The Austrian Journal of Technical and Natural Sciences, No 3 – 4
ISSN 2310-5607

PREMIER Publishing
ppublishing.org

Section 1. Chemistry

DOI:10.29013/AJT-24-3.4-3-11

SYNTHESIS AND STUDY OF THE PROCESSES OF BIOCHEMICAL ACTION OF THE COORDINATION COMPOUND OF COBALATE II-NITRATE WITH QUINAZOLIN-4-ONE, 6-BENZYLAMINOPURINE ON THE MORUS ALBA VARIETY OF MORACEAE PLANTS

G.O. Baymuratova [1], G. Sh. Khaydarov [2], F.E. Saitkulov [1], I.I. Okhunov [3], T.U. Eshboboyev [1], H.M. Nasimov [4]

[1] Tashkent State Agrarian University, Uzbekistan

[2] Uzbek-Finnish Pedagogical Institute, Uzbekistan

[3] Kakand State Pedagogical Institute, Uzbekistan

[4] Samarkand State University

Cite: *Baymuratova G.O., Khaydarov G.Sh., Saitkulov F.E., Okhunov I.I., Eshboboyev T.U., Nasimov H.M. (2024). Synthesis and Study of the Processes of Biochemical Action of the Coordination Compound of Cobalate II-Nitrate With Quinazolin-4-one, 6-Benzylaminopurine on the Morus Alba Variety of Moraceae Plants. Austrian Journal of Technical and Natural Sciences 2024, No 3 – 4.* https://doi.org/10.29013/AJT-24-3.4-3-11

Abstract

In the article, for the first time, the methods of synthesis of coordination compounds of cobalt (II) nitrate with quinazolin-4-one, 6-benzylaminopurine in different proportions are presented. Their formation in the presence of various solvents was shown and analyzed using physical research methods. The biological effect of the synthesized coordination compound on Morus plant was studied.

Keywords: *Quinazolin-4-on, 6-benzilaminopurin, reaction, cobalt (II)-nitrate, coordinate compound, moraceae plant, morus alba, biochemical effect, solvent, root system, development, leaf, photosynthesis, fruit, increase in carbohydrate content, nutrients, temperature, moisture, soil composition*

Introduction

For centuries, trade caravans on a long and dangerous journey from China to the west were scrutinized very carefully. Traders are fined for violating the law, and sometimes all goods are confiscated. Immediately, however, the death penalty awaited everyone trying to carry at least a few yellows, tiny grains, transparent silk wound particles – silkworms like testicles.

Silk served as money in China, producing paper from silk, and writing books before the invention of silk. For 100 years, for example, it was written in the silk classic of the Chinese historian Sima Qian, which consists of 130 chapters (Yurovskaya, M.A., Kurkin, A.V., Lukashev, N.V., 2007; Uwaydah, J.M., Aslam, M., Brown, C.H., Fitzhenry, S.R., Medonough, J.A., 1997; Shakhidoyatov, H.M., 1988; The search for pathogenic pesticides in a number of 2-thioxoquinazolinov-4, 1982; Kalinin, F.L., Merezhinsky, Yu.G., 1965; Sapaev, B. et al., 2021; Saitkulov, F.E. et al., 2014; Sapaev, B. et al., 2022; Saitkulov, F. et al., 2023; Saitkulov, F. et al., 2022).

With long and great profits, China was sold to the West with the oldest most expensive and luxurious fabrics-silk. They were regularly shipped in large quantities to the Mediterranean coast, and yet production remained a mystery to the Europeans for a long time. According to the ancient Chinese philosopher Confucius, the Chinese were well versed in silkworm breeding 3,000 years ago. China's neighbors, and even loved ones like Korea and Japan, have only known the secrets of this product for centuries. For centuries, China has kept the secret of silk production, which has led fans astray. In Greece and Rome, for example, silk was believed to have been made from the lower part of birds living in high mountain trees that were almost inaccessible.

Despite the fact that the Mulberry treeng Root is very well developed, this plant is a very demanding plant for nutrients, temperature, moisture, soil composition.

So, despite the fact that the root system of the mulberry tree is developed, the more abundant and qualitative leaf mass, and in order to increase the amount of Hydrocarbons contained in the fruit, the incense must be formed on fertile, soft-grained land (Saitkulov, F. et al., 2022; Saitkulov, F. et al., 2022; Saitkulov, F. et al., 2022; Saitkulov, F. et al., 2022; Alafeefy, A.M. 2011; Navneet Singh., Agarwal, R.C., Singh, C.P., 2013; Khodjaniyazov, Kh.U., Mamadrahimov, A.A., 2017; Byr'ko, V.M., 1984; Blokh, G.A., 1972; Koval', I.V., Usp. Khim., 1996; Brauer, G., Ed. 1963).

Most of the lands of Central Asia consist of Sandy and Sandy (Karakum, Kyzyl-Kum, Karshi steppes) soils, which well conduct water, heat and air from themselves, but can't retain moisture and nutrients in themselves. The main reason for this can be observed that the amount of humus in the soil is very small, that is, around 0,2–0,5%, the thickness of the humus layer does not exceed several centimeters. Therefore, in such soils, the mulberry tree grows very poorly (Smith, G.E.P., Alliger, G., Carr, E.L., and Young, K.C., J. Org. Chem., 1949; Schwarzenbach, G. and Flashka, H., 1970; Klimova, V.A., 1975; Kalinnikov, V.T. and Rakitin, Yu.V., 1980; Rao, C.N.R. and Venkataraghavan, R., 1962; Jensen, K.A. and Nielssen, P.H., 1966; Daescu, C., Bacaloglu, R., and Ostrogovich, G., 1973; Nakamoto, K., 1991).

It should also be noted that the application of such measures as timely processing of the tree row-to-row in mulberry and the correct path of watering is of great importance in increasing the fertility of the soil, so it is necessary to ensure that between the row-to-row of mulberries and sowing, as well as planting lands are plowed in autumn, in order for this to not happen, the incense should be watered by grinding the owners.

If we compare the reproduction of shrubs with seeds and vegetative ways in order to increase the yield of Mulberry, then in the first years of use, it is possible to make sure that in the first case, the increase in productivity is different in different environments. While it is possible to observe that the Leaf yield growth in the Bush mulberry, which is grown from Sprouts, is very sluggish, while in the Bush mulberry, which has its own roots, it was observed that the use of the Leaf sharply increases the yield in the second year, in other words, the yield of the second year leaf from the In the Bush mulberries with an acre root, the range of plants in the range of 3 meters in a row was 0,5 meters, while the number of Bush mulberries in each hectare was 3700 units, in the second year after planting from cuttings in the first year of using mulberry leaves, the yield of leaves per hectare was 2,8–3,0 tons, It can be seen that in the third year of use of mulberries, the Leaf yield obtained from Mulberry was observed in the fourth year in a permanent place in the seed – recovered mulberries, the mass of the Leaf was 2–3 tons more than in the first year, which indicates that the yield was 2,0–2,5 times higher than the (Geary' W.J.

1971; Grand' A.F. and Tamres', M. 1969; Lever, A.B.P. 1987).

The data on the development of the root system, photosynthesis in the leaves, methods of increasing the hydrocarbons content in the fruit, with the participation of various concentrated solutions of biochemical action processes of the coordination compound synthesized in the "morus alba" variety of the Moraceae plant of Mulberry, continue their scientific work in this area.

Experimental part

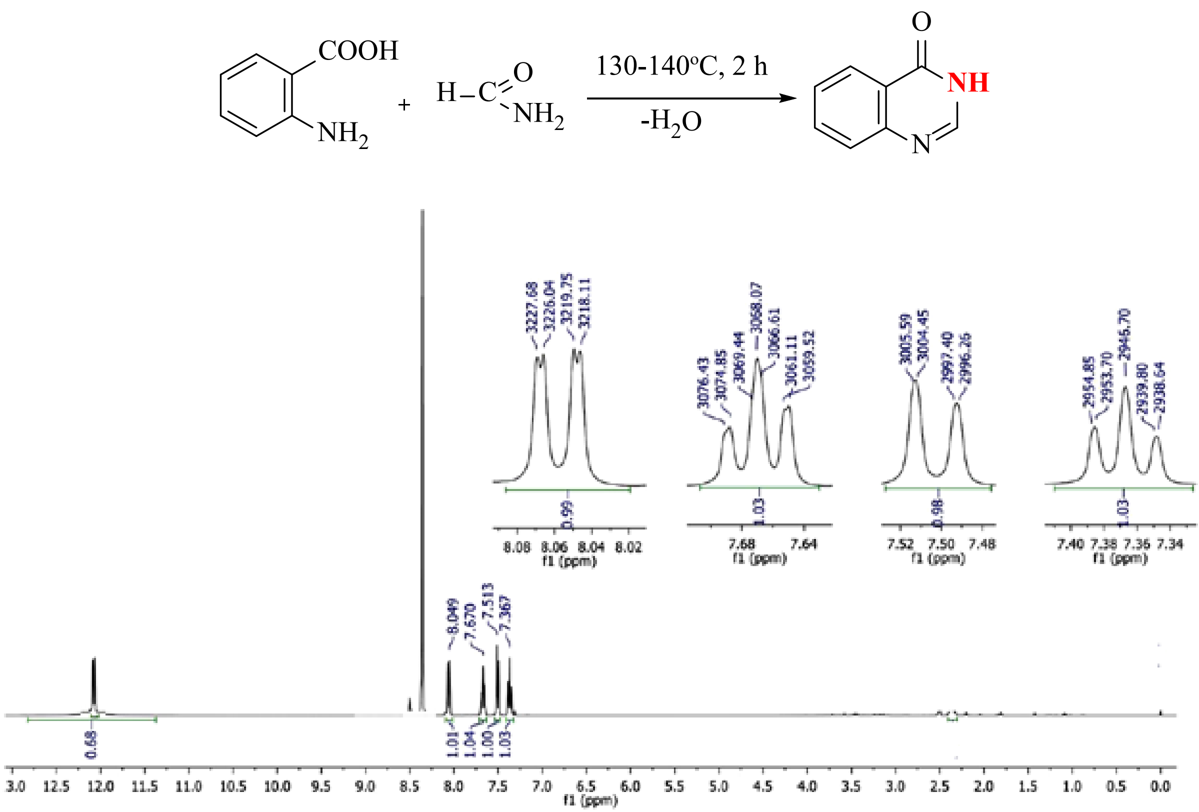
Synthesis of quinazolin-4-one. Method A. From the literature there are many works on the synthesis of quinazolines and its derivatives (Weisberger, A., Proskauer, E., Riddik, J., and Tups, E. (1985; Smith, G.E.P., Alliger, G., Carr, E.L., and Young, K.C., J. Org. Chem. 1949).

We also carried out the synthesis of quinazolin-4-one in two different ways.

Method: A. Experiments were carried out in a reaction chamber flask with a volume of 100 ml equipped with reflux refrigerator. To obtain the substance quinazolin-4-one, add 13.7 g (0.1 mol) anthranilic acid 16 ml of formamide was added (ρ = 1.42 g/cm^3). The reaction mixture was heated to the levels indicated in Table 2 temperatures and kept for a specified time. Then the reaction mixture poured into a glass containing crushed ice and left for 6–8 hours at room temperature. Dropped Crystals filtered and dried. The output was 13.8 g quinazolin-4-one. Product further purified by recrystallization in water in the presence of activated carbon. Exit the purified substance was 12.87 g (88.17%). T. = 217–218 °C. (Saitkulov, F. et al., 2022; Alafeefy, A.M., 2011; Navneet Singh, Agarwal, R.C., Singh, C.P., 2013; Khodjaniyazov, Kh.U., Mamadrahimov, A.A., 2017; Byr'ko, V.M., 1984; Blokh, G.A., 1972; Koval', I.V., Usp. Khim., 1996).

Method: B. Boil a solution of 4 ml (0.1 mol) formic acid and 5 ml (0.1 mol) ammonia (25%) in a water bath for 1 hour. Then 13.7 g (0.1 mol) was added to the reaction mixture anthranilic acid was continued to boil in for 5 hours. The gray sediment was washed acetone and dried. Recrystallized from water with activated carbon. Got white the color precipitate was dried. Yield: 7.8 g (53%), m.p. = 216–218 °C.

Figure 1. *^{1}H NMR spectra quyinazolin-4-on*



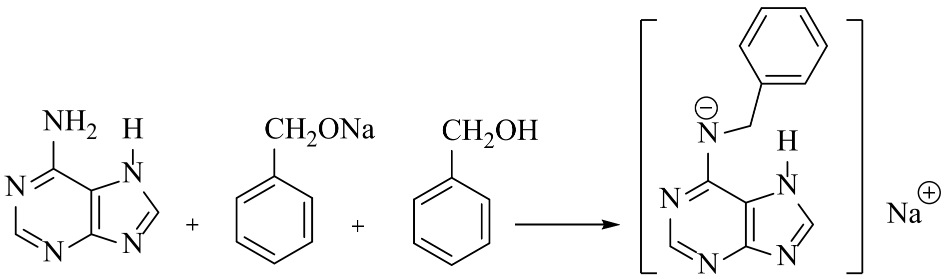
Melting point of quinazolin-4-one determined on a heating table "BOETIUS" (Germany).

Product purity and reaction progress controlled by TLC Silufol UV-254. (chloroform: benzene: methanol system 5 : 3 : 1) R_f = = 0.61. IR spectra were recorded on an IR spectrometer -Fourier system 2000 in KBr tablets 1H NMR spectra were recorded on a Unity instrument 400+ (operating frequency 400 MHz, internal TMS standard, scale δ) solvent CD3COOD+HMDSO.

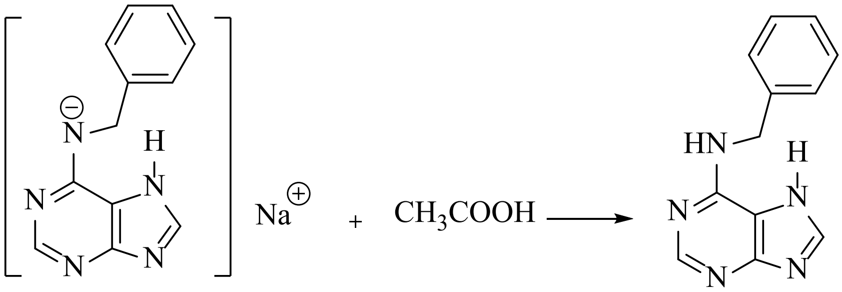
Mass spectrometry results with electrospray ionization (ESI–MS) recorded using a 6420 Triple Quad LC/MS mass spectrometer (Agilent Technologies, USA) (Brauer, G., Ed. 1963).

The chemical reaction of the process is carried out as follows.

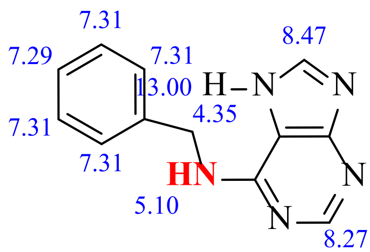
Synthesis of 6-benzylaminopurine. Adenine of sodium benzylate, and benzyl alcohol were added to the flask (the molar ratio of adenine, sodium benzylate, benzyl alcohol is and with stirring boiled for 2.5 hours. Cooled to room temperature, 150 ml of diethyl ether was added and the precipitate was filtered. Sodium salt of 6-benzylaminopurine was obtained, the yield was 94%.



Sodium salt of 6-benzylaminopurine was dissolved in 150–200 ml of hot water, 1.3–1.5 ml of acetic acid was added to pH 6.5–7.5, cooled to room temperature and filtered, dried.

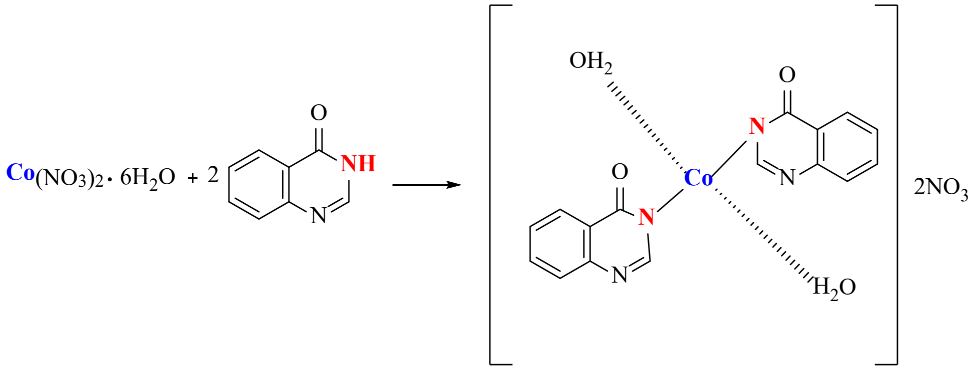


When the structure of 6-benzylaminopurine molecule was analyzed by 1H NMR spectrum, it was found that the molecular bonds are as follows.

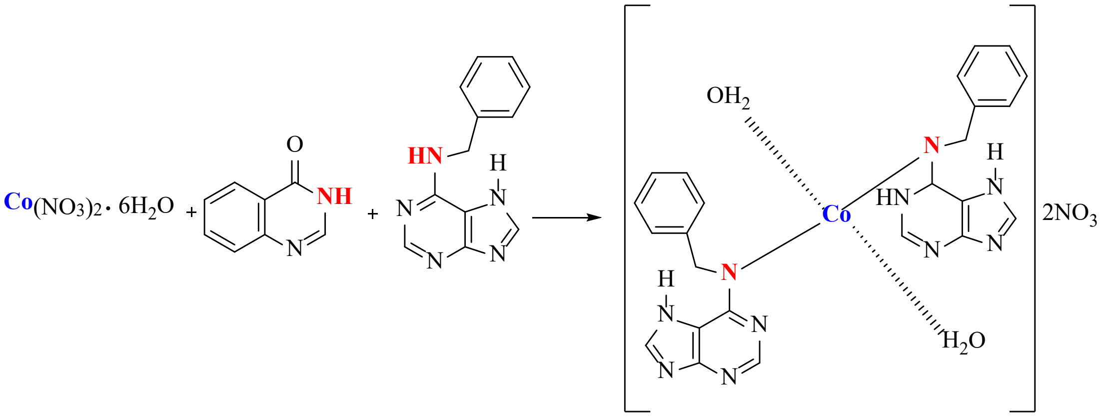


Synthesis of quinazolin-4-one coordination compound with cobalt (II)-nitrate hexahydrin

To 0.01 mol of cobalt (II) nitrate hexahydrate dissolved in 20 ml of boiled ethyl alcohol, 0.02 mol of quinazolin-4-one dissolved in 25 ml of ethyl alcohol was added. The solution was stirred for 50 minutes. The solution was kept in the cold for some time, then the white precipitate that formed was filtered off, washed with water and then with alcohol. Dried in a desiccator over sulfuric acid until constant weight was established.

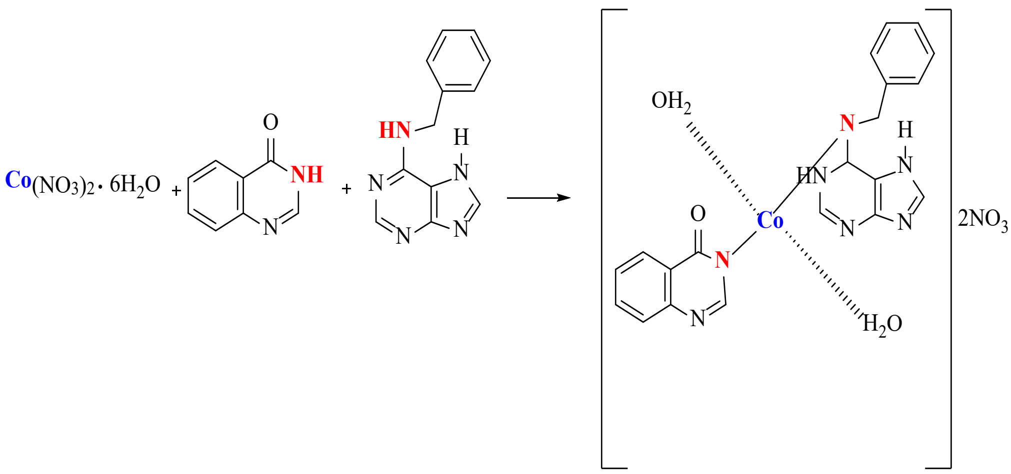


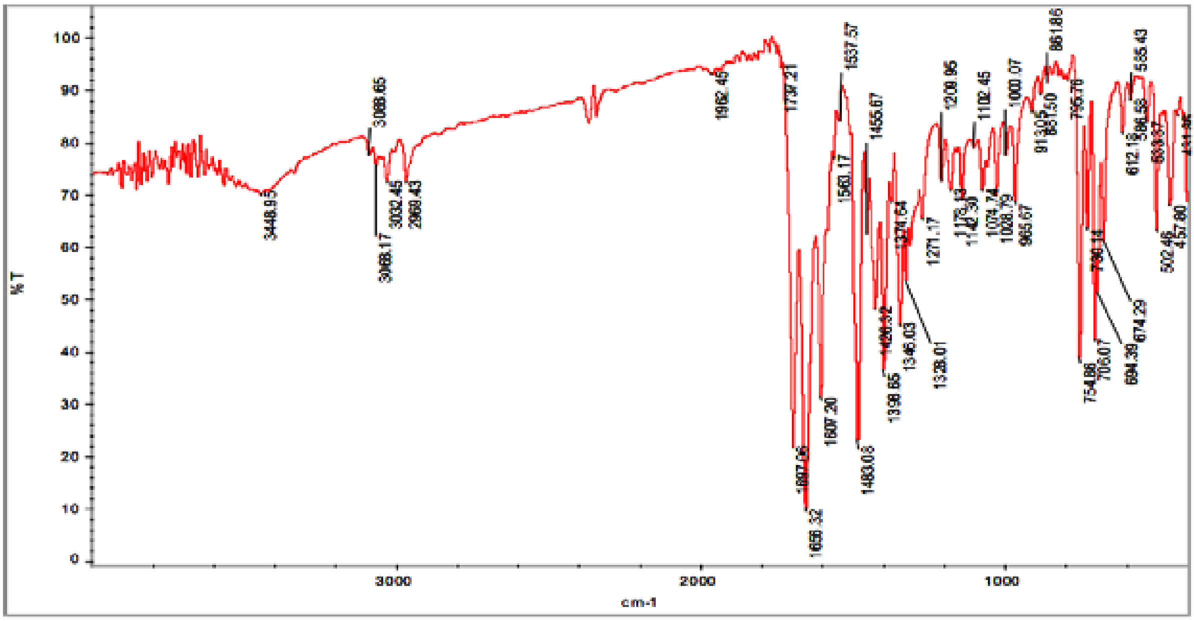
Synthesis of 6-benzylaminopurine coordination compound with cobalt (II)-nitrate hexahydrin. 0.01 mol of cobalt-(II) nitrates were dissolved in 30 ml of a mixture of methyl alcohol and triethyl orthoformate (1:1). The resulting solution was added to a solution of 0.02 mol of 6-benzylaminopurine in 30 ml of a mixture of the same solvents. The reaction mixture was stirred for 50 min until the solvent boiled. The resulting complexes were separated by filtration, washed with diethyl ether and dried.



Synthesis of quinazolin-4-one and 6-benzylaminopurine coordination compound with cobalt (II)-nitrate hexahydrin. 0.01 mol of cobalt-(II) nitrate hexahydrate dissolved in 20 ml of boiled ethyl alcohol, 0.01 mol of quinazolin-4-one and 0.01 mol of 6-benzylaminopurine dissolved in 25 ml of ethyl alcohol were added. The solution was stirred for 50 minutes. The solution was kept in the cold for some time, then the white precipitate that formed was filtered off, washed with water and then with alcohol. Dried in a desiccator over sulfuric acid until constant weight was established.

Figure 2. *IR spectrum coordination compounds salt cobalt.*





By reacting solutions of ligands with the corresponding metal nitrates in the molar ratio M: L 1:2, 1:1:1, complexes with a common value for all synthesized ones were obtained. Compounds of the formula ML2X2, where: M – Co; L-quinazolin-4-one, 6-benzylaminopurine; X-NO_3-.

Analysis of the IR spectrum of the complex showed that quinazolin-4-one, 6-benzylaminopurine is coordinated. This conclusion was made based on the finding in the IR spectrum of the complex of new absorption bands at 1386 cm^{-1}, absent in the spectrum of the free ligand.

In addition, a new band at 827 cm^{-1} that appeared in the IR spectrum of the complex is attributed to out-of-plane bending vibrations of the coordinated nitrate group. As mentioned above, according to coordination, the stretching vibrations of this group should split into two bands. The bands at 1473 and 1278 cm^{-1} found in the IR spectrum of the complex also indicate that the nitrate ligand is outer spheral.

To complement the results obtained by IR spectroscopy, an NMR spectroscopic study of the structure of the synthesized diamagnetic cobalt complexes was carried out. PMR spectra of nitrate complexes are slightly different from the PMR spectrum free ligand. In the NMR spectrum of the complexes, all signals of hydrogen-containing functional groups are slightly shifted to the weak field region compared to their location in the NMR spectrum of the ligand, which indicates an ongoing reaction complexation. In the NMR spectrum of the $Co(NO_3)_2L2{\cdot}H_2O$ complex, the doublet-doublet signals of the protons of the benzene ring are shifted to the weak field region and have centers at δ 7.32 and 7.84 ppm. In the 1H NMR spectrum of the $Co(NO_3)_2$ complex in the high field region at δ 1.90–1.94 ppm. a singlet signal is observed. Shift of all signals responsible for hydrogen-containing functional groups in the ligand molecule to the weak region fields, as well as the appearance of a new signal from protons quinazolin-4-one, 6-benzylaminopurine indicates coordination to the complexing ion. Results of PMR spectroscopic study the structures of the synthesized complexes confirmed the previously obtained conclusions using IR spectroscopy about the location of acid ligands in the internal sphere of the complex connections..

Results analysis

Kobalt (II)-nitrate and quinazolin-4-on, 6-benziaminopurin in the study of biochemical action processes on the "Morus alba" varieties of the Moraceae plant of the coordination compound formed by fatty acid, the following processes were carried out. In previous scientific works, one-year herbs, "Kahraba" variety of Phaseolus aureus plant belonging to the family of legumes, as well as the processes affecting the root-throwing system of the goose "Bukhara-102", "Namangan-77", "Sultan", "Onkurgan-1", "C-6524" varieties are also studied.

In order to carry out the processes of biochemical action on the "Morus alba" varieties of the Moraceae plant, cobalt (II)-nitrate and quinazolin-4-on 6-benziaminopurin a coordination compound formed by fatty acid dissolved in the Absolut ethyl alcohol so that it does not decompose into ions, we prepared the necessary solution, then 200 milliliters 5% and 200 milliliters 10% increments were prepared.

The results obtained from the conducted experiments are as follows.

1. As a result of the experiment, 5% and 10% solutions of the II product were prepared in distilled water.

2. The root of the one-year plant variety "Morus alba" of 4 Moraceae plants was dipped in a 5% solution for 5 hours.

3. The root of the one-year plant variety "Morus alba" of 4 Moraceae plants was dipped in 10% li solution for 5 hours, and the root of the one-year plant variety "Morus alba" of another Moraceae plant was dipped in ordinary water for 5 hours.

The effect of cobalt (II)-nitrate and quinazolin-4-on, 6-benziaminopurin coordination compound formed by fatty acid on root growth was studied.

One-year plant varieties of the Morus alba plant of the Moraceae plant were transferred to the canvases (total 9 pots), watered every morning at 8–00 hours.

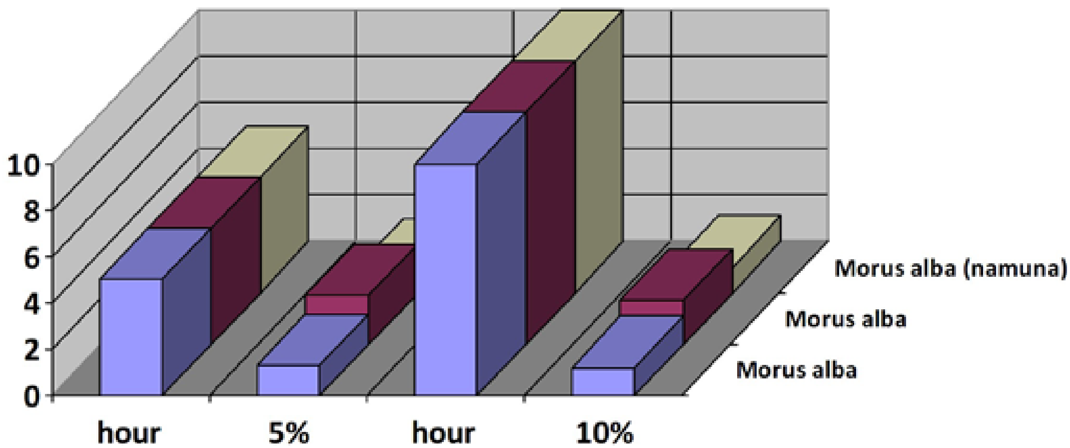
Moraceae plant "Morus alba", immersed in the root in a solution of 5% for 10 hours, is faster to form a leaf than the annual plant variety 5 hours, and the length of the rod in the plants was carried out in the same sequence.

It can be concluded that if the roots are dipped for 5 hours in a 10% solution compared to a 5% solution with an increase in the rate of growth of the root, it is desirable to count.

Table 1. *The effect of coordination compound of quinazolin-4-one with 6-benziaminopurin on Morus alba plant is described in table-1 below*

№	Plant name	hour	5% root length, cm	hour	10% 5% root length, cm
1	Morus alba	5	1.3	10	1.2
2	Morus alba	5	2.1	10	1.9
3	Morus Alba (namuna)	5	1	10	1.1

Diagram 1. *The effect of the coordination compound of quinazolin-4-one with 6-benziaminopurin on the Morus alba plant is shown in diagram-1 below*



Conclusion

So this complex organic compound plays an important role in the processes of hemopoiesis. Cobalt in plants is a microelement necessary for the assimilation of molecular nitrogen, promotes the formation of nodular bacteria in the root system of leguminous crops.

Cobalamin, also known as vitamin B_{12}, is well soluble in water, vitamin-related metabolism is of great importance in biochemical processes in every cell of the body of man, animal, ossicles.

Vitamins of the Group "B" are the largest and most complex vitamins in terms of composition. Cyanocobalamin and Hydroxocobalamin are used to prevent or treat vitamin deficiency. After assimilation into the body, they are converted into adenosylcobalamin and methylcobalamin, these compounds are important metabolites processes. All forms of vitamins of the Group " B " are a complex macrocyclic compound, biochemically occupying microelements in its composition, among these vitamins is the central atomic cobalt (II)-valence cation in the composition of vitamin B_{12}, as well as regulating metabolic processes.

References

Yurovskaya, M.A., Kurkin, A.V., Lukashev, N.V. (2007). Chemistry of Aromatic Heterocyclic Compounds – 5 p.

Uwaydah, J.M., Aslam, M., Brown, C.H., Fitzhenry, S.R., Medonough, J.A. (1997). Pat. 5.696.274. (USA). Synthesis based on 2-hydroxyacetophenone

Shakhidoyatov, H.M. (1988). Quinazolones-4 and their biological activity – Book-Tashkent.– 135 p.

The search for pathogenic pesticides in a number of 2-thioxoquinazolinov-4 (1982). UFA.– P. 93–95.

Kalinin, F.L., Merezhinsky, Yu.G. (1965). Plant growth regulators. Biochemistry of action and application.– Moscow.– 408 p.

Sapaev, B. et al. (2021). Study of methylation reactions of 2-phenylquinazoline-4-tion with "soft" and "hard" methylation agents and determination of its biological activity //E3S Web of Conferences.– EDP Sciences,– T. 258.– P. 04023.

Saitkulov, F.E. et al. (2014). 2, 3-Dimethylquinazolin-4 (3H)-one //Acta Crystallographica Section E: Structure Reports Online.– T. 70.– № 7.– P. o788-o788.

Sapaev, B. et al. (2022). Synthesis of 2-methylquinazoline-4-thione with the purpose of alkylation of 3-propyl 2-methylquinazoline-4-thione with alkylating agents //AIP Conference Proceedings.– AIP Publishing LLC,– T. 2432.– № 1.– P. 020009.

Saitkulov, F. et al. (2023). Reactions of alkylation of quinazoline-4-one //Theoretical aspects in the development of pedagogical sciences.– T. 2.– № . 1.– P. 157–163.

Saitkulov, F. et al. (2022). Biochemical nutrition family plant rute-lemon leaved //Academic research in modern science.– T. 1.– № . 17.– P. 268–273.

Saitkulov, F. et al. (2022). Study of the effect of fertilizing on grain productivity //development and innovations in science.– T. 1.– № . 17.– P. 32–35.

Saitkulov, F. et al. (2022). Recommendations for the use of fats //Theoretical aspects in the formation of pedagogical sciences.– T. 1.– № . 7.– P. 175–177.

Saitkulov, F. et al. (2022). Titrimetric analysis of calcium cation in "obi navvot" variety of melon // Academic research in modern science.– T. 1.– № . 19.– P. 302–304.

Saitkulov, F. et al. (2022). Biochemical effects of the coordination compound of cobalt-ii nitrate quinazolin-4-one with 3-indolyl acetic acid in the "amber" plants grades phaseolus aureus // Academic research in modern science.– T. 1.– № . 17.– P. 263–267.

Alafeefy, A.M. (2011). Some new quinazolin-4(3H)-one derivatives, synthesis and antitumor activity. Journal of Saudi Chemical Society – № 15.– P. 337–343.

Navneet Singh., Agarwal, R.C., Singh, C.P. (2013). Synthesis and Evaluation of Quinazolinone Derivatives for Cardiovascular Activity. // Global Journal of Medical research Pharma, Drug Discovery, Toxicology and Medicine. Dehradun – Vol. 13.– Is. 7, Ver. 1.– P. 43–50.

Khodjaniyazov, Kh.U., Mamadrahimov, A.A. (2017). Characteristic fragmentations of 2,3-polymethylenepyrido [2,3-d] pyrimidin-4-ones and their derivatives on liquid chromatography/mass spectrometry.– Uzbek Biological journal. – Tashkent – № . 4.– P. 3–6.

Byr'ko, V.M. (1984). Ditiocarbamates,– Moscow: Nauka.

Blokh, G. A., (1972). Organicheskie uskoriteli vulkanizatsii kauchukov (Organic Accelerators of Resin Vulcaniza- tion), 2nd ed., Leningrad: Khimiya.
Koval', I. V., Usp. Khim. (1996).– Vol. 64.– No. 5,– P. 452–472.
Brauer, G., Ed. (1963). Handbook of Preparative Inorganic Chemistry,– Vol. 1. – 884 p.
Weisberger, A., Proskauer, E., Riddik, J., and Tups, E. (1985). Organic Solvents, – Moscow: Inostrannaya Literarura.
Smith, G. E. P., Alliger, G., Carr, E. L., and Young, K. C., J. Org. Chem. (1949).– Vol. 14. – No. 6.– P. 935–945.
Schwarzenbach, G. and Flashka, H. (1970). Complexometric Titrations.– Moscow: Khimiya.
Klimova, V. A. (1975). Osnovnye mikrometody analiza organi- cheskikh soedinenii (Basic Micromethods of Analysis of Organic Compounds), 2nd ed.,– Moscow: Khimiya.
Kalinnikov, V. T. and Rakitin, Yu. V. (1980). Vvedenie v magnetokhimiyu. Metod staticheskoi magnitnoi vospri- imchivosti v khimii (Introduction to Magnetochemistry. Method of Static Magnetic Susceptibility),– Moscow: Nauka.
Rao, C. N. R. and Venkataraghavan, R. (1962). Spectrochim. Acta.– Vol. 18.– No. 3.– P. 541–547.
Jensen, K. A. and Nielssen, P. H. (1966). Acta Chem. Scand.– Vol. 20.– No. 3.– P. 597–629.
Daescu, C., Bacaloglu, R., and Ostrogovich, G. (1973). Bul. Sti. Tehn. Inst. Politehn. Timisoara, Ser. Chim.– Vol. 18.– No. 2.– P. 121–129.
Nakamoto, K. (1991). IR and Roman Spectra of Inorganic and Coordination Compounds.– Moscow: Mir,
Geary' W. J. (1971). Coord. Chem. Rev.,– Vol. 7.– No. 1.– P. 81–122.
Grand' A. F. and Tamres', M. (1969). Inorg. Chem.– Vol. 8. – No. 11.– P. 2495–2498.
Lever, A. B. P. (1987). Inorganic Electronic Spectroscopy. Part 2.– Moscow: Mir.

submitted 07.03.2024;
accepted for publication 20.03.2024;
published 23.05.2024

Contact: fsaitkulov@bk.ru