the entire water bodies. The water body was liquid, so, filtrate by clearing solid and muds by fork and keep for 30 min prior to sampling and ensure collection of a representative sample as purely liquid. The analyses were carried out in soil laboratory of Arsi University and private sector accordingly.

Sample analysis methods: Samples were analyzed according to a methods and protocols described in Fishman and Friedman (1989). Important biophysical-chemical parameters that were tested included total dissolved solids (TDS), Electrical conductivity (EC) and pH, temperature, calcium (Ca), Magnesium (Mg), Potassium (K), Sodium (Na), lead (Pb), Chromium (Cr), Cadmium (Cd) and Total coliform/100ml. The results were then matched and discussed with WHO standards. The pH of the water samples was determined using the Hanna microprocessor pH meter. Determination of electric conductivity was done using a conductivity meter. Measurement of temperature; this was carried out at the site of sample collection using a mobile thermometer. Determination of total dissolved solids (TDS) was measured using Gravimetric Method (Mahmud et al. 2014). The trace metals were determined by inductively coupled plasma atomic emission spectrometry. Water samples were placed in clean containers provided by the analytical laboratory and immediately placed on ice. Nitric acid was used to preserve samples for metals analysis. The value of K and Na were determined by flame photo meter while the Ca and Mg as well as Heavy metal concentrations (Pb, Cd and Cr) in the water were measured using atomic absorption spectrophotometer. The results of the analysis were compared with standards prescribed in world health organization [WHO, 2008].

Microorganism analysis: In the membrane filtration method, a 100 ml water sample was vacuumed through a filter using a small hand pump. After filtration, the bacteria remain on the filter paper was placed in a Petri dish with a nutrient solution (broth or agar). The Petri dishes are placed in an incubator at a specific temperature and time which can vary according the type of indicator bacteria and culture media (total coliforms are incubated at 35 °C). After incubation, the bacteria colonies were seen with the naked eye or using a magnifying glass. The size and color of the colonies depends on the type of bacteria and culture media are used. For the calculation of water quality index, ten important parameters were chosen. The WQI had been calculated by using the standards of drinking water quality recommended by the World Health Organization,Bureauof Indian Standards (BIS) and Indian Council for Medical Research (ICMR). The weighted arithmetic index method had been used for the calculation of WQI of the water body. Further, quality rating or sub index (qn) was calculated using the following expression.

(Let there be n water quality parameters and quality rating or sub index (q_n) corresponding to **n** parameter was a number reflecting the relative value of this parameter in the polluted water with respect to its standard permissible value.).

q =Quality rating for the nth Water quality parameter.
V_n = Estimated value of the nth parameter at a given sampling station.
S_n =Standard permissible value of the n^{th} parameter.
V_{io} = Ideal value of n^{th} parameter in pure water. (i.e., 0 for all other parameters except the parameter pH and Dissolved oxygen (7.0 and 14.6 mg/L respectively). Unit weight was calculated by a value inversely proportional to the recommended standard value S_n of the corresponding parameter.

$$Wn = K/ Sn$$

Wn= unit weight for the n^{th} parameters.
Sn= Standard value for n^{th} parameters
K= Constant for proportionality.

The overall Water Quality Index was calculated by aggregating the quality rating with the unit weight linearly.

$$WQI = \sum q\,n\ Wn/ \sum Wn$$

Data analysis: The experimental data from each treatment would be subjected to ANOVA and means were compared by tests of least significant differences (LSD), at the confidence level of $p < 0.05$. All data generated was analyzed statistically by calculating the mean and compare the mean value with the acceptable standards. The statistical software used is SAS software version 9.2 for mean comparison (SAS, 2008) and correlation analysis by SPSS version 16.

RESULTS AND DISCUSSION

Water Quality Characterization

Electrical conductivity (EC): High soluble solid concentration decreases the water availability to the plants as increase in salt concentration reduces the osmotic potential resulting in stunted plant growth. Electrical conductivity determines the ionic process of a solution that enables it to conduct current. The amount of liquefied entities in water determines the electrical conductivity. The significantly higher mean value of EC was found at the nursery site (173.2µS/cm) whereas the lowest were at the Arsi University discarding waste (155.3µS/cm) comparison with Emipond site (164.3µS/cm) of the middle phase of the waterway. These outcomes indicate that water in the nursery site was considerably has the higher level of ionic concentration activity owing to too much dissolve solids in the solution as well as less oxidized of Arsi university wastes. The principal consequence of high EC water on the environment was the inability of the plant to compete with ions in the soil solution and the plant reflect wilting and some of the tree get completely dry. This was because plants can merely transpire unpolluted water. As compared with the recommended standard of (300µS/cm), the whole water sample sites were averaged as 164.3µS/cm which was found below the recommended standard. Similar, Musa *et al.,* (2011) indicate that, the primary effect of high ECw water on crop productivity was the inability of the plant to compete with ions in the soil solution for water. Because plants can only transpire "pure" water, usable plant water in the soil solution decreases dramatically as EC increases. The water quality index of the study site at the Arsi university waste discarded site, Emipond site and nursery area were different in the water quality indicators of biological, physical and chemical properties of water quality indicators. The values of various biological, physical and chemical properties of water for calculation of Water quality index are presented in Table 3 and it displayed that the relatively high contamination contents o f water at the nursery site (113.37) or bottom when compared to the Arsi University discarding waste fluidity (51.61) and the Emipond site (87.34) at the middle. These high values of water quality index was maintained at the lower site owing to flat setup of the pond at the middle of the watershed with non-drainage and change of temperature enable the discarded material of home and Arsi University to oxidize or react and make high index value. This agrees with Yohannes and Elias, (2017) and Minbale *et al.,* (2015) that, currently, Rivers are highly polluted as a result of increasing human population, uncontrolled urbanization and inadequate sanitation infrastructure. The main cause of this pollution was domestic waste, industrial and hospital wastes from point and non-point sources.

pH: Amongst all the properties of water quality indicator, pH determines the suitability of water for several consumptions. In all of the sample collections the pH remained significant variation and when the average values for all sites within the watershed were taken into account and it was found to be slightly alkaline. The present inquiry of Arsi University discarded, Emipond and nursery (offsite) site were displays 7.34, 7.85 and 8.53 respectively in which except the nursery (offsite) site the whole was in the range of WHO standards because the WHO has recommended maximum permissible limit of pH as 6.5 to 8.5 for drinking water. So that, the overall result indicates that the commutative offsite of the entirely site found at the nursery site water was within the non-desirable and unsuitable range for home consumption as well as plantation and irrigation because it was slightly to strongly alkaline. This was similar with reports made by Muhammad *et al.,* (2013) that, the pH values of water samples were above the neutral (> 7) limit and falls in basic range. The increased pH in the dump site soils was a positive productivity indicator in an acidic tropical soil where low pH limits uptake of nutrient elements (Anikwe and Nwobodo, 2002).

Total dissolved solids (TDS): A significant difference in the mean values of TDS (mg/l) was observed in the water of the Ardu to Tulu dimtu watershed. It was found to be low in Emipond sites while it was significantly different and found higher at nursery sites. According to Table 3, relatively, the highest mean value for TDS was (179.11mg/l) while the lower was (147.91mg/l). This was due to the land configuration take in different discarded waste and store for long time through oxidation and changes the neatness of the water body. Moreover, water had the ability to dissolve a wide range of inorganic and some organic minerals and the water with high TDS value indicates that water was highly mineralized.

According to WHO the desirable limit for TDS is 500 mg/l and maximum limit was 1000 mg/l which prescribed for drinking purpose. Accordingly, the mean total dissolved solids concentration in Ardu to Tulu dimtu watershed was found to be 160.1mg/l, and it was within the limit of WHO standards of drinking water. Similar value was reported by Muhammad *et al.,* (2013) that, total dissolved solids (TDS) and Hardness of ground water were also increasing and caused harmful diseases.

Temperature: The temperature content of the Arsi University, Emipond and nursery site indicate variation in Ardu to Tulu dimtu watershed while there was a reduction in temperature at the nursery site (15.5^{o}c) and increase at the Arsi university (18.20^{o}c) phase. The average temperature of water samples of the Arsi University, Emipond and nursery area was 16.73°C. Therefore, the temperature in this investigation was found within the permissible limit of WHO (30°C). This agrees with Halina, (2004) that, considerable variation in temperature was observed along the same river system, compared to similar systems in the region.

Chemical properties

Basic cations [Calcium (Ca) Magnesium (Mg), Potassium (K) and Sodium (Na)]: The significantly differences were observed in the mean values of Ca, Mg, K and Na at Arsi university, Emipond and nursery sites. The mean value of Ca and Mg were higher at Arsi university (24.12, 36.01mg/l) site whereas lower in Emipond (7.46, 23.09mg/l) respectively. Similarly, the higher mean value of K and Na were 12.49 and 92.62mg/l at the nursery while lower at Emipond (10.46mg/l) and Arsi University (73.92mg/l) with K and Na value respectively (Table 3). This might be the dumping sites consist of row materials which reach with calcium and magnesium and slightly alkaline with pH range between 7.34 and 8.53 and the fluctuation of temperature and oversaturation of moisture enables the oxidation reduction action of waste material less. According to WHO standards, concentration of calcium, magnesium, potassium and sodium should not exceed 75, 30, 12 and 200mg/l and in the study areas, excluding magnesium at the nursery and university site as well as potassium at the nursery site, the value of calcium, magnesium, potassium and sodium verified at acceptable level respectively. In average the value of calcium (15.25mg/l), magnesium (29.96mg/l), potassium (11.64mg/l) and sodium (82.39mg/l) in all sites and are relatively acceptable. Similarly, the values of calcium in Satellite town were 84mg/l which were above the permissible limits of 75mg/l causing health related problems (Muhammad *et al.,* 2013). Moreover, all the values of sodium, potassium, calcium, and magnesium fall under the permissible limit and there were no toxicity problem. Water samples showed no extreme variations in the concentrations of cations and anions (Yirdaw and Bamlaku, 2016*).* Also, Yohannes and Elias, (2017) stated that, Akaki River among other river is the most polluted river due to it surrounded by industries and largest market of the country as well as east Africa.

Trace metal [Lead (Pb), Cadmium (Cd) and Chromium (Cr)]: Analysis of watershed water samples from three sampling sites in the surrounding of an Arsi university area showed the significant variation in the properties analyzed for Pb, Cd and Cr at Arsi University, Emipond and nursery site (Table 3). The value of Pb, Cd and Cr were lower in the Arsi university discarded waste site (0.001, 0.001 and 0.03mg/l) whereas significantly higher at the nursery site (0.014, 0.0014 and 0.052mg/l) of the Tulu dimtu watershed water sample site respectively. There are many factors which control the mobility and availability of heavy metals in water like pH, percentage of organic matter, cation and anion exchange capacity and amount of rainfall. This might be the discarded waste from Arsi University and nearby environment to the middle phase of the watershed were fresh waste materials whereas the nursery site face to high oxidation reaction of wastes and presences of micro minerals cause to toxic since the waste arrive and rest their after long time owing to the land setup. Also, washing of pieces of metals to the waste discarded site and reaction taken in long time as well as the relatively suitable pH value for excess presence of microorganism in weathering (oxidation reduction) of residues, results in solubility and availability of heavy metals especially in the long stay of dumped site than recently. The WHO allows maximum permissible limit of Pb, Cd and Cr as, 0.05, 0.03 and 0.05mg/l in drinking water. Except the value Cr at the nursery site (0.052), the Pb, Cd and Cr content of the water body for Pb 0.001-0.014mg/l, Cd 0.001-0.0014mg/l and Cd 0.03-0.031mg/l were found within an acceptable phase in Arsi university, Emipond and nursery, respectively whereas, Cr was classified into non-acceptable category because of extremely toxic with regard to the standard. Considering the average values of Pb (0.009mg/l), Cd (0.0012mg/l) and Cr (0.038mg/l) content at all site, none of them was found above the threshold values as described in the WHO. This agrees with Raja and Namburu, **(**2014) that, dietary intake of many heavy metals through consumption of plants had long term detrimental effects on human health. Yohannes and Elias, (2017) that, most studies agreed that the river water should not be used for irrigation, drinking, livestock drinking and washing. Minbale *et al.,* 2(015) replay that; the loss of water quality due to recent rapid urbanization and industrialization, poor waste management system in the city, result in contamination of river water by potential toxic elements and using this water for drinking purpose, irrigation, animals, recreational and washing was detrimental to human health and environment. Raja and Namburu, (2014) stated that, health effects of cadmium were lung cancer, bone defects in humans and animals liver and kidneys. Food intake and tobacco smoking were the main routes by which cadmium enters the body.

Biological properties: At microscopic examination for total count of microbial community of selected sample with 10-^{5} dilution, the presence of various microbes was counted (Table 3). accordingly, the quantitative microbiological analysis of Arsi university waste site, Emipond and nursery had yield 125 × 10^{-5} CFU/g, 57 × 10^{-5} CFU/g and 83 × 10^{-5} CFU/g respectively. The increased number of CFU/g in case of all these samples indicates the spontaneous composting and enrichments and potentials of catabolic profile of the responsible microbial community with reference nature of the sample at the various stages of compost process. The higher quantitative count of these samples was due to its more assessable native nutrient value. The total coliform association had been designated as the principal pointer of the microorganisms for the presence of illness causing organisms in drinking water. In the case of bulky quantities of coliforms are found in water, there was a high probability that other pathogenic organisms exist. Accordingly, comparing the effect of urban and Arsi University discarded waste disposal on water born microorganism, the average value of Arsi university discarding site had higher (161 colony/100ml) value of total

Table 1.Water Quality Index and status of water quality (Chatterji and Raziuddin 2002)

Water quality Index level	Water quality status
0-25	Excellent water quality
26-50	Good water quality
51-75	Poor water quality
76-100	Very Poor water quality
>100	Unsuitable for drinking

Table 2. Drinking Water standards recommending Agencies and unit weights (All values except pH and Electrical Conductivity are in mg/L)

S/R	Parameter	Standard	Recommended agency	Unit weight
1	pH	6.5-8.5	ICMR/ BIS	0.2190
2	Electric conductivity	300	ICMR	0.371
3	Temperature	30^{o}c		
4	Total dissolved solid	500	ICMR/ BIS	0.0037
5	Lead	0.05	BIS or Bureau of Indian Standards	20
6	Calcium	75	ICMR/ BIS	0.025
7	Magnesium	30	ICMR/ BIS	0.061
8	Potassium	10	WHO	0.186
9	Sodium	200	WHO	0.009
10	Cadmium	0.003	WHO	0.098
11	Chromium	0.05	WHO	20
12	Coli form/100ml	10	ICMR	0.154

Table 3. Urban waste and Arsi University discarded disposal effect on of the bio-physicochemical properties of the Ardu to Tulu dimtu watershed

Sn	Parameter	Analyzed value			Standard value (Sn)	Unit weight (Wn)	Quality rating (qn)			Wnqn		
		University	Emipond	Nursery			University	Emipond	Nursery	University	Emipond	Nursery
1	pH	7.34	7.85	8.53	6.5-8.5	0.219	68	170	306	14.89	37.23	67.01
2	EC	155.3	164.33	173.2	300	0.371	51.77	54.78	57.73	19.21	20.32	21.42
3	Temp	18.2	16.5	15.5	30	62.2	60.67	55	51.67	3773.67	3421.00	3213.87
4	TDS	153.23	147.91	179.11	500	0.0037	30.65	29.58	35.82	0.11	0.11	0.13
5	Ca	24.12	7.46	14.18	75	0.025	32.16	9.95	18.91	0.80	0.25	0.47
6	Mg	36.01	23.09	30.78	30	0.061	120	76.97	102.6	7.32	4.70	6.26
7	K	11.97	10.46	12.49	12	0.186	99.75	87.17	104.1	18.55	16.21	19.36
8	Na	73.92	80.62	92.62	200	0.009	36.96	40.31	46.31	0.33	0.36	0.42
9	Pb	0.001	0.012	0.014	0.05	20	2	24	28	40.00	480.00	560.00
10	Cd	0.001	0.0011	0.0014	0.03	0.098	3.33	6	6.67	4.57	0.59	0.65
11	Cr	0.03	0.031	0.052	0.05	20	60	62	104	1200.00	1240.00	2080.00
12	TCF	161	74	108	10	0.154	1610	24666	37333	247.94	3798.56	5749.28
						∑ Wn= 103.3	∑ qn= 2175.3	∑ qn= 25281.8	∑ qn= 38194.8	∑Wnqn= 5327.4	∑Wnqn= 9019.3	∑ Wnqn= 11718.9
Individual Water Quality Index of university waste, Emi and nursery respectively =$\sum q_n Wn/ \sum Wn$										51.61	87.34	113.37
Over all Water Quality Index =$\sum q_n Wn/ \sum Wn$ = 252.32												

Where EC=electric conductivity, Temp=temperature, TDS=total dissolved solid, TCF=total coliform, Ca=calcium, Mg=magnesium, K=potassium, Na= sodium, Pb=lead, Cd=cadmium, Cr=chromium.

coliform, while the lower was at the Emipond (74 colony/100ml) site of water sampling. Since, it was a principal pointer of suitability of water for consumption; the WHO drinking water guidelines require the absence of total coliform in public drinking water supplies. Water samples collected from Ardu to Tulu dimtu were analyzed for total coliform which resulted as 125-180, 57-98 and 83-159count/100ml with Arsi University, Emipond and nursery site respectively. With respect to WHO, the standard for pure water was 10 count/100ml and according to the investigation, all water sampling sites in Ardu to Tulu dimtu watershed were unfit world health organization standards. This agrees with Hossain *et al.,* (2017) that, increasing the organic waste enhance enzyme activities, microbial respiration and reduce toxicity of some heavy metals such as Cd and Cr. Moreover, Wastewater management or the lack has a direct impact on the biological diversity of aquatic ecosystems, disrupting the fundamental integrity of our life support systems (Corcoran *et al.,* 2010). This agree with Atalia *et al.,* (2015) that, the qualitative and quantitative microbial analysis of hotels, fruit market and vegetable market garbage samples were having 558 × 10^5 CFU/g, 418 × 10^5 CFU/g and 368 × 10^5 CFU/g microbial count respectively. Moreover, Yohannes and Elias, (2017) say that, vegetables had a capacity to accumulate large concentration of heavy metals and pass to human body through food chain which affects the health of the community. The biota of the river already destroyed

Conclusion and Recommendation

The discarded urban and Arsi university slurry waste in Ardu to Tulu dimtu watershed were located in the nearly residential and cultivation area at the southwest part of Asella city and were extensively investigated in terms of biological, physical and chemical properties of water for water quality measuring indicators. Since the fluid waste was disposed directly to the watercourse of the Ardu to Tulu dimtu watershed, a number of contaminants (Pb, Cd, Cr, Co and Ni) readily influence the water and suiting the microorganism. Moreover, the problem of urban and Arsi University discarded waste had significant effect on the water quality. This especially at the nursery site there was a disturbing through toxification in excess presence of pH at nursery site (8.53), Mg at Arsi university (36.01mg/l) and nursery site (30.78mg/l), K and Cr at nursery site (12.49mg/l and 0.053mg/l) respectively as well as total coli forming organism in Arsi University (161/100ml), Emipond

(74/100ml) and nursery (108/100ml) site than the threshold value. Also, it was ostensible that all the values of EC, Temp, TDS, Ca, Na, Cd and Pb at Arsi University, Emipond and nursery site, Mg at Emipond (23.09mg/l), K at Arsi University (11.97mg/l) and Emipond (10.46mg/l) respectively, were characterized under the non-permissible limit with their toxicity problem. Moreover, microbiological determinations of water from Ardu to Tulu dimtu watershed water were found that, the water in the watershed was not good for home consumption and domestic application because of toxicity and influence by surplus replication of microorganism. Also, owing to its toxicity nature of the watershed, the total coliform result was low in nursery as well as Emipond site but, higher in Arsi university part of the watershed were poisonousness effect was not as much. Generally, the investigation outputs reveal that, they were inconsistent with World Health Organization standard for home-based consumption and irrigation water (WHO). Therefore, it is recommended for Arsi University to care for the health of people in the outlet of the watershed through treating of the waste by recycling with artifacts and natural system before releasing it to the watershed. Moreover, for public to understand the quality of water being a useful tool in many ways in the field of water quality management and having quality water.

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