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Section 1. Food processing industry

THE INFLUENCE OF VARIOUS FACTORS OF THE GERMINATION PROCESS OF GRAINS AND LEGUME CROPS

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Abstract

The research aims: to investigate and optimize the processes of grain swelling up and subsequent germination, and to that end, to test the unique, weak radon mineral waters of Georgia as well as to provide qualitative and quantitative evaluation of some bioactive compounds accumulated during the germination process. In the process of grain germination, weak radon mineral water dramatically accelerated the processes of grain swelling and subsequent germination. At the same time, it significantly reduced the calorie content of cereals and increased the quantitative content of macro-, microelements, and vitamins.

Keywords: *cereal and leguminous crops; germination; germination process optimization; Georgian weak radon mineral water*

Introduction

At the modern stage, the use of plant raw materials in food production is a very relevant, important, and much-discussed scientific problem. From this perspective, germied grain and its extracts are essential to ensure the high biological value of the expected final product (Wigmore, 2021; Yıldırım et al., 2023; Criste et al., 2023). Enzymes that appear after the grain has germied, break down complex storage substances into simpler ones (amino acids, fatty acids, simple

sugars) (Tahereh et al., 2023; Lucas-Aguirre et al., 2023). At this time, the amount of vitamins synthesized by the germ increases many times. Because of that, the germied grain contains a biologically active protein complex, peptides, free amino acids, soluble sugars, soluble dietary fiber, biogenic macro- and microelements, vitamins, phytohormones, and other useful nutritional components (Ali et al., 2017; Hernández Cortés, 2022; Zilić et al., 2014).

The use of germied grains and their extracts is one of the promising areas for food industry development. The germied grain flour allows food developers to adjust the quality of food products and enrich them with dietary fibers, vitamins, and minerals (Şenlik et al., 2021; Cagla Kayisoglu et al., 2024).

Regular consumption of germis as a food supplement has a therapeutic effect: it helps clean out toxins from the body and effectively digest food, normalizes the acid-alkaline balance, improves metabolism, increases immunity, and slows down the aging process. In addition, the germis of each culture have a specific set of vitamins and trace elements, and their use contributes to the prevention of certain diseases (Lei et al., 2017).

Germied grains are an ancient health remedy that has been known for over 5,000 years. This healing food has an amazing ability to relieve a person from many diseases at once, preventing their return. True health is what this gift of nature gives us (Ebrar Altıkardes et al., 2024). The special value of germied grain lies in the fact that it is the only „living" food. Their inclusion in the diet is an opportunity for a person to use the whole living organism as food, which has all the natural biological properties and is in the phase of maximum vital activity. Under natural conditions, germinating seeds tighten with all their might during the first few days to form a root as quickly as possible, gain a foothold in the soil, and bring the first leaves to the sun. It is in this short period that a person should use them to get strength and health from such an extraordinary product.

The importance of germied grain became known relatively recently, and experimental research in this direction in Georgia is scarce and mostly limited to our research and a few publications.

Grain germination is a process in which many biochemical events occur, so the grain must be optimally compatible with internal and external factors during germination (Zhang et al., 2023; Tahereh Najib et al., 2023). The physiology of germination involves very complex procedures. Endogenous and exogenous factors play an important role in seed germination. Some endogenous factors are phytohormones and endosperm degradation. Exogenous factors are environmental impacts such as light and temperature (Carrera-Castaño et al., 2020).

The analysis of the patent materials searched in the direction of methods of grain germination and intensification of these processes showed that mostly the processes of grain softening and germination are accelerated by chemical compounds, enzyme preparations, ultrasound and thermo-alkaline hydrolysis, acoustic influence, etc. (Wang et al., 2020; Xiang et al., 2023; Lidan Dong et al., 2024).

Even though as a result of numerous studies, a certain increase in biologically active substances was achieved in the process of grain germination, the duration of the technological process was reduced on average by only 5–20%, compared to classical methods. It is worth noting the fact that the process of grain softening and germination is still quite long, which threatens the microbiological safety (contamination) of the intermediate and target final product, which is unacceptable for food production.

It is estimated that more than 50% of the energy expended in the growth of grains is used to break down the hard coat of the grain, which is usually multi-layered. After germination, the germi emerges from the seed coat (González Carretero et al., 2017).

It is known that the germination process is significantly influenced by active acidity pH, oxidation-reduction potential, the degree of mineralization, and other factors. Therefore, the key issue of the presented research is the investigation and optimization of the germination process of raw materials selected for germination. To that end, the use of the unique natural mineral waters of Georgia of different compositions and mineralization in the process of grain germination is relevant. This study was conducted for the first time, and it is innovative.

The present study aims: to investigate and optimize the processes of grain pre-treatment (swelling up) and subsequent germination and evaluate the effectiveness of these processes, and to that end, to test the mineral waters of Georgia with unique, different chemical composition and mineralization, and to determine the optimal regimes of the said processes under the influence of various environmental factors, as well as to provide qualitative and quantitative evaluation of some bioactive compounds accumulated during the germination process.

Materials and Methods

Research objects were – cereals: wheat (Triticum), flax (Linum usitatissimum), leguminous crops: peas plants (Pisum), soybeans (Glycine), green lentils (Lens), broad beans (Vicia faba); weak radon water of Tskaltubo resort; softened (swelled up) cereals and fruits of leguminous crops; germied grains and legumes

These raw materials were grown in Georgia, in peasant holdings and farms, and were purchased from LLC "Chemi Maragi".

Modern standard and modified research methods were used to perform scheduled work.

Sample mass was determined using an electronic digital analytical balance model SF-40 ˚C (Toms, Qilin, China);

We softened grain in a POL-EKO thermostat to create optimal conditions in chemical cups. Grain germination was carried out in an automated germier DY4102(LCD display)-OYSIR. In the process of grain softening, the pH of the reaction was determined using a pH meter – "Mettler Toledo".

We determined overall chemical composition of raw and germied grains, in particular the content of dry matter, protein, fat, carbohydrates, and ash. We also studied the microstructure of dry, softened and germied grain on the OMAX digital microscope.

To determine the quality of raw materials, the determination of proteins, fats, carbohydrates, vitamins, and mineral substances was carried out in accordance with the recommendations of the Codex Alimentarius (http://www.fao.org/3/i2085e/i2085e00.pdf) using the latest colorimetric, spectral and chromatographic methods. The total amount of proteins was determined by the Kjeldahl method, while the fat content – by the Soxhlet method.

We performed mathematical processing of experimental data according to the results of tre-fivefold repetitions of tests using statistics and regression analysis methods.

These studies were conducted in the laboratories of the Department of Food Technology at Akaki Tsereteli State University (Kutaisi, Georgia). The study of vitamins and mineral substances of cereals was conducted at the research base of the Western Georgia Regional Center of Chromatography of the Faculty of Natural Sciences and Health at the Batumi Shota Rustaveli State University.

Results and Discussion

At the beginning of the experiment, we selected the raw materials, where we were guided by the following principle: raw materials should be local (Georgia), low-glycemic, gluten-free or low-gluten, with a high protein content, since the work was aimed at the development of indigenous plant resources (Georgia), and their rational use and the use of the final product (germied grain) in the food industry as an additive, with the prospect of having to use them in prophylactic and functional food, by bringing the final products to the condition of the commercialization process. The raw materials we selected for germination are shown in Figure 1.

Figure 1. *Local raw materials selected for research*

| Wheat | Soybeans | Flax |

Figure 1. *Local raw materials selected for research (continues)*

Green lentils

Broad beans

Peas

Figure 2. *Chemical composition of raw materials*

Wheat

1,18
13,24
10,91
2,06
72,61

■ protein   ■ Fat
■ carbohydrate   ■ moisture

Green lentils

2,72
10,64
25,92
53,74
1,98

■ protein   ■ Fat
■ carbohydrate   ■ moisture

Broad beans

3,12
28,85
9,98
56,41
1,64

■ protein   ■ Fat
■ carbohydrate   ■ moisture
■ ash

Peas

2,64
9,13
23,75
1,16
63,32

■ protein   ■ Fat
■ carbohydrate   ■ moisture
■ ash

Soybeans

4,77
8,86
39,45
28,07
18,85

■ protein   ■ Fat
■ carbohydrate   ■ moisture
■ ash

Flax

3,82
8,01
19,25
26,07
42,85

■ protein ■ Fat   ■ moisture
■ carbohydrate   ■ ash

After selecting the raw materials for germination, we studied their basic chemical composition. The amount of moisture, proteins, fats, carbohydrates, and ash in the grain was determined. We calculated their energy value. The results of the study are shown in Figure 2. Figure 3 illustrates the main characteristics of the selected raw materials: glycemic index, thousand grains weight and caloric content of raw materials.

The results of the present research demonstrate that that lentils have a low energy value, followed by wheat, broad beans and peas plants, which have almost the same energy value. The caloric content of soybean and flax is significantly higher than other studied raw materials, in particular, on average, soybean – 20–40% and flax – 38–41%. According to the glycemic index, soybeans have the lowest values, followed by lentils and peas plants. The magnitudes of wheat, flax, and broad beans are above them, but can also be considered low-glycemic.

Figure 3. *Characteristics of selected raw materials*

Glycemic index of raw materials

Calorie content of raw materials, kCal

Thousand grain weight, g
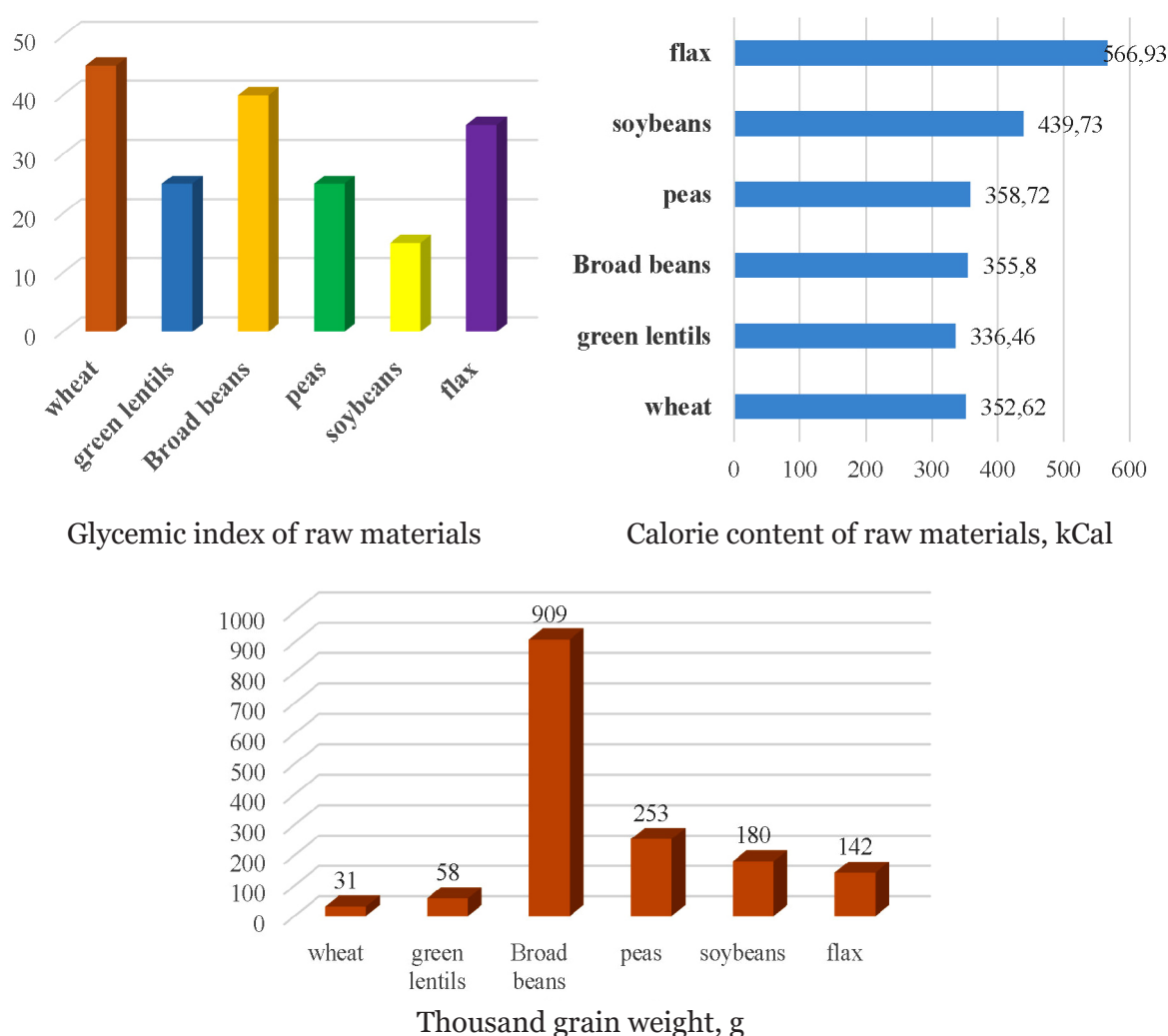
The process of grain germination consists of two main stages – softening to swell it up, and then germination of swelled grain. Grain germination actually starts from the moment it absorbs water and is completed after the formation of the germi from the germ (Hernández Cortés, 2022). It is known that physiological processes in living cells depend on the presence of water, and that germination is impossible if water is not absorbed from the environment. Absorption of water in the grain leads to the initiation of various physical and chemical processes, resulting in germination.

Grain germination was carried out as follows: we removed extraneous matter and

damaged grains from the seed, washed it well with running water, soaked it in water to remove "dead" grains, then they floated to the surface. Then we washed the grain again, and only after that we soaked it in water to swell it up. During the work, we used the traditional method (Wigmore, 2021). During the tests, we took 20 g of each grain, and added water in a fivefold amount. In order to optimize the processes of grain germination, we carried out germination both in drinking water and in the weak radon chloride-hydrocarbonate-sulfate mineral water from the resort of Tskaltubo (instead of ordinary drinking water). We conducted the study of the influence of mineral waters on the process of grain germination for the first time.

Tskaltubo mineral water is distinguished by its unique properties. The origin of Tskaltubo water is considered the oldest from a geological point of view (100–150 thousand years ago), in the formation of which hydrochemical processes take part. However, it is assumed that the formation of Tskaltubo water takes place at the expense of huge underground static water resources, which rise to the surface of the balneological zone thanks to the hydrostatic pressure of karst waters. According to the mixed hypothesis, chlorine-rich water rises from Middle Jurassic sedimentary rocks, mixes with sulfate water in the upper crust, and is then desalinated by hydrocarbonate water in the Lower Cretaceous limestones. Tskaltubo mineral water is enriched with radon in the bulk sedimentary sand. Tskaltubo's mineral springs have always attracted attention due to their distinctly different properties from other waters. It does not contain toxic elements, its chemical composition is characterized by stability and does not change over time. All ingredients are below the lower limit. This is confirmed by comparing the chemical analyzes carried out during the last 70–80 years. Physico-chemical composition of water: the said mineral water is distinguished by quite solid physico-chemical parameters. It contains noble gas – radon, large amount of nitrogen and helium. It belongs to weak radon (1– –2.7 nki/l; or 3–7.5 one trap; or 40–100 bq), chlorine-hydrocarbonate-sulfate, sodium-magnesium-calcium waters, with a total mineralization of 0.7–0.8 g/l. The daily debit of the springs is 13–15 mln. liter. The highly effective action of this is due to its complex composition and peculiar combination of the main components of the saline composition. The natural temperature of water is +33– –35 °C. Biologically active trace elements were found in Tskaltubo's mineral springs such as iodine, bromine, manganese, lithium, boron, zinc, strontium, and copper, which play an important role in the vital activity of the body. Gases play an important role: nitrogen, radon, helium, and argon. Mineral water is enriched with radon in bulk sedimentary sand(https://tskaltuboresort.ge/eng/static/37/;ttps://www.georgianholidays.com/attraction/resorts-in-georgia/tskaltubo).

We soaked the grain in drinking and mineral water. The samples were placed in a thermostat and left for 10 hours at a temperature of $22 \div 40$ °C. In the process of softening, we determined the change in pH and grain mass (swelling capacity). It should be noted that there were no significant changes in pH and grain mass as a result of softening in drinking water. The exception were the grains soaked in Tskaltubo water, where the mass increase started after 2 h and reached a maximum at 4 h and remained practically unchanged for the next 6 h. The best results were shown by soybean, flax, green lentil and broad beans delayed at a temperature 35 °C. The active acidity pH underwent a slight change during 10 hours and after 10 hours it reached: in the case of wheat in water, from 6.31 to 5.82; lentils – from 6.31 to 5.71 md; green peas – from 6.31 to 5.65; broad beans – from 6.31 to 4.98, soybean – up to 5.04, flax – up to 5.61. As for the process of dissolving in Tskaltubo mineral water, under similar conditions, the value of PH changed from the initial 7.10 up to 5.10–5.91.

Figure 4 illustrates the dynamics of pH and mass changes in the process of grain softening in drinking water and weak radon mineral water. It can be seen that in the case of grain softening in drinking water, no significant increase in mass was observed within 8 hours, the maximum result was reached only within 10 to 12 hours. As for the process of softening in mineral water, the optimal result was revealed in 4 hours. Green lentils, flax, soybeans were distinguished with the best results, followed by peas and wheat. As for the broad bean, since it did not experience an

increase in mass during the mentioned time period, we excluded it from further studies.

The temperature change in the range of 22÷40 °C did not affect the result much. Since our goal was to reduce the duration of the digestion process, it was considered optimal to digest the samples for 3––4 hours, and this process reduced the time by 50–60% (4–5 hours) compared to traditional, potable water digestion. Since only 3 cereals, namely green lentils, soybeans and flax, showed the best results in the Dalbobi Porce, we conducted further studies only on these 3 cereals.

Figure 4. *Dynamics of mass change in the process of softening of selected grains in drinking (1) and mineral water (2) in a thermostat at a temperature of 35 °C*
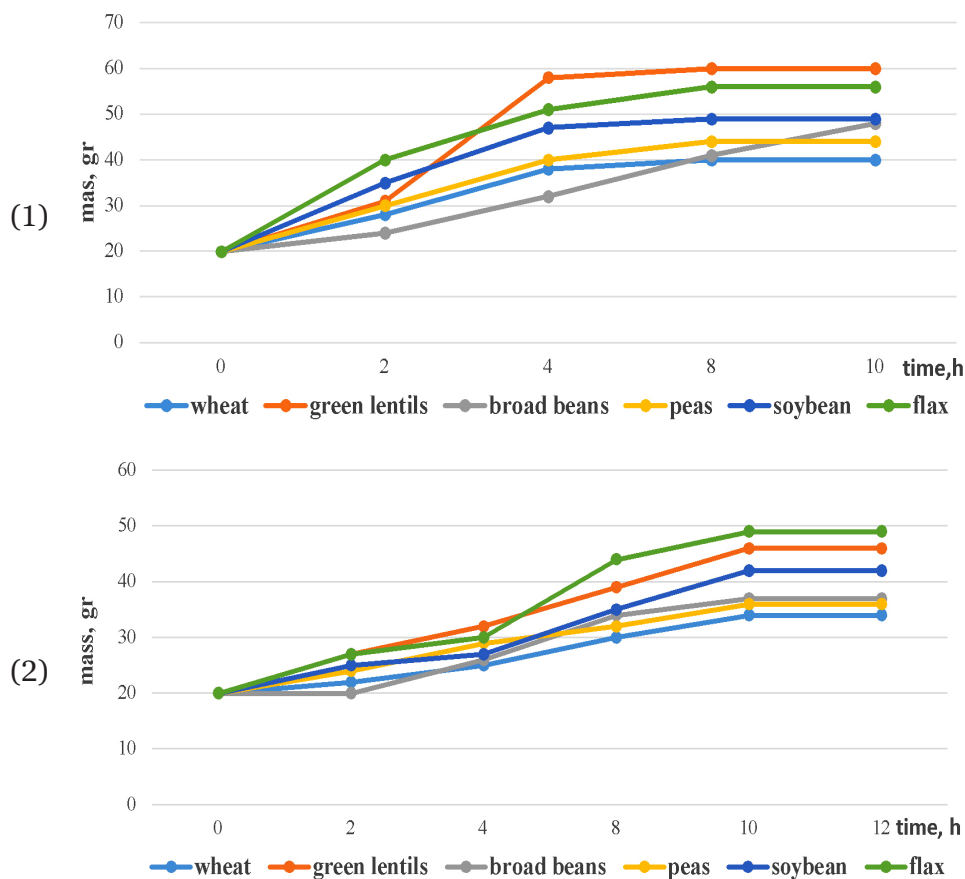
At the next stage, grains were germied in both drinking and mineral water, for which an automated germier was used. Germination was carried out at different temperatures in the range of 20–38 °C. Germination duration was 48 hours. We avoided the high temperature regime in order to preserve the natural properties of the main useful substances. Our goal was to select a high-protein raw material and maintain its properties as much as possible throughout the germination cycle. Germination was carried out up to 2–3 mm in length.

In the process of grain germination, we studied the influence of temperature and duration of germination on its quality. As a re-sult of the experiments, the optimal terms and modes of germination were determined: for the samples soaked in drinking water, the duration of time was – 24 hours for soybeans, 18–20 hours for green lentils, 40––45 hours for flax. Accordingly, the optimal temperature for all samples was 26–28 °C. As for the samples soaked in mineral water, the optimal duration of the germination process was observed as follows: for green lentils and soybeans – 8–12 hours, and for flax – 16–18 hours. Temperature: 28–33 °C. There was no significant change in the duration of the germination process during temperature variation. Figure 5 illustrates the pictures of grains germied in mineral water.

Figure 5. *Germied grains soaked in mineral water*

Green lentils   **Flax**   **Soybeans**

In the next stage of the research work, we studied the chemical composition of the best germied samples (green lentils, flax, soybean) and calculated the caloric content. Since the selected raw materials in germied form are intended for functional food, we considered it necessary to determine their macro-, microelements and vitamin content. For comparison, the corresponding parameters of raw grain and grain soaked in drinking water were used. The chemical composition, content of vitamins, macro- and microelements of the grain soaked in drinking and mineral water (softened) and subsequently germied are given in Tables 1, 2.

Table 1. *Chemical composition of germied grain*

Nutrients	Nutrients, in equivalent to 100 g, g					
	Germied grain, (swelled up in drinking water)			Germied grain, (swelled up in mineral water)		
	Green lentils	Flux	Soybean	Green lentils	Flux	Soybean
Protein	8.7	7.6	13.2	9.0	8.02	13.0
Fat	1.72	17.7	6.9	2.0	21.1	7.0
Carbohydrate	23.4	12.8	8.8	221.	13.01	9.0
Water	65.1	60.01	67.1	65.0	559.	67.0
Ash	1.1	19.	3.4	2.0	2.0	3.0
Calorie content, kcal	143.9	240.9	150.1	154.4	274.02	151.0

As shown in Table 1, as a result of germination the grains soaked in drinking water for 13–45 hours, the caloric value decreased by 2.2–2.9 times compared to the raw grain's caloric value, while the caloric content of the grains soaked in mineral water for 8––18 hours decreased by 2.06 ÷ 2.9 times. Using mineral water, this result was achieved in an average of 27 hours less time.

Table 2 clearly indicates that the use of mineral water significantly increased the content of macro-, microelements and vita-mins, which led to a high biological value of germied grains. Of particular note is the fact that vitamin C was practically absent in raw green lentils and soybeans. Vitamin C in the grains soaked in drinking water and subsequently germied was recorded for green lentils – 31.2 mg%, for soybeans – 21.6 mg%. With the use of mineral water, these values increased further and amounted to 41.2 mg% and 31.7 mg%, respectively.

Table 2. *The content of macro-, microelements and vitamins in germied grain (mg%)*

| Components | Amount of components, mg% | | | | | | | | |
| | Raw grain | | | Germied grain, (swelled up in drinking water) | | | Germied grain, (swelled up in mineral water) | | |
	Green lentils	Flux	Soy-bean	Green lentils	Flux	Soy-bean	Green lentils	Flux	Soy-bean
Vitamins									
B1, mg	0.56	1.78	0,89	0.75	1.72	0.92	0.96	1.76	1.28
B2, mg	0.19	0.25	0,18	0.22	0.35	0.33	0.52	0.58	0.51
B5, mg	–	1.08	2.05	1.10	0.56	0.67	1.45	0.62	0.71
B6, mg	–	0.37	0.92	0.36	0.18	0.39	0.51	1.09	1.12
B9, mkg	–	78.0	188.0	–	45	231,0	–	70.0	315.0
Vitamin C, mg	–	0.69	–	31.2	0.32	21.6	41.2	0.49	31.7
Macro-elements									
Calcium, mg	85	247	348	51	102	157	62	118	171
Magnesium, mg	78	390	228	70	159	184	97	225	247
Sodium, mg	60	33	7	23	18	48	33	26	52
Potassium, mg	658	789	1640	615	326	1086	687	456	1201
Phosphorus, mg	278	650	608	329	243	414	558	487	652
Microelements									
Iron, mg	11.8	5.82	10.1	12.8	2.26	10.8	14.6	4.16	12.1
Zinc, mg	2.6	4.48	2.5	–	1.78	4.0	3.01	20.8	5.3
Copper, mkg	645	1180	516	716	506	590	742	614	698
Manganese, mg	1.2	2.48	2.8	2.1	1.23	2.2	2.8	17.9	2.7

The obtained results provide the basis for continuing fundamental research to create a complete picture of the dynamics of the accumulation of biologically active compounds in the process of grain germination.

Conclusions

1. A study of the grain swelling process was conducted. It was determined that the use of mineral water significantly accelerated the said process and reduced its time by 50–60% (4–5 hours) compared to traditional drinking water. Based on the obtained results, only 3 cereals were considered as priority, particularly green lentils, soybeans and flax.

2. The optimal modes and parameters of the germination process were determined: the duration of germination for samples soaked in drinking water was 24 hours for soybeans, 18–20 hours for green lentils, 40– –45 hours for flax. Accordingly, the optimal temperature for all samples was 26–28 °C. As for the samples soaked in mineral water, the optimal duration of the germination process was observed as follows: for green lentils and soybeans – 8–12 hours, and for flax – 16– –18 hours, and the temperature: 28–33 °C.

3. It was determined that as a result of the use of weak radon mineral water in the process of grain germination, the caloric content of grain was significantly reduced and the content of macro-, microelements and vitamins increased. It was observed that vitamin C was practically absent in raw green lentils and soybeans. Vitamin C in the grains soaked in drinking water and subsequently germied was recorded for green lentils – 31.2 mg%, for soybeans – 21.6 mg%. With the use of mineral water, these values increased further and amounted to 41.2 mg% and 31.7 mg%, respectively.

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Section 2. Legal studies

COMPARATIVE ANALYSIS OF FRANCHISING AGREEMENT WITH OTHER INSTITUTES

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Abstract

The article "Comparative analysis of Franchising agreement with other Institutes" analyses Franchise contract in contrast with these agreements. According to these agreements it's emphasized what are similarities and differences of the contracts mentioned above. It represents scientific points of view over "Franchise Business Agreement and other Agreement's Instruments of Legislative Character". This comparative analysis aims to explore how franchising agreements differ when considered alongside agreements or business models of other institutions, such as licensing agreements or distributorships.

Keywords: *Franchising, licensing agreement, distributorships*

Introduction and Research Objective

Franchising agreements are a common method for expanding business operations, especially for brands looking to replicate their success in new locations with minimal investment. These agreements outline the relationship between the franchisor (the brand owner) and the franchisee (the business operator) and provide detailed terms on the use of trademarks, business systems, marketing, and operational guidelines. However, the specifics of these agreements can vary significantly across different industries, regions, and institutions.

What's the concept of "distribution agreement"? Unfortunately this is unknown concept for Civil Code and we should seek it its analysis in doctrine branch. There are some developments by a certain number of scientists regarding to a new distribution contract (exclusive right of sale contract), that provides a buyer with exclusive right to sell seller's product- which is required by certain customers in the concrete territory. Providing complex of exclusive rights is a concept that is shared by franchise and lease agreements as the similar feature. Through a franchise, a person or group of people (franchisee) receives the right to market products and/or services using the trademark or trade name patent, know-how (commercial infor-

mation) of an existing business (franchisor). The franchisee usually pays a licensing fee, uses particular operating methods and has an ongoing obligation to pay the franchisor a portion of revenue. In return, the franchisor offers advertising and marketing, training, and potential financing of the business.

In case of distribution agreement (Albaric C., Dickstein M., 2017) the following obligations are taken into account for distributors: obligation to purchase and then sell in the name of franchisor or via franchise business account; taking a responsibility of choosing appropriate market place. Do not create obligations for the producer (parent company). This doesn't mean that "within the framework of distribution agreement grantor and distributor aren't able to regulate availability of trade mark and trade name as well as providing rights of protected objects of intellectual property. But existing conditions really matters and seem to be of secondary importance in contrast with terms and conditions for sale of products that involves purchasing product and then sell via its name and account. It should be observed that several points get under influence of franchise business legal regulation but we can't talk of equity in this respect" (Schwenken, C., Riedl, H., 2024).

These represented agreements can be isolated by one thing that is economic interest of the parties entering a franchise business. For example, economic interest for franchise agreement is associated with the profit that you make due to exclusive rights.

The meaning of economic interest conveys improvement of level of sales of produced goods territorial limits condition is the main concept in distribution. Extent of territory may be brought within its compass. Unlike it for franchise agreement it isn't of great importance.

Notwithstanding their minor similarities constructions upon which these agreements are based on really differs from each other to a certain extent. Property Management Agreement implies that an owner hereby appoints Manager as his lawful agent and attorney-in-fact with full authority to do any and all lawful things necessary for the fulfillment of this agreement to manage, operate, control, rent and lease the following described property and the second part takes respon-

sibility to use this property for the benefit of the owner according to his interests. The object of power of attorney this is complex of exclusive rights that may

appear to get in the hands of confidant (confident manager). A power of attorney is a document that evidences the creation of a relationship between two people who are designated as the "principal" and the "agent". The principal designates the agent in the document, and the agent is authorized to act on the principal's behalf – to stand in the shoes of the principal – for whatever business the power of attorney permits. A power of attorney can be general, so that the agent can conduct any sort of business on behalf of the principal, or it may be specific, limited to the transactions expressly provided for in the document. Third parties may treat the agent as if he or she is the principal in any transactions which the agent is authorized to conduct. Powers of attorney are commonly used in all sorts of business activities, and are very frequently executed on behalf of individuals.

According to the law a beneficiary acquires exclusive rights to manage his or her own business activities. In franchising beneficiary becomes eligible to use exclusive rights to his succeed in his entrepreneurial activity and he is to pay a right-holder certain price for them.

According to power of attorney management agreement, confidant i.e. in this case as the agent is authorized to act on the right-holder's behalf and uses exclusive rights to manage entrepreneurial activities on behalf of franchisor observing principal's interests and when franchise makes profit he transfers the total income to the right-holder and retains only his entrepreneurial salaries. A confident manager doesn't use his own bank account (the revenue account of administration) but principal i.e. right-holder acts according his own interests covering private expenditure.

Exclusive rights of protected objects are considered to be isolated property of power of attorney. Franchising aims at acquiring effectiveness and profit on intellectual property, a right-holder provides entrepreneur with these rights in exchange for payment and protecting date expiration and restrictions beneficiary uses them for his succeed. As

scientists remarks, under this circumstance the part who gives away intellectual property is privileged one, called professional entrepreneur and the object of franchising the part interested in gaining useful properties to benefit himself (Sheikh S., Singleton S., 2020). Then the author concludes that management this is put objects qualitatively in different positions and it consists of property possession and benefit as well as its management and control. entrepreneur is not a right-holder but the one who receives intellectual property, and this is confidant accredited professional manager –entrepreneur.

According to power of attorney management agreement salary is given not to the right-holder (as it happens in franchising) but to the part who is entitled to all the rights and is responsible for it reliable for business activity. Besides this, in franchising a right-holder gets payment (some amount of money) in exchange for swapping intellectual property, but a manager gets payment (i.e. salary) for management and performing job duties.

In conclusion, already mentioned contract constructions can be differentiated due to the significant feature is the fact that management includes being authorized, but franchising draws line at the same probability, because the right to benefit from franchise doesn't involve acquiring rights on complex of exclusive rights of protected objects. The subject matter of power of attorney management as well as in franchising is provision of complex of exclusive rights. And features discussed above will help us

to talk about differences that cause these constructions to be used for different legislative regime. As it has been observed the main principle of franchising is transferring exclusive rights to beneficiaries. It's very important to analyze what's the difference between a franchise construction and concession institute (cession). Concession is considered to be universal law of obligation institute. In its concrete meaning, this law refers fundamentally to regulation for concession agreements i.e. enacting protocols by

commitment concession that involves creditor's claim to theservices of a second party. "This institute doesn't involve transference of exclusive rights. When in franchising beneficiary is provided with exclusive rights on the resultsof intellectual activity directly connected with right-holder's personality. In this case concession institute as well as franchise agreement both of them provide opportunities on exclusive rights but the difference we should seek in the nature of these rights. If concession institute enacts regulation for the commitment of fulfilling requirements, franchising mediates transference of exclusive rights. One major difference between them is that giving up some demands or making concession is weird and unfamiliar to franchising.

A right-holder transfers right to franchisee to use complex of exclusive rights but at the same time he retains exclusive right to the results of an intellectual activity. As the author concludes there is no connection between exclusive license of the rights and exclusive right to the results of an intellectual activity, in other words there is no transfer of intellectual property act that refers to commitment concession.

Conclusion

Franchising is a unique business model that offers more control, support, and brand consistency compared to other institutional agreements like licensing, joint ventures, distributorships, and affiliate marketing. The level of control, investment, risk, and support varies significantly between franchising and these other models, making it crucial for businesses to choose the model that best aligns with their goals, resources, and expansion strategies.

Franchising is ideal for businesses looking to rapidly scale with control over operations and brand consistency, while other models such as licensing or distributorships may suit companies that prefer lower investment, less control, and greater flexibility for their partners.

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Section 3. Medicine

DETERMINATION OF ELECTROMORPHES OF HYALURONIC ACID

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Abstract

Hyaluronic acid is polymer widely used in the cosmetology and medicine. In the usage of HA the size of molecules has a very important significance. The use of hyaluronic acid is due, in particular, to its hydrophilic properties, which is why the size of the hyaluronic acid molecule is of great importance. Currently available methods for determining the length of hyaluronic acid molecules require significant reagent and time consumption. This work demonstrates the possibility of determining the lengths of hyaluronic acid electromorphes using agarose gel electrophoresis.

Keywords: *hyaluronic acid, molecular size, electrophoresis, electromorphes, molecular markers*

Introduction

Hyaluronic acid (HA) is a mucopolysaccharide consisting of glucuronic acid and N-acetylglucosamine residues linked by β-1,3' bonds (Wende, 2016). HA is a non-sulphated glycosaminoglycan that is part of connective, epithelial and nervous tissues and is one of the main components of the intercellular matrix of vertebrate connective tissue; it contributes significantly to cell proliferation and migration, and may also play a role in tumor formation. HA is used in the treatment of joints, conjunctivitis, infertility, cosmetic procedures, etc. (Collinsa & Birkinshaw, 2013; Lia & Hec, 2014; Kogan, 2007; Kong, 2013; Ming & Vivek, 2014).

When using HA, the size of the molecule is important (Lee & Banquy, 2014; Parka et. al., 2014; Kazuaki et. al., 2003). For example, in the preparation of ophthalmic preparations, larger HA fractions are preferred (Xu et. al., 2007; Hardingham & Muir, 1972; Owen & Fisher, 2013). The size of HA is determined either by paper chromatography or by filtration through micropores with molecular size markers (Oueslatia et. al., 2015; Lan et. al., 2013; Ünlüera & Ersöz, 2013; Zhoua et. al., 2006). These techniques are time-consum-

ing and costly, so the issue of determining the size of hyaluronic acid by a low-cost, fast, and high-quality method is relevant (Lee & Banquy, 2014; Ming, 2013; Price et. al., 1997; Volpi, 2000). One such method is electrophoretic separation in a polyacrylamide gel (PAGE), which is commonly used for proteins and nucleic acids. Electrophoretic mobility depends on the size of the molecule, thus, after electrophoretic separation, it is possible to determine the size of molecules relative to molecules of known size (Duan, 2008; Volpi, 2000).

The aim of the study was to determine the possibility of electrophoretic separation of HA in PAAG, visualization and determination of electrophoretic mobility relative to the molecular weight marker.

Methods

There have been used HA solutions in distilled water and HA-containing preparations, namely Oxyal (contains 15 % HA), Synocrom (contains 1 % water-soluble sodium hyaluronate), Suplasyin (contains 1 % sodium hyaluronate), 'Hyalgan (contains 2 % sodium hyaluronate), Syngial (contains 1 % HA) in concentrations of 100 % (for HA-containing preparations only), 10 %, 1 %, 0.1 %, 0.01 %, 0.001 %, 0.0001 %.

Solutions of appropriate concentrations were obtained by multistep dilutions in distilled water.

The separation of HA solutions and HA-containing preparations was carried out in a 10% polyacrylamide gel in 1x Tris-buffer at a constant voltage of 500 V and a temperature of 60 °C for 2-4 hours, depending on the size of the amplification fragments, in a vertical gel electrophoresis apparatus (Helicon). HA solutions, molecular weight marker LADDER 50 (to determine the electrophoretic mobility of HA solutions) and an aqueous solution of electrophoretic-neutral dye as a negative control were applied to the gel. Before applying the substances to the gel, prephoresis was performed for 30 min at a constant voltage of 300 V and a temperature of 60 °C. Visualization of the HA solutions separated in the PAGE was performed with silver nitrate (specific for organic compounds). The PAGE plate was washed with deionised water for 1 min and DNA was fixed with 10.0% ethanol for 10 min. The plate was transferred to 1.0 % nitric acid for 6 min and washed 3 times with deionised water with continuous shaking. The preparations do not contain organic compounds, except for HA, which makes it impossible to obtain false-positive results during staining.

The plate was placed in 0.012 M AgNO$_3$ for 30 min in the dark. After that the plate was washed twice with deionised water with vigorous shaking. The plate was incubated in a reducing solution (0.28 M Na$_2$CO$_3$, 0.019 % formalin), with the solutions being replaced after each darkening, until the amplification fragments were visually stained. The plate was fixed in 10.0% acetic acid for 5 min. The gel was washed for 2 min with deionised water and stored between two sheets of transparent plastic film.

The electrophoretic mobility of HA was determined by the molecular weight marker LADDER 50 using the TotalLab software.

Results

The results of the study are presented in Table 1.

Table 1. *Electrophoretic mobility of HA solutions, equivalent/bp*

Solution	Solution concentration, %						
	100	10	1	0.1	0.01	0.001	0.0001
	Electrophoretic mobility						
HA	1752, 1850	1752, 1850	1752, 1850	1752, 1850	1752, 1850	1752, 1850	1752, 1850
Oxyal	1745, 1841	1745, 1841	1745, 1841	1745, 1841	1745, 1841	1745, 1841	1745, 1841
Synocrom	1650	1650	1650	1650	1650	1650	1650
Suplasyn	1456, 1643	1456, 1643	1456, 1643	1456, 1643	1456, 1643	1456, 1643	1456, 1643

Solution	Solution concentration, %						
Hyalgan	1656, 1703	1656, 1703	1656, 1703	1656, 1703	1656, 1703	1656, 1703	1656, 1703
Syngial	1767	1767	1767	1767	1767	1767	1767

Discussion

The results of the study demonstrated the possibility of electrophoretic separation of HA in PAGE with subsequent visualization. The fractions of different lengths in HA solutions and HA-containing preparations were determined, their size relative to each other and the molecular weight marker was determined. It was shown that the preparations Oxyal, Suplasyn, and Hyalgan contain HA fractions of different sizes. The absence of concentration effect on the electrophoretic mobility of HA was found.

The use of electrophoretic distribution allows us to determine the electrophoretic mobility of HA and to compare the length of different HA fractions relative to each other and the molecular weight marker.

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DETERMINATION OF ELECTROMORPHES OF HYALURONIC ACID

Section 4. Pedagogy

METHODOLOGY OF TEACHING FUNCTIONAL DEPENDENCIES BETWEEN QUANTITIES THROUGH SIMPLE PROBLEMS IN PRIMARY CLASSES

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Abstract

Teaching functional dependencies between the quantities learned in elementary grades is one of the requirements for education. Imparting the necessary knowledge to students, being able to apply the acquired knowledge in everyday life and future education directly depends on the knowledge, skills and habits acquired by primary school teachers and future classroom teachers in higher schools. Experiments show that elementary school students cannot understand the dependences of many quantities, they have difficulty in applying them. Therefore, in the article, we have given the theoretical basis of the implementation of dependencies between the quantities that will play an important role in the professional training of future classroom teachers by means of simple problems and corresponding methodical works.

Keywords: *price, quantity, value, speed, time, distance, labor productivity, work duration, volume of work*

Introduction

Training of human resources in the field of education is one of the main directions of the State Strategy for the development of education in the Republic of Azerbaijan. This direction envisages the regular improvement of the qualifications of competent pedagogical personnel who apply innovative training methods and ensure effective mastering of the content of education. The implementation of all these depends on the basic education, in other words, knowledge, skills and habits, which future teachers receive in higher schools. A teacher with high basic knowledge has the ability to improve his specialty, transfer his knowledge, skills and abilities to the new generation, and perform flexible activities. The basis of success in this subject is directly dependent on the level of mathematics teaching in primary classes. The current mathematics program (curriculum) and mathematics subject are taught in 5 content lines. These are:

"numbers and actions"; "algebra and functions"; "geometry "; "measurement"; is "statistics and probability". It is known that mathematics is the science of spatial forms and quantitative relations of the real world. As it can be seen, the study of quantities within the content lines of mathematics is not intended as a separate line. However, all units are intended to teach information about quantities. Since the quantity includes the property of being able to measure and compare objects, events, and objects, the measurement content line directly implies the measurement of quantities (Mathematics education program (curriculum), 2012). In the "Numbers and operations" section, length, mass, capacity, time, etc. during primary education. it is intended to teach quantities, their measurement and relationships between measurement units, geometric quantities in the "Geometry" content line, statistics and probability-related quantities in the "statistics and probability" content line. The "Measurement" content line is intended to teach the basics of measuring all studied quantities. The teaching of functional dependencies between quantities is included in the content line "algebra and functions".

Actuality

According to the Mathematics program of the Republic of Azerbaijan, elementary school students must determine the following relationships between dependent quantities at the end of the 4th grade.

– To interpret how the change of one of the dependent variables affects the other;

– Relating simple functional dependencies to vital issues;

– To interpret the functional dependencies between different quantities (price, quantity, value, speed, time, route, labor productivity, duration of work, volume of work);

– To express the dependencies between the quantities in the form of a formula with the help of letters. All this shows the importance of teaching quantity, its measurement and functional dependencies between quantities (Mathematics education program (curriculum), 2012).

Research

The mathematics program (curriculum) designed in accordance with the concept of Education of the Republic of Azerbaijan involves the teaching of a number of quantities in primary classes: quantity (number), length (distance), capacity (volume), mass, area, price, value, time, speed, etc. It should be noted that the educational program of the Russian Federation envisages teaching the same quantities. (Mathematics education program (curriculum), 2012 & Federal working program of primary education, mathematics, 2023). Quantities intended to be studied in elementary grades can be conditionally divided into two parts: those that have no functional dependence on other quantities and those that have functional dependence on other quantities: for example, mass, capacity, etc. In primary classes, independent quantities are formed as a result of measurement, using measuring tools directly. For example, the concept of mass is formed by measuring an object with a scale, measuring tape, roulette, etc. the concept of length is formed by using such measurement tools. Other quantities are measured by the intervention of other quantities. For example, to determine the value of the goods purchased, it is necessary to know both the price of the goods and the quantity of the goods purchased. Such quantities are functionally dependent quantities. In elementary grades, the following three groups of quantities can be attributed to such a group of quantities:

– Price, quantity and value; – Speed, time and distance (path); – Labor productivity, Work duration (time spent on work) and work volume.

Some of the quantities involved in this group of triples are also independent quantities. For example, the amount of time. In the first case, this quantity acts as a measure of the duration of the event, and in the second case, its size acts as a quantity that determines the effect on the measurement of other quantities in the given event. However, in each case, time is the measure of the duration of the event. Also, the quantity indicates the number of the item in all cases, the quantity of other quantitative units involved in the dependence. For example, if the car moved for 3 hours, it means that the number of time units (hours) of the car in motion is 3. Analysis of programs and textbooks shows that the teaching of relationships between

functionally dependent quantities is mainly carried out by means of problem solving. It is planned to teach these relationships in the 3rd–4th grades by solving 2–3 practical problems. In the textbooks, almost no theoretical information is given about the relations between the three quantities – proportional dependencies. In particular, the relationship between labor productivity, time spent on work (Work duration) and the amount of work performed is not theoretically justified in any way. Therefore, it is up to the classroom teachers to eliminate this gap (Federal working program of primary education, mathematics, 2023).

Application of the method of analogy

Analogy in teaching mathematics, drawing up and finding analogues of various given objects and relationships; transferring information about the model to the original, reasoning by analogy with the solution of the original problem when solving the problem; is a special training method in which actions such as checking expressions obtained by analogy are carried out (Textbooks, 2023). Here, in order to realize functional dependencies between a group of quantities, we have intended to apply the dependencies between price, quantity and value quantities to other quantities based on analogy.

Theoretical explanation

First, let's clarify the meaning of each of these quantities and note the types of simple problems related to them. Matters related to price, quantity and value are usually called "purchasing matters" or "purchasing" matters. **Price** – is the amount of money to be paid for one unit of the item to be purchased, that is, the size of only one item. For example, a box of tea, a kg of fruit, etc. the amount of money to be paid to buy it is its price. **Quantity** – Indicates the number of items of the same (same price) to be purchased. For example, 3 loaves of bread, 6 kg of potatoes. Here, the number of loaves is 3, and the amount of potatoes in kilograms is 6. **Value** – The amount of money given to all items of the same value purchased. For example, 6 manats paid for 2 kg of peaches, which are 3 manats per kilogram, is the value of all purchased peaches (2 kg). If we denote the value by a, the quantity by n, and the value by C, the dependence between these quantities can be expressed as $C = a\,n$. It should be noted that the following types of simple issues related to the dependencies between price, value, and quantity quantities are considered in primary classes: 1.1. Issues related to finding the value when the price and quantity of the goods are given; 1.2. When the price and value of the goods are given, issues related to finding its quantity; 1.3. Issues related to finding the price of goods given their value and quantity. First, let's give the rules for solving each of these issues.

a) **Rule:** When the price and quantity of the goods are given, to find the value, it is necessary to multiply the price by the quantity, $C = an$; b) Rule: When the price and value of the goods are given, to find its quantity, it is necessary to divide the value by the price, $n = C : a$; c) **Rule:** Given the value and quantity of the goods, to find the price, it is necessary to divide the value by the quantity, $a = C : n$. Another group of quantities studied in primary classes are speed, time, and distance quantities. Issues related to speed, time, and distance are commonly referred to as "motion issues" or "motion" issues (Guryanov, 1980). **Speed** – is the distance traveled in unit time. First of all, let's note that when we say speed in matters related to movement in elementary grades, we mean uniform movement. For example, if the car was in motion for 4 hours and traveled a total of 300 km, then it is understood that the car travels the same distance every hour, that is, 75 km. Likewise, if a car travels 80 km per hour, then the speed of the car is 80 km per hour; if a pedestrian travels 100 m per minute, then the speed of the pedestrian is 100 m per minute; etc. Although each of the latter refers to the average speed, in the problems presented in the elementary grades, we treat these speeds as the speeds of uniform motion. Let us denote the speed by V t. **Time** – is the number of units of time spent on the entire road at the same speed, the time period. For example, if the car traveled from one point to another in 3 hours, then the amount of 3 hours is the time spent on this movement. Let us denote **time** by t. **Distance (path)** is the length of the path from the beginning to the end of the movement. – Total time travelled. In elementary grades, distance is understood

as straight line movement. For example, we mark the rider's movement from the village to the city as a segment of a straight line and assume that he moves along a straight line. For example, the distance traveled by a fast moving car in 4 hours. Traveled path (distance) – Let's denote the distance (traveled path) with S. Now let's look at the relationship between speed, time and distance quantities. The following types of simple problems are considered regarding the dependences between these quantities: 2.1. Problems related to finding the distance given the speed and time; 2.2. Issues related to finding time given speed and distance; 2.3. Problems related to finding speed given distance and time. Now let's give the rules for solving each of these issues.

a) **Rule:** Given the speed and time, to find the distance, you need to multiply the speed by time, $S = V*t$; b) **Rule:** When speed and distance are given, to find time, distance must be divided by speed, $t = S: V$; c) **Rule:** Given distance and time, to find speed, divide distance by time, $V = S: t$ The third group of quantities studied in primary classes is labor productivity, duration of work and volume of work. Issues related to labor productivity, duration of work and volume of work are called "work-related issues" or "work" issues (Ashurov, 2020). Labor productivity is the work done in a single time. For example, the work done by a loom in one hour, cotton collected by a person in one day, etc. let us denote it by a. Work duration – The total amount or number of work done with the same productivity. For example, the number of hours worked by a loom working with the same productivity, the number of working days of a cotton picker working with the same productivity, etc. Let us denote it by n. Scope of work – Work performed during the entire period of work. For example, the number of parts made by the loom in 5 hours, the amount of cotton collected by a cotton farmer in 10 days with the same productivity, etc. Let M denote the volume of work. The following types of simple problems are considered regarding the dependences between these quantities: 3.1. Issues related to finding the volume of work given labor productivity and the duration of the work; 3.2. Issues related to finding the duration of work given the labor productivity and volume of work; 3.3. Issues related to finding Labor productivity given the volume of work and duration of work.

Now let's give the rules for solving each of these issues.

a) **Rule:** Given the labor productivity and the duration of the work, it is necessary to multiply the speed by the time to find the volume of work, $M=n*a$; b) **Rule:** Given the labor productivity and the volume of work, to find the duration of the work, it is necessary to divide the distance by the speed, $n=M: a$; c) **Rule:** Given the volume of work and the duration of work, to find labor productivity, you need to divide the distance by time, $a=M: n$. Let's look at the formulas given for solving all three types of problems (3 types of each). Future classroom teachers should know that in each of these three quantities, while one of the quantities is constant, there is a certain dependence between the other two. When one of the quantities is constant, the relationship between the other two quantities is directly or inversely proportional. The relationship between quantity and value is directly proportional: $C=a*n$.

- When the speed remains constant ($V = const$), the dependence between time and distance is directly proportional dependence: $S = V * t$;
- When labor productivity remains constant ($a=const$), the relationship between the duration of work and the volume of work is directly proportional: $M = a * n$;
- When the quantity is constant ($n = const$), the relationship between price and value is directly proportional: $C = n * a$;
- When time remains constant ($t = const$), the relationship between speed and distance is directly proportional: $S = t * V$;
- When the work duration remains constant ($n = const$), the relationship between labor productivity and the volume of work is directly proportional: $M = n * a$. Summarizing all three formulas, we get different written forms of the dependence $y = k * x$, which is for directly proportional dependence. This means that 1.1., 2.1., 3.1. $y = kx$ mathematical model can be used for each of the problems;

- When the price is constant (a= =const), the relationship between quantity and price is inversely proportional: a = C: n and n= C: a;
- When distance is constant (S = = const), the relationship between time and speed is inversely proportional: t = S * V and V = S : t;
- When the amount of work remains constant (M = const), we get different written forms of the y=k: x dependence for proportional dependence: a = = M: n and n = M: a. Here, by generalizing all three formulas, we will get different written forms of the dependence y = k/x for the inversely proportional dependence. This means that 1.2., 2.2., 3.2. and 1.3., 2.3., 3.3. y = =k/x mathematical model can be used for each of the problems. The possibility of building the same mathematical model for problems allows them to be studied on the basis of analogy. Therefore, it is possible to learn how to solve all three types of problems jointly and with the same methodical approach (Textbooks, 2023).

Methodology of teaching the subject

In the second grade of primary classes, multiplication is supposed to be taught. When applying multiplication to solving problems, textbooks use "buying and selling" problems (related to finding value). This "movement" (relating to finding the distance) and "work" (relating to finding the volume of work) issues of training can also be considered (Textbooks, 2023).

Issue 1: One notebook is 2 manats, how much money is paid for 5 such notebooks?

The solution to the problem is to find the sum of 5 equal sums, in other words, to apply multiplication: 2 manats * 5 = 10 manats.

Problem 2: They bought 5 identical notebooks. If one notebook is 2 manats, how much money will be paid?

The solution to this problem is to find the sum of 5 equal sums, in other words, to apply multiplication: 2 manats * 5 = 10 manats.

In solving these problems, the terms price, quantity and value can also be used quantitatively: Here,

– 2 manats is money given to a notebook, which means its price;

– 5 is quantity, indicating the number of identical items purchased;

– 10 manat is the value, the purchase is the money given for all things.

After the formation of knowledge about these quantities, an analogous problem concerning the second group of quantities can be presented.

Problem 3: A pedestrian travels 4 km per hour. How far will it go on foot in 3 hours?

Issue 4: He walked for 3 hours. If he traveled 4 km per hour every hour, how far did he travel in total?

Even if the students do not know the names of the quantities as terms in solving these problems, they do not have any difficulty in solving the problem. The solution to the problem comes down to finding the sum of 3 equal sums, in other words, applying multiplication: 4km*3=12km. Therefore, the meaning of the quantities speed, time and distance must be exclusively explained in solving these problems. In the 2nd grade, for the purpose of strengthening the act of multiplication, one can offer a problem related to the third type of problems.

Problem 5: A tailor sews 3 shirts in one day. How many such shirts in 5 days?

Problem 6: The tailor worked for 5 days. If he sewed 3 shirts every day, how many shirts did he sew? In these matters, sewing 3 shirts every day means labor productivity, 5 days means the duration of work, and the sought quantity is the volume of work. This problem is related to finding the volume of the work, the solution comes to finding the sum of 5 equal sums, in other words, applying the multiplication operation: 3 shirts * 5 = = 15 shirts. At this stage, in "purchasing" issues, when the price and value of the goods are given, the issues related to finding its quantity (1.2.) and the issues related to finding the price of the goods when the value and quantity are given (1.3) can be considered. In other words, in "shopping " issues, one can look at issues where the value remains constant. Each of these issues comes under the application of the division act. Therefore, in the process of formation of knowledge about the act of division, it is possible to consider the formation of quantities (Ashurov, 2021).

Issue 7: Azer has 24 manat money. One notebook costs 4 manats. How many such notebooks can he buy?

Issue 8: Azer bought 6 identical notebooks for 24 manats. How much is a notebook? The 7th problem is of the type of problems related to finding the quantity of goods when the price and value of the goods are given. According to the rule, the solution of the problem comes to the application of the act of division: 24 : 4 = 6 (notebook). In solving this problem, students can use the words "price", "quantity" and "value", which are exclusive knowledge, and explain their meaning.

– "4 manats" is the money given to one notebook, this is called the price of those notebooks;

– Found answer – "6 notebooks", the number of the same notebooks purchased is called the quantity;

– "24 manats" given in the question is all the money given to 6 notebooks with a price of 4 manats, this is called value. After such an explanation, it would be better to change the content of the question: how many notebooks can be bought for 4 manats for 24 manats? The 8th problem is related to finding the price of the goods when the price and quantity of the goods are given. According to the rule, the solution of the problem comes from the application of division: 24 manats : 6 = 4 manats. In the solution process, the explanation in problem 7 can be repeated analogously and the content of the problem can be changed as follows: Azerin bought 6 identical notebooks for 24 manats. Find the price of the notebook (or How much is the notebook?) Issues related to "Movement" can also be included in teaching with a similar methodical method. Although specific lesson hours are allocated to the study of price, quantity, value, speed, time, traveled distance quantities from the mathematics program, there is no place and time allocated to the study of productivity, work duration, work volume quantities. The study of these quantities, like many quantities, should be done through problem solving. Therefore, when solving the issues related to "shopping" and "movement", it is necessary to include "work" issues in parallel (Volkovyssky, 1976).

Discussions

Theoretical studies show that the three mentioned quantities are studied separately. From these quantities, functional dependencies for price, quantity and value quantities are realized from the 2nd grade, after teaching multiplication and division operations, while the realization of functional dependencies between other quantities of speed, time and distance is realized from the 4th grade. Functional relationships between labor productivity, work duration and work volume quantities are viewed very superficially. All three types of problems can be achieved by using the first types of problems when verifying knowledge about multiplication. After learning division, all three types of problems can be achieved using types 2 and 3. Also, this realization can be done by solving simple problems, which will not cause difficulties for students to acquire knowledge about the appropriate quantities. Such problems, which are propodeutics of direct and inverse proportional dependencies between these quantities, will be of great help to the study of the subject of functional dependence in the future.

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ISSUES OF DEVELOPMENT OF ETHNO-PEDAGOGICAL CULTURE OF FUTURE TEACHERS ON THE BASE OF HISTORICAL AND ETHNOGRAPHIC MATERIALS

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Abstract

The article highlights the importance of using historical and ethnographic materials in developing the ethnopedagogical culture of future teachers. It is emphasized that the use of historical and ethnographic materials reflecting national values, customs, and traditions in the educational process can contribute to the formation of patriotism among students.

Keywords: *ethnopedagogy, historical and ethnographic materials, professional development of teachers, national values, culture of the Uzbek people*

Introduction

The rich history and culture of Uzbekistan is an important resource for the national education system. Through historical and ethnographic materials, students can get in-depth information about the past, culture, customs and traditions of their people. This, in turn, serves to raise their national consciousness and educate them in the spirit of love for the motherland. Restoring national values in the society, educating the young generation in the national spirit and forming their ethnopedagogical culture is one of the important tasks today. Raising a generation that deeply understands the history, culture and values of their nation and treats them with respect is of great importance in preserving national spirituality and ensuring the integrity of society. In

this process, it is very important to equip future teachers with knowledge of ethno-pedagogical culture and enrich educational processes using historical-ethnographic materials.

Ethnopedagogy includes educational methods formed on the basis of national traditions and values, and strengthens national pride, traditional knowledge and values in the minds of young people (Ismailova M., 2018; Karimov F., 2019). And the historical-ethnographic materials embody the knowledge about the lifestyle, customs and rituals of the past generations, and they provide an opportunity to use them effectively in the process of training future teachers. This article analyzes the issues of using historical-ethnographic materials in the development of ethnopedagogical culture of future

teachers and shows the importance of their use in pedagogical activity.

Research methodology

The methodology of this research is aimed at studying the issues of using historical-ethnographic materials in the development of ethno-pedagogical culture of future teachers, and involves the use of the following main methods:

1. Theoretical analysis: At this stage, existing theoretical sources and research works on the role of ethnopedagogy and national values in education are studied. Pedagogical possibilities of ethnopedagogical culture development based on historical and ethnographic materials are identified through theoretical analysis. In this way, the topic is explained in more depth through available scientific sources.

2. Ethnographic research: Through this method, ways of using historical-ethnographic materials to preserve and develop national values and traditions are analyzed. Based on the rich heritage and traditions of the Uzbek people, various historical sources, ceremonies and customs are studied and their role in the educational process is analyzed.

3. Practical research (experiment): In the research, practical training is conducted with future teachers, and the effectiveness of special educational programs and pedagogical technologies for the formation and development of ethno-pedagogical culture is tested. Using the data obtained as a result of this experiment, the level of effectiveness of the use of historical-ethnographic materials is measured.

4. Interviews and questionnaires: questionnaires and interviews will be conducted to determine the level of knowledge and interest in ethnopedagogical culture of future teachers. Through this method, there is an opportunity to deeply analyze the opinions of students and teachers and to study their attitude to ethno-pedagogical culture.

5. Comparative analysis: Based on the researches and experiences carried out on the development of ethno-pedagogical culture of teachers in different countries, a comparative analysis is conducted in order to adapt them to local conditions. With the help of this method, the possibilities of applying foreign experience to the Uzbek education system are explored.

Based on these methods, reasonable conclusions are made in the research aimed at determining the role and importance of historical-ethnographic materials in the development of ethno-pedagogical culture. The results of the research will be important in preparing future teachers for pedagogical activities aimed at deepening the assimilation of national values.

Analysis and results

This study analyzed the influence and effectiveness of historical-ethnographic materials in the development of ethnopedagogical culture of future teachers. Based on practical experiments and questionnaires conducted during the research, the following main results were achieved:

1. Changes in the development of ethno-pedagogical culture: According to the results of practical experiments, it was observed that the classes conducted on the basis of historical-ethnographic materials are effective in forming a positive attitude towards national pride and ethno-pedagogical values in students. This was especially reflected by increasing their knowledge of national rituals and customs, understanding their spiritual values.

2. Results of the survey: Based on the results of the survey and interviews, the majority of teachers (85%) emphasized the need to use historical-ethnographic materials in the development of ethno-pedagogical culture. The respondents highly appreciated the influence of these materials in conveying their national values to the younger generation.

3. Comparative analysis: A comparative analysis of the researches and experiments carried out in different countries was conducted and it was found that the effectiveness was increased through the use of curricula and methods formed on the basis of national values in the foreign education system. These results were adapted to local conditions, and the possibilities of application in the Uzbek education system were studied.

Using tables and charts, research results are presented graphically, including:

Diagram 1: Attitudes of the students who participated in the survey to the use of historical-ethnographic materials in the development of ethnopedagogical culture. This chart shows the positive, neutral and nega-

tive opinions of the respondents in percentages. Attitudes towards the use of historical-ethnographic materials in the development of ethno-pedagogical culture among future teachers – positive (85%), neutral (10%) and negative (5%) opinions of the respondents are reflected here in percentages.

Figure 1. *Relationships regarding the use of historical-ethnographic materials in the development of ethno-pedagogical culture*
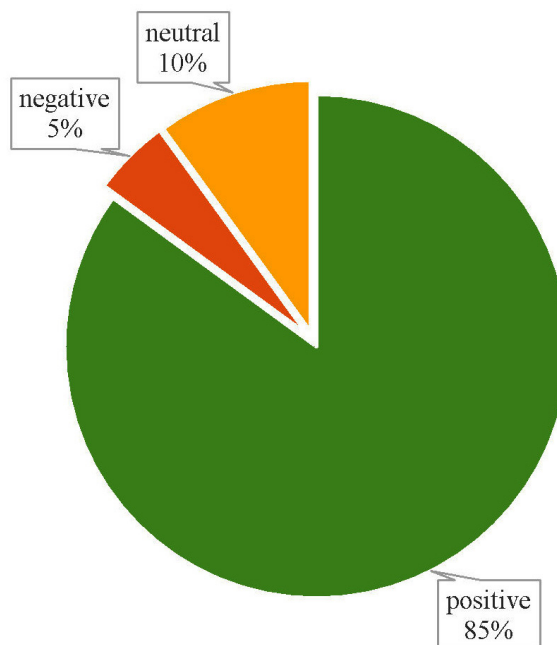

Diagram 2: The level of effectiveness achieved using historical-ethnographic materials in the process of developing ethno-pedagogical culture. This chart shows the results by experimental group and compares the changes of students in each group. Performance indicators obtained in experimental groups during the development of ethno-pedagogical culture. The experiment was conducted in three groups, and the efficiency for them was 75%, 80%, and 90%, respectively.

Figure 2. *Effectiveness of ethnopedagogical culture development in experimental groups*
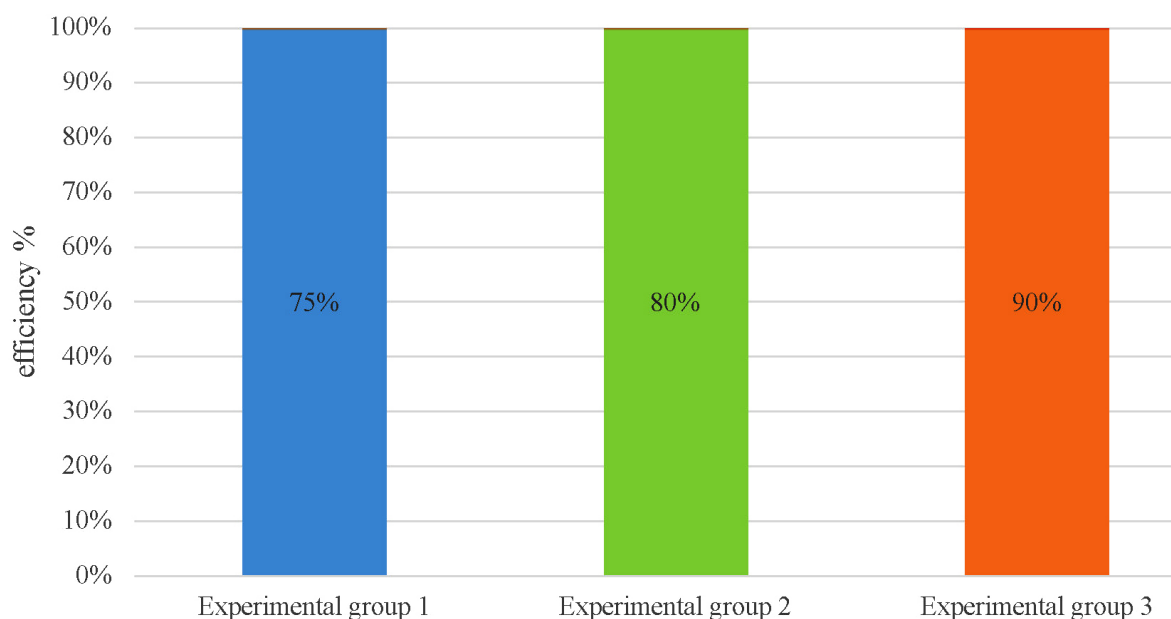
Table 1: The main factors affecting the formation of ethno-pedagogical culture. In this table, factors such as historical-ethnographic materials, interactive methods and methods of teaching national values are presented and the level of influence of each is evaluated.

- Historical-ethnographic materials: 85%
- Interactive methods: 75%
- Methods of teaching national values: 65%

Table 1. *The main factors affecting the formation of ethno-pedagogical culture*

Influencing factors	Level of influence (%)
Historical and ethnographic materials	85
Interactive methods	75
Methods of teaching national values	65

The information obtained through these tables and diagrams is visually expressed, and the role and importance of historical-ethnographic materials in the development of ethnopedagogical culture of future teachers is more deeply understood. The results serve as a basis for more effective use of these methods in the future.

Summary

As a result of studying the issues of using historical and ethnographic materials in the development of ethnopedagogical culture of future teachers, the following main conclusions were reached. First of all, the effective application of national education and cultural values in the educational process helps to form a sense of national pride and self-awareness in teachers. With the help of historical-ethnographic materials, students gain in-depth knowledge of national traditions, customs, and historical heritage, and their positive attitude towards national values is formed (Nematov M., 2024; Volkov G. N., Baubekova G. D., 2000).

Secondly, the results of the research showed that the assimilation of historical-ethnographic materials in the educational process is an effective way to improve the ethnopedagogical culture of students and future teachers. At the same time, such an approach allows students to preserve the national heritage, convey it to the younger generation, and apply the knowledge learned in their pedagogical activities.

Therefore, introducing historical-ethnographic materials into pedagogical programs and equipping teachers with ethno-pedagogical culture will give positive results in the development of the national education system. The results of this research can serve as a basis for additional scientific research aimed at the development of ethnopedagogical culture in the future.

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Section 5. Political science

POLITICAL ECONOMY OF RISING RUSSIAN INTEREST IN AFRICA: PROSPECTS AND CHALLENGES

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Abstract

The vast natural resources available in Africa, the corresponding energy needs, an increased demand for raw materials in Russia, and the need to forge diplomatic coalition that will counter balance Western dominance in Africa that has spurred rising Russian interest in Africa. Inspite of limitless opportunities that such an association potentially offers, it remains to be seen whether Africa will benefit in the long run from Russian involvement as well as whether Russian can maximize the potentials its rising interests in Africa offer. Through the examination of primary and secondary sources which were interpreted following a qualitative analyses and presented thematically. This article examines these issues, first looking at the historical basis for the present cooperation between Russia and Africa. The second part gives an overview of various political and economic initiations already taken to strengthen Russo-African ties; this is followed by analysis of the political economy of rising Russian interest in Africa. The final part addresses the reasons why Africa is seemingly retrogressing and offers solutions that could aid Africa to fully maximize the benefits of rising Russian interest.

Keywords: *Political Economy, Africa, Russia, interest, prospects, challenges*

Historical Background

The relationship between the African states and Russian is not only economic but also socio-political. Politically, the relationship between African states and Russia dates back to the preindependence era and revolve around fighting colonialism and imperialism of the western European countries. The early relationship between Africans and Russians, for instance, evolved in response to the west-ern world's domination of Africans as colonized people. In spite of western European countries early contact with Africa in the Fourteenth century, it was the Russians who had a better understanding of the plight of Africans as oppressed people dominated by western imperialism. Russian had more sympathy with African Nationalism than most European countries (Encyclopedia Britannica 2011).

Russian offered support to Africa countries in the struggle for freedom and independence. It was in this context that African Nationalism got its inspiration from the domestic socialist policies or the soviet union and from the ideas of Vladimir Lenin's theory of imperialism (Mazui and Tidy 1986) contend that Lenin's theory inspired many African nationalist not only to speak against colonialism and imperialism but also to revolt against domination by colonial masters. Lenin view imperialism as the highest stage of capitalism and reason that the revolution against Western capitalism was a revolution against its highest stage. Domestic socialism was, for him, the appropriate economic policy suitably positioned to counter imperialism which was the cornerstone of international capitalism. Lenin views resonated well with the aspirations of many Africans who detested western imperial domination and demanded independence.

Russo-African political and Economic initiative after 1945

The beginning of the cold war in the aftermath of the Second World War saw the intensification of the relationship between the Soviet Union and the African states. The Soviet Union presented itself as a country that had the interest of poor countries at heart. During the 1950 and early 1960s, the Soviet Union under the leadership of President Nikita Khrushchev actively supported Africa's revolution and instructed soviet scholars to defend African Nationalism and support revolution against imperialism on the continent. One Russian scholar, I. I. potekhin, perfectly contextualized and linked the idea of pan-Africanism with the Russian philosophy of socialism and imperialism when he stated that;

Pan-Africanism as an ideology contains much of what is alien to our (soviet) ideology. However, pan-Africanism aims at uniting all the peoples of Africa for the struggle against colonialism and imperialism, and for their national liberation. In addition, from this point of view pan-Africanism deserves the support of all people of good will of all striving for the ideas of progress and democracy (Mazui and Tidy 1986. 367). The Soviet Union supported African states when many Western countries including the United States were reluctant to

extend moral support to freedom fighters towing to the socio-economic and political relations they had with minority regimes in Africa.

In 1973, for instance, after many global countries recognized Guinea Bissau's independence from Portugal, the united states vetoed its application for united Nations membership (Mazui and Tidy 1986. 367) the continued support for Portugal by Western countries was based on its membership of the North Atlantic Treaty organization (NATO), despite the fact that Portugal was under the fascist rule of Salazar and caitano and was reluctant to Liberate its colonies in Africa, notably Angola, Guinea-Bissau contribution to the independence of Africa can be summarized in three ways. First Lenin philosophy of domestic socialism and his theory of Anti-imperialism provided a theoretical attack on economic imperialism (Marxism, or socialism) in the struggle for the liberation of the continent. It extended considerable financial and material support to the movement engaged in liberation struggles in Africa.

Second, the Soviet Union socialist policies of raising an economically backward country to an industrial one through widespread Literacy programs and the massive introduction of social welfare policies.

The Soviet Union not only condemned imperialism and colonization in Africa but also provided practical solutions and alternative through its socialist policies. Third and most importantly the Soviet Union was and is still one of the world super powers and had a permanent seat and veto powers in the security council of the United Nations. This gave the Soviet Union the moral authority and a platform to speak against colonialism and defend the plight of the poor countries in Africa. Comparatively though the United States spent more money on Africa than the Soviet Union, especially in alleviating poverty and underdevelopment. Russia provided military support and trained cadres during the wars of liberation in Southern Africa region (Alexius Amtaika 2013).

The First Russian- African summit 23–24 October, 2019

In his efforts to strengthen relations between African States and Russian, President Vladimir Putin organized the summit which

was co-hosted by him and the Egyptian president Abdel Fattah El-Sisi at sochi in Russia. The motto of the summit was "peace, security and development. It was attended by seventeenth heads of states. It was aimed at laying a good foundation for further deepening the Russia-Africa partnership in the interest of African States and Russia in prosperity and wellbeing. The conference also set out to strengthen the legal and contractual framework for cooperation in communication and mass media, promote mutual participation of the masses.

President Putin sought to rekindle relations established during the cold war and pledged to double trade with African countries.

It should be worth noting that, for president Putin, and arguably for many African states, the summit conference may be simply that, it took place. President Putin needs to retain his relations in Africa that help him dilute UN. Condemnations and economic sanctions over his attack on Ukraine (Russia-Africa summit 2019 widipedia.org).

The second Russian- African summit 27–28 July, 2023

This summit took place in St. Petersburg on the 27 and 28 July, 2023 with the presence of 43 heads of States from Africa. President Putin used the summit to try to reassure African countries that Russia would provide free grain from its own reserves and find a way to move its shipments to countries most in need.

Many resolutions were taken in the conference inter alia.

- Russia will find solutions on the supply of grains and fertilizers to the continent despite the suspension of the black sea grain agreement;
- President Putin also announced a debt cancellation initiative to the tune of 23 Billion Dollars;
- He equally endorsed the need for the African union to be granted full membership in the G20 club of nations. This conference was highly successful with the presence of 43 heads of states from Africa.

Political economy of Russian interest in Africa

It can be argued that the rise of Russian interest in Africa is fundamentally driven by motivations such as the quest for resources, business opportunities, diplomatic openings, and strategic alliance. Africa holds a central place in president Putin's foreign policy which declares it determination to end an unjust "unipolar" world order dominated by a United States and its European allies, and replace it with a "multipolar" geometry among great powers including Russia. Africa is a primary audience for Putin's narrative in which he promised Russian help to African states in casting off the Lingering vestiges of European colonization (Russian –African summit 2023) Wikipedia. Org).

Also, Africa is the single largest audience for Putin's campaign against diplomatic isolation. African states are central to Moscow's periodic appeals for nation's votes or at least abstention, against UN resolutions condemning the brutal assault on Ukraine.

Trade Flows

In the domain of Trade flows, during the independence period there were many exchanges between Russia and African States. Such connections collapse into low levels of economic engagement during the 1970s and 1980s, the arms trade being an exception. One of the major barriers that impacted on this cooperation and relationship negatively was language. Many Africans speak western European languages, such as English, French and Portuguese. These languages indirectly link Africa countries to the economies of Western European countries. This suggest that language and economics are interlinked, and since business cannot take place in the absence of language. This explain why African countries have maintained their close relationship with former colonial masters in spite of a better past of oppression and imperialism. The low level of contact between Russia and Africa countries have led to calls being made by African governments to review its policies toward Africa. Trade between Russia and Africa amounted to only US $6 billion in 2009 (Klomegah 2008). Low levels of trade with Russia are mainly blamed on the lack of knowledge and expertise among African economies in entering into the challenging Russian market. Apart from its sheer size and language problems, Russia presents a serious challenge to many African countries in terms of the bureaucratic hurdles

that make doing business with that country difficult, as African countries lack the resources to help their companies do business with Russia. Consequently, Africa countries prefer to stick to their regional or traditional markets such as the European Union, Canada, Japan, and the U.S.A where they receive trade benefits. In order to boost trade relationship with Africa, Russian leaders have made only two visits to Africa-one in 2009, when Russia president Dimitry Medvedev visited four African countries namely Egypt, Nigeria, Namibia and Angola (Smoicheko 2009). In 2006, Russian president Vladimir Putin visited Africa. These visits reflects positive development in revitalizing the Russian African relationship and reasserting Moscow's clout in a former soviet sphere of influence.

Military cooperation

The military cooperation over the past decade, as Russia has built new security relationships with African countries, it has supported Wagner's provision of soldiers, advisors, trainers and weapons to help elites maintain their power in the face of insurgencies or communal conflict. Wagner Finances its role not only with funding from Russian States but also by negotiating concessionary deals with the ruling elites to mine gold, diamonds or other minerals, or to extract valuable hard woods from forest lands. Wagner and other prigozhinlinked companies have been prominent, if uneven in execution, recent years in the central African Republic/Libya, Mozambique, Sudan and Mali (Kirtika sharad 2023).

The end of the cold war has not only extinguished a number of proxy wars, it has also dramatically affected the flow of external resources to the African government. As Jeffery Lefebvre observed in the new world order, "the days of right-wing and left-wing dictatorial regimes being lavished with aid and excessed for their internal excesses were over" Russia's presence in the continent with the Wagner company linked to the Russian president Vladimir Putin with a goal to train African soldiers and sell sophisticated weapons to friendly African countries she has signed defense agreement with. To this end, four countries in Africa are in the spot light, the Republic of Central Africa (CAR), Sudan, Libya and Mozambique have signed this defense agreement with Russia. In Mali after the military takeover, there was an uproar in the capital city Bamako where the masses were jubilating, requesting for the deployment of Russian fighters into the country after many years of Islamic insurgency in the North that has led to the death of several persons (Tarh 2021). Russia military pacts with these countries is a big threat to France that had hitherto exclusive rights to provide military equipment and train military officers of her former colonies.

The Tragedy of Africa's continued Retrogression

There is no gainsaying that Africa countries have relatively larger endowments of natural resources than Russia, while Russia have engaged in high rates of savings, investment in education, capital accumulation, sound macroeconomic management practices, relatively open trade policies dynamic agricultural sectors, the maintenance of relatively equitable income distribution, and political credibility, African countries, with the exception of a few, have done the exact opposite (political Articles 2009).

The main obstacle to African development is the corrupt autocratic leadership and incompetent government that most African countries have been saddled with since independence.

African is widely considered among the world's most corrupt places, a factor seen as contributing to the stunted development and impoverishment of many African states of the ten countries considered most corrupt in the world, six are in Sub-Saharan Africa, according to Transparency international, a leading global watchdog on corruption (Furphy 2010). A 2002 African union study estimated that corruption cost the continent roughly US $150billion a year. To compare, developed countries gave US $22.5 billion in aid to sub-Saharan Africa in 2008, according to the organized action for Economic Cooperation and Development (Hanson 2009). Transparency international 2010 corruption perception's index, released in October 2010, identified Africa as the most corrupt region in the world (Transparency international 2010). Sub-saharan Africa is also one of the most underdeveloped regions on earth (United Nations 2010)

while government commit large sums to addressing the plethora of problems hindering development on the continent, corruption remains a major obstacle to achieving much needed progress (Furphy 2010) corruption results in the deviation of funds intended for development and undermines the rule of law, breeds inequality and justice and discourages foreign investment, this further impeding development (Furphy 2010).

Conclusion

The prospect of strong socio-political and economic cooperation between Africa and Russia raises much optimism in view of the boundless human and natural resources available in Africa and Russia. At present, the identified goals of the Russian-African partnership- such as political solidarity, economic cooperation, and socio-cultural collaboration are far from being realized, as Africa continues to retrogress under the burden of corruption, poverty, bad governance, and an unfavourable balance of trade. The rising interest of Russia in Africa has not conferred simply because Russia is out to serve its own interest but because Africa has not positioned itself to reap the vast benefits that strong Russian-African ties can confer.

The must be concerted efforts to entrench true democracy all over Africa. The need for effective institutions that provide checks and balances as well as credible accountability mechanisms, which will ensure that benefits are spread equitably, cannot be overemphasized. These include a free press and strong civic society. African governments need to demonstrate a clear commitment to human rights and the rule of law, because it is only when a government is grounded in the rule of law, fairly and consistently applied to leaders as well as their citizens, including minorities, are respected will therefore bring stability and prosperity (Annan 2010). Increased foreign direct investment and transfer of technology from Russia to Africa will also go a long way in alleviating the problems of Africa as opposed to food or financial aid.

The article has examined and assessed the historical basis for the present cooperation between Russia and Africa and the political and economic initiative already taken to strengthen ties. The study equally analyzes the political economy of rising Russian interest in Africa and addresses the reasons why Africa is seemingly retrogressing and lastly offers solutions that could help Africa to fully maximize the benefit of rising Russian interest.

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