

GREYWATER AND YOUR DETERGENT

The following is reprinted courtesy of City of Tucson Water Department. Text in [italics] is my addition. It is important to note that the information is based on research conducted over 10 years ago. Detergent companies may have modified their formulas in that time, and of course there are many other detergents and soaps not included. For now, it is the best thing I've seen on the topic, though I understand the Water and Environment Research Foundation (www.werf.org) is conducting a new study that should be complete by 2008.

This is intended for those conservation-minded people who would like to use washing machine water (greywater) to irrigate their landscapes. Before using greywater, make sure that you are aware of the appropriate methods to operate and maintain a greywater system and the local regulations regarding its use. Information can be obtained from the Pima County Department of Environmental Quality at 520-740-3340. It should be used only for subsurface irrigation, and human or animal contact must be kept to a minimum.

If you plan to use washing machine water to irrigate, you should be aware of the elements present in this water, which may affect your plants or soils. Detergents and other clothes-washing products use a variety of chemicals to aid in cleansing. Some of these ingredients can be harmful to your plants. Because labeling on detergent and other clothes-washing products is often incomplete, a study was conducted to evaluate some critical product characteristics which may adversely affect the landscape, including alkalinity, boron, conductivity, sodium, and phosphate.

Alkalinity

Alkalinity refers to the relative amounts of alkaline chemicals in a solution. Sodium, potassium, and calcium are alkaline chemicals; they often are combined with carbonates, sulfates, or chlorides. Plants do not tolerate high concentrations of alkali salts.

Boron

Boron is considered a plant micronutrient, required in only very, very small amounts. Most soils provide adequate amounts of this chemical. Concentrations only slightly higher than those considered beneficial can cause severe injury or death to plants.

Conductivity

Conductivity is a simple measure of the amount of dissolved chemicals in a solution. These chemicals can be beneficial or harmful. The higher the conductivity, the more dissolved salts and minerals are present. In general, the higher the concentration of dissolved salts and minerals in the water, the greater the potential for adverse affects on the environment and plant health.

Sodium

Sodium can act as a plant poison by reducing the plant's ability to take up water from the soil. Too much sodium can destroy the structure of clay soils, making them slick and greasy by removing air spaces and thus preventing good drainage. Once a clay soil is damaged by sodium, it can be very difficult to restore it to a viable condition.

Phosphate

Phosphate is a plant food and is added to soil as a fertilizer. Soils in the Tucson area are typically low in phosphate; thus, there may be some benefit to plants if phosphate is present in greywater. This should not be relied upon, however, since many forms of phosphate are not readily usable by plants and soils.

Is Biodegradable Better?

The word biodegradable means that a complex chemical is broken down into simpler components through biological action. Do not be confused by the word biodegradable, which often is used to imply environmentally safe. Harmful chemicals as well as beneficial ones may be biodegradable.

A Note About Chlorine

Although chlorine in bleach and detergents is generally expended in the washing process, some may be left in the greywater that reaches plants. Chlorine should not be used in the garden because it may substitute for similar nutrients, blocking normal metabolic processes. The addition of chlorine to water used for irrigation should be kept to a minimum. Choose your detergent and clothes-washing products keeping in mind that it is better for your plants and soils to have a low alkalinity, boron, conductivity, and sodium content in the water. Personal preference may affect your choice of products, since higher levels of these constituents may add to their cleansing ability.

Product Name	Product Type	P or L	Conductivity	Alkalinity	Sodium	Boron	Phosphate
Ajax Ultra	Laund det	P	1130	219	292	0.040	11.2
• Alfa Kleen	Laund det	L	25.6	16.8	3.71	<<	<<<
All	Laund det	P	2030	659	492	0.10	NT
All Regular	Laund det	L	116	29.8	39.3	<<	<<<
Amway	Laund det	P	939	310	227	<<	4.00
Ariel Ultra	Laund det	P	1020	247	280	0.030	10.8
Arm and Hammer	Laund det	P	2450	1160	572	<<	<<<
• Bold	Laund det	L	46.7	68.6	9.74	<<	<<<
Bonnie Hubbard Ultra	Laund det	P	1560	617	377	0.036	<<<
Calgon Water Softener	Water softener	P	1290	345	359	<<	22.9
Cheer Free	Laund det	L	307	80.3	94.7	<<	<<<
Cheer Ultr	Laund det	P	710	149	171	0.076	<<<
Chlorox 2	Bleach	P	2880	1430	672	11.2	<<<
Dash	Laund det	P	1060	482	238	2.14	<<<
Dreft Ultra	Laund det	P	737	328	189	9.75	<<<
Downy Fabric Softener	Fabric soft.	L	6.37	NT	<	<<	<<<
Ecover	Laund det	L	132	63.7	24.3	<<	<<<
ERA Plus	Laund det	L	102	15.3	26.3	<<	<<<
Fab Ultra	Laund det	P	1140	199	443	<<	21.7
Fab 1-Shot	Laund det	Pkt	501	09	109	<<	5.26
Fresh Start	Laund det	P	510	106	132	0.026	8.28
Gain Ultra	Laund det	P	792	300	180	0.058	<<<
Greenmark	Laund det	P	1690	568	395	<<	1.67
Ivory Snow	Laund det	P	258	219	70.8	<<	NT
• Oasis	Laund det	L	89.6	16.2	<	<<	<<<
Oxydol Ultra	Laund	P	1030	501	272	11.3	<<<

Legend: P: Powder L: Liquid *Laund det: Laundry detergent*
Fabric soft: Fabric Softener
 <: Less than the sodium detection limit of 1.0mg/l.
 <<: Less than the boron detection limit of 0.025 mg/l.
 <<<: Less than the phosphate detection limit of 1.2 mg/l.
 NT: Testing of sample not possible
 N/A: Not applicable
 • *Greywater-friendly detergents highlighted by Art Ludwig in his book "Builder's Greywater Guide (www.Oasisdesign.net)*

[Note that rainwater (before it hits the ground) is comparable in quality to distilled/deionized water.]

What Can I Irrigate?

Greywater can be used to irrigate fruit trees, groundcovers and ornamental trees and shrubs. Salt-tolerant plants and native desert plants are well-suited to irrigation with greywater. Avoid using greywater on plants that prefer acid conditions, such as:

Ash	Foxglove	Philodendron	Hydrangea	Camellia
Azalea	Gardenia	Primrose	Oxalis	Xylosma
Begonia	Hibiscus	Rhododendron	Violet	Fern
Dicentra	Impatiens			

Sandy soils are less vulnerable to damage than clay soils because they drain better. In very low rainfall areas, apply fresh water [*or better yet, harvested rainwater*] occasionally to leach out accumulated salts. Be aware that some harmful effects are not always visible immediately and may take one or two years to appear. In any case, you should always pay attention to the health of the plants being irrigated and discontinue using greywater if some signs of stress are observed.

About The Study

All the detergents and related clothes-washing products were purchased in Tucson during May, 1992. The amounts used were based on the manufacturers' recommended levels for a cool to warmwater wash in a top-loading machine. Distilled water was used as a source to minimize the effect of widely-varying salt and mineral levels in tap water. The list is presented in alphabetical order and is intended as a basis for comparison only. No endorsement of any product is intended.

This study was based in part on research conducted by the Pima County Extension Service, and was prepared by the Office of Arid Lands Studies, in cooperation with the Soil, Water and Plant Analysis Laboratory, University of Arizona, and sponsored by Tucson Water.