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ВЛИЯНИЕ БЫТОВОЙ ХИМИИ НА РАСТЕНИЯ**Научный руководитель — Межова Н.В.**

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В работе представлены результаты изучения влияния растворов бытовой химии (моющих средств, бытового жидкого мыла, стирального порошка и пищевой соды) на рост травы газонной (*gramina herba*), лука репчатого (*allium cepa*) и фасоли обыкновенной (*faba communis*). Работа выполнена в домашних условиях, проведение исследования почвы были выполнены в школьной лаборатории, оснащённой специальной техникой. Для эксперимента были выбраны быстрорастущее съедобное растение класса Однодольных, семейства Лилейных – лук репчатый, представитель семейства злаки – газон мавританский и представитель класса Двудольных семейства Мотыльковые – фасоль обыкновенная, в связи с их нетребовательностью к различным видам почв, а также в связи с их живучестью. По результатам оценки влияния бытовой химии на растения сделан вывод, что вся бытовая химия оказывает негативное влияние на рост и развитие растений, биоразлагаемые моющие вещества не оказывают негативных последствий.

Ключевые слова: бытовая химия, биоразлагаемое моющее средство, фасоль обыкновенная, газон мавританский, лук репчатый.

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THE EFFECT OF HOUSEHOLD CHEMICALS ON PLANTS**Scientific supervisor — Mezova N.V.**

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The paper presents the results of studying the effect of household chemicals solutions (detergents, household liquid soap, washing powder and baking soda) on the growth of lawn grass (*gramina herba*), onion (*allium cepa*) and common beans (*faba communis*). The work was done at home, soil research was carried out in a school laboratory equipped with special equipment. For the experiment, a fast-growing edible plant of the Monocotyledonous class, the Lily family – onion, a representative of the cereal family – Moorish lawn and a representative of the Dicotyledonous class of the Moth family - common beans were selected, due to their undemanding nature to various types of soils, as well as due to their vitality. According to the results of the assessment of the effect of household chemicals on plants, it was concluded that all household chemicals have a negative impact on the growth and development of plants, biodegradable detergents do not have negative effects.

Key words: household chemicals, biodegradable detergent, common beans, Moorish lawn, onion.

Any detergent is a chemical solution containing a complex composition of molecules, therefore, it is a chemical pollutant that can cause acute poisoning, chronic diseases, and also have a carcinogenic effect. Detergents negatively affect the skin of human hands: washing powder contributes to the development of allergic reactions, such as bronchial asthma, allergic skin diseases, gastrointestinal diseases of allergic origin; baking soda, when it comes into contact with the skin or mucous membranes, can cause burns due to the large amount of alkali it contains. Even soap can negatively affect the epidermis of the skin and cause allergies as well. The basis of a synthetic detergent is surfactants, coupled with various auxiliary substances: preservatives, solvents, fat saponification agents and flavorings.

Plants easily accumulate chemicals and are not capable of active movement. Plant foods are the main source of chemical detergents and other substances of the human and animal body. Therefore, the health of the population heavily depends on the level of toxicity accumulated in plants used for food. Consequently, their condition can be used to judge the environmental situation. Due to the fact that plants are bioindicators, i.e., many changes manifest themselves through them, they are ideal for research work. Each city resident produces approximately 1 ton of waste per year, and this figure increases every year. During the decay of waste, toxic, foul-smelling and flammable gases are produced (for example, NH_3 , H_2S , CH_4 , etc.). Waste concentrated in landfill sites is a dangerous source of pollution, which affects surface and ground waters, atmospheric air, soils and plants. The current situation poses a real threat to the health of the current and future generations of the country.

The aim

The influence of household chemical solutions (detergents, household liquid soap, washing powder and baking soda) on the growth of lawn grass (*gramina herba*), onions (*allium cepa*) and common beans (*faba communis*).

Material and methods

Methods used in work:

- literature analysis;
- observation;
- experiment.

The purpose of the experimental research unit is to process data on the effect of Fairy solutions, liquid soap, ARIEL laundry detergent and baking soda on plant growth and development, as well as to compare information from the used literature with the final results of the experiment. The influence of household chemicals has not been sufficiently studied, which is of particular interest for research. For the research, the following were selected: a fast-growing edible plant of the Monocotyledonous class, the Lily family – onion, a representative of the Grass family - Moorish lawn and a representative of the Dicotyledonous class of the Faboidea family – common beans. These plants were chosen due to their undemanding nature to various types of soils, as well as due to their vitality. Onions, lawn and beans grow quickly compared to other plants and are bioindicators, which makes them the most successful object for conducting experiments in a short time.

We selected Fairy solutions, household soap, ARIEL laundry detergent and baking soda as particularly toxic substances, since they accumulate in plants and are not eliminated as a result of metabolism. In addition, solutions of Fairy and ARIEL laundry detergent can cause severe poisoning of the body.

The plants were grown in December 2021. For the experiment, previously sprouted plants of onions, Moorish lawn and common beans were used, placed in chemical glasses with tap water. These

samples were watered with water containing household chemicals solutions and also 4 control plants that were watered with ordinary water. To prepare the solutions, 10 ml chemical samples were taken and dissolved in purified tap water. Regular monitoring was carried out during the experiment.

Results and discussion

Watering of the samples was carried out every other day. The first watering was on December 26, 2021. Two days later, changes were observed in the plants: the samples watered with soda and detergent began to wilt, the leaves changed their shape, which indicated the destruction of the mechanical tissue of the plants.

On 01.01.2022, it could be concluded that the soda solution has a detrimental effect on plants. Modification of the plant body and drying of the stem were observed in these samples, which indicates the destruction of the main tissue. A white coating was observed on the soil surface due to sodium bicarbonate salts. The lawn grass watered with the same solution had waterlogging of the soil, and it withered, as the root system of the sample was destroyed.

Also, the samples watered with ARIEL laundry detergent solutions stopped absorbing the prepared solutions. The root system of the lawn grass atrophied and could not absorb the solutions. As a result, the soil was swampy, and there was a white coating on the surface. When inspecting the root of the plant, it was concluded that since the beginning of watering the plants with a solution of laundry detergent, the roots of the plants did not increase their size compared to the sample, which was watered with ordinary water.

On January 3, 2022, in the leftover samples, the concentration of liquid soap and Fairy was increased from 10 ml to 20 ml.

On January 6, 2022, the samples watered with Fairy solution lost their body shape, except for the beans: the plants began to bloom, green-yellow fruits also appeared, but the leaves were sluggish, which indicated the destruction of mechanical tissues. The leaves of onion and lawn turned yellow and lost their shape, which indicates the destruction of the main and mechanical tissues.

On January 11, 2022, a bean, watered with a solution of liquid soap, had a fruit – a bean. Chemical burns appeared on the stems. The lawn, watered with the same solution, had the soil heavily swamped, the plant body atrophied (lost mechanical tissue), the root system did not change from the moment of watering when compared with the sample, watered with ordinary water. Onion leaves stopped photosynthesizing, as the pigment chlorophyll was lost.

Work was also carried out to determine the acidity of the soil (pH). In a laboratory setting, we took a soil sample from samples of 1,2, 3 and 4 plants. After placing the earth in distilled water, stirring and letting it steep, the indicator papers were placed in the prepared solutions to determine the pH. The samples were distributed among the plants that grew in the experimental soil.

Normal pH=7

Table 1.**Common bean**

Solution with household chemicals, watered plants	pH indicator
Fairy solution	5
Liquid soap solution	4
ARIEL laundry detergent solution	9-10
Baking soda solution	8-9

Table 2.**Moorish lawn**

Solution with household chemicals, watered plants	pH indicator
Fairy solution	5
Liquid soap solution	4
ARIEL laundry detergent solution	10
Baking soda solution	9

Table 3.**Onion**

Solution with household chemicals, watered plants	pH indicator
Fairy solution	6
Liquid soap solution	5
ARIEL laundry detergent solution	8
Baking soda solution	9

Conclusion

All household chemicals are harmful to the plant community. Plants of the Angiosperm division of the Monocotyledonous class are greatly influenced. This may be due to the fact that Monocotyledons in the course of evolution are less protected from the effects of household chemicals than plants of the Dicotyledonous class.

This research shows that Fairy solution initially has no reaction on plants, but subsequently waterlogs the soil, thereby stopping the growth and development of the plant. Solutions of ARIEL laundry detergent and baking soda are more harmful to the plant due to the alkali content in their composition.

Biodegradable detergent has no harmful effect on plants.

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