

Purification of University Water for Rehabilitation to Use in Agricultural Water

By

Dr. Abdul Salam Atwa Ali Al-Fndi

Associate Professor of Hadith and its Sciences, College of Sharia and Islamic Studies,
Applied Science Private University

Auxiliary staff

Mays Walid / Hadeel Hisham / Wisal Salem

Preface

Study problem

The brief idea is based on purifying the water used in ablution, where it is initially purified and then used for irrigating, and the reason for choosing the ablution water over others because of:

- It is free from fats and oils
- The expected cost of completing this project is minimal.
- Applicability so that this idea does not remain confined to papers and debates.

Objectives of implementation of this project:

- Providing fare for laborers in agriculture within the university.
- The possibility of controlling the time in which the crops are irrigated so that they are irrigated very early in the morning.

The amount of water drained into the irrigation is also controlled.

- Saving the costs of water "tanks" brought to the university for irrigation.

Previous studies

Domestic grey water treatment and recovery to meet up the standards of characteristics of irrigation water

Adnan Khalil

Department of Chemical Engineering, Al-Balqa' Applied University, Faculty of Engineering Technology

P.O. Box (15008), 11134 Marka, Amman – Jordan.

Email: dr_adnan_khalil@hotmail.com

Methodology:

Experimental method

instructions:

1. collecting information on the quantity of water used for ablution, as well as the quantity of water used to irrigate crops taking into account the accuracy of this information, given the change in weather conditions throughout the year between summer and winter.
2. Passing the water coming out of the ablution over the sedimentation resource, until the clear water separated from the sediment and the clear water passes through the drip system. That is, it is concerned with the processing process.
3. Sedimentary water is collected in pumps (similar to a tank) and then used to clean yards and buildings.
4. Connect to a drip irrigation device.

Abstract

In arid and semi-arid regions where water is in short supply, greywater treatment offers the possibility of supplemental water resources for reuse in irrigation at household and farm levels. The greatest environmental challenge that Jordan faces today is water scarcity. Jordan has one of the lowest per capita levels of water resources in the world. In this work, an overview of the types and characteristics of household greywater was made. An experimental pilot plant for greywater treatment was constructed at a residential house in Al-Faysaliya village five kilometers east of Madaba city in Jordan. Household greywater (from showers, sinks, washing machines, and dishwashing machines) was separated from black water (from the toilet) and collected in a separate pipe system. The collected greywater was subjected to processes of filtration, sedimentation, aeration, and pumping into an irrigation system to irrigate many olive trees in the house garden. Samples of untreated and treated grey water have been taken and analyzed for chemical and biochemical parameters. The quantity of freshwater consumption and greywater generation has been recorded. Analysis of available experimental data has been done. Results of analysis and calculations showed that the treatment and reuse of household greywater lead to reducing the use of fresh water, saving drinking water, less strain on septic tanks, enhancing plant growth, and reclamation of nutrients.

Keywords: Greywater, Domestic Wastewater, Septic Tanks, and Greywater Reuse.

First topic: types of water

Wastewater or sewage water is defined as the water consumed by human uses to meet their daily needs be it domestic, industrial, or commercial needs. It also includes rainwater falling on the ground to run into water bodies and it consists of polluted water in addition to harmful organic materials. This polluted water may be yellow or gray in color, depending on the nature of its use.

It may be thought at first glance that wastewater is limited to one type, but it is two, namely:

First requirement: is light gray water.

Gray water is the water coming out of sinks, bathtubs, washing machines, and floor drains. Gray water takes its name from the gray color that it becomes after stagnation and is characterized by the fact that it does not contain organic materials.

The pollution ratio in it is low compared to black water, full of plant nutrients and organic components that result from washing dishes, bathing, and other. The world is now looking to reuse grey water in various countries, by reusing gray water even for irrigation, we will have saved our natural water sources for drinking purposes.

European Standard 12056-1 defines gray water as water free from feces or dung, or as low pollution household water as the water generated during showering, washing, washing hands, or also from the washing machine. Kitchen water is excluded from the definition, due to its exposure to organic contamination from grease and food waste.

Gray water can be reclaimed – for example, through the use of water recycling systems – to make it suitable for reuse. Usually, the cleaning process is based on purely mechanical-biological means.

Second requirement: black water

Black water is a term used to refer to wastewater containing feces, urine, toilet water, and toilet paper.

Third requirement: precautions that must be taken into account when reusing gray water

Care must be taken when reusing gray water, among these caveats is the high level of microbial content, as gray water contains microbes from the water of washbasins, bathtubs, etc., and may contain pathogenic and heat-resistant microbes. Also, be wary of the chemical content in water, which comes from chemicals used in washing and bathing, such as shampoos, soaps, dyes, and detergents. One of the important caveats in dealing with gray water is not to treat water as soon as possible, because gray water rots if it is stored and stagnant for long periods, and this is to remove substances that may affect humans, remove substances that affect soil and plants, and remove substances that affect the environment, environmental components such as groundwater.

Second topic: mechanism of the operation device.

Presenting an idea to apply at the university, which is to purify the water of ablution to match the specifications of agricultural water.

Preface

Gray water reuse: the path to practice water conservation.

Problem

People all over the world are facing dwindling water supplies. Excess consumption, extension in the suburbs, an increase in urban populations and poor individual management contribute to the water shortage in both developing and developed countries alike. Simply put, there is not enough water available to allow continued urban and suburban growth without reducing water waste and consumption.

Reaction

Many municipalities have had to impose measures to free up water sources, and impose restrictions on homeowners in the suburbs. The first and most common form of water restriction is in landscape irrigation, which accounts for an average of 32% of residential water use (US). This is a temporary solution at best, although limited, still uses water from the city network to residential watering.

Solution: Install a grey water system

Our Simple Solution Reuse water from your shower, bathtub, and washing machine to irrigate your landscape via high-efficiency drip irrigation. This provides a second use for the water already used and allows to irrigate all year round, while significantly reducing water consumption in the building. (1).

First requirement: Mechanism of the operation Grey Water System.

1. Greywater Production

Gray water is produced from the shower, tub, or washing machine, and in our project, it will be from the external ablution water from the university ablution.

2. Greywater pours into a separate line from black water sources (toilet, kitchen sink), then this separate greywater line must be run to operations.

Approximately the amount of water leaving the ablution basin every day = 10 gallons (2).

How much water do all greywater compositions produce?

(2) www.Greylinksystem.com

Reuse washing water

Connecting a washing machine to a greywater system and recycling an average of 25 gallons of water into use for irrigation. A system removes lint and debris from grey washing machine water, turning it into water suitable for landscape irrigation.

Reuse shower water

Showers are the most abundant source of grey water in your home at 25 gallons per use, a shower per day can produce 9,125 gallons of grey water for landscape use with a greywater system.

Reuse bathtub water

The average bathtub holds 50 gallons of water, which instead of draining into a sewer can be immediately used as recycled water for irrigation using the greywater system.

Reuse sink water

A traditional non-kitchen sink produces 0.25 gallons of water per use although the amount of water produced by a typical basin is insignificant in comparison to the above sources. However, the frequency of use of drains in a home or commercial building increases when the rate of use is taken into account. Water from a kitchen sink is considered black water due to its often high bacterial load and should not be incorporated into a greywater system (3).

(1) &(3) www.flotender.com

3. **Grey Water Treatment**

Gray water is filtered through a basin in which multiple stages occur to separate solids and oils from the gray water.

4. Once the grey water is filtered it falls into a gray water storage tank where it will remain until the irrigation system is activated

5. The existing grey water is pumped through the filter based on the selected irrigation location and then the activated zone pump and valve are activated and to the drip emitters.

Experimental steps for stages:

1. Grey water collects in the place of collection and solids are deposited at the bottom, and the clear water floats to the top.

2. In the tank of water, fats and oils are separated, like soap, to the top, and then they are taken to a landfill.

3. The rest goes through a pipe (tube) to the basin with a dispenser inside and also through which grey water is passed over the zeolite stones through which the water is purified and filtered.

4. Then it reaches the collection basin, which contains an automatic submersible pump that either pumps water to the drip irrigation distribution system or to a tank to collect it and use it when needed. (4)

(4) Morel, A. and Diener, S. (2006). Greywater Management in Low and Middle-Income Countries. Eawag. Dübendorf, Switzerland.

Grey Water Management Document in Low and Middle-Income Countries

Second requirement

Drip Irrigation Mechanism

When irrigating with greywater, most municipalities require underground greywater drainage via subsurface drip irrigation. In this style of drip irrigation, emitters are created in the distribution tubes these emitters are often pressured equivalent and designed to resist tree root growth. If an installation is done around large or problem trees, an additional tree root barrier can be installed to protect the drip line from damage.

A system that filters and compresses grey water for reuse in drip irrigation. Both commercial and residential greywater systems are available in a variety of different sizes and have been installed both internationally and locally on projects ranging from small to large scale. We believe that the best use of grey water is natural drip irrigation because grey water does not need to be treated as much as it does for uses such as washing the toilet or sprinkler irrigation. Additionally, 60 to 70 percent of a typical water budget is used for outdoor irrigation. The use of grey water for natural irrigation is the use of almost all grey water produced on the property. Greywater reuse on-site helps reduce the amount of potable water the landscape requires allowing landscape vegetation to thrive with recycled water.

Landscape Irrigation

The most efficient application of reused gray water is a drip irrigation system. Drip irrigation provides efficient water delivery to plants, trees and flowers throughout the landscape while significantly reducing evaporation since the gray water is reused outdoors where minimal human contact is expected, and the permit is much less strict than reusing it in internal applications. Grey water is not recommended for lawn irrigation, as lawn areas are best irrigated by sprinkler irrigation which is against the law in almost every municipality in the United States.

When using landscaping greywater for irrigation, the complexity of a greywater system to be installed can vary depending on specific landscape needs. The following examples are the three most common greywater irrigation system configurations.

Good drip system

A good drip system requires proper filtration or else the emitters will clog and fail. Drip irrigation is widely used in agriculture, and costly high-purification systems have been developed to maintain these drip irrigation systems. This is why a lot of technology has been invested in filtration on Flotender. We've also chosen self-cleaning drip emitters that resist clogging.

A good drip system also requires pressure-compensating emitters and sufficient pressure so that all emitters output the same amount of water regardless of their location on the system or their height. If the drip system is connected to the domestic water, then there is usually sufficient pressure for rainwater and greywater, A pump is needed that will put enough pressure to make the drip system work properly. This requires a high-pressure water pump rather than a regular water pump or water feature pump. (5)

(5) www.Greylinksystem.com

Drip Irrigation

Plants need irrigation to be able to grow properly, the drip irrigation method is one of the main irrigation methods, through which water is delivered to plants in calculated quantities and slowly, in the form of points. Small portions called drip are used, and the drip method is often used to irrigate vegetable crops, forests, graduation projects, and ornamental shrubs.

Drip Irrigation System Components

1. Main console:

It is installed at the water source, and it consists of a water pump and a water purification unit before entering the system. Various measuring devices can also be installed such as water pressure gauges and water discharge gauges.

2. Piping lines

PVC pipes or PE pipes are often used where water is transferred from the water supply and main control unit to the drip hoses.

3. Drip hoses

They are usually made of polyethylene PE, which contains anti-sun materials, and these hoses are distributed above the surface of the ground, extending next to or between plants, and then installing drops on them.

4. Dots

It is the final and important part of the dripping net, where water comes out in the form of droplets that have a regular discharge rate, and the drops are often made of durable plastic.

Advantages of drip irrigation:

1. Significantly saving water due to the local humidification of the seed spread area, and the lack of evaporation processes that may occur for irrigation water.
2. Obtaining well-grown crops as a result of the constant availability of moisture in their roots due to the long and frequent irrigation period, and this method also protects the plant from agricultural pests as a result of the vegetative cover remaining dry.
3. Eliminate excess salinity that may form in the soil through frequent irrigation.
4. Reducing the chances of weeds and harmful plants growing as a result of reducing the irrigated area around the plant, does not allow these weeds to get the water needed for growth.
5. Facilitating the cultivation process, given that the area between the presence of plants is not irrigated.
6. The possibility of providing fertilizers and pesticides at the same time as irrigation.
7. Suitable for highly sloping areas, this method does not require leveling surfaces.
8. Ease of maintenance.
9. There is no need for underground drainage systems because there is no water leakage.
10. The ability to operate automatically through soil moisture meters.

Disadvantages of drip irrigation:

1. Possible clogging of dropper holes with sediment, salt, and irrigation water contents.
2. Water pressure difference along the pipe, resulting in irregular water distribution.
3. Plastic pipes may be damaged by rodents.
4. The high cost of construction, as you need a dense network of tubes and dots.(6)

(6) Written by Sana Dwikat: www.mawdoo3.com

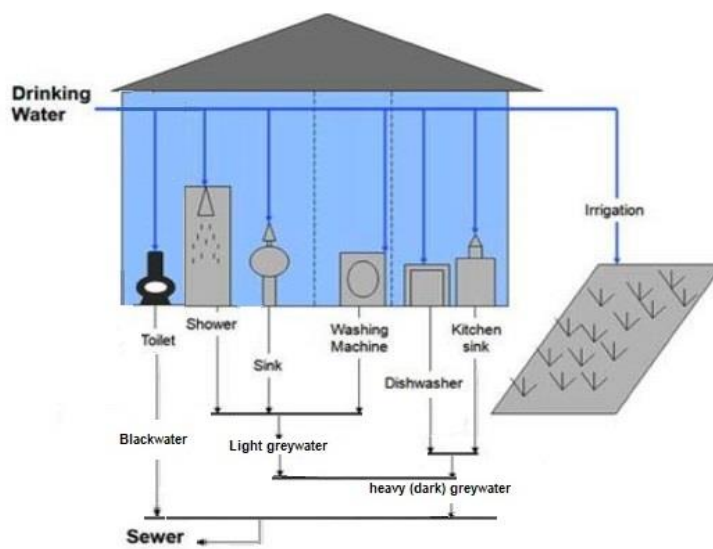
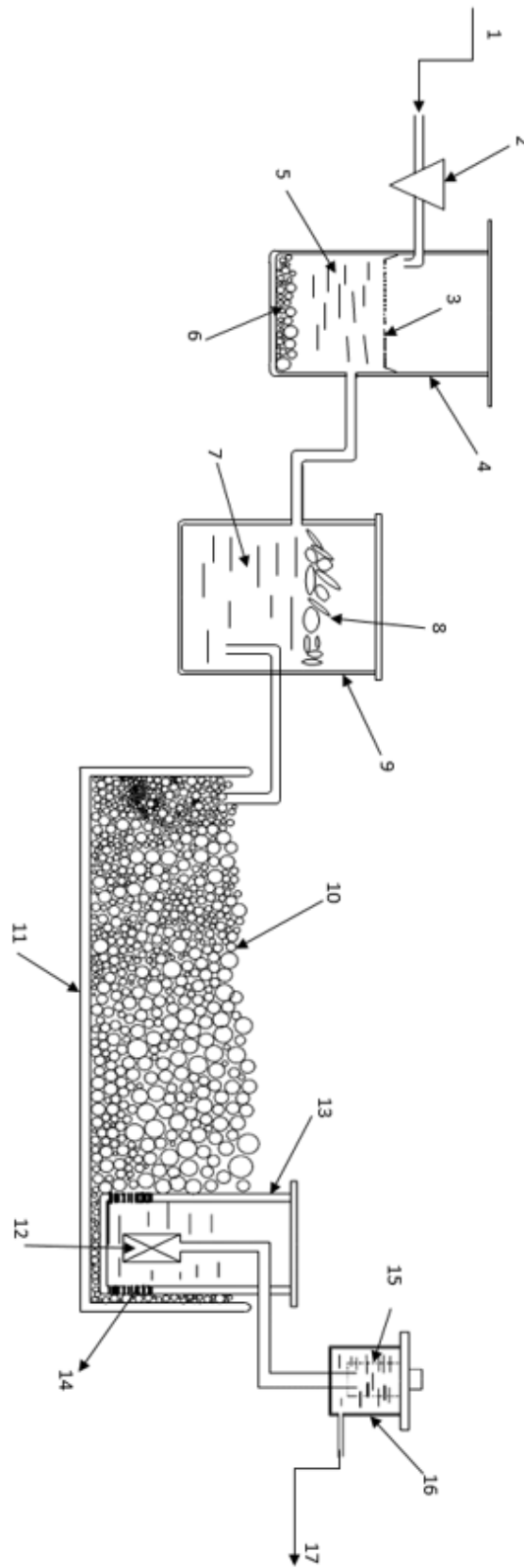


Fig (1): Domestic sewer types

1. Greywater influent
2. Flow meter
3. Filtration screen
4. Settling tank
5. Liquid layer
6. Sloid precipitate
7. Liquid layer
8. Grease and oil layer (scum)
9. Grease & oil separating tank



10. Volcanic stones (tuff)
11. Concrete basin (covered with plastic sheet)
12. Submerged pump
13. Treated greywater collecting tank
14. Small holes for water inlet
15. Internal filter screen
16. Filter
17. To irrigation system greywater effluent

Fig (2): Station Scheme



Fig (3): Greywater Station



Fig (4): Submerged Pump and Filter



Fig (5): Irrigation System



Fig (6): Olive Tree Irrigated by Greywater

Third topic: Agriculture from an Islamic perspective.

First requirement: types of trees suitable for irrigation with greywater

We stress that gray water should not be used to irrigate seedlings, and it is recommended to use it to irrigate mature plants only because it has the ability to withstand somewhat high levels of salinity, sodium, and alkaline compounds. As for the trees that can use gray water for irrigation, they include, “olive, some types of cypress, eucalyptus, Iraqi jasmine, basil and carob” and some types of patience, as Ayesh explains. Grey water is also suitable for the irrigation of some trees and ornamental plants.

Second requirement: the olive tree from an Islamic perspective

Olives are among the blessed trees that are mentioned in the Holy Qur'an seven times and Prophet, may God bless him and grant him peace, recommended to his nation that they eat its oil and anoint it with it. The benefits of eating olive oil and anointing with it have been scientifically proven. In this topic, we will talk, God willing, about some Qur'anic verses in which the descriptions of olives and their benefits are mentioned then we list some of the benefits and descriptions of olives in the purified Sunnah of the Prophet, and we conclude the topic with the words of some wise men and scientists in olives.

First: Olives in the Holy Qur'an:

- God Almighty said "And it is He who sends down rain from the sky, and We produce thereby the growth of all things. We produce from it greenery from which We produce grains arranged in layers. And from the palm trees - of its emerging fruit are clusters hanging low. And [We produce] gardens of grapevines and olives and pomegranates, similar yet varied. Look at [each of] its fruit when it yields and [at] its ripening. Indeed in that are signs for a people who believe."
- God Almighty said "And He it is who causes gardens to grow, [both] trellised and untrellised, and palm trees and crops of different [kinds of] food and olives and pomegranates, similar and dissimilar. Eat of [each of] its fruit when it yields and give it's due [zakah] on the day of its harvest. And be not excessive. Indeed, He does not like those who commit excess."
- God Almighty said "Allah is the Light of the heavens and the earth. The example of His light is like a niche within which is a lamp, the lamp is within glass, the glass as if it were a pearly [white] star lit from [the oil of] a blessed olive tree, neither of the east nor of the west, whose oil would almost glow even if untouched by fire. Light upon light. Allah guides to His light whom He wills. And Allah presents examples for the people, and Allah is Knowing of all things.."

Second: Olives in the purified Sunnah of the Prophet:

The actual and verbal Sunnah of the Prophet has alerted us to the importance of using olive oil, whether in food or in anointed, and the Prophet, peace and blessings be upon him, used to eat olive oil and anointed with it, and he informed us that the olive tree is a blessed tree.

** On the authority of Abu Usayd, may God be pleased with him, the Messenger of God, may God bless him and grant him peace, said: "Eat the oil and anoint with it, for it comes from a blessed tree."

** On the authority of Aisha, the Mother of the Believers, may God be pleased with her, that she said: The Messenger of God, may God's prayers and peace be upon him, if he wanted, it was forbidden to wash his head with *Khiṭmī* and *asashnān*, and to anoint him with oil that was not much.

Third: They said about olives:

** Ibn Abbas, may God be pleased with him, said: "In olives there are benefits. Oil Saddle, and it is food, anoint, tanning, and fuel that is lit with wood and dregs, and there is nothing in it except that it has a benefit, even the ashes with which the *Al-ibrisim* is washed." It is the first tree that grew in the world and the first tree that grew after the flood, and it grew in the homes of the prophets and the Holy Land. Seventy prophets prayed for it for blessing, among them Abraham, and among them Muhammad, may God's prayers and peace be upon him, for he said: "Oh God, bless the oil and the olive."

**Dawood said: “Olives are from trees of clear destiny, of great benefit. They are planted from October to December, so they remain for four years, then bear fruit and last for a thousand years.”

** Ibn Sina said in his book (The Canon of Medicine): “The olive is a great tree that is found in some countries and it may be squeezed out of raw olives. It may be squeezed from the Almudrik olive, and the Al-infaq oil is the oil that is squeezed from the raw. The oil may be from gardener olives or it may be from wild olives.

** Dr. Sabri al-Qabbani said in his book Food, Not Medicine: “Man has known the olive tree since ancient times, so he made good use of it if it was eating its fruits, lit with its oil, and lit its wood”

** Dr. Hassan Shamsi Pasha said in his book Olive Oil between Medicine and the Qur'an: Aldous Huxley said in his book, The Olive Tree, "If I could paint, and had enough time, I would spend several years painting the olive tree, and how many different forms of one tree? It is the olive tree.”

Recommendations

1. The water produced from the treatment is completely suitable for irrigation.
2. The station size is suitable for one medium-sized mosque.
3. Possibility of building purification plants for the rest of the university faculties' facilities.
4. Clean volcanic rocks every 3 months.
5. If the treated water is stored, it must be sterilized before storage.
6. Watering regularly.

Preface:

First topic: Types of water

First requirement: is light gray water.

Second requirement: is black water.

Third requirement: precautions that must be taken into account when reusing gray water

Second topic: The mechanism of the operation.

First requirement Mechanism of the operation Grey Water System.

Second requirement: Drip Irrigation Mechanism:

Third topic: Agriculture from an Islamic perspective.

First requirement: types of trees suitable for irrigation with gray water

Second requirement: is olive trees from an Islamic perspective.

Recommendations

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