IRSTI 64.29.23

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https://doi.org/10.55956/AITD1583

OVERVIEW OF PLANT EXTRACTS FROM THE FLORA OF THE KAZAKHSTAN FOR DYEING AND PRINTING TEXTILE MATERIALS

Abstract. The use of natural raw materials in the process of production and sale of textiles represents such a promising direction, which is based on the principles of environmental sustainability, innovation and quality. The results of research show that rare extracts have a potential for application in textile industry not only for painting, but also for application of unique properties and design of textile materials, as well as environmental improvement characteristic production of textiles, reduction of the average volume and increase the price of finished products in the eyes of buyers.

Currently, attention is paid to environmentally friendly and sustainable methods of dyeing and printing textile materials. In the Republic of Kazakhstan, interest in dyes obtained from plant extracts for dyeing and printing textiles has become an urgent problem, as the preservation and efficient use of natural resources is a priority task. This work is aimed at analyzing the main types of flora of Kazakhstan, their characteristics, possible advantages and limitations, and at understanding the possibilities and prospects of using plant extracts in the textile industry, studying the potential.

Keywords: textiles, natural materials, functional properties, biodiversity, natural flora, synthetic materials.

Sabyrkhanova S.Sh., Yeldiyar G.K., Abzalbekuly B. Overview of plant extracts from the flora of the Kazakhstan for dyeing and printing textile materials // Mechanics and Technology / Scientific journal. – 2024. – No.2(84). – P.360-368. https://doi.org/10.55956/AITD1583

Introduction. Chemical bonds in natural dyes not only fight the known type of disease, but can also strengthen the general state of health and have preventive properties [1]. Also, plants from which this coloring substance is obtained can undergo changes under the influence of the type, place of growth, Time, season, harvest time, drying conditions and other factors [2,3]. In this regard, the use of natural dyes with improved properties in the development of dyeing technology for textile materials is an urgent problem. The combination of colors, high color stability in museum textiles and fabrics found in archaeological excavations indicate the advantage of natural dyes. From the research of many scientists, it is known that the

technological properties of these dyes can be changed, improved by transformation [4,5].

The properties of a textile material depend on their intended purpose, the properties of textile fibers, threads, structure, method of fabric production and finishing. It is important to improve the properties in the finishing process of textile materials [6]. One of the ways to improve the properties of textile materials is its coloring. In recent years, interest in natural dyes that do not contain artificial and synthetic components has increased due to their safety and hypoallergenic properties. Regarding the above-mentioned information, one of the types of this direction may be the development of technology for dyeing textile materials with natural dyes obtained from vegetable raw materials. [7].

From the point of view of ecology and green technology, all dyes can be divided into two large groups: natural (organic and mineral) and synthetic. All natural dyes of organic nature are absolutely harmless, biodegradable and, moreover, many of them exhibit biocidal and medicinal properties. They are friendly to nature. Currently, there is a revival of natural dyes of organic nature. The raw materials for these dyes are various colored plants (leaves, flowers, bark, roots), seaweed of various colors (green, brown, red).

The growth of environmental awareness is causing a surge of interest in natural textiles dyed with natural sources of dyes. Sustainable or environmentally friendly products are a key concern of the modern consumer. Sustainable products tend to be constantly growing in the market. Various efforts have been generalized to respond to this trend, including the use of natural dyes and natural fibers [8].

Materials and methods. The emergence of synthetic dyes in the textile industry has caused the displacement of natural dyes. Research scientists are increasingly interested in alternative methods of dyeing and printing textiles, including the use of plant extracts, in pursuit of sustainable development and environmental responsibility. From numerous research papers, it can be seen that the use of synthetic dye types in the production of textile materials leads to environmental pollution [9-11].

At the same time, high energy and chemical costs in the recycling of waste from the production of dyeing textiles are a big problem for enterprises. Due to the use of various synthetic dyes in the textile industry, a very large amount of toxic substances can be released into the environment [7, 12]. It has been studied that an average of 70-150 liters of water, 0.6 kilograms of sodium chloride and about 40 grams of reactive dye are required to dye 1 kilogram of cotton fabric [13]. But, from the point of view of ecology, active (reactive) dyes are the most harmful dyes. This is because the author reported in his research that wastewater from active dyes contains a large amount of chloride or sodium sulfate, residues of hydrolyzed dyes, a significant amount of alkali and insoluble particles such as cotton fibers [14].

The development of an environmentally friendly technology for dyeing textiles for various purposes, reducing the harmfulness of technological processes is carried out using paint obtained from natural plants. Researchers have shown prospects for the use of natural dyes obtained from plant raw materials [15]. This is due to a number of factors, primarily the environmental safety of such dyes [16, 17]. Dyes from plants are biodegradable and harmless to the environment, in addition, many of their types have antibacterial and healing properties[1, 4, 5, 16, 18-21].

The comparative advantages of natural dyes over synthetic dyes the abundance of plant raw materials and the possibilities of using natural dyes in agricultural processing, light and food industries determine the purpose of the development of processing technology. This issue is relevant for Kazakhstan, which

has significant dye plant resources, as it does not have opportunities for the development of the industry for the production of expensive synthetic dyes. The use of natural plant dyes is also beneficial for folk traditional industry. Creating a large natural dye industry is not cost-effective. But, due to the fact that natural dyes have environmentally friendly, safe, useful biologically active properties, maximum environmental friendliness of materials, it is very useful to use them in the production of clothing for patients, especially in the production of children's clothing, shoes and other items, including children's toys, with high allergic sensitivity. As experts note, it is profitable to create a small enterprise for the production of targeted natural dyes [18]. Small-scale production does not require complex expensive devices and highly qualified personnel, and large-scale costs. The creation of small-scale production is especially important for the development of traditional national culture. Such industries can produce highly artistic products that create an opportunity to preserve traditional culture.

The hygienic properties of the product can be improved by using natural dyes in the light and textile industries [22]. Some phytopreparations have a high effect relative to the extended therapeutic effect. But, many medicinal plants have not been sufficiently studied in terms of pharmacological and chemical composition. For this purpose, the structure of textile materials when dyed with various natural dyes was studied using IR-spectral research methods [23]. Plant extracts are most often natural pigments obtained from various plants, such as IndiGo, nettle, saffron, walnut, etc. These mentioned natural plant extracts, due to their broad spectrum shades, can be used both for dyeing and for printing textiles. Due to the biodegradability and non-toxicity of plant extracts, they are environmentally friendly compared to chemical dyes. This corresponds to the sustainable development strategy in Kazakhstan. These listed factors determine the importance of using plant extracts in the textile industry.

In general, plant extracts are a promising tool for the development of an environmentally sustainable textile industry in the Republic of Kazakhstan, that is, further research and development of technologies in the field of textile production can contribute to reducing the negative impact on the environment and creating high-quality textiles.

Plant species from the Republic of Kazakhstan and Central Asia have a huge potential for obtaining natural dyes. Its roots and leaves contain a rich set of pigments, including anthraquinones, flavonoids and carotenoids, which can give bright and diverse colors to textiles. The production of these dyes is relatively simple, that is, it can be achieved using environmentally friendly methods, such as extraction with water or using a solvent. Plant extracts are a renewable resource, and the processes of its cultivation and dye production have the least impact on the environment. It also has unique properties such as UV protection, antibacterial activity and antistatic properties that add value to textiles. The color palette includes a wide range of colors for different textile applications, from plant extracts. These dyes can be used in dyeing various textile fibers, including cotton, wool, silk, flax. It is especially well suited for natural textiles based on fiber, as they have a high affinity and compatibility with fiber coloring.

The world of colors is very diverse, there are a lot of color schemes. These ranges of colors can not only please the eye, but also be strong irritants. Plants with a significant content of coloring substances grow in hot climates, in Asia, Africa and America, and then spread to temperate countries. European countries received dyeing plants from hot countries, however, Europe also had its own plants traditionally used for dyeing, such as vida, mignonette, etc. [24] Some natural dyes from different plants have additional properties against foot mold and

microorganisms [25]. Studying the literature, you can come across facts that indicated that natural dyes were used to dye fabric in ancient times.Almost any pure fabric color can be given with the help of natural dyes, which are easy to find in nature. The ancient dyers made the most interesting discoveries in their craft, which allowed them, having at their disposal only a few dozen natural dyes, to obtain up to 800 colors and shades. They discovered the secret of the formation of colored "varnishes" - a way to obtain a variety of colors on fabric using salts of various metals (mordants, or mordants) and just one dye.

Studies conducted by various scientific groups have shown that the use of a wide range of combinations of mordants in various ratios gives a variety of shades and different results in color fastness [26]. Vegetable dyes and tanning agents differ from synthetic ones not only in environmental safety, but also in a number of other advantages. Unlike synthetic substances that are individually chemically structured, vegetable dyes are accompanied by a whole set of natural tanning, 4 coloring substances. The complex composition of the coloring agent allows you to get colorful artistic effects, which synthetic dyes cannot always give. Natural dyes and tanning agents allow you to give an original beautiful coloring to the textile material. Vegetable dyes are susceptible to biodegradation, and in some cases it is rational to use production waste as fertilizer on farmland. The production and use of vegetable dyes will require the creation of additional jobs in agriculture (cultivation, processing and collection of raw materials), textile and leather production, food and pharmaceutical industries.

It is obvious that it is economically unprofitable to create a large-scale production of natural dyes, but the recommendations under consideration for their use in areas where maximum environmental cleanliness of materials is important, such as the production of clothing for patients, especially with increased allergic sensitivity, clothing, shoes and other items for children, as well as exclusive textiles, leaves hope for development this industry [27].

The volume of research on expanding the range of plants that can be valuable as raw materials for the production of natural dyes is steadily growing. Asian scientists are working most actively and fruitfully in this direction. In recent years, such publications by domestic researchers have also begun to appear [25, 28, 29].

Attempts are being made to isolate coloring substances from increasingly large varieties of plants, primarily agricultural crops. An example would be various varieties of Chinese tea, extracts of which are dyed wool. There are publications devoted to the study of the possibility of using wood species of our climatic zone for dyeing textile materials. Thus, the paper presents the results of dyeing wool and nylon with extracts of oak bark or fir cones [30]. Let's highlight the monograph by professional English botanists John and Margaret Cannon [31], which provides information about 48 plants from around the world used to produce dyes for natural fibers, mainly wool and silk.

The work mentions only a small number of literary sources. Based on a brief overview of the research results and the practical use of natural dyes, it is already possible to get an idea of the current situation in this area and the prospects for its development. The dyeing plants of the Aktobe region were studied based on the analysis of their own long-term studies of the flora of the region. As a result of the analysis of the flora, 108 dye plants belonging to 71 genera and 36 families were identified. The study of the systematic diversity of dye plant species showed the predominance in the number of species of the subclasses Rosidae , Dilleniidae, Lamiidae, and among the families Rosaceae, Rubiaceae and Polygonaceae. The predominance in the number of species of such genera as Galium (13 species),

Polygonum, Tamarix, Geranium by 4 species has been established. The obvious dominance of polycarpic grasses in the spectrum of life forms of dye plants according to I. G. Serebryakov was revealed [32]. Polycarpics accounted for 47.2% of the dye plant species in the region. An analysis of the distribution of species by ecological groups showed the prevalence of the mesophilic group, which made up 61.1% of the total number of species [33].

The Republic of Kazakhstan has a great prospect for obtaining natural paints. The flora of Kazakhstan includes 68 species of tree species, 266 species of perennial herbaceous plants, 849 species of annual grasses. In total, there are over six thousand plant species in Kazakhstan, 515 of them are endemic. There are also 178 genera and 700 species of green algae known in Kazakhstan [34]. In Kazakhstan, there is 1 class of mosses – leaf-stalked; more than 400 species, 3 of them – smooth sphagnum, large-leaved pachyphissidene and smoothed orthotrichum – are listed in the Red Book of Kazakhstan.

The flora of any region is a complex, constantly changing system, so any compiled floral summary is able to reflect its state only at a given time. The flora of Kazakhstan includes more than 6,000 wild plants, but it is not yet possible to talk about the full study of the region. Most of the landscapes of Kazakhstan are represented by grassy steppes that stretch from the Volga in the west to the Altai Mountains in the east and from the plains of Western Siberia in the north to the deserts and oases of Central Asia in the south. Different climatic zones have caused a wide range of vegetation growing here. Most of the country is occupied by desert and semi-desert landscapes. But they are hardly lifeless. About 250 plant species have adapted to life in these regions, which at first glance seem unfavorable for the development of a diverse flora. The sandy expanses of Kazakhstan are home to sandy acacia, zhuzgun and ephedra cone-bearing. Relict plants such as Siberian wormwood and multi-rooted onion are also found here. In the mountainous regions merging with the steppe (in particular, in the Southern Altai), typical steppe vegetation is found, as well as various shrubs, including almonds, meadowsweet, and maikargan. Forests cover only 1.2% of the territory of Kazakhstan. But, despite the relatively small area, the forest expanses of the country are impressive with a variety of vegetation. In the mountains of Kazakhstan, covered with forests, spruce, maple, fir, walnuts grow. It is worth noting that only 5.5% of the entire territory of the country is covered with trees.

In Altai, pine and cedar forests predominate, and in the Dzungarian Alatau – fir and spruce forests, represented by Shrenka spruce. The expanses of Saur are mainly covered with deciduous forests. Apricot and apple orchards grow at the foot of the Tien Shan. The alpine vegetation of Kazakhstan is represented by alpine cornflowers and cobresia [35].

Conclusion. In conclusion, a review of plant extracts for dyeing and printing textile materials in the Republic of Kazakhstan highlights their significant potential in the context of sustainable development of the textile industry. Plant extracts are an effective alternative to chemical dyes, while having a number of advantages such as environmental safety, biodegradability and potential positive properties for human health. However, in order to maximize the benefits of plant extracts, it is necessary to continue research in this area, develop technologies and methods of their application, as well as improve production processes. In addition, it is important to carry out information work among textile manufacturers and consumers in order to raise awareness of environmentally friendly alternatives and stimulate demand for them.

In general, the use of plant extracts in the textile industry of Kazakhstan is a promising area that contributes to the creation of a more sustainable and environmentally friendly production of textile materials in the country. Further efforts in this direction can make a significant contribution to achieving the goals of sustainable development and preserving the natural resources of the Republic of Kazakhstan.

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This article has been prepared at the SKU named after M. AUEZOV, in the framework ERASMUS + project REILEAP –Reinforcing capacities of HEIs for leather and leather products in UZBEKISTAN –KAZAKHSTAN (618930-EPP – 1-2020- 1 – EPPKA2 –CBHE-JP.

Material received on 24.05.24.

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ТОҚЫМА МАТЕРИАЛДАРЫН БОЯУҒА ЖӘНЕ БАСЫП ШЫҒАРУҒА АРНАЛҒАН ҚАЗАҚСТАН ФЛОРАСЫНАН АЛЫНҒАН ӨСІМДІК СЫҒЫНДЫЛАРЫНА ШОЛУ

Аңдатпа. Тоқыма бұйымдарын өндіру және әрлеу процесінде табиғи өсімдік сығындыларын пайдалану экологиялық тұрақтылық, инновация және сапа принциптерін біріктіретін перспективалы бағыт болып табылады. Зерттеу нәтижелері көрсеткендей, өсімдік сығындылары тоқыма өнеркәсібінде бояу құралы ретінде ғана емес, сонымен қатар тоқыма материалдарына бірегей қасиеттер мен дизайн беру құралы ретінде де қолдану мүмкіндігіне ие. Сонымен қатар тоқыма өндірісінің экологиялық сипаттамаларын жақсартуға, қоршаған ортаға зиянды әсерді азайтуға және тұтынушылардың көз алдында түпкілікті өнімнің құндылығын арттыруға ықпал етеді.

Қазіргі уақытта текстиль материалдарын бояудың және басып шығарудың экологиялық таза және тұрақты әдістеріне көңіл бөлініп жатыр. Қазақстан Республикасында да табиғи ресурстарды сақтау және тиімді пайдалану басым міндет болып табылатын болғандықтан текстильді бояу және басып шығару үшін өсімдік сығындыларынан алынған бояғыштарға қызығушылық өзекті мәселеге айналды. Бұл жұмыс Қазақстанның флорасының негізгі түрлерін, олардың сипаттамаларын, ықтимал артықшылықтары мен шектеулерін талдауға және тоқыма өнеркәсібінде өсімдік сығындыларын қолдану мүмкіндіктері мен перспективаларын түсінуге, әлеуетін зерттеуге бағытталған.

Тірек сөздер: тоқыма, табиғи бояғыштар, функционалдық қасиеттері, биологиялық ыдырауы, отандық флора, синтетикалық бояғыштар.

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ОБЗОР РАСТИТЕЛЬНЫХ ЭКСТРАКТОВ ИЗ ФЛОРЫ КАЗАХСТАНА ДЛЯ КРАШЕНИЯ И ПЕЧАТИ ТЕКСТИЛЬНЫХ МАТЕРИАЛОВ

Аннотация. Использование натуральных растительных экстрактов в процессе выработки и отделки текстиля представляет собой перспективное направление, сочетающее в себе принципы экологической устойчивости, инноваций и качества. Результаты исследования показывают, что растительные экстракты обладают потенциалом для применения в текстильной промышленности не только как средство

окрашивания, но и как средство для придания уникальных свойств и дизайна текстильным материалам а также способствуют улучшению экологических характеристик производства текстиля, снижению вредного воздействия на окружающую среду и повышению ценности конечного продукта в глазах потребителей.

В настоящее время уделяется внимание экологически чистым и устойчивым методам окрашивания и печати текстильных материалов. В связи с тем, что сохранение и эффективное использование природных ресурсов является приоритетной задачей и в Республике Казахстан, актуальным вопросом стал интерес к красителям, полученным из растительных экстрактов для текстильной окраски и печати. Данная работа направлена на анализ основных видов флоры Казахстана, их характеристик, потенциальных преимуществ и ограничений, понимание возможностей и перспектив применения растительных экстрактов в текстильной промышленности, исследование потенциала.

Ключевые слова: текстиль, природные красители, функциональные свойства, биоразлагаемость, отечественная флора, синтетические красители.