The Effect of Detergents on the Anatomical Changes in the Roots of Beans

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Abstract
The studies found that the degree of toxicity to the kidney bean detergents is arranged in series: soap - powder-gel. Toxic effect is expressed in the degree of seed germination, changes in the shape and structure of the tissue cells of the root and stem of the plant. 5% of the content of powders and gels in the culture medium causes inhibition of plant growth or death of bean seeds. A similar soap content in the environment has a mild toxic effects, but there was a change in organogenesis.

Keywords: Detergents, Anatomical Changes, Test-Organisms, Phaseolus Vulgaris

Introduction
In recent years, a huge contribution to the process of environmental pollution occupies detergents, which is associated with high rates of production of detergents and their use in everyday life. Receipt of detergents in the aquatic environment has reached alarming volume. The threat of biological objects is to change the physical and chemical properties of water as a habitat (Stojanovich J. et al, 2002, Mungray A.K. and Kumar P., 2008, Patussamy V. et al., 2013). Especially great harm detergents causing organisms, aquatic organisms reduced gas exchange. There are studies on the effect of detergents on microscopic fungi Penicillium verrucosum (Stojanovich J. et al, 2010), Aspergillus niger (Mitidieri S. et al., 2006, Stojanovich J. et al, 2011), microalgae Chromonas salina (Reunova Y.A., Ayzydaycher N.A., 2003). Getting into the water course, detergents is actively involved in the redistribution and transformation of other pollutants (such as zinc, carcinogens, heavy metals and others.), Enhancing their toxic effects. Even low concentrations (0.05-0.10 mg / dm3) in water activate toxic substances adsorbed to sediments. Most detergents and their decay products are toxic to various groups of aquatic organisms: micro-organisms (0.8-4.0 mg / dm3), algae (0.5-6.0 mg / dm3), and invertebrates (0, 01-0, 9 mg / dm3) even at low concentrations, especially chronic exposure. Detergents can accumulate in the body and cause irreversible pathological changes (Chaturvedi V. and Kumar A., 2010, Jovanich J. et al., 2010). As a consequence, there is eutrophication.

The problem of pollution of water and soil resources is extremely relevant to the south of Kazakhstan, where there is acute water scarcity. Contaminated water detergents, getting into the soil, have a negative impact on terrestrial flora. It is known that the detergents affect photosynthetic performance of plants of enzymatic activity and exert deleterious effect on the germination of plant seeds (Nand, L. Richa M., 2003, Gadallah, MAA, 2004). The negative effect can affect the anatomic changes in plant tissues.

The purpose of research is to study the effect of detergents on the anatomical changes in the test by plants Phaseolus vulgaris.
Materials and Methods

Objects of research was common bean, the green bean, kidney bean, is an herbaceous annual plant in the Fabaceae (legume or bean family) that originated in Central and South America. The bush forms, which grow in erect leafy clumps, reach 1 m (3.25 ft) tall, while twining forms, which need to be supported with poles or trellising, grow up to 4 m (13 ft) long. Plants have trifoliate compound leaves with oval to rhombic leaflets, each up to 16 cm (9.25 in) long, which are pubescent (covered with downy hair). The flowers, which may be white, yellow, violet, or red, in loose, open unbranched clusters (racemes) that are shorter than the leaves, and develop into linear round to slightly flattened pods up to 15 cm (6.75 in) long.

Detergents: powders Dosya, Losk, Deni, Ariel, Tide, Persil, April, Mapa, Myth, Pemos, gels Fairy, Bingo, drop, soaps Good, Nivea, Chic, The effect of 78%, Sunbeam, Maxim, Brilliant 72%, NM 65%, Tic - Tac.

Bean seeds were tested for pre-germination and planted 10 pieces in plastic cups with vermiculite. Detergents at various concentrations were diluted in distilled water that was deposited in plastic cups; used as control option where detergents were not brought and watering was carried out only with distilled water. The cups were covered with plastic bags and placed in a lighted area at + 22 + 24°C. Duration of the experiment was 14 days. Morphometric changes were assessed with a ruler. Microscopy was performed using a microscope “Tayuda” (Japan) at magnification X400, X600.

Results and Discussion

For 14 days of the experiment, it was found that increasing the concentration of powders in the environment reduces the performance of seed germination test plants, the concentration of the detergent in 5% has a toxic effect on the plant. From a number of detergents toxic effect at 5% concentration and increasing the concentration to 10% results in total loss of seeds (Figure 1a). 3 and 5% soap concentration leads to moderate toxicity. Seed germination is slowed in comparison with the control embodiments. At the same time, revealed the physiological abnormalities in seedling growth, marked curvature of the stem, the violation of photosynthesis (Figure 1b).

Figure 1. Physiological disorders in bean sprouts

In the anatomical structure of the stem of the control plants are clearly defined friable core, proto-xylem, xylem, phloem, epidermis. In plants that grow on the medium with soap substantial anatomical changes are detected. Powders lead to a change in cell shape of the core and the xylem (Figure 2).
Using gel detergent “Drop” was changed the contour and structure of the soft core, the seal layer of xylem (Figure 3).

![Figure 2. The effect of powdered detergents to anatomical changes in the roots of beans: A. control, B. 3%](image_url)

**Figure 2.** The effect of powdered detergents to anatomical changes in the roots of beans: A. control, B. 3%
1-friable core; 2 proto-xylem; 3 xylem; 4-phloem; 5 epidermis

Figure 3. Effect of gel detergents on anatomical changes in the roots of beans: A. control, B. 1%, C.3%, D.5%.

Thus, it was found that a number of the most studied detergents powders were toxic, which at a 5% concentration of all seeds caused death. Influence of soaps and gel detergents causes mild toxic effects with detectable anatomical changes in the structure of the stem sprouts. The study of the effect of detergents on the anatomical changes Phaseolus vulgaris show undoubted negative effect. Thus, a number of the most studied detergents have toxic effects gelled form, which causes structural changes in the core and phloem. Powder form has less toxic effects, which is expressed in a change in cell shape as the least toxic soap.

References
Chaturvedi V., Kumar A. (2010). Toxity of sodium dodecyl sulfate in fishes and animals, IJABPT 1, 630–633

