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APPLICATION OF MODIFIED HUMIC COMPOUNDS FOR RESTORATION OF DESERTIFICATION IN MANGISTAUS REGION

Abstract. In this article considered agrochemical experiments of modified humic preparations in the field conditions which carried out in the Mangistau region (Senek, Ushtagan, Tushchikadyk) on the black saxaul and zhuzgen crops. It is established that their use allows obtaining a high yield of saxaul seedlings of black and zhuzgen in nurseries. It has been revealed that the application of modified humic preparations contributes to the formation of a more branched and powerful root system, to an increase in the coefficient of soil moisture use by plants, to regulate the yield of nutrients and to improve the mineral nutrition of plants, to shorten the periods of their vegetation (by 10-15 days), to enhance the protective action of plants adverse factors. The survival rate of black saxaul and zhuzgen saplings transplanted from the nursery to mobile sand (over 2000 pieces each) was 94-98% and 67-72% in control variant in the absence of irrigation. The tests carried out over three years have shown that the application of modified composite humic preparations leads to an increase in the areas occupied by saxaul and zhuzgen (total forest area is more than 250 ha), stopping mobile barks and fixing sand.

Keywords: modified humic materials, growth stimulants, desertification, saxaul, zhuzgen, field tests.

One of the most acute problems at present is the problem of land degradation and desertification. The scale and intensity of this phenomenon are becoming more and more threatening [1-5]. About 75% of the territory of Kazakhstan is subject to degradation processes. In the Mangistau region the process of desertification has been intensifying and brings about economic and social losses. The main causes of land degradation are: erosion terrain, arid climate, alkalinity, salinity, etc. Natural soil conditions create natural background to the instability of soil covering to man-made impacts. The development of oil and gas industry and irrational use of natural resources have intensified the process of desertification of soils. There are different ways to restore desertified and degraded lands, however, the work performed does not lead to high results. Therefore, the development of innovative ways to restore degraded and deserted grounds is an important task. The use of composite humic materials makes it possible to solve the problems described above with a minimum of costs, since the chemical composition of humic compounds is compatible with organic ground substances by genetic characteristics, and humic materials also have structure-forming and moisture-retaining properties. Modification of their phosphogypsum and polymeric compounds enhances this ability, and also imparts new properties.

In mobile sands, the bulk of sands should be mastered by blocking barkhans and fixing sands, i.e. cultivation of saxaul, zhuzgen, salsola, etc. The experiments were laid by the Mangistau and Karakian regions, where mobile sand dunes are observed. Seeds and saplings of black saxaul and zhuzgen (figure 1) are taken as test crops. Before planting, furrows were prepared, modified composite humic preparations were introduced by spreading into the furrow, the expenditure was about 10-15 g.



Figure 1 – Humic growth-stimulants experiments layout in Mangistau and Karakiya regions

Modified compositional humic preparations have been applied in the following settlements in the Mangistau region:

1. Senek village
2. Usthagan village
3. Tuschykydyk village

Experiments have been carried out in the nursery, as well as on a fenced and sand-covered area.

In the nursery of Senek village modified humic preparations mixed with the ground and prepared grooves 5 m in long, 12 m in wide and 30-35 cm in deep, holes made on both sides of the groove, and planted zhuzgen seedlings (height 15-32 cm), just 500 pieces. From phenological observations it follows that the use of humic materials leads to an increase in the survival of the tested crops, their better growth and development throughout the growing season.

Agrochemical experiments carried out for three years. During the conducted works it was established that the application of modified humic preparations helps to obtain a stable and rather high yield of seedlings in the nurseries of the Mangistau region. In the course of work, seedlings of black saxaul and zhuzgen were already obtained from the first years, which were used to create protective plantations. The main way to create plantings of saxaul and zhuzgen in the region is planting seedlings. So, in 2015 black saxaul and zhuzgen seedlings - 100 pcs, and in 2016 - 300 pcs are transplanted to bare sandy soil from the nursery. It is shown that the application of modified humic preparations makes a positive effect on the plant from the beginning of the period of its growth and vegetation, in particular, improving such parameters as survival rate, growth, stem thickness, number of leaves. The survival rate of the tested crops was about 97-100%, and in control variants - 80-87%. At the same time, the vegetation period of the test plants reduced by 10-15 days.

Cultivated in the nursery in Ushtagan using modified humic preparations black saxaul seedlings (2000 pcs.) and zhuzgen (2000 pcs.) are landed on the sand in Ushtagan and Tushchykydyk villages in the fall of 2015. When calculating the number of plants that have risen, it turned out that humic preparations increase the habits of black saxaul and zhuzgen. As shown by phenological observations, after their transplantation, there was a noticeable advance in the growth and development of plants with the application of modified humic preparations.

During the vegetative period the experimental plants were externally noticeably distinguished by more intense color of leaves and by total power of their development in comparison with plants of the control variant. In experimental variants, plants grew by an average of 90-95%. Thus, the height of tested black saxaul was about 68-73 cm (the highest), in control variant about - 39-47 cm, experimental zhuzgen about - 81-89 cm, and control one from 42 to 48 cm.

It is known that irrigation is mandatory in the cultivation of saxaul and zhuzgen seedlings. However, in the conducted experiments the plants were not watered, and irrigation was carried out by sprinkling. As noted above, the weather conditions of the field season 2015-2017 were characterized by dry and hot weather. It was established that the experimental plants, in contrast to the control ones, were more resistant to a lack of moisture during their growth and development. With a lack of water, the stems of the experimental plants remained strong, and the leaf surface was saturated green and smooth, and in the control variant leaves turned yellow, the stem of the plants weakened and dried out, i.e. the use of modified humic preparations lowers the intensity of transpiration. This means that when processing plants with modified humic preparations, they use less water.

Effectiveness of the assimilation of nutrients from the environment depends on the volume and quality of their root system. In the course of the experiments it was established that the application of modified humic preparations promotes the formation of a more branched and powerful root system. The developed root system promotes the intensive intake of nutrients and the best growth of saxaul and zhuzgen.

The effectiveness of the assimilation of nutrients from the environment depends on the volume and quality of their root system. In the course of the experiments it was established that the use of modified humic preparations promotes the formation of a more branched and powerful root system. The developed root system promotes the intensive intake of nutrients and the best growth of saxaul and zhuzgen. It should be noted that in the absence of watering and loosening of the soil in experimental variants for 3 years, the black saxaul and zhuzgen plants grew by 2.2-3.1 m on average, their trunks were strong and branched, average trunk diameter was 15-26 cm (figure 2). Survival rate of the experimental crops was 94-98%, and in the control variant - 67-72%, the plants on average grew by 20-30%.



Figure 2 – Influence of modified humic preparations on the plants growth and development

Conclusions. Thus, as a result of use of modified humic preparations from the transplanted from the nursery to the sand black saxaul and zhuzgen appeared a forest which led to the stopping of mobile dunes. In addition, when using them the soil is enriched with nutrients, its agrotechnical properties are improved. This allows us to return the soil to a productive state and solve the problem of desertification of ground. The use of humic preparations also helped to regulate the nutrient yield during the entire growing season of development of experimental crops and improve the mineral nutrition of plants, and helped to better growth and development of black saxaul and zhuzgen.

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Резюме

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ТҮРЛЕНДІРІЛГЕН ГУМИНДІ ҚОСЫЛЫСТАРЫН МАҢҒЫСТАУ ОБЛЫСЫНДА ШӨЛЕЙТТЕНГЕН ТОПЫРАҚТЫ ҚАЛПЫНА КЕЛТІРУГЕ ҚОЛДАНУ

Түрлендірілген гуминді материалдарға Маңғыстау обл. (Сенек, Ұштаған, Тұшықұдық а.) егістік жағдайында қара сексеуіл мен жүзгенге қолдану арқылы агрохимиялық сынақтар жүргізілді. Бұларды қолдану қара сексеуіл мен жүзгеннің биотикалық мен абиотиктік стрестерге тұрақтылығын арттыратындығы, құмды бекітіп және жылжымалы құмды тоқтататындығы анықталды.

Түйін сөздер: түрлендірілген гуминді материалдар, өсімдіктің өсуін тездеткіштер, шөлейттену, сексеуіл, жүзген, егістік сынақтар.

Резюме

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ИСПОЛЬЗОВАНИЕ МОДИФИЦИРОВАННЫХ ГУМИНОВЫХ СОЕДИНЕНИЙ ДЛЯ ВОССТАНОВЛЕНИЯ ОПУСТЫНЕННЫХ ПОЧВ В МАНГИСТАУСКОЙ ОБЛАСТИ

Проведены агрохимические опыты модифицированных гуминовых препаратов в полевых условиях Мангистауской обл. (с. Сенек, Уштаган, Тушыкудык) на культурах черного саксаула и жузгена. Установлено, что их применение повышает устойчивость саксаула черного и жузгена к биотическим и абиотическим стрессам, приводит к остановке подвижных барханов и закреплению песка.

Ключевые слова: модифицированные гуминовые материалы, ростостимуляторы, опустынивание, саксаул, жузген, полевые испытания.