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MAKKAJO'XORI KEPAGI ASOSIDA TAYYORLANADIGAN BIOPARCHALANUVCHAN IDISHLAR KIMYOVIY TARKIBI

ХИМИЧЕСКИЙ СОСТАВ БИОРАЗЛАГАЕМЫХ ОДНОРАЗОВЫХ ПОСУД НА ОСНОВЕ КУКУРУЗНЫХ ОТРУБЕЙ

CHEMICAL COMPOSITIONS OF BIODEGRADABLE DISPOSABLE TABLEWARE BASED ON CORN BRAN

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Аннотация

Ushbu maqolada N,N'-geksametilen bis-[(2,4,6-tribromfenoksi)-karbamat]ni samarali sintez qilish usuli taklif etilgan. Shuningdek, olingan moddaning kimyoviy xossalari o'rganilgan va biostimulyatorlik faolligi aniqlangan. Tajribalarda "O'zbekiston-740", "Temp" navli pomidor va "C-6524" navli o'rta tolali g'o'zada sinab ko'rildi. Preparatlar DMFda eritiladi va ekishdan oldin urug'larni 18-20 soat davomida namlab, 0,1%, 0,01% va 0,001% konsentratsiyalarda ishlatilgan. Tajribalarning takrorlanishi 4 marta. Hisoblash 10 kunlik g'o'za nihollarining poya va ildiz uzunligini o'lchash yo'li bilan o'tkazildi. Ta'kidlanganidek, barcha preparatlar ham sabzavot ekinlarining, ham paxtaning ildiz tizimining o'sishini rivojlantirishga moyildir.

Аннотация

В данной работе предложен метод эффективного синтеза N, N'-гексаметилен-бис - [(2,4,6-трибромфенокси) -карбамата], изучены его химические свойства и определена его биостимулирующая активность. В опытах использовались сорта «Узбекистан-740», томаты сорта «Темп» и средневолокнистый хлопок сорта «С-6524». Препараты растворяли в ДМФА и применяли методом предпосевной замочки семян в течение 18-20 часов. Были использованы концентрации 0,1%; 0,01% и 0,001%. Повторность опытов 4-х кратная. Учеты проводили по измерению длины стебля и корня у 10-дневных проростков хлопчатника. Было отмечено, что все препараты имеют тенденцию стимулировать рост корневой системы молодых проростков, как овощных культур, так и хлопчатника.

Abstract

In this work, a method for the efficient synthesis of N, N'-hexamethylene-bis - [(2,4,6-tribromophenoxy) -carbamate] is proposed, its chemical properties are studied, and its biostimulating activity is determined. In the experiments, varieties "Uzbekistan-740", tomatoes of the "Temp" variety and medium-staple cotton of the "C-6524" variety were used. The preparations were dissolved in DMF and used by pre-sowing seed soaking for 18-20 hours. Concentrations of 0.1% were used; 0.01% and 0.001%. The repetition of experiments is 4-fold. The counts were carried out by measuring the length of the stem and root of 10-day-old cotton seedlings. It was noted that all preparations tend to stimulate the growth of the root system of young seedlings, both vegetable crops and cotton.

Kalitso'zlar: Bioparchalanuvchanidishlar, kraxmal, kepak, makkajo'xori, poliaktid, kimyoviytarkib, ilmiyvaekonomiktaxlil, yog' kislotalari.

Ключевые: слова. Биоразлагаемая посуда, крахмал, отруби, кукуруза, полиактид, химический состав, научный и экономический обзор, жирные кислоты.

Keywords: Biodegradable tableware, starch, bran, corn, polyacid, chemical composition, scientific and economic review, fatty acids.

INTRODUCTION

Since the pandemic period, the global market has been dominated by the demand for disposable tableware. In turn, we want to mention that disposable plastic utensils were acceptable until the world ecology recognized the harmful facts in the use and disposal of these petroleum products. To solve the above problems, we studied the research of some scientists in the field of production of biodegradable disposable tableware based on a plant component (secondary raw

materials of grain crops in our country). Based on such biopolymers, it is possible to obtain films for the manufacture of durable bags (as packaging materials) and disposable tableware.

LITERATURE ANALYSIS AND METHODS

Already in 2019, in the CIS countries, in particular, in Russia, scientists created a completely biodegradable plastic from ordinary potato or grain starch and began the production of this product on an industrial scale. Disposable innovative tableware made from it is so harmless that it can even be eaten after use if desired. [1] Analyzing the chemistry of biodegradable tableware according to the Scopus database and Web of Science publications, the query for the tag "Biopolymer materials" received a response to more than 121 thousand publications on a global scale, including China (about 25 thousand), leaders among countries, United States (about 25 thousand) and India (more than 10 thousand). [2]

The main areas of application of biodegradable polymeric materials are wholesale and retail trade enterprises using polystyrene foam substrates and film materials for packaging of goods sold; public catering enterprises (cafes, restaurants, food delivery, fast food enterprises), catering (organization of off-site banquets, receptions).

RESULTS AND DISCUSSION

Today, among the natural components proposed for the technology of biodegradable materials from an economic point of view, secondary products of plant and animal origin, which, as a rule, are waste products of processing industries, are of interest. A significant share in the total volume of renewable raw materials is accounted for by waste from grain and flour production, textile and wood processing industries. [3]

In our sunny country, many varieties of agricultural crops are grown, in particular, cereal crops of plants occupy a predominant place. Most often, in the technologies of molded products, the use of grain bran, collapsed seed coats of grain crops, sugar cane processing waste, straw, etc. is suggested as a raw material basis in compositions.

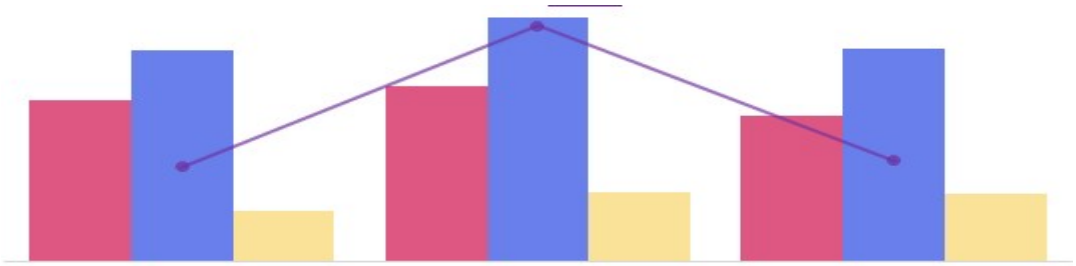
We have studied the research of many scientists from developing countries on the production of biodegradable tableware in recent years. For example, in the scientific works of Doctor of Technical Sciences, Professor of the South Ural State University I.Yu. Potorok and a number of her employees developed the physical and mechanical characteristics of samples of rectangular plates from wheat bran and introduced the process of molding prototypes (rectangular plates) hydraulically modernized by the P-500 press of laboratory composite materials, and a mold for the above samples was designed by laboratory specialists. [2]

The production line can use starch, calcium carbonate (calcium carbonate), talc powder, polylactic acid, polypropylene, polystyrene, vegetable fibers (corn cobs, straw, bagasse) and other decomposing raw materials. Depending on the raw materials used, biodegradable tableware of various qualities is formed and processed.

The proposed production line can produce knives, forks, spoons by injection molding, and can also produce disposable cups, dishes, glasses by extrusion and vacuum forming. According to the different requirements of the buyer, a different configuration of the production line is formed. [4]

One of the most promising modern bioplastics is polylactide (PLA), for the synthesis of which renewable natural resources are used, mainly sugar cane and corn. In terms of its chemical properties, polylactide is close to PET and polystyrene, but decomposes within two months at an air humidity of 80% and a temperature of 55–70 °C.

The volume of the Russian biodegradable tableware market in 2019 increased by 15% compared to 2018. More than half of this increase was provided by increased imports, whose share in the total volume does not yet exceed 30%. Domestic production also grew, but less significantly both in percentage and in absolute terms. The export of biodegradable tableware from Russia is insignificant and does not make any significant contribution to the market volume. In the following chart, we want to look at the size of the biodegradable tableware market before the pandemic.



1--diagram. Market volume of biodegradable tableware in the period of 2018 and 2020
Pink - production, blue - market volume, yellow - imports.

In 2020, due to restrictions imposed during the first wave of the spread of the COVID-19 virus, the consumption of biodegradable tableware decreased. However, already in 2022, these figures increased significantly by 22%. [5]

One of the main raw materials for the production of biodegradable tableware is starch and corn bran. Currently, corn is the third largest in the world in terms of production after wheat and rice. Sweet corn (lat. Zea mays) is the only cultivated representative of the genus "corn" of the cereal family. Man began to grow it 7-12 thousand years ago on the territory of modern Mexico. Corn is the oldest cereal grain in the world.

Up to 90% of the nutrients are in the shell, called bran, which is obtained during the processing of corn kernels into flour. They are made from the skin, which is removed from the main product. The shell is crushed or pressed and sold as a separate commodity unit. This production method causes many people to associate bran with waste. However, the rich chemical composition does not allow to treat the product with disdain. [6]

Table 1 presents data on the rich chemical composition and analysis of the nutritional value of the main raw materials in the production of biodegradable corn bran dishes. The table shows the content of nutrients (calories, proteins, fats, carbohydrates, vitamins and minerals) per 100 grams of the edible part of the product. [7]

1-table. Chemical composition of corn bran

Composite Components	Quantity	Norm	% of the norm in 100 gr	% relative to 100 kcal
Calories	224 kcal	1684 kcal	13,3%	5,9%
Squirrels	8.36 g	76 g	11%	4,9 %
Fats	0.92 g	56 g	1,6%	0,7%
Carbohydrates	6.64 g	219 g	3%	1,3%
Alimentary fiber	79 g	20 g	395%	176,3%
Water	4.71 g	2273	0,2%	0,1%
Ash	0.36 g	-	-	-
vitamins				
Vitamin A, P, E	4 mcg	900 mcg	0,4%	0,2%
Alpha carotene	21 mcg	-	-	-
betta carotene	0.006 mg	5 mg	0,1%	0,1%
Lutein-Zeaxanthin	1355 mcg	-	-	-
Vitamin B1, thiamine	0.01 mg	1.5 mg	0,7%	0.3%
Vitamin B2, riboflavin	0.1 mg	1.8 mg	5,6%	2,5%
Vitamin B4, choline	18.1 mg	500 mg	3,6%	1,6%
Vitamin B5, pantothene to-ta	0.636 mg	5 mg	12,7%	5,7%
Vitamin B6, pyridoxine	0.152 mg	2 mg	7,6%	3,4%
Vitamin B9, folate	4 mcg	400 mcg	1%	0,4%
Vitamin E, alpha tocopherol	0.42 mg	15 mg	2,8%	1,3%
Vitamin K, phylloquinone	0.3 µg	120 mcg	0,3%	0,1%
Vitamin PP, picric acid	2.735 mg	20 mg	13,7%	6,1%

Betaine	4.6 mg	-	-	-
Macronutrients				
Potassium, K	44 mg	2500 mg	1,8%	0,8%
Calcium Ca	42 mg	1000 mg	4,2%	1,9%
Magnesium	64 mg	400 mg	16%	7,1%
Sodium, Na	7 mg	1300 mg	0,5%	0,2%
Sulfur, S	83.6 mg	1000 mg	8,4%	3,8%
Phosphorus, P	72 mg	800 mg	9%	4%
trace elements				
Iron, Fe	2.79 mg	18 mg	15,5%	6,9%
Manganese, Mn	0.14 mg	2 mg	7%	3,1%
Copper, Cu	248 mcg	1000 mcg	24,8%	11,1%
Selenium, Se	16.5 mcg	55 mcg	30%	13,4%
Zinc, Zn	1.56 mg	12 mg	13%	5,8%
Saturated fatty acids				
Saturated fatty acids	0.13 g	Max 18.7 g		
16:0 Palmitic	0.111 g	-		
18:0 Stearic	0.015 g	-		
Monounsaturated fatty acids	0.243 g	Min 16.8g	1,4 %	0,6%
16:2 palmitol	0.001 g	-		
18:3 Oleic Omega-9	0.243	-		
Polyunsaturated fatty acids	0.421 g	From 11.2 to 20.6g	3,8%	1,7%
18:2 Linoleic	0.408 g	-		
18:3 Linolenic	0.013 g	-		
Omega-3 fatty acids	0.013 g	0.9- 3.7 g	1,4%	0,6%
Omega-6 fatty acids	0.408 g	4.7-16.8 g	8,7%	3,9%

Amino acids in the composition of corn bran are both a source of nitrogen and carbon, the latter being absorbed from the keto acids formed as a result of the elimination of amino groups. Direct assimilation of amino acids from a nutrient medium containing their complete set and any fermentable sugar is also possible.

As a nutrient medium, up to 4% nitrogen can be obtained from corn extract in relation to 100 g. product. [10]

CONCLUSION

We mentioned that biodegradable tableware can be consumed after use. And the dishes obtained on the basis of corn bran, based on the chemical composition, have the following beneficial properties for the human body: 1) B vitamins contribute to the proper absorption of nutrients and support the immune system. Thiamine (B1) increases human performance, improves appetite, is responsible for the normal activity of the cardiovascular and nervous systems. Pantothenic acid (B5) prevents the development of malignant tumors and is involved in the synthesis of adrenal hormones. Folic acid (B9) regulates hormonal processes in the female body and is involved in the formation of red blood cells. Its presence in the body is especially important during pregnancy; 2) Fiber is good for the intestines - it prevents the absorption of glucose, normalizing blood sugar levels. It also increases intestinal patency, helping to get rid of constipation, which often bothers women during pregnancy and fans of strict diets; 3) Unsaturated fats reduce the amount of bad cholesterol and strengthen the heart and blood vessels. Monounsaturated fatty acids reduce the risk of cancer and normalize glucose levels. Polyunsaturated fats support the beauty of hair, nails and skin. [8]

The raw materials are first compressed under a press with hot air and turned into plates, cups, forks and knives. From one ton of bran comes 10 thousand plates. Moreover, the dishes turn out to be quite solid, you can also heat food in it, use it for hot or cold, liquid or solid food. It is proved that biodegradable tableware based on corn bran at a temperature of 55-70 C and a

humidity of 45-60%, the disintegration of dishes occurs within 30-31 days. And such A disposable plastic plate will take 500 years to decompose. (1-pic.) [9]

Disposable biodegradable tableware.

Given the diversity and three-time sowing of corn varieties in our irrigated fields only to

obtain corn flour (as well as starch) and silage, we want to offer the processing of secondary raw materials of corn bran for the production of biodegradable tableware, as raw materials with a low cost, with an organoleptic chemical composition useful for the human body. That is why we want to offer the production of absolutely harmless, environmentally friendly, biodegradable tableware based on corn bran and corn starch as a substitute for disposable plastics from oil refining.

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