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ВЕСТНИК

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РЕСПУБЛИКИ КАЗАХСТАН

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NAS RK is pleased to announce that Bulletin of NAS RK scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of Bulletin of NAS RK in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential multidiscipline content to our community.

Қазақстан Республикасы Ұлттық ғылым академиясы "ҚР ҰҒА Хабаршысы" ғылыми журналының Web of Science-тің жаңаланған нұсқасы Emerging Sources Citation Index-те индекстелуге қабылданғанын хабарлайды. Бұл индекстелу барысында Clarivate Analytics компаниясы журналды одан әрі the Science Citation Index Expanded, the Social Sciences Citation Index және the Arts & Humanities Citation Index-ке қабылдау мәселесін қарастыруда. Web of Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабаршысының Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді мультидисциплинарлы контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Вестник НАН РК» был принят для индексирования в Emerging Sources CitationIndex, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Вестника НАН РК в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному мультидисциплинарному контенту для нашего сообщества.

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RESEARCH OF GROWTH, DEVELOPMENT AND PRODUCTIVE PROCESSES OF PLANTS GROWN IN BIOCONTAINERS

Abstract. In the article, biocontainers consist of an optimal amount of organic, environmentally friendly substances necessary for the growth of plants, without chemical additives. Their composition is mainly biohumus, in terms of dry matter is about 95%, treated with biohumus agricultural waste and cattle manure with the help of California red worms. When planting seedlings, biocontainers were created conditions that positively affect their output. Their seeds and seedlings have well stored energy from the process of point feeding and quickly formed a strong root system. The use of biocontainers with a real volume of components leads to economic efficiency in saving fertilizers, does not threaten the cleanliness of the environment and products. In addition to environmental impacts, soil pollution is associated with high economic losses associated with reduced crop yield and quality. Prevention of soil pollution should prevail throughout the world. Most pollutants are the result of human activity. Ecological and agrotechnical justifications for the creation of biocontainers of optimal composition of various sizes have been developed and the possibility of growing agricultural plants in the field has been proved. Biocontainers also contribute to the rapid growth of vegetables and increase productivity. When using biocontainers in the field of agriculture, the need to feed plants with additional mineral and organic fertilizers is reduced by about three times. It is proved that the technology of creating biocontainers of optimal composition for planting highly productive plants with high biological potential has acquired practical value. The use of biocontainers with a real volume of components leads to the economic efficiency of saving fertilizers.

Keywords: biocontainer, soil, fertilizer, erosion, biohumus, mineral, pollution, degradation, productivity, plants.

Introduction. The agro-industrial complex (AIC) is one of the most important factors affecting the environment. The impact of the agro-industrial complex on the environment consists in the intensification of agricultural production, in particular, the mechanization of many processes, pumping and chemicalization of the territory, and water reclamation. Taking into account the state of waste generation in agro – industrial production, it should be noted that the main part of waste falls on the animal and water industry - 56%, crop production - 35.6%, poultry - 3.7%, manufacturing-4.7%.

The main areas of negative impact of agro-industrial enterprises:

- formation of previously formed physical organs and substances;
- the appearance of industrial noise;
- pollution of the atmosphere and lithosphere by various industrial emissions and wastes;
- pollution of the hydrosphere by industrial wastewater, as well as depletion of fresh water;
- consumption of non-renewable natural resources;
- withdrawal of land resources for objects;
- creation of a certain adverse environment at production facilities that is harmful to human health and dangerous to his life [1-5].

Currently, 95 million hectares of land are characterized by a low level of humus, subject to wind and water erosion-70%, surface and watered soils-20%, salty soils-8%, highly toxic soils-44% (figure1).

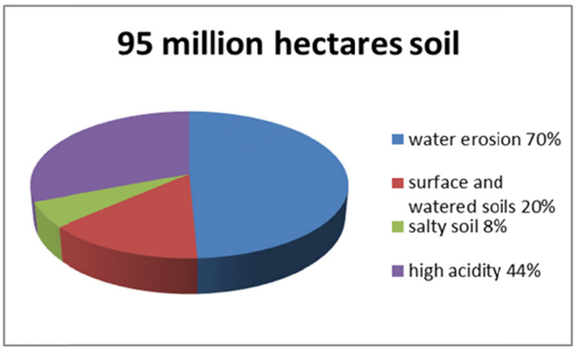

Figure 1-the level of humus that is located on the surface of the Earth

In addition to environmental impacts, soil pollution is associated with high economic losses associated with reduced crop yield and quality. Prevention of soil pollution should prevail throughout the world. The vast majority of pollutants are the result of human activity, so we are directly responsible for changing the situation, reducing pollution and ensuring a safe future for our environment.

Soil contamination may be the result of inappropriate agricultural practices. Improper farming practices reduce soil organic matter reserves and damage their ability to reduce organic pollutants. This increases the risk of pollutants entering the environment. In many countries, intensive crop production reduces soil that threatens future production opportunities in these areas. Therefore, the stability of agricultural production has become a prerequisite for restoring the anti-wear process and ensuring global food security for present and future generations [6-8].

Reclamation consists of two main stages: agrotechnical planning, formation of slopes, removal and use of fertile soil cover, installation of hydraulic and reclamation installations, elimination of toxic pollution and creation of necessary conditions for further economic use of reclaimed land [9-12]. The biological period includes a complex of agromeliorative and phytoreactivation measures aimed at improving the agrophysical, agrochemical, biochemical and other properties of soils. This is the main stage of land reclamation, since the soil must create the same conditions for the favorable development of plants and ensuring the life of microorganisms. Organic and mineral fertilizers should be used in the soil, and greenish-dung fields should be used to create a favorable environment for the development of soil microflora (figure 2).

The object of research relates to the field of agriculture, in particular, to the branch of crop production and can be used in technologies for planting and growing plants using biocontainers, when sowing seeds of agricultural crops, garden, medicinal or ornamental plants, planting roots, tubers, bulbs or tubers, when planting in the soil reduced green or silage cuttings of various crops and when planting seedlings of plants grown in greenhouses [13].

It is known that a biocontainer for planting seeds or plants, the material of which has a pressed shell of biologically absorbable substances. In the shell of the biocontainer (for example, a spherical shape), a blind cavity is made to accommodate the fruits of plants. The biocontainer also contains a compacting element of forming biologically absorbing substances, part of which contains mineral elements, biologically active substances [14].

Norm-forming biologically absorbed substance, as a rule, is crushed to a powdery type with a particle size of no more than 2.5×3 mm and dried to a rash in proportions that ensure the best squeezability and normal safety when assembling and transporting biocomposers, peat or their compounds. The biocontainer used for pressing the biocontainer taking into account possible natural impurities, biocompos, peat or a mixture of them, is at least 97% of the weight (in terms of dry matter) of the forming biologically absorbed substance. The biocontainer material does not contain additional binders, as they impair the growth of seeds and slow down the further development of plants. The required strength and transport of the biocontainer is provided by selecting the sealing mode of its shell. Pressing is performed on a rotating rotary press with an average capacity of 100 kg/cm^2. In this case, the humidity of the compressed mixture should be within 25-30%. Depending on the humidity and dispersion of the pressed material, its volume is reduced by 2-4 times during pressing.

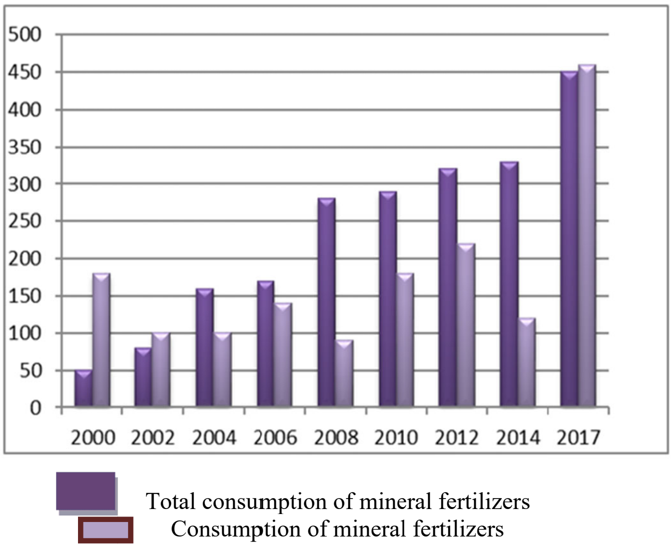

Figure 2 - Indicators of mineral and organic fertilizers application (1000T))

When a biocontainer is introduced by seed or plant germination into a soil with low humidity (often occurs during a spring drought), the shell of the biocontainer is mechanically destroyed due to its high density (i.e., it breaks up into separate fragments) too slowly. Additional watering also does not solve problems, since the moisture evaporates partially, and the material of the biocontainer shell, without having time to absorb, is partially removed to the deep layers. This leads to the fact that when planting fast-growing and fast-growing crops (for example, legumes), the growth of plant roots is faster than the process of fragmentation and complete destruction of the biocontainer shell. This prevents the rapid growth of plants. In addition, some of the intensively growing roots of the plant may come out of the zone where the fragments of the biocontainer are located, which are not yet completely disintegrated. As a result, there is a loss of the possibility of obtaining plants at the early stages of development of biologically absorbed substances embedded in the material of the biocontainer shell [15].

In this case, the volume of the cavity divided by the planting material in the biocontainer always selects a large volume that in this cavity exactly leads to the planting material (or its root system, if root vegetation is planted). This ensures better conditions for breathing of the planting material, and reduces the possibility of damage to the planting material when the volume of the cavity changes with fluctuations in temperature and / or humidity in the storage.

Methods of research. General requirements for methods for determining soil pollutants are regulated by SST 17.4.3.03-85. Sampling, transportation and storage of samples for analysis in accordance with SST 17.4.3.01-83. Sampling is carried out to control soil contamination and assess the quality of natural and disturbed soil connections. Indicators to be monitored are selected from those specified in SST 17.4.2.01-81 and SST 17.4.2.02-83. Sampling for chemical, bacteriological and helminthological analyses is carried out at least once a year. Sampling for the control of heavy metal contamination is carried out at least once every 3 years.

Salts, mineral fertilizers. In unorganized nitrates are determined by the method of Ag, VA, P, N-Dumas. For the determination of nitrogen in pure sodium nitrate and sodium nitrate, the titrimetric method is used after dissolving the sample and passing it through a cationic column.

Results and discussion. Biocontainers consist of highly active biological components, such as humus, peat, and various soil impurities obtained from the soil where plants grow that act as natural fertilizers. After these components and special binding organic compounds have the same properties as clay, which is convenient for plastic processing, cylindrical or spherical shapes are formed.In some cases, mineral fertilizers, such as phosphate, potassium, and others, are mixed into biocontainers intended for use in non-fertile soils of very poor content.

In our work, biocontainers consist of an optimal amount of organic, environmentally friendly substances necessary for the growth of plants, without chemical additives. Their composition contains mainly biohumus, in terms of dry matter is about 95%, which we obtained biohumus by the method mentioned in the previous section, that is, agricultural waste and cattle manure treated with California red worms (figure 3).

The content of nutrients in biocontainers is as follows: nitrogen (N) at least-0.7%; phosphorus (P) - at least -0.6%; potassium (K) at least - 0.9%; pH-7.0. by microelement composition: Zn, Gu, Mn, Mo, B, Fe, Se. the Biocontainer has a shell of one or more impurities from several compacted biological substances available for planting plant material. The shell material contains absorbent granules that absorb water in the soil. Creates optimal conditions for growing seed seeds in the initial, critical period. Provides optimal, favorable conditions for seed growth and further development. The "Biohumus" granule (biocontainer) consists of an optimal amount of organic, environmentally friendly substances, without the addition of chemical impurities necessary for plants, which is based on" biohumus " from cattle manure (cattle), enriched with a very useful microflora, enzymes and vitamins from the strings of earthworms.

Figure 3-Optimal composition of biocontainers

According to the developed technology biocontainers have the following properties:

- ensures the reproduction and production of highly productive plants on fertile soils;
- protects against adverse factors of the external climatic environment, including frosts and droughts;
- saving the amount of fertilizers in terms of economic efficiency and funds for their purchase, since the seeds or seedlings of plants consume nutrients in the biocontainer;
- reduces the number of weeds that cause the greatest harm in the field of agriculture, reduces the number of diseases and pests, respectively, reduces the cost of fighting them;
- additionally reduce the number of thin sprouts and seedlings.

The use of biocontainers with a real volume of components leads to economic efficiency in saving fertilizers, does not threaten the cleanliness of the environment and products.

Granules of dried biologically decomposed absorbent (i.e. before they enter the wet environment) in the soil have a solid consistency and do not reduce its strength after pressing when adding the biocontainer material to 2.5-3%. At the same time, for the shell material of the biocontainer, the granules of such an absorber are not a passive filler. On the contrary, they actively interact with the other components of the biocontainer shell material, in particular with the biocompost and peat. For example, the latter contain significant microfibre. This microclimate due to its capillary structure, in the initial stage of absorption of moisture from the soil biocontainer actively applies moisture directly to the granules of biodegradable absorbent, swelling in the soil in deep layers of the shell from the outer surface of the shell of the biocontainer. Since the rate of edema of this absorbent exceeds the rate of edema of the biocontainer shell material with the participation of soil moisture (water and/or water solutions of mineral and organic substances), the biocontainer grains that swell in the soil increase their volume faster compared to the biocomposer and peat particles. This is provided by acute mechanical destruction of the biocontainer shell and rapid contact of the fruit, tubers, bulbs, etc. (or the root of the plant) with soil moisture and soil nutrients. When the biocontainer shell is destroyed, the granules of a biodegradable absorbent that is oozed in the soil can reach soil moisture (i.e., in water and aqueous solutions of mineral and organic substances) and become active in their volume, leaving it on the deep layers of the soil or uselessly giving off evaporation.

At the beginning of the field season, biocontainers are planted with plant seeds (or other planting materials) on moist soil. In case of insufficient humidity of the initial soil, additional irrigation works are carried out. When providing water for 60-80% after placing moisture in the soil, the biocontainer increases by at least 1.5-2.5 times. Due to the lack of adhesives or other binders in the biocontainer material, it quickly absorbs the substance under the action of elastic forces for several hours (with excess soil moisture) or up to several hours (with a lack of soil moisture), increasing the volume and gradually begins to decay. As a result, a favorable microclimate is created around plant seeds or seedlings, and the seeds are provided with full primary nutrition. In addition, the biocontainer prevents the reproduction of weeds and protects plants from diseases, cold, bumps and infections in the early stages of development.

Since the Biocontainer is a complex dimensional structure, eventually, after complete mechanical decomposition of the outer shell in the soil, due to the spread of biohumus and bentonite in the soil homogeneous, it leads to a good development of plant nutrients and moisture-saving root systems.

The bottom of the biocontainer is covered with soil, so it is covered with plant seeds, the top is covered with additional soil, which is left to the surface by two or three millimeters. The biocontainers are planted at a depth of 5-7 cm for large seeds (corn, cucumber, pumpkin, etc.) and 4 cm for small seeds (tomatoes, peppers, onions, etc.). Then the pit with the biocontainer fills 200-300 ml of water, wait for one to three minutes and is covered with soil. For growing seedlings, biocontainers can be placed in boxes or in bundles. In this case, no additional soil is used. Biocontainers are filled with water, after a while they are swollen and get the entire volume. After watering in wet soil, the biomolecular bonds of the biocontainer are destroyed and disintegrated. An extensive environment for breathable, nutritious substances is formed around the seeds, which forms a cell about twice the original size.

From the above examples, it is established that the results obtained from the use of biocontainers in accordance with the presented technology are not ordinary research work in comparison with the product grown in ordinary soil. On the contrary, the result obtained significantly exceeds the sum of the above results, which is explained by the presence of a synergistic effect associated with the complex interaction of the plant with the components of the biocontainer.

When seeds are shown on biocontainers, conditions are created that promote their output. Their seeds store energy well from the point feeding process and quickly form a strong root system. Due to the fact that the soil around the vegetation is not fertile, the growth of weeds slows down sharply. Biocontainers also contribute to the rapid growth of vegetables and increase productivity. When using biocontainers in the field of agriculture, the need to feed plants with additional mineral and organic fertilizers is reduced by about three times. For example, to get a large crop in a fertile soil, carrots are enough to place biocontainers with seeds on the edges and cover with soil. At the initial stage of vegetative propagation of seeds, Biocontainerde nutrients and in the process of all production etilgendiginen profitability of 1.5-2 times, which will ensure (figure 4).

Figure 4-Technology of growing plants in Biocontainers

The biocontainer after a complete mechanical destruction of the soil nutrient particles biocompost, peat and pellets, feed moisture biodegradable substances in excess of the soil are distributed spatially evenly in the soil and are directly in the vicinity of the root system of the developing plants. Thus, around the plant at the initial stage of its development, a local zone is created, saturated with moisture and nutrients, and it does not need to spend its limited energy resources (at the juvenile stage of development) and nutrient reserves for long-term nutrition and searching for sources of moisture. The shell material contains seeds or biocontainers for planting plants containing a shell of several formative biologically absorbing substances or pressing material, the rate of edema in the soil exceeds the rate of edema and the absorption capacity of the biocontainer shell material, respectively, the rate of edema exceeds the rate of edema and the absorption capacity of the biocontainer shell material, respectively.

A biocontainer is a ball of compressed fertilizer components and trace elements with a diameter of two centimeters. It includes all the things necessary for a powerful start of the plant and its further development. After watering, the biocontainer's molecular bonds are broken in the wet soil and begin to decay, creating an air-nutrient biomass that exceeds 2-2. 5 times the original volume of the container around the fruit placed in the biocontainer. The plant will receive a powerful boost for healthy development. At the same time, the nutrient shell protects the vegetation from infection in the early stages of development.

Conclusion. When planting seedlings of the bio containers are created conditions favourable for their departure. Their seeds and seedlings store energy well from the point feeding process and quickly form a strong root system. Ecological and agrotechnical justifications for the creation of biocontainers of optimal composition of various sizes have been developed and the possibility of growing agricultural plants in the field has been proved. In General, the production of plants when planted in biocontainers allows you to get a 100% good yield. These biocontainers are in great demand, since it is possible to plant plants of different sizes in the right time. In addition, it will be easy to control the nutrition regime of plants in containers, choosing the optimal substrates and fertilizers. Since the Biocontainer is a complex dimensional structure, eventually, after complete mechanical decomposition of the outer shell in the soil, due to the spread of biohumus in a homogeneous soil, it leads to a good development of nutrients and moisture-saving root systems. In addition, these biocontainers can be used in a quadrilateral, round shape, in different sizes, and for different purposes. It decays to a few weeks, months, or one year, depending on the force used in the continuous production process.

It is proved that the technology of creating biocontainers of optimal composition for planting highly productive plants with high biological potential has acquired practical value. The use of biocontainers with a real volume of components leads to economic efficiency in saving fertilizers, does not threaten the cleanliness of the environment and products. In addition to environmental impacts, soil pollution is associated with high economic losses associated with reduced crop yield and quality. Prevention of soil pollution should prevail throughout the world. The vast majority of pollutants are the result of human activity, so we are directly responsible for changing the situation, reducing pollution and ensuring a safe future for our environment.

According to the developed technology biocontainers have the following properties:

provides overgrowth of plants and high yield in fertile soils, protects against adverse factors of the external climatic environment, including frosts and droughts, saves on economic efficiency the amount of fertilizers and funds for their purchase, as seeds or seedlings of plants consume the nutrients contained in the biocontainer, reduce the number of weeds that cause the greatest harm in the field of agriculture, reduce the number of diseases and pests, respectively,, additionally reduce the number of thin sprouts and seedlings.

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БИОКОНТЕЙНЕРДЕ ӨСІРІЛГЕН ӨСІМДІКТЕРДІҢ ӨСУ, ДАМУ ЖӘНЕ ӨНІМДІЛІК ҮДЕРІСТЕРІН АЙҚЫНДАУ

Аннотация. Мақалада биоконтейнерлер химиялық қоспаларсыз өсімдіктердің өсуіне қажетті органикалық, экологиялық таза заттардың оңтайлы мөлшерінен тұрады. Олар негізінен биохумустан тұрады, құрғақ заттарға қарағанда, Калифорниядағы қызыл құрттардың көмегімен биохумуспен өңделген ауылшаруашылық қалдықтары мен малдың көңінің шамамен 95% құрайды. Биоконтейнерлердің көшеттерін отырғызу кезінде олардың шығуына оң әсер ететін жағдайлар жасалды. Олардың тұқымдары мен көшеттері нүктелі тамақтандыру процесінде энергияны жақсы сақтайды және тез тамыр жүйесін қалыптастырады. Компоненттердің нақты көлемі бар биоконтейнерлерді қолдану тыңайтқыштарды үнемдеуде экономикалық тиімділікке әкеледі, қоршаған орта мен өнімнің тазалығына қауіп төндірмейді. Қоршаған ортаға әсер етуден басқа, топырақтың ластануы дақылдардың өнімділігі мен сапасының төмендеуіне байланысты жоғары экономикалық шығындармен байланысты. Топырақтың ластануын болдырмау бүкіл әлемде басым болуы керек. Ластаушы заттардың көпшілігі адам қызметінің нәтижесі болып табылады. Әр түрлі мөлшердегі оңтайлы құрамдағы биоконтейнерлерді құрудың экологиялық-агротехникалық негіздемелері әзірленді және далалық жағдайда ауыл шаруашылығы өсімдіктерін өсіру мүмкіндігі дәлелденді. Биоконтейнерлер сонымен қатар көкөністердің тез өсуіне және өнімділіктің жоғарылауына ықпал етеді. Ауыл шаруашылығы саласында биоконтейнерлерді пайдаланған кезде өсімдіктерді қосымша минералды және органикалық тыңайтқыштармен қоректендіру қажеттілігі шамамен үш есе азаяды. Биологиялық әлеуеті жоғары жоғары өнімді өсімдіктерді отырғызу үшін оңтайлы құрамдағы биоконтейнерлерді құру технологиясының практикалық маңызы бар екендігі дәлелденді. Компоненттердің нақты көлемі бар биоконтейнерлерді пайдалану тыңайтқыштарды үнемдеудің экономикалық тиімділігіне әкеледі.

Түйін сөздер: биоконтейнер, топырақ, тыңайтқыш, эрозия, биогумус, минерал, ластану, деградация, өнімділік, өсімдіктер.

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ИЗУЧЕНИЕ РОСТА, РАЗВИТИЯ И ПРОДУКТИВНЫХ ПРОЦЕССОВ РАСТЕНИЙ, ВЫРАЩЕННЫХ В БИОКОНТЕЙНЕРАХ

Аннотация. В статье сообщается, что биоконтейнеры состоят из оптимального количества органических, экологически чистых веществ, необходимых для роста растений, без химических добавок. Они в основном состоят из биогумуса, в пересчете на сухое вещество составляет около 95% обработанного биогумусом сельскохозяйственных отходов и навоза крупного рогатого скота с помощью калифорнийских красных червей. При посадке рассады биоконтейнерами были созданы условия, положительно влияющие на их выход. Их семена и саженцы хорошо накапливают энергию от процесса точечной подкормки и быстро формируют сильную корневую систему. Применение биоконтейнеров с реальным объемом компонентов приводит к экономической эффективности в экономии удобрений, не угрожает чистоте окружающей среды и продукции. Помимо воздействия на окружающую среду, загрязнение почвы связано с высокими экономическими потерями, связанными со снижением урожайности и качества сельскохозяйственных культур. Предотвращение загрязнения почв должно превалировать во всем мире. Большинство загрязняющих веществ являются результатом деятельности человека. Разработаны эколого-агротехнические обоснования создания биоконтейнеров оптимального состава различных размеров и доказана возможность выращивания сельскохозяйственных растений в полевых условиях. Биоконтейнеры также способствуют быстрому росту овощей и повышению урожайности. При использовании биоконтейнеров в области сельского хозяйства потребность в подкормке растений дополнительными минеральными и органическими удобрениями снижается примерно в три раза. Доказано, что технология создания биоконтейнеров оптимального состава для посадки высокопродуктивных растений с высоким биологическим потенциалом приобрела практическое значение. Использование биоконтейнеров с реальным объемом компонентов приводит к экономической эффективности экономии удобрений.

Ключевые слова: биоконтейнер, почва, удобрение, эрозия, биогумус, минерал, загрязнение, деградация, продуктивность, растения.

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