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# Investigating Quality Of water used for Irrigation in Peshawar - Pakistan

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**Abstrac**t: **Wastewater** is used for irrigation purpose in most of the countries. Wastewater has both nutrients and organics. Nutrients are comprised of nitrates and phosphate which act as an effective fertilizer while the organics acts as contaminants lead to human health issues, also damage the plant's production and soil productivity. A series of laboratory tests were carried out while analyzing the wastewater quality of Peshawar (1) to assess the quality of wastewater used for irrigation in Peshawar, (2) To find whether the quality of water use for irrigation in Peshawar comply with the World health organization standard, (3) To find out the impact of irrigation water on human health and environment. Parameters including E.coli, Total Coliform, Fecal Coliform, Nitrate, Nirite, and Phosphate were compared with World Health Organization (WHO) Quality Standards. The results show an alarming deviation from the standards. From the study it is concluded that wastewater used in Peshawar for irrigation purpose does not comply/fulfil WHO Quality Standards. Using this water for irrigation purpose will leads to serious human health problems, and damage the soil and environment negatively.

## 1: INTRODUCTION

The rapid population growth in many municipalities in the arid and semiarid of world countries to place increased demands on limited fresh water supplies. The population increase has not only increased the fresh water demand but also increased the volume of wastewater generated. According to (USEPA-1992) sewage, often untreated water is used to irrigate 10% of the world's crops according to the first ever global survey of wastewater irrigation. Many farmers, especially those in urban areas, use sewage because it is free and abundant, even during drought, and being full of nitrates and phosphates, acts as in effective fertilizer. Proper disposal wastewater is a very big problem for the world. Application of wastewater for irrigation is a best option because it possess certain nutrients (nitrates and phosphates) However, agronomics (Branch of agriculture dealing with agricultural production and soil management) aspects to human health and environment due to this wastewater must also be taken into account.

Advantages of using wastewater for agricultural irrigation are that it recycles organic matter and other nutrients to soils therefore reduces the cost of fertilizers (or simply makes them more accessible to poor farmers).it will Acts as a low-cost wastewater disposal method that can also be hygienic (under controlled conditions) and The cost of pumping wastewater from nearby channels is lower than the cost of pumping groundwater.

Risks and drawbacks of using wastewater for agricultural irrigation that Pathogens contained in wastewater can cause health problems for humans. Some substances that may be present in wastewater can be toxic to plants, cattle, or humans consuming crops. Some substances that may be present in wastewater can reduce soil productivity. Infiltration of wastewater to aquifers may cause aquifer pollution with pathogens and organic matter.

## 2: LITERATURE REVIEW

Water pollution occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds and it affects plants and organisms living in these bodies of water. In almost all cases, the effect is damaging not only to individual species and populations, but also to the natural biological communities. [1]
Wastewater is used to irrigate in many forms. It can be used as treated (reclaimed water) or untreated (raw wastewater) and it can be applied directly to crops or indirectly after discharge and dilution with water from rivers or reservoirs. Sometimes reuse is part of a planned project, but most of the time—and particularly in developing countries—it just happens. In industrialized countries water reuse is part of a strategy to protect water bodies and to reduce wastewater treatment costs. It is usually performed only after high ecological standards of wastewater treatment have been achieved, and as a consequence reclaimed water has a low organic matter and nutrient content. In contrast, in developing countries reuse is frequently a spontaneous response to a shortage of water and job opportunities. It is generally practiced with "poor quality"

water (even raw wastewater), which farmers like for its fertilizing properties but mostly because it is the only way to earn a living [2]
Irrigation is a key factor in securing food supplies in many developing countries. Of the world's total arable land, 17 percent is irrigated and produces 34 percent of the crops (Pescod1992). Three-quarters of the irrigated area (192 million hectares) is located in developing countries (United Nations 2003), and as a consequence there is a high dependence on water for food production (figure 1). Frequently in these countries, wastewater is used to irrigate land because of high demand for water (70 percent of total use), the availability of wastewater, the productivity boost that the added nutrients and organic matter provide, and the possibility to sow all year round. [2]

The health effects of irrigating with wastewater can be both positive and negative. The positive effects have not been fully studied, but they have begun to be recognized in literature and are related to food security in poor areas. Thanks to wastewater, it is possible (and commonly the only way) to produce food and increase income in poor areas, thus also increasing nutrition and the quality of life. Malnutrition plays a significant role in the death of 50 percent of all children in developing countries 10.4 million Children under the age of five die annually from it. [3] Coliforms commonly occur in the water and generally not harmful to humans but their presence is used as an indicator for water contamination with diseases causing germs and pathogens. [3]

## 3: METHODOLOGY

### 1) SITE SELECTION

After analyzing the sewerage system of Peshawar two site were selected for sampling

1: Budhni

2: Palosai



### 2) SAMPLING

Three samples are selected from both sites

1: at point of disposal to analyze the quality of water come from domestics.

2: 100ft downstream to analyze the quality of water before mixing the domestic wastewater.

3: 100ft upstream to analyze the quality of water after mixing the domestic wastewater.

### 3) PARAMETERS ANALYSED

1. E.coli
2. Total Coliform
3. Fecal Coliform
4. Nitrate
5. Nirite
6. Phosphate

**4) RESULTS AND DISSCUSSION**

**GOVERNMENT OF KHYBER PAKHTUNKHWA**

**Public Health Engineering Department Central Water-Quality Laboratory Peshawar**

**Plot No. 40, Sector B-II, Phase-V Hayatabad Peshawar**

| **Sample Nature** | **Waste Water** | **Sampling Date & Time** | **05/06/2020 8:00AM** |
|---|---|---|---|
| Address/District | Peshawar | Sample receipt Date & Time | 05/06/2020 1:30PM |
| Collected by/Received From | Client | Temperature (during test) | 34 ºC |
| Sample Collected: | In Sterilized tubes in Ice bag | Date & Time of Analysis | 05/06/2020 2:00PM |
| Client Contact No. | | Reporting Date | 12-Jun-2020 |

| **Guideline Values / Standard Limits** | | | | | | | |
|---|---|---|---|---|---|---|---|
| S# | Agency | Nitrate | Nitrite | Phosphate | T.Coliform | F.Coliform | E-Coli |
| 1 | WHO | 50 mg/L | 1 mg/L | 0.5 mg/L | 0 CFU | 0 CFU | 0 CFU |

| **Methodology and Related Details** | | | | |
|---|---|---|---|---|
| **S#** | **Parameter** | **Detectable Limit** | **Reference Method** | **Unit** |
| 1 | Nitrate | 0.06 | Photometric Method | mg / L |
| 2 | Nirite | 0.04 | Photometric Method | mg / L |
| 3 | Phosphate | 0.06 | Photometric Method | mg / L |
| 4 | T.Colifrom | 1 CFU | Coliform PF | CFU |
| 5 | F.Coliform | 1 CFU / 1 ml | Coliform PF | CFU |
| 6 | E.coli | 1 CFU / 1 ml | Coliform PF | CFU |

| **Analysis Results** | | | | | | | |
|---|---|---|---|---|---|---|---|
| S# | Sample Name / ID | Nitrate | Nitrite | Phosphate | T.Coliform | F.Coliform | E-Coli |
| 1 | Disposal Pint @ Palosai (P1) | 10 | 31 | 1.7 | 50 | 23 | 23 |
| 2 | 100 Feet Down Stream Palosai (P2) | 25 | 75 | 1.4 | 44 | 11 | 11 |
| 3 | 100 feet Up Stream Palosai (P3) | 5.9 | 43 | 0.82 | 40 | 14 | 14 |
| 4 | Disposal Pint @ Budhni (B1) | 6.3 | 20 | 1.2 | 700 | 80 | 80 |
| 5 | 100 Feet Down Stream Budhni (B2) | 6.2 | 25 | 1.07 | 620 | 380 | 380 |
| 6 | 100 feet Up Stream Budhni (B3) | 6.5 | 8 | 1.47 | 570 | 290 | 290 |

**Lab Incharge:**

***Comparison of selected parameters with WHO Standards:**

**1) Nitrate**

| S no | Sample | Observed Nitrate (mg/l) | WHO Standard (mg/l) | Comment |
|---|---|---|---|---|
| 1 | p1 | 10 | 50 | ok / in range |
| 2 | p2 | 25 | 50 | ok / in range |
| 3 | p3 | 5.9 | 50 | ok / in range |
| 4 | p4 | 6.3 | 50 | ok / in range |
| 5 | p5 | 6.2 | 50 | ok / in range |
| 6 | p6 | 6.5 | 50 | ok / in range |

**2) Nitrite:**

| S no | Sample | Observed Nitrite (mg/l) | WHO Standard (mg/l) | Comment |
|---|---|---|---|---|
| 1 | p1 | 31 | 1 | not ok / not in range |
| 2 | p2 | 75 | 1 | not ok / not in range |
| 3 | p3 | 43 | 1 | not ok / not in range |
| 4 | p4 | 20 | 1 | not ok / not in range |
| 5 | p5 | 25 | 1 | not ok / not in range |
| 6 | p6 | 8 | 1 | not ok / not in range |

**3) Phosphate:**

| S no | Sample | Observed Phosphate (mg/l) | WHO Standard (mg/l) | Comment |
|---|---|---|---|---|
| 1 | p1 | 1.7 | 0.5 | not ok / not in range |
| 2 | p2 | 1.4 | 0.5 | not ok / not in range |
| 3 | p3 | 0.82 | 0.5 | not ok / not in range |
| 4 | p4 | 1.2 | 0.5 | not ok / not in range |
| 5 | p5 | 1.07 | 0.5 | not ok / not in range |
| 6 | p6 | 1.47 | 0.5 | not ok / not in range |

**4) Total coliform:**

| S no | Sample | Observed Total coliform (cfu) | WHO Standard (cfu) | Comment |
|---|---|---|---|---|
| 1 | p1 | 50 | 0 | not ok / not in range |
| 2 | p2 | 44 | 0 | not ok / not in range |
| 3 | p3 | 40 | 0 | not ok / not in range |
| 4 | p4 | 700 | 0 | not ok / not in range |
| 5 | p5 | 620 | 0 | not ok / not in range |
| 6 | p6 | 570 | 0 | not ok / not in range |

**5) Fecal coliform:**

| S no | Sample | Observed Fecal coliform (cfu) | WHO Standard (cfu) | Comment |
|---|---|---|---|---|
| 1 | p1 | 23 | 0 | not ok / not in range |
| 2 | p2 | 11 | 0 | not ok / not in range |
| 3 | p3 | 14 | 0 | not ok / not in range |
| 4 | p4 | 80 | 0 | not ok / not in range |
| 5 | p5 | 380 | 0 | not ok / not in range |
| 6 | p6 | 290 | 0 | not ok / not in range |

**6) E coli:**

| S no | Sample | Observed E coli (cfu) | WHO Standard (cfu) | Comment |
|---|---|---|---|---|
| 1 | p1 | 23 | 0 | not ok / not in range |
| 2 | p2 | 11 | 0 | not ok / not in range |
| 3 | p3 | 14 | 0 | not ok / not in range |
| 4 | p4 | 80 | 0 | not ok / not in range |
| 5 | p5 | 380 | 0 | not ok / not in range |
| 6 | p6 | 290 | 0 | not ok / not in range |

After comparing the results with standards we come to know that the results are much alarming. Every parameter except nitrate in each sample is deviating in a large sale to the standards.

## 4: CONCLUSION:

Study result indicates that the wastewater use in Peshawar for irrigation not comply with the world health origination standards. The canal water was already contaminated before adding wastewater from main disposal points due to separate disposal of water by houses. While using this water for irrigation will leads to serious health problems to human, plants and damage the soil and environment badly.

## 5: Future Recommendation:

Proper monitoring is required to fulfil the needs of WHO regarding disposal of wastewater to canals. Forming strict law against separate disposal of wastewater to canal. Wastewater treatment plant should be design for Peshawar. Wastewater should use for irrigation after treatment.

## 6: REFERENCES:

1: Assessment of waste waters quality for irrigation purposes Hassan H. Abbas, Heba S. A. Rashed and Diaa El-Din A. A. El-Zaeaty *Soils and waters Department, Faculty of Agriculture, Moshtohor, Benha University, Egypt.*
*2:* Irrigation in Developing Countries Using Wastewater
Blanca Jiméneza

3: Assessment of waste waters quality for irrigation purposes. Hassan H. Abbas, Heba S. A. Rashed and Diaa El-Din A. A. El-Zaeaty