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Recycling of Wastewater Treatment Plants Sludge in Urban Landscaping in West Siberia

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Abstract

Proposed method of disposal of precipitation sewage treatment plants and increase soil fertility in Nizhnevartovsk. The properties of soils obtained using precipitation generated in the wastewater treatment process of the city. The effect of dose sediment germination, growth and yield of lawn grass. The optimum content of sewage sludge in the soil. Lawn grass crops in soils produced using sewage sludge showed the resistance of plants to adverse conditions of continental climate in West Siberia. Soils obtained recommended for creating urban lawns, which will reduce the cost of purchasing the traditional types of fertilizers, eliminate the need for storage of sewage sludge.

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1. Introduction

One of the determining factors of the mankind's existence and development is the environment, which accumulates more and more waste of human activity year by year [1, 2].

The problem of utilization of wastewater sludge, which is formed in process of sewage treatment and present oneself as special kind of waste, is actual for municipal facilities of all big cities of Russia.

On the sewer treatment facilities (STF) of the city of Nizhnevartovsk is about 15,000 m³ of the dehydrated

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wastewater sludges are annually formed. For today sludge fields, which is about 5 hectares in total, are close to filling (Fig. 1).



Fig. 1. Sludge fields of Nizhnevartovsk's STF

Promising ways of wastewater's sludge recycling is their use in the production of construction materials [3÷5], for recultivation of soils [6], for land reclamation in the forestry and recreational purposes, for planting, forest nurseries and municipal facilities with growing seedlings, flowers, industrial crops [7÷10]. Disposal of sewage sludge reduces the cost of wastewater treatment and create further commercial product, which is can be sold, as well as the prevention of negative influence on the environment [11÷14].

Technogenic pollution and degradation of soils are problems of big cities [2], which is especially noticeable in northern climate in cities as Nizhnevartovsk, which is located along the Ob River. Lands of city and outskirts include well-drained uplands, forested areas and swamps most of which is backfilled. Its soils are characterized by the low content of nitric nitrogen; ammonium nitrogen; chlorides; phosphates; potassium. There is a gradual deterioration of chemical properties of soils: exhaustion of stocks of nutritious elements, alkalizing, acidifying and pollution by toxicants. The average content of organic matters in the soil samples – 4.9%. Soil quality don't satisfy required parameters for city soils [15]. Using of wastewater sludge as addition to soil of urban landscaping is solution to the problem of soil pollution and increasing their fertility [16, 17]. The sludge added to the depleted soil in the form of compost comprehensively improves its structure, returns to the soil initial abilities to a filtration and fixing, detains nutrients and moisture in a topsoil. Under the influence of the sludge, as a rule, soil acidity decreases, moisture content and their biological activity are increasing, which is especially important for soils of light granulometric composition of the Middle Ob. Soil regimes of heat, water and air are improving [11].

Wastewater sludge improves aggregate structure of soil and forms agronomical valuable structure by gathering humus and water strength of soil aggregates [18].

Efficiency of the sludge as component of soils in urban landscaping depends on climatic conditions and chemical composition of wastewater sludge of application location [7, 10, 19]. The problem of wastewater sludge utilization as soil component of urban landscape is not researched enough and demands additional study. For different territories with different bedrock, water regime, requires an individual treatment to creating artificial soil [20].

2. Subjects and Methods

For our research, wastewater sludge of primary and secondary sedimentation tanks of sewage treatment facilities of Nizhnevartovsk has taken. The sludge was dehydrated on centrifuges with use of reagents, which was on silt cards within two years. Experiments on local soil served as controls.

Through a system of capillary electrophoresis "Kapel 105M" was defined composition wastewater sludge and the local soil. The obtained results of statistical processing are presented in Table 1.

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