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Article



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USE OF GROWTH PROMOTER ACTIVATORS FOR ROOTING DECORATIVE CULTURES

Abstract: The article is devoted to the improvement of the reproduction technology of coniferous (the blue spruce, the savine juniper) and deciduous (forsythia and the shiny cotoneaster) ornamental plants using activators of root formation and development, such as Kornevin, Zirkon and HB-101. The research was conducted in 2014-2015 in conditions of protected and open ground of the municipal unitary enterprise "Kyzylzhar" located in the city of Shymkent, Turkestan region. The soils in the nursery were dark grey, middle loamy in texture. Humus content was 3.5%, the supply with labile phosphorus was average (5-10 mg/100 g of air-dry soil) and the supply with exchange calcium was high (15-25 mg/100 g air-dry soil). Rooting of green cuttings took place in plastic foil houses with a system of automated irrigation. As a substrate, a mixture of peat and sand 1: 1 was used. The estimation of the rooting ability of green cuttings of the blue spruce (a poorly rooting culture) and the savine juniper with the use of different types of biologically active substances showed that the best data on this indicator were noted when the cuttings had been processed by Zirkon, the worst data were on the control (water). The development of the roots of the studied coniferous species treated by Zirkon was also the best. The use of growth stimulants on ornamental and deciduous plants also increased the yield of rooted green cuttings (%). The maximum number of rooted green cuttings of the cotoneaster was provided by Zirkon, and those of forsythia – by HB-101. Consequently, the processing of green cuttings of coniferous and deciduous ornamental species is a necessary condition for obtaining the maximum number of rooted cuttings for a short period of time.

Key words: landscaping, ornamental coniferous and deciduous plants, growth activators, vegetative propagation by green cuttings.

Language: English

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Introduction

In connection with the need to provide food for the growing population of the Earth, the issue of increasing plant productivity is becoming more and more acute. Judging by the huge losses of the crop, in order to protect plants and preserve the crop, there is a practical need for a set of protective measures. One of the modern agriculture. Despite the fact that the practical use of synthetic growth regulators in many

cases gives excellent results, in terms of consumption, these products are still significantly inferior to pesticides. Not least, this is due to the fact that the results of the use of growth regulators are highly dependent on the effectiveness of all other agrotechnical measures.

At present, for the Republic of Kazakhstan, the development of research in the field of creating new highly effective domestic drugs for the needs of

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agriculture based on organic substances obtained from local natural and synthetic raw materials is especially important. In particular, there is very little data on the creation of growth-regulating preparations based on natural organic acids. Scientific schools in various areas of modern science have developed and are successfully developing in Kazakhstan. In the field of chemical sciences, fundamental and applied research is being carried out in the field of creating chemical and medical preparations, new biologically active substances, their properties and mechanisms of action are being studied. Research carried out in the Laboratory of Chemistry of Synthetic and Natural Medicinal Substances JSC Institute of Chemical Sciences. A.B. Bekturov", make a certain contribution to the creation of a database of directed search for a new generation of compounds with specified practically useful properties.

Therefore, in our opinion, it seems interesting to develop a scientific direction for the development of a new generation of growth stimulants obtained by modifying natural and synthetic organic carboxylic acids. A series of works was carried out to search for growth-accelerating properties in oil and products of its processing. Presumably, these properties are attributed to naphthenic acids, on the basis of the sodium salts of which the petroleum growth substance (NRB) was later obtained. Growth preparations are proposed based on the active principle of NRV - naphthenic acids.

Studies have been carried out on the isolation of individual naphthenic acids, the synthesis of their derivatives and the verification of physiological activity. It has been established that C12-C18 naphthenic acids have the highest growth activity, and the selectivity of their biological action has been shown possible ways to achieve this goal is to accumulate fundamental knowledge in this area, as

well as a differentiated scientifically based approach with the maximum realization of the potential of plant growth regulators. Under natural conditions, the growth and development of plants is regulated by substances, endogenous phytohormones (produced by the plant itself). Currently, six main groups of natural plant growth regulators (phytohormones) have been identified, characterized and studied: auxins, gibberellins, cytokinins, brassinosteroids, abscisic acid and ethylene, which control biochemical processes in plant cells. Low consumption rates of regulators, the ability to control the processes of plant growth and development with their help, to change the resistance of plants to various external factors determines their prospects. This allows the growth and development of plants to be shifted in the desired direction and degree, providing practitioners with particular interest.

The way to create growth regulators is a long process lasting 8-10 years and is not inferior to the creation of new medicines in terms of labor intensity. To date, about 5,000 compounds (of chemical, microbial and plant origin) that have a regulatory effect have been discovered and studied to some extent, but about 50 are used in world practice. This indicates that their widespread industrial use is just beginning. Indeed, the share of all industrial formulations of growth regulators in the world market of agrochemicals is currently about 10-12%. However, in terms of the rate of expansion of production, sale and use of plant growth regulators, they surpass all other chemicals that are used in agriculture. The use of plant growth regulators is becoming an increasingly promising and rapidly developing area of intensification.



where R = R₁ or R₂ R₁ = C₂H₅ R₂ = CH₃ - alkyl substituents in the ring, n = 1-3

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Picture 1.

One of the growth preparations for agricultural crops and animal husbandry was recommended preparations NK-240, NK-270, obtained on the basis of naphthenic acids. When using NK - 240 in feed at a concentration of 2 mg / kg of live weight, it gives an increase of 15-24% Under the leadership of

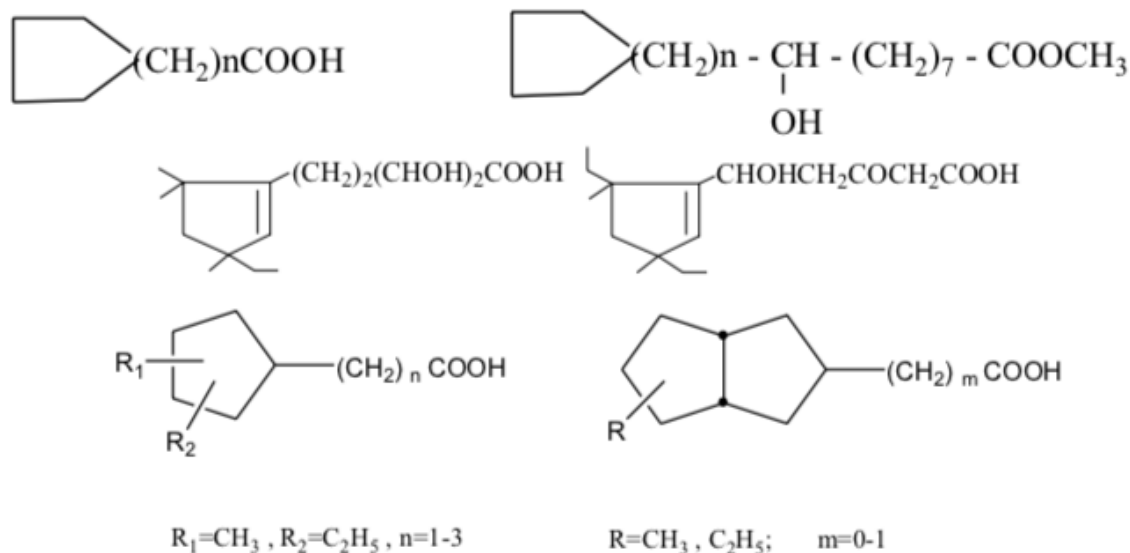
Academician M.I. Goryaev, studies were carried out on the synthesis of growth-stimulating substances structurally close to auxins, gibberellin based on a-pinene, camphor and cedar, a homologous series cyclopentanoic acids with different side chain lengths

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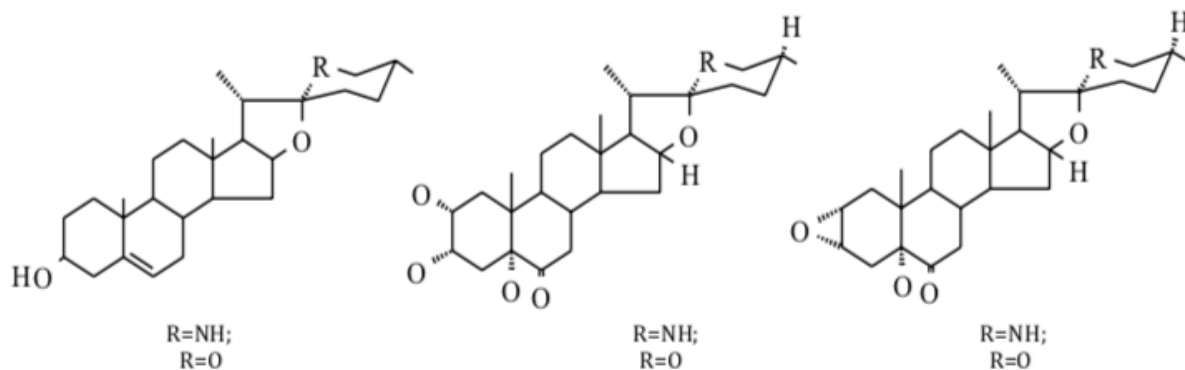
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**Picture 2.**

One of the ways to solve the problems of increasing agricultural production is the use of environmentally friendly technology of phytohormonal regulation of plant production processes. A group of phytohormones found in many plant species is commonly called brassinosteroids. The latter are of interest as environmentally friendly plant growth regulators. Being highly effective phytohormones, brassinosteroids are synthesized in plants in very small quantities. Therefore, advances in the study of biological activity and practical

application Brassinosteroids is determined by the possibility of their chemical synthesis from available steroids. Biologically active exotic brassinosteroids contain cis-2,3 - diol function, intermediate compounds in the formation of which are substances containing 2-bond. Under the guidance of Professor Irismetov M.P. the synthesis of structural analogs of brassinosteroids was carried out by means of a series of synthetic transformations based on solasodine and diosgenin.

**Picture 3.**

Compounds are of practical interest as phyto regulatory substances

Under the guidance of d.h.s. Artamonova A.F. simple and accessible methods have been developed for the preparation of esters of synthetic and natural organic carboxylic acids with polyhydric alcohols and

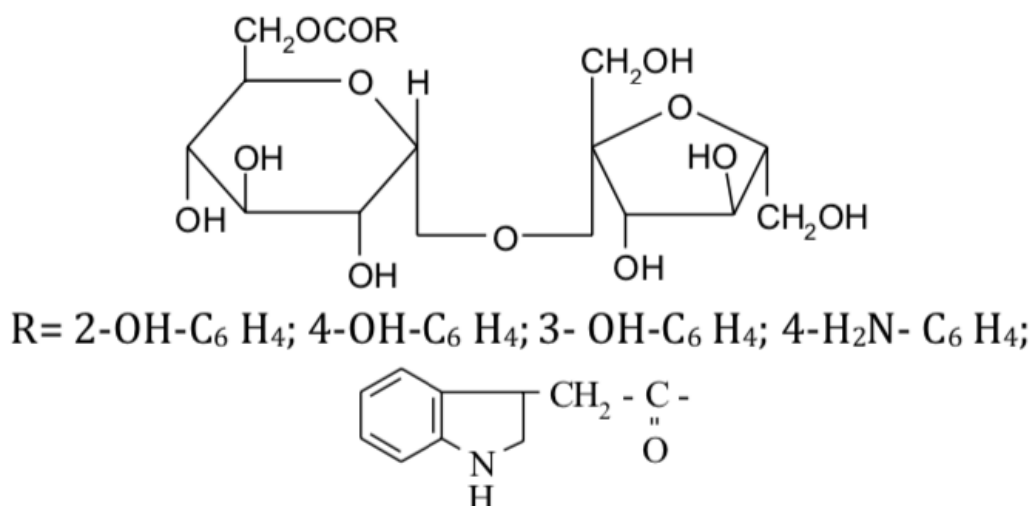
carbohydrates, which are of great practical interest. When tested in laboratory and field conditions on various vegetable crops, effective stimulants were identified among them, which have advantages over the drugs used - cineb and heteroauxin

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Picture 4.

Tests of esters of aromatic and 3-indolylacetic acids with sucrose for growth-stimulating and antiviral activity on vegetables and potatoes were carried out at the Kazakh Research Institute of Potato and Vegetable Economy. The preparations are environmentally friendly, after treatment of plants they are not found either in the soil or in products. When testing growth-stimulating and antiviral activity on potatoes in laboratory conditions, an effective drug was identified - PC-1 and PC-2. As a result of the studies, it was shown that diseases of viral etiology were less pronounced on potato plantings protected by the drug than in the control (untreated plants). 30-35 days after treatment of plants, during the period of accumulations of inhibitors - substances that inactivate viruses, the nonspecific antiviral activity of potato juice in the experimental variant was 27-35% higher than in the control. All this testifies to the immunizing antiviral effect of the studied drug on plants. The studied drug also had a phytostimulating effect. As a result of the use of RS-2, the potato yield, depending on the variety, increased by 16.1-19.7% or by 20.7-40.0 c/ha (concentration 0.005%, and in the base case by 14.5- 18.4% or by 19.6-37.3 c/ha (0.25% concentration). The use of the drug instead of the standard - TUR for obtaining an analogous crop allows to reduce the amount of the drug applied per unit area by 50 times, which is important ecological value.

The drug is recommended for practical use in potato growing to protect potatoes from viral diseases and increase yields.

One of the areas with a high innovative potential is the development of a technology for presowing seed treatment of agricultural crops, which increases the yield and biological value of plants. Seeds of beets, onions and carrots are tight. Seeds of vegetable crops with different physiological parameters and the ability

to germinate often germinate over a long period (30-40 days), which leads to heterogeneity of plants. The use of growth stimulants in the preparation of seeds for sowing increases the vigor of germination, field germination and resistance to adverse environmental factors, prevents the spread of diseases and pests by seed, while improving nutrition for emerging seedlings, as well as early ripening and increased yield. As part of promising research on the development of new environmentally friendly physiologically active plant growth regulators based on sucrose and phenylcarboxylic acids, esters were obtained, conventionally called OFC-1 and OFC-3., onions by 12-27%. The optimal dose for OFC-1 is 0.0001%, and for OFC-3 - 0.001% concentration.

It has been established that pre-sowing treatment of slow-growing seeds of carrots and onions with preparations increases field germination, plant density of carrots and onions, accelerates the dynamics of the assimilation surface of plants and the mass of root crops and bulbs, improves the quality and nutritional value of products, and contributes to an increase in yield by 22-24% (carrots) and 13-14% (onions). An increase in plant resistance against viral diseases by 3-4 times compared with heteroauxin was also noted. Preplant treatment of potato tubers with drugs at a concentration of 0.001% provided an additional yield of 21 t/ha.

It is known that the disadvantages of natural heteroauxin include instability during storage (darkens quickly in the light), phytotoxicity and low efficiency as a stimulator of growth and crop yields. Chemical modification of 3-indolylacetic acid (IAA) with sucrose made it possible to increase solubility in water, storage stability and significantly reduce toxicity, as well as provide active transport of substances due to the carbohydrate fragment, enhance and change physiological activity. At present,

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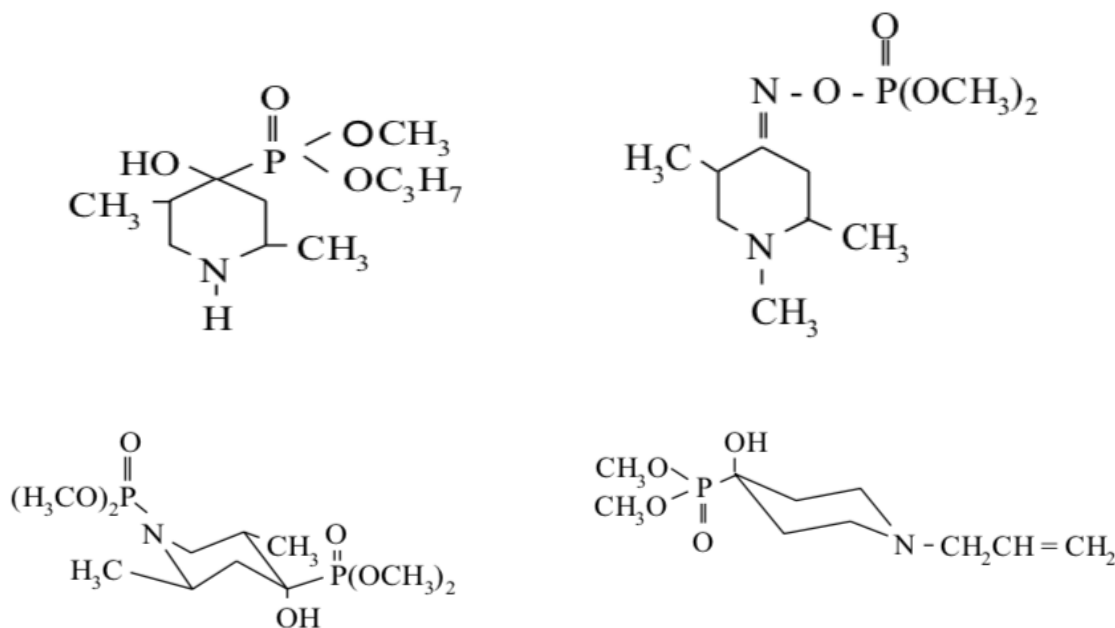
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significant factual material has been accumulated, highlighting the effect of the synthesized compounds on the growth and development of vegetable crops. When tested in laboratory and field conditions on various vegetable crops, effective stimulants were identified among them, which have the advantages before the drugs used - heteroauxin and potassium salt of heteroauxin. The monoester of 3-indolylacetic acid and sucrose showed growth-stimulating activity on potatoes. Under laboratory conditions, the effect of substances on the awakening of the kidneys of potato tubers was studied. Treatment of tubers with a 0.001% concentration of the drug promotes bud germination by 48.3%, and when treated with a 0.0001% concentration by 37.9%, respectively. In the field, the effect of the drug on the growth, development and yield of potatoes during preplant soaking of tubers in optimal concentrations was studied. Succinic acid was used as a reference. Plants grown from tubers treated with preparations were distinguished by a more intensive growth of tops, a more developed root system, due to which the number of tubers per bush increased. The positive effect of drugs on the growth and development of potato plants contributes to an increase in the yield of tubers. Preplant treatment of tubers with A-27 preparations at a concentration of 0.001% provided an increase in yield in relation to the control 4.2 t/ha (22.5%), and at a concentration of 0.0001% - 3.4 t/ha (18.6%) respectively.

Field tests of the monoester for the growth-stimulating activity of various types of industrial crops (soybeans, corn) were carried out. The use of the

drug in the optimal concentration for the treatment of seeds of corn and soybeans contributes to the maximum increase in the yield of corn to the control by 15.9%, soybeans - by 18.3%. Studies conducted in laboratory and field conditions have shown that when treating seeds of root crops with a preparation (0.0001%), it increases the yield of carrots and beets compared to the reference variant (0.06% heteroauxin) by 1.1-2.3 times 17, 18.

The most promising and intensively developing areas of synthetic organic chemistry is the search for new biologically active substances based on saturated heterocyclic compounds. The dependence of the rostagulating activity of the compounds on their composition and structure was studied. It has been established that the introduction of unsaturated radicals into the phosphonate group reduces the activity of the preparations. In phosphonpiperidols, it increases if the phosphon group contains an alkyl substituent. The nature of the substitution at the nitrogen atom has a significant effect on the activity of oxy- and aminophosphonates of the piperidine series; unsubstituted phosphonpiperidols are less active than their N-alkyl counterparts. Among the phosphorylated derivatives of the piperidine series, drugs were identified: 2,5-dimethyl-4-methylpropyl-phosphonpiperidin-4-ol 1-dimethoxyphosphoryl-2,5-dimethyl-4-dimethoxyphosphorylpiperidin-4-ol; O-dimethoxyphosphoryl - oxime 1,2,5 - trimethylpiperidin-4-one, which has a stimulating effect on the growth and development of potato plants.



Picture 5.

Under the influence of drugs, a greater increase in yield was observed, pre-planting treatment of potato tubers with drugs at a concentration of 0.001%

helps to accelerate germination and increase the number of germinated buds of eyes. At the same time, plants are distinguished by a more intensive growth of

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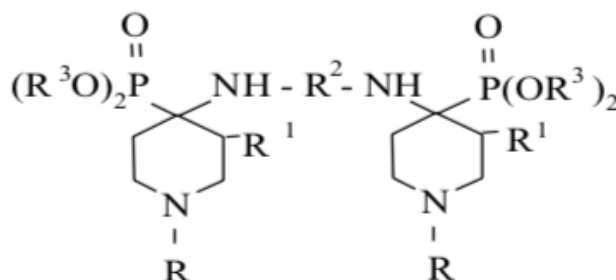
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tops, a more developed assimilation surface and a root system, which contributes to an increase in potato yield by 17-19%. For further in-depth testing as vegetable growth regulators, a-

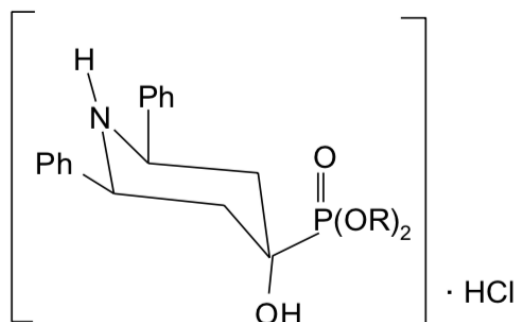
diaminodiphosphonates of the piperidine series of the general formula are recommended:



Picture 6.

The preparations had a growth-stimulating activity on cultures of onion varieties "Karatsky", tomatoes varieties "Soviet 679" and pepper varieties "Bulgarian". The tested preparations in comparison with the control (water) and standards (heteroauxin, gibberellic acid) in the conditions of laboratory and field experiments have a noticeable growth-regulating

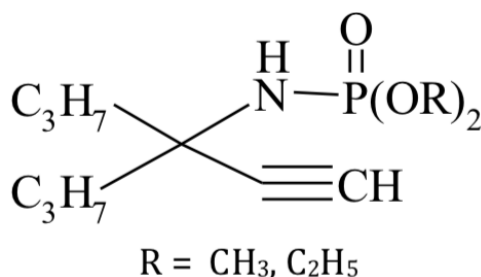
activity and are recommended for further research. Determined that dimethoxyphosphorylpiperidin-4-ol under the code "Alt-12", as a result of the activation of the vital process, in the treated tubers, the number of germinated buds accelerates and increases by 54% compared to untreated planting material



Picture 7.

As a result, potato plants grown from tubers treated with Alt-12 grew and developed better and sprouts were observed 3-4 days earlier, the additional yield was 4.4 t/ha or 19.6%. According to the results

of biological tests in laboratory and field conditions, new effective drugs have been identified in the series of amidodialkoxyposphorylhexines



Picture 8.

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The research results showed that the synthesized compounds exhibit pronounced growth-stimulating activity at the optimal concentration: Alt-10 (R=CH₃) at 0.0001%, and Alt-9 (R=C₂H₅) at 0.001%.

Under laboratory conditions, the growth-stimulating effectiveness of new domestic preparations was studied in the pre-sowing treatment of potato tubers. At the same time, the effect of new compounds on the germination energy and germination of carrot and beet seeds treated with drugs at different concentrations was studied. An additional yield was obtained when using Alt-10 at a concentration of 0.0001% - 4.5 t/ha or 20.0%, and when using Alt-9 at a concentration of 0.001% - 4.7

t/ha or 20.9%. When developing new highly effective plant growth regulators, it should be taken into account that establishing the "structure-activity" relationship is a complex function that depends on many parameters, structure, including the presence of biophore groups, their solubility, and a combination of these and other properties. The above brief indicators confirm the feasibility of developing new competitive domestic drugs for the needs of agriculture. The presented research results correlate with the further growth and development of crops, which indicates the expediency of further research on the use of new compounds as a plant growth regulator.

References:

1. Baskakov, Yu.A., & Shapovalov, A.A. (1982). *plant growth regulators*, (pp.56-62). Moscow: Knowledge.
2. Nickell, L.J. (1984). *plant growth regulators*, (pp.80-90). Moscow: Kolos.
3. Kolbin, A.M., & Ikrina, M.A. (n.d.). *Plant growth and development regulators*, (p.205). Moscow: Chemistry.
4. Shapoval, O.A., Vakulenko, V.V., & Prusakova, L.D. (2008). *Plant growth regulators. Protection and quarantine of plants*. 2008. No12, pp.54-71.
5. Dzhiembaev, B.Zh. (2001). *Fundamental and applied research of the laboratory of chemistry of natural compounds*. Chemistry of natural and synthetic biologically active compounds (structure, properties and transformations): Sat. scientific tr. IHN them. A.B. Bekturov MES RK. (pp.24-41). Almaty: 2001. T. 76.
6. Dzhiembaev, B.Zh., Irismetov, M.P., & Baramysova, G.T. (2005). Formation and development of research in the field of chemistry of natural compounds in the Institute of Chemical Science of the Ministry of Education and Science of the Republic of Kazakhstan. *Khim. magazine Kazakhstan*, 2005, No 4, pp. 240-267.
7. Ergozhin, E.E., Dzhiembaev, B.Zh., & Baramysova, G.T. (2004). *Scientific legacy of Academician M.I. Goryaev*, (p.540). Almaty: "Evero".
8. Khrupach, V.A., Zhabinsky, V.N., & Lakhvich, F.A. (1995). Prospects for the practical application of brassinosteroids - a new class of phytohormones. *Agricultural biology. Plant biology series*, No1, pp. 3-11.
9. Dzhiembaev, B.Zh. (2005). *State and prospects of research in the field of search and creation of new biologically active compounds for agriculture*. Mat. International scientific - practical conf. "Modern problems of protection and quarantine of plants", dedicated. 90th anniversary of Zh.T. Dzhiembaeva, (pp.35-40). Almaty.
10. Artamonov, A.F. (2005). *Synthesis, structure, properties and application of esters of organic acids with polyhydric alcohols and carbohydrates*: Abstract of the thesis. doctor of chem. Sciences: 01.07.05, (p.45). Almaty.
11. Artamonov, A.F. (2004). Synthesis of esters of salicylic acid with carbohydrates and polyhydric alcohols. *Izv. MES RK, ser. chem*, Almaty. No 1, pp.76-81.
12. Baramysova, G.T., & Artamonov, A.F. (2010). phytohormones based on natural and synthetic raw materials of Kazakhstan. *Khim. magazine of Kazakhstan*, Almaty, No4, pp.166 - 174.
13. Baramysova, G.T., Artamonov, A.F., Dzhiembaev, B.Zh., Tleubaeva, A.A., & Igdirova, A.N. (2010). *Development of plant growth regulators based on natural hydroxycarboxylic acids*. Intern. scientific conference "Actual problems of development of bioorganic chemistry". (p.44). Tashkent: September 20-21, 2010.
14. Baramysova, G.T., Dzhiembaev, B.Zh., Artamonov, A.F., & Tleubaeva, A.A. (2011). *Synthesis of aromatic pesticides and their biological activity*. IV Intern. "Innovative ideas and technologies-2011", (pp.173-175). Almaty.
15. (2011). *Innovative patent 24646 RK. Composition based on salicylic acid and*

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- sucrose, which has growth-stimulating activity on slow-growing seeds* / Baramysova G., Artamonov A.F., Dzhiembaev B.Zh., Tleubaeva A.A.: publ. 10/17/2011, bul. No10. 5 s.
16. (2005). *Pre-patent 16358 RK. Potato growth stimulator: publ. 2005.*
 17. (2011). *Innovative patent 26146 RK. Indole series stimulator for the growth of industrial crops: publ. 2011.*
 18. (2011). *Innovative patent 26145 RK. Indole stimulator for the growth of cucumber and root crops: publ. 2011.*
 19. Dzhiembaev, B.Zh. (2003). *-Oxy and -aminophosphonates of six-membered (N, O, S, Se) heterocycles.* (p.234). Almaty.
 20. Zhumanova, G.S., Baramysova, G.T., & Dzhiembaev, B.Zh. (2007). Oxyphosphonates of the piperidine series. *Izv. NTO "KAHAK". 2007. Special issue (17), pp. 187-189.*
 21. Baramysova, G.T. (2009). Phosphorus-containing derivatives of diphenyl-substituted heterocyclic (N,S,Se) ketones. *Reports of the National Academy of Sciences of the Republic of Kazakhstan, 2009, No2, pp.36-43.*
 22. (2010). *Innovative patent 22966 RK. Potato growth stimulator* /Baramysova G.T., Dzhiembaev B.Zh., Zhumanova G.S., Tleubaeva A.A., Alimkulov D.: pub. 2010.
 23. Baramysova, G.T., Zhusupbekova, N.S., & Dzhiembaev, B.Zh. (2009). Synthesis of amidodialkoxyposphorylhexines and diamidodipropoxyphosphoryldodecadine. *Chemical Journal of Kazakhstan. 2009. No2, pp. 100-105.*