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CONTENT

ARTS

Masliakova A.

VARIOUS ASPECTS OF ART HISTORY3

BIOLOGICAL SCIENCES

Rakhimova Y., Kyzmetova L.,

Assylbek A., Sypabekkyzy G.

DIVERSITY AND DISTRIBUTION OF ASCOMYCETES ON

THE TERRITORY OF THE KETMEN RIDGE

(KAZAKHSTAN)15

CHEMICAL SCIENCES

Zarbaliyeva I., Nabyeva H.,

Alimova A., Abilhasanli R.

SYNTHESIS AND STUDY OF SURFACE-ACTIVE SALTS

OBTAINED FROM THE REACTION OF 1,2-

DIAMINOETHANE WITH CIS-9-OCTADECANOIC ACID

AND TETRADECANOIC ACID28

CULTURAL SCIENCES

Cai Fan

STUDY ON EDUCATION AND INHERITANCE OF RED

MUSIC CULTURE AMONG CONTEMPORARY CHINESE

TEENAGERS IN THE CONTEXT OF GLOBALIZATION ...38

MEDICAL SCIENCES

Rakhimova D., Alyavi A.,

Muminov D., Sabirjanova Z.

THE INFLUENCE OF COMPLEX THERAPY ON

PARAMETERS QUALITY OF LIFE AND DYSFUNCTIONS

CARDIORESPIRATORY SYSTEM IN PATIENTS WITH

BRONCHIAL ASTHMA43

Khabibyanov R., Maleev M.

CLOSED OSTEOSYNTHESIS OF VERTICAL FRACTURES

AND INJURIES OF THE PELVIC RING46

Khabibyanov R., Maleev M.

MECHANOGENESIS OF ROTATIONAL UNSTABLE

FRACTURES AND INJURIES OF THE PELVIC RING51

Khabibyanov R., Maleev M.

THE ROLE OF THE PUBIC JOINT IN STABILIZING

THE PELVIC RING58

POLITICAL SCIENCES

Kozhakhmetova D.

WHY DO WOMEN REMAIN UNDERREPRESENTED IN

POLITICS IN KAZAKHSTAN?64

ARTS

VARIOUS ASPECTS OF ART HISTORY

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Abstract

This research is the product of years of research executed by the author in the field of Art history. Each part of the article reveals various aspects of the issue mentioned above, in particular, the influence of Antiquity on the formation of the aesthetic preferences of artists, the role of the Bauhaus in the development of Modern architecture, the interaction between Art and Nature, the symbolism of a mirror in the context of the Baroque era, as well as the importance of restauration and preservation of the Artworks. The narrative is supplemented by the photographs taken by the author during her trips around Russia and Europe.

Keywords: art history, Bauhaus, mirrors, Borges, restauration.

First of all we are going to concentrate on the theme of Ancient Gods and Heroes. As you know, the influence of Antiquity on the history of Art is difficult to overestimate. Many architectural monuments were inspired by Antique samples (see Fig. 1.). For example, the painting style of the Loggias of Raphael in the Vatican (as well as their copy adorning the Hermitage Museum in St. Petersburg, which was made in the 18th century by the order of the Empress Catherine II) is based on the bizarre, grotesque ornament of the Golden House of Nero, discovered by chance at the end of the 15th century. The aesthetics of “The Belvedere Torso”, found in Rome in the 15th century, had a great influence on the work of such prominent artists as Michelangelo and Rubens [1]. Whereas James Stewart’s and Nicholas Revett’s study “The Antiquities of Athens” largely determined the direction of the development of the British architecture in the late 18th century.

In general, interest in the ideals of the past has had a special attraction and charm. So it is no coincidence that many authors has turned to this topic, starting with Richard Wagner, who developed Germanic mythology in his cycle of four epic operas called “Ring of the Nibelungen”, and ending with “The Lord of the Rings” by J.R.R. Tolkien creating his own, unique mythology. Not to mention Woody Allen’s movie “Midnight in Paris” emphasizing the fact that every generation finds the past much more attractive than the present.

As a matter of fact, there are a lot of plaster cast collections around the World aiming to develop the aesthetic taste of the audience and awaken people’s interest in the works of the outstanding masters of the past, including the Cité de l’Architecture et du Patrimoine located at the Palais de Chaillot in Paris, the Cast Gallery of the Academy of Fine Arts Museum in St. Petersburg, the plaster cast reproductions located at the Pushkin Museum, etc.

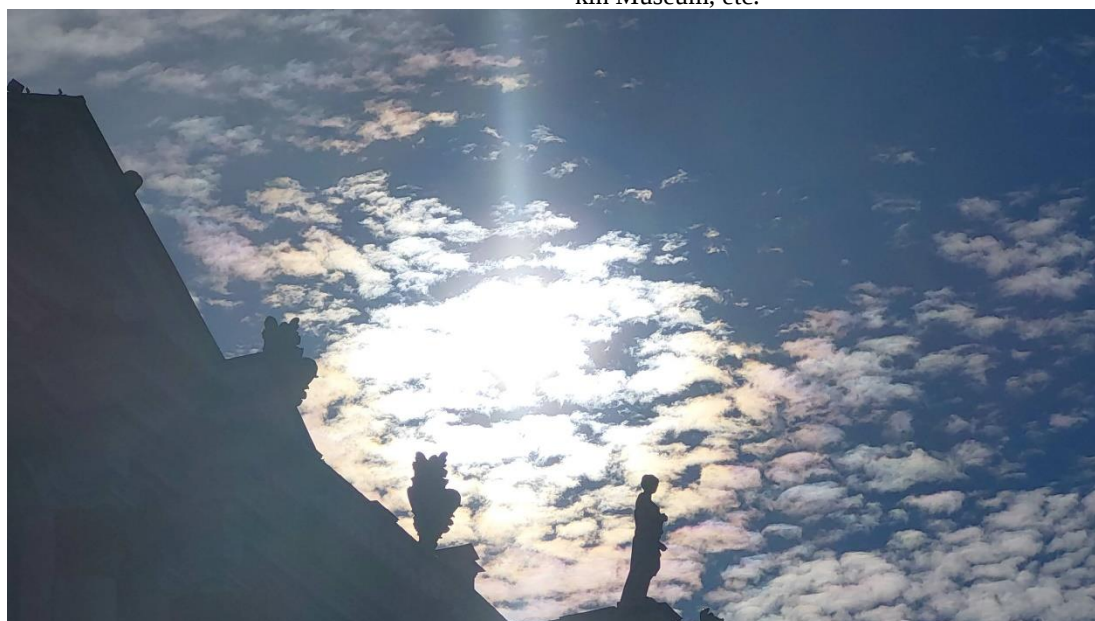


Fig. 1. Sculptural décor of the Hermitage Museum.

On the one hand, Nature is an integral part of Ancient culture (see Lecture “Art and Nature”), but at the same time, it can destroy the Art objects created by man. Suffice it to recall the eruption of Vesuvius in 79 BC, which killed thousands of inhabitants of the Roman cities of Pompeii, Herculaneum and Stabia. But at the same time, due to the unique property of the volcanic ash that coated those cities, they have been preserved in their original state, and we have a unique opportunity to study their culture and Art. Besides, the excavations of Pompeii led to the emergence of the Neo-Pompeian Style, for example, “The Last Day of Pompeii” by Karl Bryullov, the Pompeian Dining Room in the Winter Palace of the Romanovs designed by the architect Alexander Bryullov, the Apartments of the King and Queen in the Munich Residence decorated by Leo von Klenze, etc.

Now we are going to reflect of the issue of Mirrors in Art. It is a well-known fact that for many centuries mirror was a sign of wealth. And it was believed that mirrors of the highest quality could be produced only in Venice. For instance, at the Louvre Museum there is a Mirror of Maria Medici, incrustated with precious stones, which was presented to her by Venetian masters.

Firstly, mirror allows you to see things from an unusual angle adding new meanings and making familiar things look ambiguous. And I find it exceedingly fascinating to take pictures of reflective surfaces, such as glass façades of the buildings, or the expanses of water, for it helps to see the objects, reflected in them, differently giving an opportunity to get closer to understanding the World not as it appears for us, but as it is (see Fig. 3.). Let us mention in this regard “The Arnolfini Portrait” by Jan van Eyck, located at the National Gallery in London, depicting a mirror showing two men entering the room; “Las Meninas” by Diego Velazquez, which is rightfully considered the gem of the collection of the Prado Museum, representing a mirror, hanging of the wall, that reflects the figures of the parents of the Infanta Margaret Theresa of Spain, depicted in the foreground, – the King Philip V and his wife Marianna of Austria. Moreover, the conversation that seems to be transpiring between the barmaid and the gentleman, represented in Eduard Manet’s “A Bar at the Folies-Bergère”, is revealed to be an optical trick since the man stands outside the painter’s field of vi-

sion, to the left, and looks away from the barmaid, rather than standing right in front of her [2]. And similar technique was used by Olafur Eliasson in his installation “Pentagonal Mirror Tunnel” exhibited at the Emma Museum in Espoo in 2017 [3].

Nevertheless, it was during the Baroque époque that mirrors acquired particular importance creating the illusion of a much larger space and reinforcing the effect of surprise which, as you know, was essential for the Baroque aesthetics. Suffice it to mention the Hall of Mirrors in the Palace of Versailles demonstrating that France could rival the Venetian monopoly on mirror manufacturing, or the Audience Room of the Grand Palace in Peterhof designed to the order of the Emperor Peter I to surpass the grandeur of the Versailles (see Fig. 2.).

On the one hand, mirror could give its owner “superpowers” – for instance, Perseus killed the Gorgon Medusa using a mirror, and in Peter Paul Rubens’ painting “Perseus and Andromeda”, located at the Hermitage Museum in St. Petersburg, one can see the hero holding his shield with the head of Medusa on it. One can even travel with the help of a mirror, as shown in Lewis Carroll’s novel “Through the Looking Glass” telling a story of a girl who slipped through a mirror to another world. Besides, a mirror can warn of danger, just like in the movie based on Agatha Christie’s story “In a Glass Darkly” telling about a man who “witnessed” a murder of a young girl reflected in a bedroom mirror.

It should be noted that many prominent film directors used mirrors in their films so as to enrich the symbolism of the plot – for instance, the “Mirror Talk” from Jean Luc Godard’s movie “Breathless” in which the protagonists examine their faces in the mirror while chatting; or Andrei Tarkovsky’s film “Mirror” showing Alexei, the main character, looking intently at his reflection in the mirror. Yet, on the other hand, the excessive use of the mirror may lead to a negative effect – let us use as an example “Narcissus” by Caravaggio who, according to Ovid’s “Metamorphoses”, fell in love with his own impression, and died of his passion, and, after that, ended up in Dante’s “Inferno”. In this regard one should also mention the fate of the Evil Queen from the “Snow White and Seven Dwarfs” – longing to be “the fairest of them all”, she would turn to her Magic Mirror every morning to make sure that her goal was achieved, and that ultimately led to her death.



Fig. 2. The Audience Room of the Grand Palace in Peterhof.

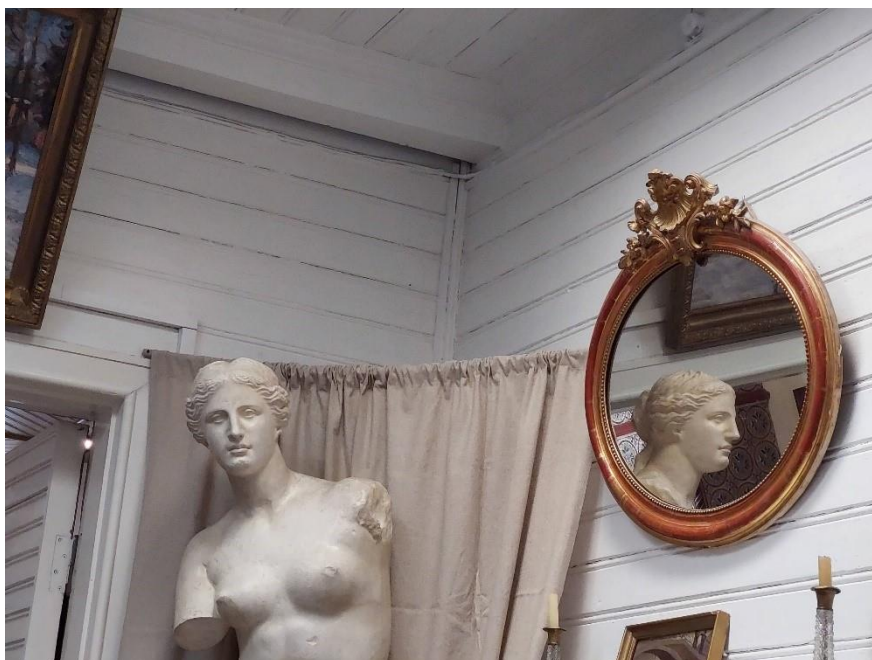


Fig. 3. The reflection of a statue in a mirror, Repin Estate Museum.

A broken mirror is no less dangerous – for instance, the Snow Queen shattered the glass into thousands of small pieces and made it so that the fragments fell into the eyes of people, as a result of which a person was evil, and hated the beautiful while the fragment was in their eyes. And in the film “The Mirror Crack’d From Side to Side”, inspired by Agatha Christie’s story with the same title, Mrs. Bantry, when recounting to Miss Marple the events that occurred on the day of the

murder, uses the lines from Alfred Tennyson’s poem “The Lady of Shalott”, in which a curse falls upon the heroine of the poem when the mirror cracks, to describe the look she observed on Marina Gregg’s face.

It is possible that the secret of the attractiveness of mirrors will never be completely unraveled. After all, no matter how much we look in the mirror, we see not how others perceive us, but our “mirrored” reflection.

And it is high time we talked about Art and Nature. It is a well-known fact that Art and Nature are closely connected. Many authors, including Vitruvius, agree that a column could be compared to a tree; that is to say, the base of the column corresponds to the stump, the shaft of the column resembles the tree trunk, whereas the capital reminds of the branches of the tree. And I must say that whenever I walk in the forest, or in the park located on Yelagin Island, it seems to me that the trunks of the trees look like giant pillars supporting the invisible “Temple of the World”, and their branches are serving as flying buttresses.

Various interior and exterior designs were inspired by Nature – let us mention in this regard the patterns of twelve panels embroidered with glass beads, decorating the Bugle Study in the Chinese Palace in Oranienbaum, which were created to the order of the Empress Catherine II (see Fig. 4.); the woodcarvings of the Voltaire Room in the Sanssouci Palace in Potsdam (in French, the Palace’s name means «without care») in which the representations of fruit and foliage are combined with the depictions of monkeys and birds; the Raphael Loggias richly adorned with the representations of squirrels, owls, mice, snakes, etc. (see Fig. 5.). Rococo artists were guided by the whimsical curve of the sea shell in their works, not to mention that the Baroque style itself owes its emergence to a “flawed”, “misshapen” pearl. And if one looks closely at the façades of the buildings erected in the style of Art Nouveau – for example, the Lidval Apartment House designed by the architect Fyodor Lidval and adorned with representations of spider webs, lizards, lions, hares, etc., or the Ivan Al-yushinsky Apartment House, created by the architect Alexander Lishnevsky and decorated with the sculptures of cats with raised tails – one may see, that their décor was also created to resemble the diversity of Nature. And one should not forget about “La Mer” (“The Sea”) by Claude Debussy, “The Ninth Wave” by Ivan Al-vazovsky, “The Cuckoo” by François Couperin, and Arkady Rylov’s “Self-Portrait with a Squirrel”.

Interestingly enough, despite the fact that the depictions of Nature can be found in the Artworks of different époques, starting with the frescoes decorating the Knossos Palace on Crete and ending with Claude Monet’s “Impression. Sunrise”, the “emancipation” of a landscape in the European Art occurred rather late, in the 19th century. And although even Peter Paul Rubens created landscapes (for instance, “Landscape with a Rainbow”, or “Landscape with Stone Carriers” located at the Hermitage Museum in St. Petersburg), only during the Romanticism landscape comes to the fore (for example, Caspar David Friedrich’s “The Lonely Tree”

located at the Alte Nationalgalerie in Berlin, or his “Ruins of the Oybin (Dreamer)” exhibited at the General Staff Building in St. Petersburg; J.M.W. Turner’s “Fishermen at Sea” and “Snow Storm: Hannibal and his Army Crossing the Alps” presented at the Tate Gallery in London, etc.).

And when we move towards the 20th-21st centuries, the interpretations of Nature in Art becomes more and more original – “Fallingwater” designed by Frank Lloyd Wright, who, following the tradition of the Greek theatre in which Nature not only served as scenery, but also was an essential component of the performance, made the sounds of the waterfall an integral part of his architectural project; the Building of the Didrichsen Museum in Helsinki designed by Viljo Revell who had a vision of the surface reflecting the architecture and the surrounding Nature; the Sächsische Aufbaubank Building in Leipzig with mushroom-shaped columns designed by the ACME London; Fujiko Nakaya’s fog sculptures dancing with the wind [4]; Sten Are Sandbeck’s installation “While We Are Waiting”, showing birch boards with eyes, peering into the faces of the visitors, and contemplating the issues of experience and expectations, which was presented at the Amos Rex Museum in Helsinki during the exhibition called “Subterranean” [5]; Olivier Messiaen’s “Catalogue of Birds” for, as we all know, he was a devoted ornithologist, and “Birdsong: a Musical Field Guide” by Alexander Liebermann, who, following the footsteps of his predecessor, creates the transcriptions of various birds and uses those tunes in his creativity [6], etc.

Without any doubt, the ability to understand Art and appreciate the diversity of Nature could not only broaden the horizons of a person, but also contribute to the improvement of their psychological state. And it is no surprise that Art Therapy, Music Therapy, and Landscape Therapy are extremely popular nowadays. And yet, it seems to me that is not only important to communicate with the Artworks and Nature, but also to develop the ability to see the Beauty in “mundane” things, for which the advocates of the ready-made movement, such as Marcel Duchamp (“Bicycle Wheel”, “Fountain”), Man Ray (“The Gift”), Pablo Picasso (“Bull’s Head”), etc., were aiming. In other words, the windmills located in different parts of the World and transforming the wind energy into electricity are no less impressive than Alexander Calder’s kinetic sculptures in which the movement is produced by exploiting the natural movement of air in space. And, as the old saying goes, beauty is in the eye of the beholder.



Fig. 4. The Bugle Cabinet in the Chinese Palace in Oranienbaum.



Fig. 5. The copy of the Raphael Loggias, the Hermitage Museum.



Fig. 6. Viipuri Library, the glass wall.

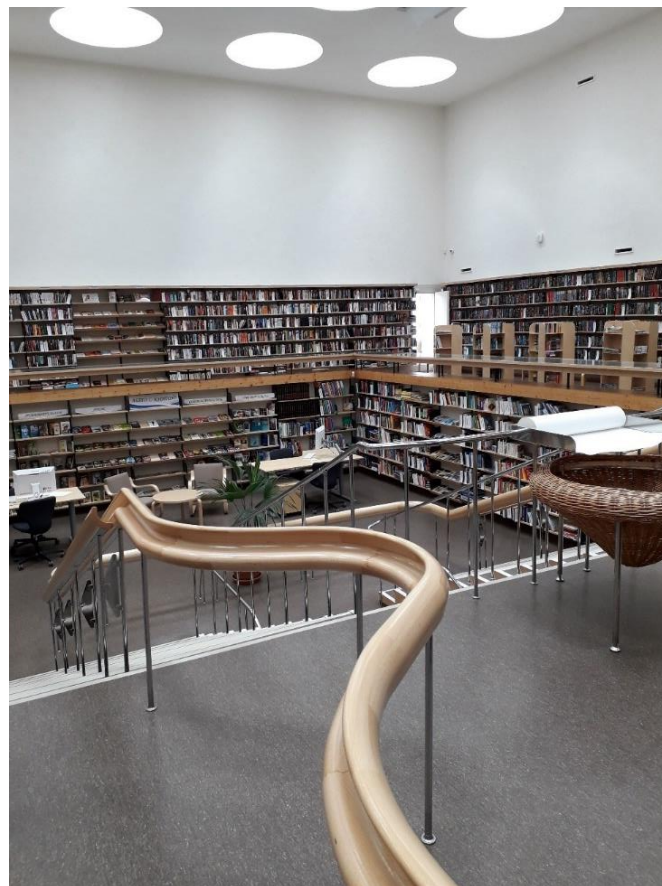


Fig. 7. Viipuri Library, barrel skylights.

As for the connection between Avant-Garde and the Bauhaus, needless to say that Russian Avant-Garde (1850-1930) played a significant part in the development of the Art of the 20th-21st centuries. Suffice it to mention that “Malevich’s Tektonik” – a design project for a fourteen-level hotel in London created by the inimitable Zaha Hadid, who, by the way, was the first woman to be awarded the Pritzker Prize, the equivalent of the Nobel Prize for architecture, – was inspired by the Russian Suprematist movement [7].

And if Avant-Garde was aiming to break the rules, go beyond the ordinary and expand the limits of possibility, the members of the Bauhaus School (1919-1933) represented another influential tendency of the time, namely, they wanted to create a “total work of Art” (Gesamtkunstwerk) combining aesthetics with everyday function – according to the Bauhaus Manifesto artists and craftsmen were to unite their efforts in order to create the “building of the future” [8, p. 28]. Yet these two seemingly separate movements have something in common, which is no surprise since Wassily Kandinsky, one of the prominent Avant-Garde artists, worked at the Bauhaus for about ten years (1922-1933). In other words, both trends were striving for the renewal of the Art with the sole difference that the attitude of the Avant-Gardists towards it was more theoretical and radical, whereas the Bauhaus concept was more “down to earth” and practically oriented. Albeit at the beginning, there were attempts to find a certain spiritual basis for the Bauhaus project; one need only note Johannes Itten’s educational philosophy making emphasis on the inner-self, or Gertrud Grunow’s classes in harmonization based on the belief that a universal equilibrium of color, music, perception and form is anchored in each person and could be discovered through physical and mental exercises [8, p. 69]. And it seems to me that, to some extent, that unites Bauhaus with the creativity of

Alexander Scriabin, one of the most mysterious composers who at the turn of the 19th and 20th centuries was working on the synthetic Work of Art – “Mysterium” the performance of which was supposed to transform the World and make it a better place. Unfortunately, Scriabin died in 1915 before his work was finished. Interestingly enough, Johannes Itten left Bauhaus a little bit later, in 1922. And from that time on, the importance of the practical component of the Bauhaus activities begins to grow.

There was a transition from an intuitive to a systematic approach, for they had an ambition to create original products to suit industrial requirements [8, p. 95-96]. Hence the slogan – “art and technology, new unity” [8, p. 121]. And the House am Horn, designed especially for the Exhibition of 1923, was a Bauhaus creation from top to bottom representing the first practical attempt of new living in Germany [9]. Moreover, Walter Gropius came up with the idea of the “large-scale building set” implying the use of standardized construction elements, and thus making it possible to assemble a “designer” in different ways and erect various “machines for living” according to their function [8, p. 242]. One may cite as an example the Dessau-Törten Housing Estate (1926-1928) comprising simple one-storey detached houses with garden created by Walter Gropius especially for workers since during the Weimar Republic there was an acute shortage of affordable housing [10]. By the way, one should distinguish between functionalism and constructivism, that is to say, the first one makes accent on the convenience of space for a person dwelling there, whereas the main goal for second one is creative self-expression of an artist (although later on it would acquire a more utilitarian quality). Suffice it to compare the Törten Housing Estate with Tatlin’s Tower which was supposed to decorate the Trinity Square in St. Petersburg.



Fig. 8. Oodi Library, Helsinki.

Traditions of functionalism, laid down by the Bauhaus, have become widespread not only in Europe, but also in America, largely due to the fact that after the closure of the Bauhaus in Berlin in 1933 many teachers who worked there emigrated to the United States. For example, Ludwig Mies van der Rohe, the last director of the Bauhaus, designed several skyscrapers in Chicago, the Neue Nationalgalerie in Berlin, as well as the Building of the Embassy of the German Empire in St. Petersburg. And even the Viipuri Library, created by a Finnish architect Alvar Aalto, has very much in common with the Bauhaus Building in Dessau – it suffices to compare Walter Gropius’ “curtain wall”, evoking the towering walls of colored glass of the Gothic cathedrals and making the exterior and interior spaces visible simultaneously, with the glass facade-enclosed staircase of the library (see Fig. 6.). Not to mention the fact that not only the exterior, but also the interior décor of the Viipuri Library was made by Alvar Aalto himself, including the famous stacking stools consisting of only four wooden parts – three legs and a round seat. When inside the library, one cannot help but feel the urge to learn, for everything has been thought out to the smallest detail – the furniture is simple yet comfortable, the space is full of light due to the white color of the walls and the sky-lighted roof (in a way, alluding to the big skylights of the Hermitage Museum in St. Petersburg), and the wave-like, curved forms of the surfaces not only improve the acoustics, but also seem to bring a sense of calm and harmony (see Fig. 7.). And I must say that when exploring the modern buildings in Helsinki, one gets the distinct impression of the continuity of the modern Finnish architecture with the works of Alvar

Aalto, and through him with the Bauhaus aesthetics itself – let us mention, for example, the Oodi Library with its curved lines, natural materials and barrel-shaped skylights (see Fig. 8.).

As for the restoration and preservation issues, Needless to say that past and present are inseparable from each other, suffice it to look and the Old Mariinsky Theatre, created by Alberto Kavsos, reflected in the glass façade of the Building of the New Stage of the Mariinsky Theatre designed by Jack Diamond (see Fig. 9.). And I share the opinion of an American Art historian Vincent Scully who in one of his lectures on Modern Architecture says that “the ruin is deeply built into the culture of the Modern Age” for one of the great facts of the 20th century is that “it made more ruins than any other century ever did before” [11]. The importance of preserving Memory of the past is difficult to underestimate, yet when it comes to specific methods for implementing that idea, the plurality of approaches corresponds to the complexity of the stated problem.

If, for example, in the 19th century many people tried to “correct” the works of the “old masters” – suffice it to compare Karl Cherni’s edition of J.S. Bach, abounding with dynamic shades, with the urtext (original text), – recently there has been a trend, according to which restorers should not try to make old Artworks look like new ones, but, on the contrary, they ought to strive to preserve their original appearance with all its “imperfections”. For example, the Kaiser Wilhelm Memorial Church in Berlin was not rebuilt after a bombing raid in 1943, but preserved in its “ruinous” state so that we could both appreciate our past and enjoy the “dilapidated beauty” of that architectural masterpiece.

Richard Rogers created the Lloyd's building preserving the façade of the Neo-Roman structure of 1928 and putting it into the context of the assemblage of elevators and pipes reminding of Alice's adventures in Wonderland [12]. If we look closely at the columns of St. Isaacs Cathedral, we may find out that they bare traces of shell splinters, yet those "defects" do not reduce, but rather increase the aesthetic value of the structure. And, more

often than not, when cleaning the paintings and removing centuries of grime and dust from them, as well as the corrections and glues applied during previous restoration campaigns, they tend to leave certain small areas unrestored so that visitors could see the original version of the Artwork in question, and, at the same time, go "back to the future" and compare it with the later additions.



Fig. 9. The New Stage of the Mariinsky Theatre.



Fig. 10. Karl Bryullov, "Portrait of the Architect Arhioni" (Nizhny Novgorod Art Museum).

Besides, one should not forget that there are a number of Artworks which were left unfinished by their creators for various reasons – Franz Schubert's Symphony No. 8 in B minor consisting only of two movements; W.A. Mozart's "Requiem" completed by Joseph Leopold Eybler and Franz Xaver Süssmayr; Alexander Borodin's opera "Prince Igor" which after his death was edited and finished by Nikolai Rimski-Korsakov and Alexander Glazunov; Mikhail Bulgakov's novel "The Master and Margarita" edited by his wife Elena Sergeevna; Michelangelo's "incomplete" statue of "Awakening Slave", trying to break free from its marble prison, located at the Florence Academy of Fine Arts; Karl Bryullov's "Portrait of the Architect Arhioni" in which only the model's face was carefully traced (see Fig. 10.); "Portrait of Sergei Diaghilev" by Valentin Serov, exhibited at the Russian Museum in St. Petersburg, which was not finished since the artist lost interest in this subject; Tatlin's Tower which was supposed to adorn the Trinity Square in St. Petersburg yet the project was never implemented, etc. And although the idea of completing all the "unfinished" Works of Art might seem rather tempting, I quite agree with Vincent Scully that some Artworks should be preserved in a "ruined state", and since, for example, La Sagrada Família always was a great ruin and had an enormous appeal "as a never to be finished ruin", it might have been better to leave everything as it was and not to try to complete Antoni Gaudí's project.

Without any doubt, restauration and preservation of Artworks require significant material costs, so it is no surprise that the façades of many historic buildings

in St. Petersburg have been covered in scaffolding for years. And yet, however complicated this issue may seem, I do believe that each person can make a feasible contribution to its solution within their means. For a start, one should not make any alterations to the listed buildings without prior approval from the authorities for it may cause damage or even destruction to those historical structures. Moreover, when it comes to repairing of the interiors of the apartments located in the houses of the late 19th-early 20th centuries (or older), this matter should not be approached lightly either. On the one hand, it might seem easier to cover the old ceiling with a new drywall, not to mention the financial advantages of that procedure. On the other hand, nothing could compare with the original ceiling design for, unlike the latter, it has its own memory – each crack reveals a small piece of the past, and the combination of rough texture of the wooden beams and smooth white moldings creates a layered effect allowing us to explore the history of the past, just like archeologists, yet without leaving our houses (see Fig. 11).

And last but not least we should talk about Jorge Luis Borges' story "The Secret Miracle", written in 1943, which narrates about a Jewish author Jaromir Hladík, living in Prague, who was arrested and sentenced to death. Hladík wrote many books, yet he would like to be remembered as the author of a work called "The Enemies", in which he is trying to prove a theory, according to which the number of experiences, possible to men, is not infinite, and that a single "repetition" would be enough to demonstrate it. [13].

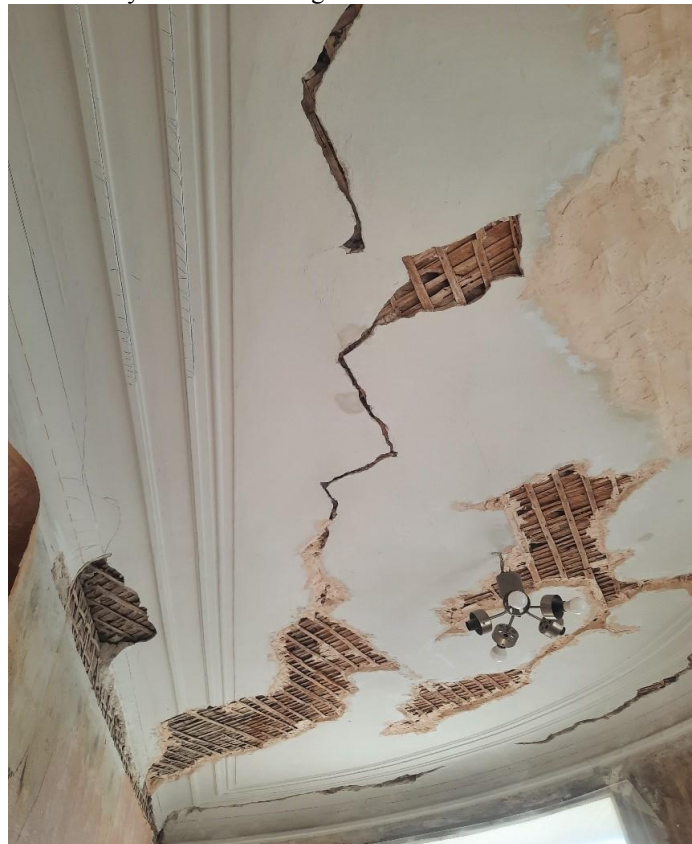


Fig. 11. Ceiling of the apartment building designed by Nikolai Rezviy (1912-1913), St. Petersburg, Basil's Island.

And it should be noted that, from my own perspective, the word “repetition” is key in Borges’ story. For the first time, it appears when Borges describes the plot of the above-mentioned verse drama by Hladík, namely, both in the first scene of the first act, and in the third, last act, the clock strikes seven, the sun reverberates in the window panels, and the sounds of Hungarian music are heard. And when the situation repeats itself, it turns out that the drama has never taken place, that everything that happened in the library of the Baron Roemerstadt was just a figment of the sick imagination of the protagonist Jaroslav Kubin, in other words, it is the circular delirium which he unendingly lives and re-lives. And here one can also draw a parallel between Kubin and Hladík himself, who, while waiting for the date of his execution, tirelessly imagines the circumstances of his impending death trying to exhaust all the variations.

No less interesting is the fact that a similar “repetition method” was used by Luis Buñuel in his film “The Exterminating Angel”, created several years later, in 1962. In both cases, the repetition of the events leads to an alternative scenario but in reverse order. That is to say, in Borges’ story, Hladík is given an opportunity to finish his drama before the execution since God performs the “secret miracle” for him – He stops the flow of time and grants Hladík a whole year between the command to fire and its implementation. While the

characters of Buñuel’s film have to wait a long time for the events to repeat themselves so as to leave the room. However, if Hladík decides to eliminate some rather obvious symbols of the repetition from his drama (the striking of the clock, the music), Borges himself retains them – a year after the scheduled date of Hladík’s execution the same drop of rain, that grazed one of his temples, slips down his cheek, he begins a wild cry, a quadruple blast brings him down, and he dies.

The theme of the library, which occurs more than once in the story, is no less significant. In his dream Hladík meets a librarian who has spent his entire life searching for God, which is supposed to be in one of the letters on the pages of one of the many books stored in the Clementine library. As we all know, Borges has referred to this issue before, for example, in the story “Babylonian Library” (1941), he describes the Universe (which others call the library) in which there are no two identical books although all the books consist of identical elements. And, despite the fact that mirrors give the illusion of infinity, the number of books is limited. Many people have spent their entire lives searching for the so-called “Book-Man” – a compendium of all other books stored in the library. For example, a librarian, who met Hladík, went blind without finding what he was looking for, whereas Hladík himself, by a miraculous coincidence, manages to do so, and, as a result, the “secret miracle” happens to him.

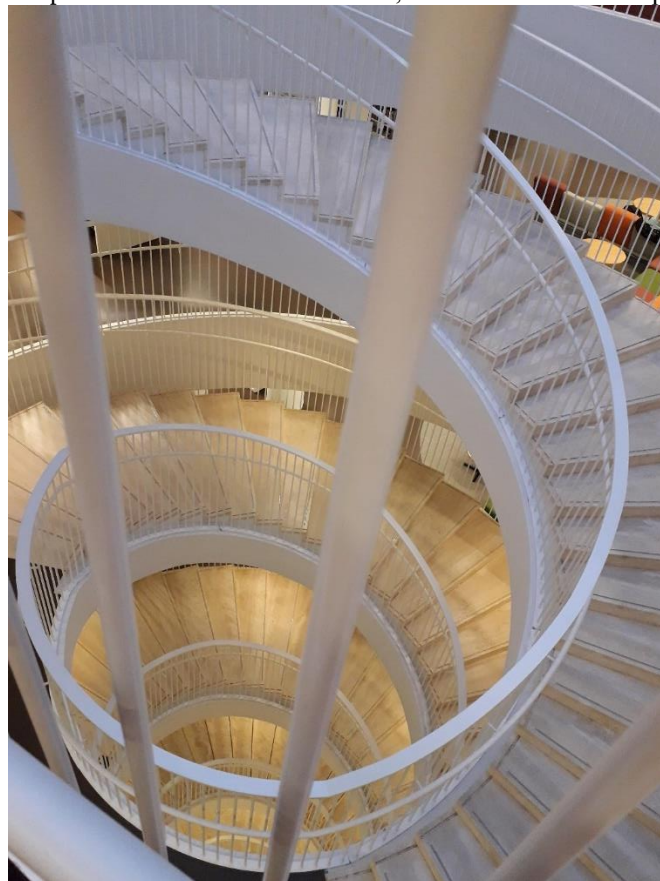


Fig. 12. Helsinki University Library.

Let us note in passing that in one of his poems called “El guardián de los libros” (“The Guardian of the Books”) Borges underlines the difference between a literate person who lost his vision and a blind man who has never been able to read. The poem narrates of a man

guarding a tower full of books describing the history of his people, yet the worst thing is that he is the only one who managed to survive and he is both blind and illiterate. That is to say, not only can he not read, but he does not even know what are those books about. And if

there is no one to read books, then they lose their significance. And I suppose that the situation described in this story is much more terrible than Ray Bradbury's "Fahrenheit 451" for although in the latter people are being persuaded to burn all the books, there are some persons who know the books by heart and thus can transmit their knowledge to others.

On the one hand, the idea that the freedom of choice of a person, and, consequently, the possibilities for the development of Art, are limited, at first glance may seem rather pessimistic. However, it should be noted that, despite the fact that the quantity of possible combinations of given elements is not unlimited, their number is so enormous that after many millennia, Art, as well as Humanity itself, has not exhausted its possibilities, and artists do not cease to amaze us. Even the Postmodern era, whose characteristic feature is the appeal to the achievements of previous époques, does not duplicate the masterpieces of the past, but "rediscovers" and refracts them in a new way.

And it seems to me that no matter how important it may seem to acquire the "Book of the Books" that gives its owner unlimited knowledge, the ability to enjoy the process of searching for truth as such is no less important. In other words, one should not try to study everything at once, on the contrary, one should learn to appreciate Art gradually, step by step, and then, perhaps, your own "secret miracle" will happen to you.

All in all, we have considered various aspects of the history of Art, and I sincerely hope that as a result of reading the article, your understanding of Art has become more complete and versatile. Of course, the above paper is only a brief summary of this issue. However, it seems to me especially important to form a clear system of the development of Art, since only when it is in place, interaction with Art becomes truly exciting. In this regard, these lectures will be expanded and supplemented.

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BIOLOGICAL SCIENCES

DIVERSITY AND DISTRIBUTION OF ASCOMYCETES ON THE TERRITORY OF THE KETMEN RIDGE (KAZAKHSTAN)

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Abstract

The mycobiota of the Ketmen ridge has 151 species belonging to Ascomycota. The ascomycetes are represented by 14 orders from 5 classes. The highest number of orders is characteristic of the class Sordariomycetes. The largest order is the order of Erysiphales from the class Leotiomycetes, with 38 species from 8 genera. The largest genera are *Erysiphe* (13 species), *Podosphaera* (9) and *Golovinomyces* (8). 13 genera have an unclear systematic position. Ascomycetes attack 183 species of vascular plants and mushrooms. The greatest number of species of ascomycetes (109 species) is noted in the steppe belt of the Ketmen ridge: on the northern macroslope 51 species from 44 genera, on the southern macroslope 42 species from 25. The following species are widely distributed in the territory of the study: *Erysiphe polygoni*, *Leveillula taurica*, *Neoerysiphe galeopsidis* and *Podosphaera aphanis*.

Keywords: coniferous forest, host plants, meadow, mycobiota, shrub belt, steppe belt

The Ketmen ridge is the easternmost of the northern chains of the Tien-Shan. The ridge is more than 300 km long, 40–50 km wide and 3500–4200 m high. The western part of the ridge (about 160 km long) is located on the territory of Kazakhstan, the eastern part – on the territory of China. The northern slopes are gentle, the southern slopes are steep, and the peaks are flat, not reaching the level of the snow line. The following types of relief are typical: high-mountainous steep (3000–3600 m), medium-mountainous (1900–3000 m), low-mountainous (1000–1900 m). Ketmen ridge refers to the Kungei-Terskei-Ketmen-South Dzhungar subprovince of the Dzungar-North Tien-Shan province (Akzhigitova et al. 2003). Due to the high aridity of the climate in the foothill deserts of Ketmen (altitude 1000–1200 m), ephemera and ephemeroids are practically absent. Above, within the limits of 1200–2000 m a.s.l., the steppe belt is located. On the northern slopes of the Ketmen ridge, the shrub belt (2000–2200 m) is well-developed. It consists of from a thicket of a dogrose, caragan, twig, cotoneaster, and barberry. In the bush belt there are separate fragments of deciduous forests. Deciduous forests are also characteristic of floodplains. At an altitude of 2200–3000 m a.s.l. there are coniferous forests from the Shrenk spruce, alternating with meadows, which is typical for the Tien Shan [1–3].

In mycological respect, the Ketmen ridge has not been studied for a long time. In 2004–2005 and in 2013–2017, an examination of the Ketmen ridge was carried

out. The gorges of the northern and southern macroslopes of the Ketmen ridge and the mountains Kuluktau, Karatau, Temirlik, Elshin Buyrik were surveyed.

Materials & Methods

The study was conducted in the Ketmen ridge (southeastern regions of Kazakhstan) for several years (2004, 2005, 2013–2017, 2021).

Different parts of plants with symptoms of fungal diseases and various substrates with visible fungal development were collected during field trips. A Canon 600E camera was used for photographing of fungi.

For light microscopy, small fragments of samples were stripped off the substrates, placed in a drop of distilled water on a microscope slide without any staining, examined and photographed using a photomicroscope Polyvar with Nomarski interference contrast optics [4]. Measurements of different fungal structure were made. Specimens were identified with the literature on Ascomycetes [5–13].

Dried specimens are stored in the herbarium of the Institute of Botany and Phytointroduction, Almaty, Kazakhstan (AA).

Results and Discussion

Checklist of ascomycetes from Ketmen ridge

The names of the host plants are given in accordance with the on-line identifier of plants [14], the names of fungal taxa – in accordance with the Index Fungorum database [15].

Ascomycota Caval.-Sm.**Insertae sedis**

Blastotrichum puccinioides Preuss. – on *Russula delica* Fr., near the village Tuyuk, spruce forest, 26.08.1971, N.M. Filimonova.

Fumago graminis (Corda) S. Hughes – on *Phragmites australis* (Cav.) Trin. ex Steud., Ketmen gorge, 43°21'10.8"N, 79°44'16.4"E, 19.07.2015, G.A. Nam.

Fumago vagans Pers. – on *Berberis sphaerocarpa* Kar. & Kir., Ketmen gorge, 1503 m a.s.l., 43°21'10.8"N, 79°44'16.4"E, 26.04.2015, G.A. Nam.

Myxofusicoccum pyrinum (Kunze) Boerema – on *Armeniaca vulgaris* Lam., Avat gorge, 1733 m a.s.l., 43°19'00.6"N, 79°41'19.2"E, 25.04.2015, N Zhakhan.

Phragmotrichum chailletii Kunze – on *Picea schrenkiana* Fisch. & C.A. Mey., Avat gorge, 1673 m a.s.l., 43°19'13.0"N, 79°41'24.4"E, 17.07.2015, N Zhakhan.

Dothideomycetes O.E. Erikss.**Insertae sedis**

Asteromella acetosae (Sacc.) Rusk. Mich. – on *Rumex tianschanicus* Losinsk., Temirlik mountains, 1900 m a.s.l., 22.09.1957, B.K. Kalymbetov.

Asteromella scabiosae (Kalymb.) Vanev & Aa – on *Scabiosa alpestris* Kar. et Kir., Temirlik mountains, 2200 m a.s.l., 22.09.1957, B.K. Kalymbetov.

Botryosphaeriales C.L. Schoch**Insertae sedis**

Camarosporium caraganae P. Carst. – on *Caragana* sp., Dardamty gorge, 1371 m a.s.l., 43°25'37.0"N, 80°04'23.7"E, 29.08.2016, EV Rakhimova.

Botryosphaeriaceae Theiss. & Syd.

Dothiorella sibiraeae Murashk. & Sieling – on *Sibiraea tianschanica* Pojark., Temirlik mountains, 2700 m a.s.l., 03.08.1946, NI Rubtsov and EF Stepanova.

Phyllosticta acetosae Sacc. – on *Rumex tianschanicus* A. Los., Temirlik mountains, 1900 m a.s.l., 22.09.1957, BK Kalymbetov.

Phyllosticta desertorum Sacc. – on *Astragalus petraeus* Kar. et Kir., Temirlik mountains, 1700 m a.s.l., 21.09.1957, BK Kalymbetov.

Phyllosticta ferruginea (Sacc.) Kalymb. – on *Artemisia dracunculus* L., Temirlik mountains, 1700 m a.s.l., 21.09.1957, BK Kalymbetov.

Phyllosticta lini Lobik. – on *Linum heterosepalum* Regel, Temirlik mountains, 2100 m a.s.l., 22.09.1957, BK Kalymbetov.

Phyllosticta lycii Ell. & Kell. – on *Lycium depressum* Stocks., Temirlik mountains, 11.08.1937, M Popov.

Phyllosticta zahlbrückneri Bäuml. – on *Oberna wallichiana* (Klotzsch) Ikonn., Temirlik mountains, 2100 m a.s.l., 22.10.1957, BK Kalymbetov.

Capnodiales Woron.**Davidiellaceae C.L. Schoch**

Cladosporium fasciculare Fr. – on *Allium* sp., Aktam gorge, 1469 m a.s.l., 43°22'42.2"N, 79°53'28.8"E, 18.07.2015, UK Jetigenova.

Cladosporium herbarum (Pers.) Link – on *Chrysomyxa deformans* (Dietel) Jacz. (III) on *Picea schrenkiana* Fisch. & C.A. Mey., Chakrambal gorge, 2284 m a.s.l., 43°07'63.7"N, 80°07'91.2"E, 27.08.2016, UK Jetigenova; Talas gorge, 2106 m a.s.l., 43°08'60.5"N, 79°47'37.7"E, 26.08.2016, LA Kyzmetova; Ulken Aksu gorge, 1500 m a.s.l., 43°20'07.1"N, 79°37'24.3"E, 04.08.2021, UK Jetigenova; on *Ziziphora clinopodioides* Lam., Temirlik mountains, 1700 m a.s.l., 21.09.1957, BK Kalymbetov.

Cladosporium olivaceum (Corda) Bonord. – on *Picea schrenkiana* Fisch. & C.A. Mey., Avat gorge, 1676 m a.s.l., 43°19'18.4"N, 79°41'24.8"E, 24.04.2015, UK Jetigenova; Ulkensai gorge, 1617 m a.s.l., 43°21'52.4"N, 80°07'57.0"E, 19.07.2015, ZhM Takiyeva.

Mycosphaerellaceae Lindau

Cercospora depressa (Berk. & Broome) Vassiljevsky – on *Aegopodium podagraria* L., Kuluktau mountains, Dalaity gorge, 1373 m a.s.l., 43°05'26.7"N, 78°53'53.1"E, 01.07.2016, EV Rakhimova.

Fusicladiella melaena (Fuckel) S. Hughes – on *Doronicum oblongifolium* DC., south of the village Ketmen, 08.07.1957, VP Goloskokov.

Mycosphaerella tassiana (De Not.) Johanson – on *Calamagrostis epigeios* (L.) Roth., Ulken Aksu gorge, 2000 m a.s.l., 30.09.2004, LA Kyzmetova.

Ovularia epilobii Lindr. – on *Epilobium* sp., Temirlik mountains, 1600 m a.s.l., 22.09.1957, BK Kalymbetov.

Ovularia schroeteri (J.G. Kühn) Sacc. – on *Alchemilla retropilosa* Juz., Temirlik mountains, 2200 m a.s.l., 25.06.1958, BK Kalymbetov.

Phacellium bulbigerum (Fuckel) U. Braun – on *Sanguisorba officinalis* L., Temirlik mountains, 2200 m a.s.l., 22.06.1958, BK Kalymbetov.

Phaeoramularia maculicola (Romell & Sacc.) B. Sutton – on *Populus talassica* Kom., Temirlik mountains, 24.09.1961, ZI Kubanskaya.

Polythrincium trifolii Kunze – on *Amoria repens* (L.) C. Presl, Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, LA Kyzmetova; Kuluktau mountains, Uzyn-Bulak gorge, 1703 m a.s.l., 43°07'40.2"N, 79°07'28.0"E, 24.08.2016, EV Rakhimova; Akbet gorge, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, N Zhakhan; Kishi Shibut gorge, 2246 m a.s.l., 43°11'02.2"N, 79°53'35.2"E, 26.08.2016, LA Kyzmetova; Kyrgyzsai gorge, 1688 m a.s.l., 43°17'36.4"N, 79°30'46.8"E, 26.08.2016, EV Rakhimova; Shoshanai gorge, 1421 m a.s.l., 43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova.

Ramularia arvensis Sacc. – on *Potentilla impolita* Wahlenb., Kozhansai gorge, 13.08.1989, Ye Abenov.

Ramularia eremostachydis Zaprom. – on *Prunella vulgaris* L., Koksai gorge, 1925 m a.s.l., 43°22'57.3"N, 80°23'26.8"E, 01.08.2021, UK Jetigenova.

Ramularia gei (Eliss.) Linb. – on *Geum urbanum* L., Kuluktau mountains, Dalaity gorge, 43°05'26.7"N, 78°53'53.1"E, 01.07.2016, EV Rakhimova.

Ramularia geranii (West.) Fuck. – on *Geranium collinum* Stephan ex Willd., Temirlik mountains, 1924.

Ramularia heraclei (Oudem.) Sacc. – on *Heracleum dissectum* Ledeb., Temirlik mountains, 24.09.1957, BK Kalymbetov.

Ramularia medicaginis Bondartsev & Lebedeva – on *Medicago falcata* L., Saryzhaz valley, 2096 m a.s.l., 43°08'91.9"N, 79°58'25.1"E, 26.08.2016, LA Kyzmetova.

Ramularia pratensis Sacc. – on *Rumex* sp., Ketmen gorge, 1925 m a.s.l., 43°20'07.1"N, 79°37'24.3"E, 01.08.2021, UK Jetigenova.

Ramularia rufomaculans Peck. – on *Aconogonon alpinum* (All.) Schur, Temirlik mountains, 03.09.1959, LD Kazenas.

Ramularia rumicis Kalchbr. & Cooke – on *Rumex tianschanicus* Losinsk., Aktas village, 22.06.1956, BK Kalymbetov.

Rhabdospora xylostei Lambotte & Fautrey – on *Lonicera* sp., Temirlik mountains, 2200 m a.s.l., 23.06.1957, BK Kalymbetov.

Septoria aegopodii Desm. – on *Aegopodium alpestre* Ledeb., Kuluktau mountains, Uzyn-Bulak gorge, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV Rakhimova; Kyrgyzsai gorge, 1688 m a.s.l., 43°17'36.4"N, 79°30'46.8"E, 26.08.2016, EV Rakhimova.

Septoria alliicola Bäumler – on *Allium korolkowii* Regel, Temirlik mountains, 2200 m a.s.l., 14.08.1954, BK Kalymbetov.

Septoria alopecuri (P. Karst.) P. Syd. – on *Calamagrostis epigeios* (L.) Roth, Ulken Aksu gorge, 2000 m a.s.l., 30.09.2004, LA Kyzmetova.

Septoria erigerontis Peck – on *Erigeron aurantiacus* Regel, Temirlik mountains, 2500 m a.s.l., 05.09.1957, BK Kalymbetov.

Septoria gentianae Thüm. – on *Gentiana* sp., Kuluktau mountains, Uzyn-Bulak gorge, 1723 m a.s.l., 43°07'21.0"N, 79°00'44.4"E, 24.08.2016, EV Rakhimova.

Septoria lycoctoni Speg. – on *Aconitum leucostomum* Worosch., Sulete gorge, 01.07.1960, YeI Andreyeva.

Septoria quevillensis Sacc. – on *Spiraea hypericifolia* L., Ketmen gorge, 2100 m a.s.l., 43°22'13.6"N, 80°20'56.5"E, 29.07.2021, UK Jetigenova.

Septoria senecionis-silvaticae P. Syd. – on *Senecio nemorensis* L., Kuluktau mountains, Dalaity gorge, 1373 m a.s.l., 43°05'26.7"N, 78°53'53.1"E, 01.07.2016, EV Rakhimova.

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Stigmia carpophila (Lév.) M.B. Ellis – on *Armeniaca vulgaris* Lam., Kyrgyzsai gorge, 1575 m a.s.l., 43°18'15.8"N, 79°30'44.4"E, 26.08.2016, EV Rakhimova; *ibid.*, 1688 m a.s.l., 43°17'36.4"N, 79°30'46.8"E, 26.08.2016, EV Rakhimova; Sumbe gorge, 1385 m a.s.l., 43°17'00.6"N, 79°27'06.0"E, 27.08.2016, YV Rakhimova; *ibid.*, 1489 m a.s.l.,

43°15'44.3"N, 79°27'48.7"E, 16.07.2015, UK Jetigenova; Kishi Aksu gorge, 1396 m a.s.l., 43°20'14.8"N, 79°34'02.9"E, 28.08.2016, EV Rakhimova; Dardamty gorge, 1369 m a.s.l., 43°23'55.8"N, 80°03'26.5"E, 29.08.2016, EV Rakhimova; Avat gorge, 1673 m a.s.l., 43°19'13.0"N, 79°41'24.4"E, 17.07.2015, N Zhakhan; Kuluktau mountains, Uzyn-Bulak gorge, 1703 m a.s.l., 43°07'40.2"N, 79°07'28.0"E, 24.08.2016, EV Rakhimova.

Dothideales Lindau

Dothideaceae Chevall.

Scirrhia rimosa (Alb. & Schwein.) Fuckel – on *Phragmites australis* (Cav.) Trin. ex Steud., Ulken Aksu gorge, 2000 m a.s.l., 30.09.2004, LA Kyzmetova; Sumbe gorge, 1385 m a.s.l., 43°17'00.6"N, 79°27'06.0"E, 27.08.2016, YV Rakhimova.

Dothioraceae Theiss. & P. Syd.

Selenophoma rupicola Petr. – on *Tulipa* sp., Kyrgyzsai gorge, 1530 m a.s.l., 43°19'01.4"N, 79°30'06.4"E, 12.09.2014, ZhM Takiyeva.

Selenophoma sp. – on *Galatella punctata* (Waldst. & Kit.) Nees, Kyrgyzsai gorge, 1441 m a.s.l., 43°18'89.5"N, 79°29'85.5"E, 12.09.2014, UK Jetigenova.

Pleosporales Luttr. ex M.E. Barr

Cucurbitariaceae G. Winter

Cucurbitaria berberidis (Pers.) Gray. – on *Berberis sphaerocarpa* Kar. & Kir., Shoshanai gorge, 1685 m a.s.l., 43°11'08.6"N, 79°23'59.3"E, 11.09.2014, AK Dziyenbekov.

Cucurbitaria caraganae P. Karst. – on *Caragana frutex* (L.) K. Koch., Ulken Aksu gorge, 1536 m a.s.l., 43°19'51.6"N, 79°38'23.3"E, 24.04.2015, UK Jetigenova; Dardamty gorge, 1369 m a.s.l., 43°23'55.8"N, 80°03'26.5"E, 29.08.2016, EV Rakhimova; on *Caragana* sp., Ulken Aksu gorge, 1432 m a.s.l., 43°19'59.9"N, 79°37'29.6"E, 24.04.2015, ZhM Takiyeva.

Cucurbitaria pruni-avium Allesch. – on *Cerasus tianshanica* Pojark., Dardamty gorge, 43°24'50.5"N, 80°03'43.6"E, 26.08.2021, EV Rakhimova.

Cucurbitaria rubefaciens Petr. – on *Salix* sp., Dardamty gorge, 1443 m a.s.l., 43°24'50.5"N, 80°03'43.6"E, 26.08.2021, EV Rakhimova.

Didymellaceae Gruyter, Aveskamp & Verkley

Ascochyta kazachstanica (Byzova) Punith. – on *Ferula* sp., Ulkensai gorge, 2000 m a.s.l., 01.10.2004, GA Nam.

Phoma eguttulata P. Karst. – on *Picea schrenkiana* Fisch. & C.A. Mey., Kaisysai gorge, 2000 m a.s.l., 24.08.1971, NM Filimonova.

Phoma festucina Thüm. – on *Festuca pratensis* Huds., Temirlik mountains, 1954, BK Kalymbetov.

Phoma graminis Westend. – on *Agropyron pectinatum* (M. Bieb.) P. Beauv., Temirlik mountains, 1700 m a.s.l., 21.09.1957, BK Kalymbetov.

Phoma xylostei Cooke & Harkn. – on *Lonicera altmannii* Regel & Schmalh., Temirlik mountains, 22.09.1957, BK Kalymbetov.

Piggotia astroidea (Berk.) Berk. & Broome – on *Ulmus pumila* L., Sumbe gorge, 1385 m a.s.l., 43°17'00.6"N, 79°27'06.0"E, 27.08.2016, EV Rakhimova.

Leptosphaeriaceae M.E. Barr

Coniothyrium acantholimonis Kalymb. – on *Acantholimon alaticum* Bunge, neighborhood Narynkol village, 14.07.1954, BK Kalymbetov.

Lophiostomataceae Sacc.

Lophiostoma vagans Fabre – on *Malus sieversii* (Ledeb.) M. Roem., Kyrgyzsai gorge, 1605 m a.s.l., 43°18'07.8"N, 79°30'77.9"E, 12.09.2014, N Zhakhan.

Lophiostoma ephedrae Hollós – on *Ephedra equisetina* Bunge, Dardamty gorge, 1443 m a.s.l., 43°24'50.5"N, 80°03'43.6"E, 26.08.2021, EV Rakhimova.

Phaeosphaeriaceae M.E. Barr

Ampelomyces quisqualis Ces. – on *Neorhynchospora galeopsidis* (DC.) U. Braun on *Marrubium vulgare* L., Dardamty gorge, 1443 m a.s.l., 43°24'50.5"N, 80°03'43.6"E, 26.08.2021, EV Rakhimova.

Sphaerellopsis filum (Biv.) B. Sutton – on *Puccinia punctata* Link (II, III) on *Galium spurium* L., Akbet gorge, 1660 m a.s.l., 43°10'80.8"N, 79°13'54.4"E, 24.08.2016, N Zhakhan.

Stagonospora atriplicis (Westend.) Lind – on *Krascheninnikovia ceratoides* (L.) Gueldenst., Temirlik mountains, 1700 m a.s.l., 21.09.1957, BK Kalymbetov.

Stagonospora fuckelii (Sacc.) Jørst. – on *Tussilago farfara* L., Ulkensai gorge, 2000 m a.s.l., 01.10.2004, GA Nam.

Stagonospora vexatula (Sacc.) Sacc. – on *Phragmites australis* (Cav.) Trin. ex Steud., Ulken Aksu gorge, 1500 m a.s.l., 43°20'07.1"N, 79°37'24.3"E, 04.08.2021, UK Jetigenova.

Pleosporaceae Nitschke

Alternaria alternata (Fr.) Keissl. – on *Iris* sp., Kegen village, 1840 m a.s.l., 42°58'43.7"N, 79°22'40.5"E, 05.08.2012, UK Jetigenova.

Lewia scrophulariae (Desm.) M.E. Barr & E.G. Simmons – on *Kaschgaria brachanthemoides* (Winkl.) Poljak., Temirlik mountains, 11.08.1937, MG Popov.

Macrosporium meliloti Peck – on *Halimodendron halodendron* (Pall.) Voss, neighborhood Taskarasu village, 03.10.2004, LA Kyzmetova.

Pleospora laricina Rehm – on *Cotoneaster* sp., Kyrgyzsai gorge, 1667 m a.s.l., 43°17'83.7"N, 79°30'77.5"E, 12.09.2014, UK Jetigenova.

Pyrenophora pellita (Fr.) Sacc. – on *Nepeta komirica* Regel, Temirlik mountains, 2100 m a.s.l., 22.06.1958, BK Kalymbetov.

Stemphylium botryosum Wallr. – on *Ferula* sp., Ulkensai gorge, 2000 m a.s.l., 01.10.2004, GA Nam.

Stemphylium herbarum E.G. Simmons – on *Ferula* sp., Karatau mountains, 2020 m a.s.l., 43°02'22.6"N, 79°59'89.5"E, 25.08.2016, GA Nam.

Venturiaceae E. Müll. & Arx ex M.E. Barr

Lasiobotrys lonicerae (Fr.) Kunze – on *Lonicera stenantha* Pojark., Komirshi gorge, 2136 m a.s.l., 43°06'51.2"N, 79°37'54.9"E, 06.07.2017, YV Rakhimova.

Venturia inaequalis (Cooke) G. Winter – on *Malus sieversii* (Ledeb.) M. Roem., Kyrgyzsai gorge, 1754 m a.s.l., 43°17'24.7"N, 79°30'50.5"E, 17.07.2015, ZhM Takiyeva; on *Malus* sp., Kyrgyzsai

gorge, 1575 m a.s.l., 43°18'15.8"N, 79°30'44.4"E, 26.08.2016, EV Rakhimova.

Leotiomycetes O.E. Erikss. & Winka**Chaetomellales** Crous & Denman**Marthamycetaceae** Baral, Lantz, Hustad & Minter

Propolis farinosa (Pers.) Fr. – on *Lonicera* sp., Komirshi gorge, 2136 m a.s.l., 43°06'51.2"N, 79°37'54.9"E, 06.07.2017, EV Rakhimova.

Erysiphales H. Gwynne-Vaughan**Erysiphaceae** Tul. & C. Tul.

Blumeria graminis (DC.) Speer – on *Bromus squarrosus* L., Akbet gorge, 1621 m a.s.l., 43°10'75.7"N, 79°19'24.9"E, 24.08.2016, LA Kyzmetova; on *Milium effusum* L., Kyrgyzsai gorge, 1688 m a.s.l., 43°17'36.4"N, 79°30'46.8"E, 26.08.2016, EV Rakhimova; on *Poa bulbosa* L., Ketmen gorge, 1503 m a.s.l., 43°21'10.8"N, 79°44'16.4"E, 26.04.2015, GA Nam; on *P. pratensis* L., Ulken Aksu gorge, 1531 m a.s.l., 43°19'36.9"N, 79°37'11.6"E, 13.09.2014, GA Nam; Kyrgyzsai gorge, 1575 m a.s.l., 43°18'15.8"N, 79°30'44.4"E, 26.08.2016, EV Rakhimova; on *Poa* sp., Ulken Aksu gorge, 1426 m a.s.l., 43°20'19.3"N, 79°37'28.4"E, 24.04.2015, ZhM Takiyeva; *ibid.*, 1489 m a.s.l., 43°19'46.8"N, 79°38'08.7"E, 24.04.2015, GA Nam; Ketmen gorge, 1535 m a.s.l., 43°20'53.4"N, 79°44'32.7"E, 26.04.2015, UK Jetigenova.

Erysiphe aquilegiae DC. – on *Aquilegia* sp., Zhulkungei gorge, 1885 m a.s.l., 43°21'13.0"N, 80°12'31.0"E, 21.07.2015, N Zhakhan; Kyrgyzsai gorge, 1688 m a.s.l., 43°17'36.4"N, 79°30'46.8"E, 26.08.2016, EV Rakhimova; on *Delphinium* sp., Kyrgyzsai gorge, 1688 m a.s.l., 43°17'36.4"N, 79°30'46.8"E, 26.08.2016, EV Rakhimova; Kuluktau mountains, Dalaity gorge, 1373 m a.s.l., 43°05'26.7"N, 78°53'53.1"E, 01.07.2016, EV Rakhimova; Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, GA Nam; on *Ranunculus* sp., Shoshanai gorge, 1421 m a.s.l., 43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova; Kuluktau mountains, Dalaity gorge, 2032 m a.s.l., 43°04'56.6"N, 78°53'11.5"E, 01.07.2016, EV Rakhimova; Uzyn-Bulak gorge, 1723 m a.s.l., 43°07'21.0"N, 79°00'44.4"E, 24.08.2016, EV Rakhimova; *ibid.*, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV Rakhimova; on *Thalictrum minus* L., Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, LA Kyzmetova; *ibid.*, 1911 m a.s.l., 43°06'97.1"N, 79°16'23.5"E, 27.08.2016, LA Kyzmetova; on *Thalictrum* sp., Kuluktau mountains, Uzyn-Bulak gorge, 1723 m a.s.l., 43°07'21.0"N, 79°00'44.4"E, 24.08.2016, EV Rakhimova; Ulkensai gorge, 2000 m a.s.l., 01.10.2004, LA Kyzmetova.

Erysiphe astragali DC. – on *Astragalus* sp., Talas gorge, 2106 m a.s.l., 43°08'61.4"N, 79°47'34.3"E, 26.08.2016, GA Nam.

Erysiphe atraphaxis (Golovin) U. Braun & S. Takam. – on *Atraphaxis frutescens* (L.) K. Koch, Dardamty gorge, 1443 m a.s.l., 43°24'50.5"N, 80°03'43.6"E, 26.08.2021, EV Rakhimova; on *A. pyrifolia* Bunge, Shoshanai gorge, 1421 m a.s.l., 43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova.

Erysiphe berberidis DC. – on *Berberis sphaerocarpa* Kar. & Kir., Shoshanai gorge, 1421 m a.s.l., 43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova; *ibid.*, 1685 m a.s.l., 43°11'08.6"N, 79°23'59.3"E, 11.09.2014, AK Dziyenbekov; *ibid.*, 1576 m a.s.l., 43°11'41.6"N, 79°23'66.5"E, 28.08.2016, LA Kyzmetova; Kyrgyzsai gorge, 1441 m a.s.l., 43°18'89.5"N, 79°29'85.5"E, 12.09.2014, UK Jetigenova; *ibid.*, 1635 m a.s.l., 43°97'40.0"N, 79°30'48.6"E, 17.07.2015, UK Jetigenova; *ibid.*, 1575 m a.s.l., 43°18'15.8"N, 79°30'44.4"E, 26.08.2016, EV Rakhimova; Aktam gorge, 1579 m a.s.l., 43°21'54.8"N, 79°53'33.6"E, 18.07.2015, UK Jetigenova; *ibid.*, 1500 m a.s.l., 43°22'30.7"N, 79°53'26.3"E, 18.07.2015, UK Jetigenova; Kishi Aksu gorge, 1463 m a.s.l., 43°19'38.6"N, 79°34'27.3"E, 28.08.2016, EV Rakhimova; *ibid.*, 1524 m a.s.l., 43°19'28.9"N, 79°34'30.2"E, 03.08.2021, UK Jetigenova; Akbet gorge, 1660 m a.s.l., 43°10'80.8"N, 79°13'54.4"E, 24.08.2016, GA Nam; Sumbe gorge, 1521 m a.s.l., 43°15'42.5"N, 79°27'40.3"E, 04.08.2021, UK Jetigenova; Dardamty gorge, 1443 m a.s.l., N43°24'50.5", E80°03'43.6", 26.08.2021, EV Rakhimova; on *Berberis* sp., Talas gorge, 2106 m a.s.l., 43°08'61.4"N, 79°47'34.3"E, 26.08.2016, LA Kyzmetova.

Erysiphe convolvuli DC. – on *Convolvulus arvensis* L., Shoshanai gorge, 1421 m a.s.l., 43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova; on *C. tragacanthoides* Turcz., Dardamty gorge, 1371 m a.s.l., 43°25'37.0"N, 80°04'23.7"E, 29.08.2016, EV Rakhimova.

Erysiphe cruciferarum (Opiz) L. Junell – on *Berteroa incana* (L.) DC., Aktam gorge, 1637 m a.s.l., 43°21'51.3"N, 79°53'32.0"E, 18.07.2015, ZhM Takiyeva; on *Camelina silvestris* (Maxim.) Korsh., Ulkensai gorge, 1617 m a.s.l., 43°21'52.4"N, 79°57'02.6"E, 19.07.2015, ZhM Takiyeva; Aktam gorge, 19.07.2015, ZhM Takiyeva; on *Capsella bursa-pastoris* (L.) Medikus, Ulkensai gorge, 1617 m a.s.l., 43°21'52.4"N, 79°57'02.6"E, 19.07.2015, ZhM Takiyeva; Aktam gorge, 1579 m a.s.l., 43°21'54.8"N, 79°53'33.6"E, 18.07.2015, UK Jetigenova; Kuluktau mountains, Dalaity gorge, 1373 m a.s.l., 43°05'26.7"N, 78°53'53.1"E, 01.07.2016, EV Rakhimova; on *Erysimum hieracifolium* L., Akbet gorge, 1664 m a.s.l., 43°10'81.9"N, 79°13'42.7"E, 24.08.2016, UK Jetigenova; on *Erysimum* sp., Kuluktau mountains, Uzyn-Bulak gorge, 1723 m a.s.l., 43°07'21.0"N, 79°00'44.4"E, 24.08.2016, EV Rakhimova; *ibid.*, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV Rakhimova; on *Thlaspi arvense* L., Kuluktau mountains, Dalaity gorge, 1373 m a.s.l., 43°05'26.7"N, 78°53'53.1"E, 01.07.2016, EV Rakhimova; Uzyn-Bulak gorge, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV Rakhimova.

Erysiphe friesii (Lév.) U. Braun & S. Takam. – on *Rhamnus songorica* Gontsch., Shoshanai gorge, 1421 m a.s.l., 43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova; Dardamty gorge, 1371 m a.s.l., 43°25'37.0"N, 80°04'23.7"E, 29.08.2016, EV Rakhimova; *ibid.*, 1443 m a.s.l., 43°24'50.5"N, 80°03'43.6"E, 26.08.2021, EV Rakhimova.

Erysiphe hyperici (Wallr.) S. Blumer – on *Hypericum hirsutum* L., Kyrgyzsai gorge, 1688 m a.s.l., 43°17'36.4"N, 79°30'46.8"E, 17.07.2015, EV Rakhimova; *ibid.*, 1575 m a.s.l., 43°18'15.8"N, 79°30'44.4"E, 26.08.2016, EV Rakhimova; Kuluktau mountains, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV Rakhimova

Erysiphe lonicerae DC. – on *Lonicera hispida* Pall. ex Roem. & Schult., Zhulkungei gorge, 1841 m a.s.l., 43°21'34.5"N, 80°12'34.2"E, 21.07.2015, ZhM Takiyeva.

Erysiphe pisi DC. – on *Medicago falcata* L., Kuluktau mountains, Uzyn-Bulak gorge, 1723 m a.s.l., 43°07'21.0"N, 79°00'44.4"E, 24.08.2016, EV Rakhimova; on *M. lupulina* L., Kuluktau mountains, 1703 m a.s.l., 43°07'40.2"N, 79°07'28.0"E, 24.08.2016, EV Rakhimova; *ibid.*, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV Rakhimova; on *Vicia* sp., Kuluktau mountains, Uzyn-Bulak gorge, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV Rakhimova.

Erysiphe polygoni DC. – on *Polygonum aviculare* L., Aktam gorge, 1579 m a.s.l., 43°21'54.8"N, 79°53'33.6"E, 18.07.2015, UK Jetigenova; Sumbe gorge, 1449 m a.s.l., 43°16'03.2"N, 79°27'36.7"E, 16.07.2015, ZhM Takiyeva; Kyrgyzsai gorge, 1575 m a.s.l., 43°18'15.8"N, 79°30'44.4"E, 26.08.2016, EV Rakhimova; Kishi Aksu gorge, 1463 m a.s.l., 43°19'38.6"N, 79°34'27.3"E, 28.08.2016, EV Rakhimova; Shoshanai gorge, 1576 m a.s.l., 43°11'41.6"N, 79°23'66.5"E, 28.08.2016, LA Kyzmetova; Kuluktau mountains, Uzyn-Bulak gorge, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV Rakhimova; Akbet gorge, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, UK Jetigenova; Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, UK Jetigenova; Karatau mountains, 2020 m a.s.l., 43°02'22.6"N, 79°59'89.5"E, 25.08.2016, GA Nam; *ibid.*, 2061 m a.s.l., 43°03'75.0"N, 79°59'79.8"E, 25.08.2016, SB Nurashov; on *Rumex acetosa* L., Ulken Aksu gorge, 2000 m a.s.l., 30.09.2004, GA Nam; on *R. aquaticus* L., Shoshanai gorge, 1421 m a.s.l., N43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova; on *R. confertus* Willd., Shoshanai gorge, 1576 m a.s.l., 43°11'41.6"N, 79°23'66.5"E, 28.08.2016, LA Kyzmetova; Akbet gorge, 1621 m a.s.l., 43°10'75.7"N, 79°19'24.9"E, 24.08.2016, LA Kyzmetova; *ibid.*, 1660 m a.s.l., 43°10'80.8"N, 79°13'54.4"E, 24.08.2016, UK Jetigenova; *ibid.*, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, GA Nam; Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, UK Jetigenova; on *Rumex* sp., Shoshanai gorge, 1421 m a.s.l., N43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova.

Erysiphe trifolii Grev. – on *Lathyrus pratensis* L., Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, UK Jetigenova; on *Trifolium pratense* L., Avat gorge, 1673 m a.s.l., 43°19'13.0"N, 79°41'24.4"E, 17.07.2015, N Zhakhan; Aktam gorge, 1637 m a.s.l., 43°21'51.3"N, 79°53'32.0"E, 18.07.2015, ZhM Takiyeva; *ibid.*, 1579

m a.s.l., 43°21'54.8"N, 79°53'33.6"E, 18.07.2015, UK Jetigenova; Shoshanai gorge, 1576 m a.s.l., 43°11'41.6"N, 79°23'66.5"E, 28.08.2016, LA Kyzmetova; on *T. repens* L., Ulkensai gorge, 2000 m a.s.l., 01.10.2004, LA Kyzmetova.

Erysiphe urticae (Wallr.) S. Blumer – on *Urtica cannabina* L., Aktam gorge, 1637 m a.s.l., 43°21'51.3"N, 79°53'32.0"E, 18.07.2015, ZhM Takiyeva; *ibid.*, 1579 m a.s.l., 43°21'54.8"N, 79°53'33.6"E, 18.07.2015, UK Jetigenova; Ulkensai gorge, 2000 m a.s.l., 01.10.2004, LA Kyzmetova; *ibid.*, 1617 m a.s.l., 43°21'52.4"N, 9°57'02.6"E, 19.07.2015, ZhM Takiyeva; Shoshanai gorge, 1685 m a.s.l., 43°11'08.6"N, 79°23'59.3"E, 11.09.2014, AK Dzhiyenbekov; *ibid.*, 1421 m a.s.l., N43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova; *ibid.*, 1576 m a.s.l., 43°11'41.6"N, 79°23'66.5"E, 28.08.2016, AK Dzhiyenbekov; Ulken Aksu gorge, 2000 m a.s.l., 30.09.2004, GA Nam; *ibid.*, 1531 m a.s.l., 43°19'36.9"N, 79°37'11.6"E, 13.09.2014, GA Nam; *ibid.*, 609 m a.s.l., 43°18'70.9"N, 79°37'53.1"E, 03.08.2021, UK Jetigenova; Dardamty gorge, 1443 m a.s.l., 43°24'50.5"N, 80°03'43.6"E, 26.08.2021, EV Rakhimova; Akbet gorge, 1621 m a.s.l., 43°10'75.7"N, 79°13'24.9"E, 24.08.2016, LA Kyzmetova; *ibid.*, 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, SB Nurashov.

Golovinomyces artemisiae (Grev.) V.P. Heluta – on *Artemisia absinthium* L., Karatau mountains, 2061 m a.s.l., 43°03'75.0"N, 79°59'79.8"E, 25.08.2016, N Zhakhan; on *A. santolinifolia* Turcz. ex Besser., Kuluktau mountains, Uzyn-Bulak gorge, 1723 m a.s.l., 43°07'21.0"N, 79°00'44.4"E, 24.08.2016, EV Rakhimova; *ibid.*, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV Rakhimova; on *A. vulgaris* L., Zhulkungei gorge, 1841 m a.s.l., 43°21'34.5"N, 80°12'34.2"E, 21.07.2015, ZhM Takiyeva; Akbet gorge, 1621 m a.s.l., 43°10'75.7"N, 79°13'24.9"E, 24.08.2016, UK Jetigenova, *ibid.*, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, N Zhakhan.

Golovinomyces biocellatus (Ehrenb.) V.P. Heluta – on *Stachyopsis lamiflora* (Rupr.) M. Popov & Vved., Kuluktau mountains, Uzyn-Bulak gorge, 1723 m a.s.l., 43°07'21.0"N, 79°00'44.4"E, 24.08.2016, EV Rakhimova; Akbet gorge, 1621 m a.s.l., 43°10'75.7"N, 79°13'24.9"E, 24.08.2016, N Zhakhan; on *S. oblongata* (Schrenk) M. Popov & Vved., Shoshanai gorge, 1421 m a.s.l., 43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova; on *S. ovata* Djugaeva, Kyrgyzsai gorge, 1667 m a.s.l., 43°17'83.7"N, 79°30'77.5"E, 12.09.2014, UK Jetigenova; on *Stachyopsis* sp., Kishi Aksu gorge, 1463 m a.s.l., 43°19'38.6"N, 79°34'27.3"E, 28.08.2016, EV Rakhimova; on *Stachys sylvatica* L., Ulken Aksu gorge, 1500 m a.s.l., 43°20'07.1"N, 79°37'24.3"E, 04.08.2021, UK Jetigenova.

Golovinomyces cichoracearum (DC.) V.P. Heluta – on *Cirsium* sp., Dardamty gorge, 1369 m a.s.l., 43°23'55.8"N, 80°03'26.5"E, 29.08.2016, EV Rakhimova; on *Galatella punctata* (Waldst. & Kit.) Nees, Karatau mountains, 2020 m a.s.l., 43°02'22.6"N, 79°59'89.5"E, 25.08.2016, N Zhakhan; on *Hieracium* sp., Ketmen gorge, 1579 m a.s.l., 43°21'54.8"N,

79°53'33.6"E, 18.07.2015, UK Jetigenova; *ibid.*, 1637 m a.s.l., 43°21'51.3"N, 79°53'32.0"E, 18.07.2015, ZhM Takiyeva; Kuluktau mountains, Uzyn-Bulak gorge, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV Rakhimova; on *Serratula coronata* L., Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, AK Dzhiyenbekov; on *Tanacetum vulgare* L., pass Ketmen, 1923 m a.s.l., 43°08'36.5"N, 79°11'55.4"E, 11.09.2021, EV Rakhimova; on *Tragopogon capitatus* S.A. Nikitin, Karatau mountains, 2020 m a.s.l., 43°02'22.6"N, 79°59'89.5"E, 25.08.2016, UK Jetigenova; on *Tragopogon* sp., Akbet gorge, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, N Zhakhan; the Saryzhaz valley, 2096 m a.s.l., 43°08'91.9"N, 79°58'25.1"E, 26.08.2016, AK Dzhiyenbekov; on *Tripleurospermum perforatum* (Merat) M. Lainz, Ulkensai gorge, 1617 m a.s.l., 43°21'52.4"N, 79°57'02.6"E, 19.07.2015, ZhM Takiyeva.

Golovinomyces cynoglossi (Wallr.) V.P. Heluta – on *Cynoglossum officinale* L., Kuluktau mountains, Dalaity gorge, 1373 m a.s.l., 43°05'26.7"N, 78°53'53.1"E, 01.07.2016, EV Rakhimova; *ibid.*, 2097 m a.s.l., 43°04'27.3"N, 78°52'21.15"E, 01.07.2016, EV Rakhimova; the Saryzhaz valley, 2096 m a.s.l., 43°08'91.9"N, 79°58'25.1"E, 26.08.2016, AK Dzhiyenbekov; Chakrambal gorge, 2116 m a.s.l., 43°05'99.3"N, 80°03'72.8"E, 27.08.2016, UK Jetigenova; on *Lappula microcarpa* (Ledeb.) Gurke, Kishi Shibut gorge, 2246 m a.s.l., 43°11'02.2"N, 79°53'35.2"E, 26.08.2016, UK Jetigenova; on *Nonea caspica* (Willd.) G. Don, Kishi Shibut gorge, 2246 m a.s.l., 43°11'02.2"N, 79°53'35.2"E, 26.08.2016, N Zhakhan; on *Solenanthus circinnatus* Ledeb., Ulken Aksu gorge, 1500 m a.s.l., 43°20'07.1"N, 79°37'24.3"E, 04.08.2021, UK Jetigenova.

Golovinomyces hyoscyami (R.Y. Zheng & G.Q. Chen) V.P. Heluta – on *Hyoscyamus niger* L., Ulken Aksu gorge, 1650 m a.s.l., 43°18'99.3"N, 79°36'54.1"E, 13.09.2014, UK Jetigenova; Kuluktau mountains, Uzyn-Bulak gorge, 1703 m a.s.l., 43°07'40.2"N, 79°07'28.0"E, 24.08.2016, EV Rakhimova; *ibid.*, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV Rakhimova; Akbet gorge, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, N Zhakhan; Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, LA Kyzmetova.

Golovinomyces magnicellulatus (U. Braun) V.P. Heluta – on *Polemonium caeruleum* L., Zhulkungei gorge, 1930 m a.s.l., 43°20'56.2"N, 80°12'39.8"E, 21.07.2015, EE Kurmantayeva.

Golovinomyces orontii (Castagne) V.P. Heluta – on *Papaver croceum* Ledeb., Ulken Aksu gorge, 1500 m a.s.l., 43°20'07.1"N, 79°37'24.3"E, 04.08.2021, UK Jetigenova.

Golovinomyces sordidus (L. Junell) V.P. Heluta – on *Plantago major* L., Chakrambal gorge, 2284 m a.s.l., 43°07'63.7"N, 80°07'91.2"E, 27.08.2016, LA Kyzmetova.

Golovinomyces verbasci (Jacq.) V.P. Heluta – on *Verbascum phoeniceum* L., Kuluktau mountains, Uzyn-Bulak gorge, 1703 m a.s.l., 43°07'40.2"N, 79°07'28.0"E, 24.08.2016, EV Rakhimova; on V.

songaricum Schrenk, Sumbe gorge, 1477 m a.s.l., 43°16'07.1"N, 79°27'30.1"E, 16.07.2015, N Zhakhan; *ibid.*, 1475 m a.s.l., 43°15'48.4"N, 79°27'40.0"E, 16.07.2015, N Zhakhan; Kyrgyzsai gorge, 1635 m a.s.l., 43°97'40.0"N, 79°30'48.6"E, 17.07.2015, UK Jetigenova; Shoshanai gorge, 1421 m a.s.l., N43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova; Dardamty gorge, 1371 m a.s.l., 43°25'37.0"N, 80°04'23.7"E, 29.08.2016, EV Rakhimova; Elshin-Buiryk mountains, 1953 m a.s.l., 43°00'78.1"N, 79°58'68.5"E, 25.08.2016, UK Jetigenova; on *V. thapsus* L., Ketmen gorge, 1925 m a.s.l., 43°20'07.1"N, 79°37'24.3"E, 01.08.2021, UK Jetigenova; on *Verbascum* sp., Kyrgyzsai gorge, 1667 m a.s.l., 43°17'83.7"N, 79°30'77.5"E, 12.09.2014, UK Jetigenova.

Leveillula duriae (Lév.) U. Braun – on *Phlomoides oreophila* (Kar. & Kir.) Adylov, Kamelin & Makhm., Akbet gorge, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, LA Kyzmetova; Karatau mountains, 2061 m a.s.l., 43°03'75.0"N, 79°59'79.8"E, 25.08.2016, N Zhakhan

Leveillula taurica (Lév.) G. Arnaud – on *Artemisia dracunculus* L., Shoshanai gorge, 1421 m a.s.l., 43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova; pass Ketmen, 1923 m a.s.l., 43°08'36.5"N, 79°11'55.4"E, 11.09.2021, EV Rakhimova; Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, UK Jetigenova; on *Clematis orientalis* L., Kishi Aksu gorge, 1396 m a.s.l., 43°20'14.8"N, 79°34'02.9"E, 28.08.2016, EV Rakhimova; on *C. songarica* Bunge, Akbet gorge, 1621 m a.s.l., 43°10'75.7"N, 79°13'24.9"E, 24.08.2016, LA Kyzmetova; on *Malva neglecta* Wallr., Akbet gorge, 1621 m a.s.l., 43°10'75.7"N, 79°13'24.9"E, 24.08.2016, SB Nurashov; on *Marrubium vulgare* L., Ulkensai gorge, 2000 m a.s.l., 30.09.2004, GA Nam; Kishi Aksu gorge, 1524 m a.s.l., 43°19'28.9"N, 79°34'30.2"E, 03.08.2021, UK Jetigenova; on *Nepeta nuda* L., Sumbe gorge, 1477 m a.s.l., 43°16'07.1"N, 79°27'30.1"E, 16.07.2015, N Zhakhan; *ibid.*, 1475 m a.s.l., 43°15'48.4"N, 79°27'40.0"E, 16.07.2015, N Zhakhan; Ulkensai gorge, 1795 m a.s.l., 43°21'18.1"N, 79°56'34.0"E, 20.07.2015, EE Kurmantayeva; on *Onobrychis arenaria* (Kit.) DC., at the entrance to Tuyuk village, 1911 m a.s.l., 43°06'97.1"N, 79°16'23.5"E, 27.08.2016, UK Jetigenova; on *Peganum harmala* L., floodplain of Temirlik river, 1038 m a.s.l., 43°18'03.9"N, 79°11'70.7"E, 28.08.2016, AK Dzhiyenbekov, Akbet gorge, 1621 m a.s.l., 43°10'75.7"N, 79°13'24.9"E, 24.08.2016, N Zhakhan; on *Scutellaria transiliensis* Juz., Kishi Aksu gorge, 1463 m a.s.l., 43°19'38.6"N, 79°34'27.3"E, 28.08.2016, EV Rakhimova; on *Vicia* sp., Ulkensai gorge, 1795 m a.s.l., 43°21'18.1"N, 79°56'34.0"E, 20.07.2015, EE Kurmantayeva.

Neorhysiphe galeopsidis (DC.) U. Braun – on *Dracocephalum integrifolium* Bunge, Shoshanai gorge, 1576 m a.s.l., 43°11'41.6"N, 79°23'66.5"E, 28.08.2016, N Zhakhan; Kishi Shibut gorge, 2246 m a.s.l., 43°11'02.2"N, 79°53'35.2"E, 26.08.2016, N Zhakhan; Akbet gorge, 1664 m a.s.l., 43°10'81.9"N, 79°13'42.7"E, 24.08.2016, N Zhakhan; on *Lamium*

album L., Kuluktau mountains, Uzyn-Bulak gorge, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV Rakhimova; Chakrambal gorge, 2284 m a.s.l., 43°07'63.7"N, 80°07'91.2"E, 27.08.2016, LA Kyzmetova; on *Leonurus turkestanicus* V.I. Krecz. & Kuprian., Akbet gorge, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, UK Jetigenova; *ibid.*, 1660 m a.s.l., 43°10'80.8"N, 79°13'54.4"E, 24.08.2016, LA Kyzmetova; Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, LA Kyzmetova; on *Nepeta nuda* L., Shoshanai gorge, 1685 m a.s.l., 43°11'08.6"N, 79°23'59.3"E, 11.09.2014, UK Jetigenova; *ibid.*, 1576 m a.s.l., 43°11'41.6"N, 79°23'66.5"E, 28.08.2016, AK Dzhiyenbekov; Kyrgyzsai gorge, 1575 m a.s.l., 43°18'15.8"N, 79°30'44.4"E, 26.08.2016, EV Rakhimova; Akbet gorge, 1664 m a.s.l., 43°10'81.9"N, 79°13'42.7"E, 24.08.2016, UK Jetigenova; Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, UK Jetigenova; on *Origanum vulgare* L., Sumbe gorge, 1475 m a.s.l., 43°15'48.4"N, 79°27'40.0"E, 16.07.2015, N Zhakhan; Zhulkungei gorge, 1841 m a.s.l., 43°21'34.5"N, 80°12'34.2"E, 21.07.2015, ZhM Takiyeva; Kyrgyzsai gorge, 1688 m a.s.l., 43°17'36.4"N, 79°30'46.8"E, 26.08.2016, EV Rakhimova; Shoshanai gorge, 1576 m a.s.l., 43°11'41.6"N, 79°23'66.5"E, 28.08.2016, AK Dzhiyenbekov; Kuluktau mountains, Uzyn-Bulak gorge, 1723 m a.s.l., 43°07'21.0"N, 79°00'44.4"E, 24.08.2016, EV Rakhimova; *ibid.*, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV Rakhimova; Baldyrgan gorge, 2078 m a.s.l., 43°05'09.2"N, 79°24'03.0"E, 27.08.2016, LA Kyzmetova; *ibid.*, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, LA Kyzmetova; on *Phlomoides oreophila* (Kar. & Kir.) Adylov, Kamelin & Makhm., Zhulkungei gorge, 1977 m a.s.l., 43°20'39.9"N, 80°12'52.0"E, 21.07.2015, UK Jetigenova; *ibid.*, 1841 m a.s.l., 43°21'34.5"N, 80°12'34.2"E, 21.07.2015, ZhM Takiyeva; Ulkensai gorge, 1795 m a.s.l., 43°21'18.1"N, 79°56'34.0"E, 20.07.2015, EE Kurmantayeva; Kyrgyzsai gorge, 1575 m a.s.l., 43°18'15.8"N, 79°30'44.4"E, 26.08.2016, EV Rakhimova; Kuluktau mountains, Dalaity gorge, 1373 m a.s.l., 43°05'26.7"N, 78°53'53.1"E, 01.07.2016, EV Rakhimova; Uzyn-Bulak gorge, 1703 m a.s.l., 43°07'40.2"N, 79°07'28.0"E, 24.08.2016, EV Rakhimova; Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, AK Dzhiyenbekov; *ibid.*, 2078 m a.s.l., 43°05'09.2"N, 79°24'03.0"E, 27.08.2016, GA Nam; Chakrambal gorge, 2116 m a.s.l., 43°05'99.3"N, 80°03'72.8"E, 27.08.2016, UK Jetigenova; Kishi Shibut gorge, 2246 m a.s.l., 43°11'02.2"N, 79°53'35.2"E, 26.08.2016, UK Jetigenova; Akbet gorge, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, SB Nurashov; Komirshi gorge, 2136 m a.s.l., 43°06'51.2"N, 79°37'54.9"E, 06.07.2017, EV Rakhimova; Karatau mountains, 2061 m a.s.l., 43°03'75.0"N, 79°59'79.8"E, 25.08.2016, GA Nam; on *Prunella* sp., Ulkensai gorge, 2000 m a.s.l., 30.09.2004, GA Nam.

Neorhysiphe galii (S. Blumer) U. Braun – on *Galium aparine* L., Kishi Shibut gorge, 2246 m a.s.l.,

43°11'02.2"N, 79°53'35.2"E, 26.08.2016, UK Jetigenova; on *G. spurium* L., Aktam gorge, 1637 m a.s.l., 43°21'51.3"N, 79°53'32.0"E, 18.07.2015, ZhM Takiyeva.

Oidium sp. – on *Chelidonium majus* L., Shoshanai gorge, 1576 m a.s.l., 43°11'41.6"N, 79°23'66.5"E, 28.08.2016, AK Dzhiyenbekov; Kyrgyzsai gorge, 1575 m a.s.l., 43°18'15.8"N, 79°30'44.4"E, 26.08.2016, EV Rakhimova.

Phyllactinia guttata (Wallr.) Lév. – on *Cratageus* sp., Kyrgyzsai gorge, 1667 m a.s.l., 43°17'83.7"N, 79°30'77.5"E, 12.09.2014, UK Jetigenova.

Phyllactinia ribis (Jacq.) Z.Y. Zhao – on *Ribes* sp., Temirlik mountains, 20.09.1957, BK Kalymbetov.

Podosphaera aphanis (Wallr.) U. Braun & S. Takam. – on *Alchemilla cyrtopleura* Juz., Kuluktau mountains, Uzyn-Bulak gorge, 1723 m a.s.l., 43°07'21.0"N, 79°00'44.4"E, 24.08.2016, EV Rakhimova; on *A. xanthochlora* Rothm., Ulkensai gorge, 2000 m a.s.l., 01.10.2004, LA Kyzmetova; on *Alchemilla* sp., Shoshanai gorge, 1576 m a.s.l., 43°11'41.6"N, 79°23'66.5"E, 28.08.2016, LA Kyzmetova; *ibid.*, 1421 m a.s.l., 43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova; Kyrgyzsai gorge, 1754 m a.s.l., 43°17'24.7"N, 79°30'50.5"E, 17.07.2015, ZhM Takiyeva; *ibid.*, 1688 m a.s.l., 43°17'36.4"N, 79°30'46.8"E, 26.08.2016, EV Rakhimova; *ibid.*, 1667 m a.s.l., 43°17'83.7"N, 79°30'77.5"E, 12.09.2014, UK Jetigenova; Ulken Aksu gorge, 1531 m a.s.l., 43°19'36.9"N, 79°37'11.6"E, 13.09.2014, GA Nam; Ulkensai gorge, 1795 m a.s.l., 43°21'18.1"N, 79°56'34.0"E, 20.07.2015, EE Kumantayeva; Aktam gorge, 1579 m a.s.l., 43°21'54.8"N, 79°53'33.6"E, 18.07.2015, UK Jetigenova; Sumbe gorge, 1489 m a.s.l., 43°15'44.3"N, 79°27'48.7"E, 16.07.2015, UK Jetigenova; Tattibulak gorge, 2027 m a.s.l., 43°24'42.3"N, 80°30'56.4"E, 31.07.2021, UK Jetigenova; Kuluktau mountains, Uzyn-Bulak gorge, 1723 m a.s.l., 43°07'21.0"N, 79°00'44.4"E, 24.08.2016, EV Rakhimova; Chakrambal gorge, 2116 m a.s.l., 43°05'99.3"N, 80°03'72.8"E, 27.08.2016, GA Nam; *ibid.*, 2284 m a.s.l., 43°07'63.7"N, 80°07'91.2"E, 27.08.2016, AK Dzhiyenbekov; Kishi Shibut gorge, 2246 m a.s.l., 43°11'02.2"N, 79°53'35.2"E, 26.08.2016, LA Kyzmetova; Baldyrgan gorge, 2078 m a.s.l., 43°05'09.2"N, 79°24'03.0"E, 27.08.2016, LA Kyzmetova; *ibid.*, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, LA Kyzmetova; on *Geum urbanum* L., Kyrgyzsai gorge, 1688 m a.s.l., 43°17'36.4"N, 79°30'46.8"E, 26.08.2016, EV Rakhimova; Kuluktau mountains, Uzyn-Bulak gorge, 1703 m a.s.l., 43°07'40.2"N, 79°07'28.0"E, 24.08.2016, EV Rakhimova; Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, UK Jetigenova; Koksai gorge, 1925 m a.s.l., 43°22'57.3"N, 80°23'26.8"E, 01.08.2021, UK Jetigenova; on *Potentilla argentea* L., Zhulkungei gorge, 1977 m a.s.l., 43°20'39.9"N, 80°12'52.0"E, 21.07.2015, UK Jetigenova; Sumbe gorge, 1449 m a.s.l., 43°16'03.2"N, 79°27'36.7"E, 16.07.2015, ZhM Takiyeva; on *P. bifurca* L., Kishi Shibut gorge, 2246 m a.s.l., 43°11'02.2"N, 79°53'35.2"E, 26.08.2016, GA Nam; on

P. pedata Willd. ex Hornem., Akbet gorge, 1664 m a.s.l., 43°10'81.9"N, 79°13'42.7"E, 24.08.2016, UK Jetigenova; on *Potentilla* sp., Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, LA Kyzmetova.

Podosphaera clandestina (Wallr.) Lév. – on *Sorbus tianschanica* Rupr., Temirlik mountains, 1900 m a.s.l., 22.09.1957, BK Kalymbetov.

Podosphaera dipsacacearum (Tul. & C. Tul.) U. Braun & S. Takam. – on *Scabiosa ochroleuca* L., Chakrambal gorge, 2116 m a.s.l., 43°05'99.3"N, 80°03'72.8"E, 27.08.2016, AK Dzhiyenbekov; Karatau mountains, 2061 m a.s.l., 43°03'75.0"N, 79°59'79.8"E, 25.08.2016, GA Nam.

Podosphaera epilobii (Wallr.) de Bary – on *Epilobium hirsutum* L., Akbet gorge, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, UK Jetigenova; on *Epilobium palustre* L., Kishi Shibut gorge, 2246 m a.s.l., 43°11'02.2"N, 79°53'35.2"E, 26.08.2016, UK Jetigenova.

Podosphaera ferruginea (Schltld.) U. Braun & S. Takam. – on *Poterium sanguisorba* L., Kishi Shibut gorge, 2246 m a.s.l., 43°11'02.2"N, 79°53'35.2"E, 26.08.2016, UK Jetigenova.

Podosphaera fugax (Penz. & Sacc.) U. Braun & S. Takam. – on *Geranium collinum* Stephan ex Willd., on *G. sylvaticum* L., Chakrambal gorge, 2284 m a.s.l., 43°07'63.7"N, 80°07'91.2"E, 27.08.2016, N Zhakhan; on *Geranium* sp., Kyrgyzsai gorge, 1688 m a.s.l., 43°17'36.4"N, 79°30'46.8"E, 26.08.2016, EV Rakhimova.

Podosphaera fusca (Fr.) U. Braun & Shishkoff – on *Taraxacum* sp., Ulken Aksu gorge, 1531 m a.s.l., 43°19'36.9"N, 79°37'11.6"E, 13.09.2014, GA Nam; Sumbe gorge, 1489 m a.s.l., 43°15'44.3"N, 79°27'48.7"E, 16.07.2015, UK Jetigenova; *ibid.*, 1507 m a.s.l., 43°15'32.9"N, 79°27'57.0"E, 16.07.2015, EE Kurmantayeva; on *Valeriana officinalis* L., Komirshi gorge, 2136 m a.s.l., 43°06'51.2"N, 79°37'54.9"E, 06.07.2017, EV Rakhimova; on *Xanthium strumarium* L., floodplain of Temirlik river, 1038 m a.s.l., 43°18'03.9"N, 79°11'70.7"E, 28.08.2016, AK Dzhiyenbekov.

Podosphaera leucotricha (Ellis et Everh.) E.S. Salmon – on *Malus sieversii* (Ledeb.) M. Roem, Kyrgyzsai gorge, 1667 m a.s.l., 43°17'83.7"N, 79°30'77.5"E, 12.09.2014, UK Jetigenova; Sumbe gorge, 1449 m a.s.l., 43°16'03.2"N, 79°27'36.7"E, 16.07.2015, ZhM Takiyeva.

Podosphaera pannosa (Wallr.) de Bary – on *Rosa beggeriana* Schrenk, Dardamty gorge, 1443 m a.s.l., 43°24'50.5"N, 80°03'43.6"E, 26.08.2021, EV Rakhimova; on *Rosa* sp., Karatau mountains, 2061 m a.s.l., 43°03'75.0"N, 79°59'79.8"E, 25.08.2016, N Zhakhan.

Podosphaera plantaginis (Castagne) U. Braun & S. Takam. – on *Plantago major* L., Akbet gorge, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, UK Jetigenova.

Podosphaera polemonii (L. Junell) U. Braun & S. Takam. – on *Polemonium caeruleum* L., Kuluktau mountains, Uzyn-Bulak gorge, 1817 m a.s.l., 43°07'13.2"N, 79°00'28.2"E, 24.08.2016, EV

Rakhimova; Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, LA Kyzmetova.

Podospaera tridactyla (Wallr.) de Bary – on *Cerasus* sp., Akbet gorge, 1723 m a.s.l., 43°10'80.8"N, 79°13'54.4"E, 24.08.2016, UK Jetigenova.

Helotiales Nannf. ex Korf & Lizoň

Insertae sedis

Coniothecium cerasi McAlpine – on *Cerasus tianschanica* Pojark., Temirlik mountains, 1700 m a.s.l., 21.09.1957, BK Kalymbetov.

Cylindrosporium basiplanum Vassiljevsky – on *Spiraea hypericifolia* L., Kishi Aksu gorge, 1524 m a.s.l., 43°19'28.9"N, 79°34'30.2"E, 03.08.2021, UK Jetigenova.

Cylindrosporium pseudoplatani (Roberge ex Desm.) Died. – on *Acer semenovii* Regel & Herder, Shoshanai gorge, 1421 m a.s.l., 43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova; Sumbe gorge, 1385 m a.s.l., 43°17'00.6"N, 79°27'06.0"E, 27.08.2016, EV Rakhimova; Dardamty gorge, 1371 m a.s.l., 43°25'37.0"N, 80°04'23.7"E, 29.08.2016, EV Rakhimova.

Cylindrosporium spiraeicola Ellis & Everh. – on *Spiraea hypericifolia* L., Aktam gorge, 1488 m a.s.l., 43°22'35.6"N, 79°53'27.1"E, 18.07.2015, N Zhakhan.

Diplocarpon mespili (Sorauer) B. Sutton – on *Cotoneaster melanocarpus* Fisch. ex Blytt., Ulkensai gorge, 2000 m a.s.l., 01.10.2004, GA Nam; on *Cotoneaster* sp., Shoshanai gorge, 1421 m a.s.l., 43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova; Sumbe gorge, 1385 m a.s.l., 43°17'00.6"N, 79°27'06.0"E, 27.08.2016, EV Rakhimova; Kuluktau mountains, Uzyn-Bulak gorge, 1723 m a.s.l., 43°07'21.0"N, 79°00'44.4"E, 24.08.2016, EV Rakhimova; on *Sorbus tianschanica* Rupr., Kyrgyzsai gorge, 1688 m a.s.l., 43°17'36.4"N, 79°30'46.8"E, 26.08.2016, EV Rakhimova; Kuluktau mountains, Dalaity gorge, 1373 m a.s.l., 43°05'26.7"N, 78°53'53.1"E, 01.07.2016, EV Rakhimova; Shoshanai gorge, 1576 m a.s.l., 43°11'41.6"N, 79°23'66.5"E, 28.08.2016, UK Jetigenova.

Diplocarpon rosae F.A. Wolf – on *Rosa* sp., Ulkensai gorge, 2000 m a.s.l., 01.10.2004, LA Kyzmetova; Shoshanai gorge, 1421 m a.s.l., 43°13'07.8"N, 79°21'57.7"E, 25.08.2016, EV Rakhimova; Kyrgyzsai gorge, 1575 m a.s.l., 43°18'15.8"N, 79°30'44.4"E, 26.08.2016, EV Rakhimova; Sumbe gorge, 1385 m a.s.l., 43°17'00.6"N, 79°27'06.0"E, 27.08.2016, EV Rakhimova; Dardamty gorge, 1371 m a.s.l., 43°25'37.0"N, 80°04'23.7"E, 29.08.2016, EV Rakhimova; Kishi Aksu gorge, 1463 m a.s.l., 43°19'38.6"N, 79°34'27.3"E, 28.08.2016, EV Rakhimova.

Dermateaceae Fr.

Pseudopeziza medicaginis (Lib.) Sacc. – on *Medicago falcata* L., Kuluktau mountains, Dalaity gorge, 1373 m a.s.l., 43°05'26.7"N, 78°53'53.1"E, 01.07.2016, EV Rakhimova; Uzyn-Bulak gorge, 1723 m a.s.l., 43°07'21.0"N, 79°00'44.4"E, 24.08.2016, EV Rakhimova; Akbet gorge, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, LA Kyzmetova.

Rhytismatales M.E. Barr ex Minter

Rhytismataceae Chevall.

Meloderma desmazieri (Duby) Darker – on *Juniperus sabina* L., Ulkensai gorge, 2000 m a.s.l., 30.09.2004, GA Nam.

Rhytisma lonicerae P. Henn. – on *Lonicera* sp., Koksai gorge, 1925 m a.s.l., 43°22'57.3"N, 00°23'26.8"E, 01.08.2021, UK Jetigenova.

Pezizomycetes O.E. Erikss. & Winka

Insertae Sedis

Torula antiqua Corda – on *Artemisia* sp., Kyrgyzsai gorge, 1441 m a.s.l., 43°18'89.5"N, 79°29'85.5"E, 12.09.2014, UK Jetigenova.

Torula splendens Cooke – on *Achnatherum splendens* (Trin.) Nevski, Elshin Buyrik mountains, 1953 m a.s.l., 43°00'78.1"N, 79°58'68.5"E, 25.08.2016, LA Kyzmetova; on *Lasiagrostis* sp., Ketmen gorge, 1453 m a.s.l., 43°21'50.0"N, 79°43'43.8"E, 25.04.2015, UK Jetigenova.

Sordariomycetes O.E. Erikss. & Winka

Insertae Sedis

Melomastia mastoidea (Fr.) J. Schröt. – on *Fraxinus sogdiana* Bunge, floodplain of Temirlik river, 27.09.1961, ZV Kubanskaya.

Strickeria artemisiae Lob. – on *Artemisia frigida* Willd., Temirlik mountains, 1700 m a.s.l., 21.09.1957, BK Kalymbetov.

Strickeria atraphaxis Kravtzev – on *Atraphaxis frutescens* (L.) K. Koch, Dardamty gorge, 1443 m a.s.l., 43°24'50.5"N, 80°03'43.6"E, 26.08.2021, EV Rakhimova; on *Atraphaxis* sp., Dardamty gorge, 1369 m a.s.l., 43°23'55.8"N, 80°03'26.5"E, 29.08.2016, EV Rakhimova.

Strickeria ephedrae Golovin – on *Ephedra* sp., Kyrgyzsai gorge, 1476 m a.s.l., 43°19'96.9"N, 79°29'96.5"E, 12.09.2014, GA Nam; *ibid.*, 1530 m a.s.l., 43°19'01.4"N, 79°30'06.4"E, 12.09.2014, ZhM Takiyeva; Dardamty gorge, 1371 m a.s.l., 43°25'37.0"N, 80°04'23.7"E, 29.08.2016, EV Rakhimova.

Strickeria spiraeae Domaschova – on *Spiraea hypericifolia* L., Kyrgyzsai gorge, 1530 m a.s.l., 43°19'01.4"N, 79°30'06.4"E, 12.09.2014, ZhM Takiyeva; *ibid.*, 1433 m a.s.l., 43°21'50.0"N, 79°43'43.8"E, 25.04.2015, UK Jetigenova; *ibid.*, 1536 m a.s.l., 43°19'51.6"N, 79°38'23.3"E, 24.04.2015, N Zhakhan; *ibid.*, 1462 m a.s.l., 43°21'50.0"N, 79°43'43.8"E, 26.04.2015, N Zhakhan.

Thyronectria berolinensis (Sacc.) Seaver – on *Ribes nigrum* L., Sumbe gorge, 1489 m a.s.l., 43°15'44.3"N, 79°27'48.7"E, 16.07.2015, UK Jetigenova.

Diaporthales Nannf.

Diaporthaceae Höhn. ex Wehm.

Phomopsis dipsaci (Cooke) Grove – on *Scabiosa alpestris* Kar. et Kir., Temirlik mountains, 2200 m a.s.l., 22.09.1957, BK Kalymbetov.

Phomopsis lonicerae (Cooke) Grove – on *Lonicera microphylla* Willd. ex Schult., Avat gorge, 1445 m a.s.l., 43°21'47.6"N, 79°40'52.0"E, 25.04.2015, ZhM Takiyeva.

Hypocreales Lindau**Insertae Sedis**

Acremonium tulasnei G.R.W. Arnold – on *Lactarius deliciosus* (L.) Gray, pass Ketmen, 2000 m a.s.l., 24.08.1971, SM Lopychova, NM Filimonova.

Clavicipitaceae O.E. Erikss.

Claviceps purpurea (Fr.) Tul. – on *Agropyron cristatum* (L.) Gaertn., Baldyrgan gorge, 1997 m a.s.l., 43°04'98.7"N, 79°23'13.5"E, 27.08.2016, UK Jetigenova; Akbet gorge, 1660 m a.s.l., 43°10'80.8"N, 79°13'54.4"E, 24.08.2016, LA Kyzmetova; *ibid.*, 1621 m a.s.l., 43°10'75.7"N, 79°19'24.9"E, 24.08.2016, UK Jetigenova; *ibid.*, 1664 m a.s.l., 43°10'81.9"N, 79°13'42.7"E, 24.08.2016, UK Jetigenova; Karatau mountains, 2061 m a.s.l., 43°03'75.0"N, 79°59'79.8"E, 25.08.2016, N Zhakhan; *ibid.*, 2020 m a.s.l., 43°02'22.6"N, 79°59'89.5"E, 25.08.2016, N Zhakhan; on *Alopecurus pratensis* L., Akbet gorge, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, LA Kyzmetova; on *Dactylis glomerata* L., Akbet gorge, 1621 m a.s.l., 43°10'75.7"N, 79°19'24.9"E, 24.08.2016, N Zhakhan; on *Elytrigia repens* (L.) Nevski, Karatau mountains, 2061 m a.s.l., 43°03'75.0"N, 79°59'79.8"E, 25.08.2016, SB Nurashov; on *Leymus multicaulis* (Kar. & Kir.) Tzvelev, Akbet gorge, 1660 m a.s.l., 43°10'80.8"N, 79°13'54.4"E, 24.08.2016, LA Kyzmetova; *ibid.*, 1664 m a.s.l., 43°10'81.9"N, 79°13'42.7"E, 24.08.2016, LA Kyzmetova; on *Leymus paboanus* (Claus) Pilg., the Saryzhaz valley, 2096 m a.s.l., 43°08'91.9"N, 79°58'25.1"E, 26.08.2016, GA Nam.

Epichloe typhina (Pers.) Tul. & C. Tul. – on *Elytrigia repens* (L.) Nevski, Komirshi gorge, 2136 m a.s.l., 43°06'51.2"N, 79°37'54.9"E, 06.07.2017, EV Rakhimova.

Glomerellaceae Locq. ex Seifert et W. Gams

Colletotrichum graminicola (Ces.) G.W. Wilson – on *Leymus multicaulis* (Kar. & Kir.) Tzvelev, Temirlik mountains, 01.07.1954, BK Kalymbetov.

Colletotrichum liliacearum (Westend.) Duke – on *Allium* sp., Shoshanai gorge, 1576 m a.s.l., 43°11'41.6"N, 79°23'66.5"E, 28.08.2016, UK Jetigenova.

Vermicularia caricis Brunaud – on *Kobresia capilliformis* N.A. Ivanova, Temirlik mountains, 2200 m a.s.l., 22.09.1957, BK Kalymbetov.

Nectriaceae Tul. & C. Tul.

Nectria cinnabarina (Tode) Fr. – on *Rhamnus songorica* Gontsch., Dardamty gorge, 1369 m a.s.l., 43°23'55.8"N, 80°03'26.5"E, 29.08.2016, EV Rakhimova; on *Ribes nigrum* L., Sumbe gorge, 1489 m a.s.l., 43°15'44.3"N, 79°27'48.7"E, 16.07.2015, UK Jetigenova; on *Ribes* sp., Ulkensai gorge, 1795 m a.s.l., 43°21'18.1"N, 79°56'34.0"E, 20.07.2015, EE Kurmantayeve.

Nectria phaeostoma Speg. – on *Caragana* sp., Dardamty gorge, 1369 m a.s.l., 43°23'55.8"N, 80°03'26.5"E, 29.08.2016, EV Rakhimova; Kishi Aksu gorge, 1463 m a.s.l., 43°19'38.6"N, 79°34'27.3"E, 28.08.2016, EV Rakhimova.

Phomatosporales Senan., Maharachch & K.D.

Hyde

Valsaceae Tul. & C. Tul.

Cytospora lonicerae Grove – on *Lonicera altmannii* Regel & Schmalh., Akbet gorge, 1613 m a.s.l., 43°10'74.9"N, 79°13'71.9"E, 24.08.2016, UK Jetigenova.

Cytospora microspora Rabenh. – on *Crataegus* sp., Dardamty gorge, 1443 m a.s.l., 43°24'50.5"N, 80°03'43.6"E, 26.08.2021, EV Rakhimova.

Cytospora salicis (Corda) Rabenh. – on *Salix* sp., Sumbe gorge, 1385 m a.s.l., 43°17'00.6"N, 79°27'06.0"E, 27.08.2016, EV Rakhimova.

Cytosporina flavovirens (Sacc.) Grove – on *Rhamnus songorica* Gontsch., Sumbe gorge, 1385 m a.s.l., 43°17'00.6"N, 79°27'06.0"E, 27.08.2016, EV Rakhimova.

Leucostoma auerswaldii (Nitschke) Höhn. – on *Malus* sp., Kyrgyzsai gorge, 1575 m a.s.l., 43°18'15.8"N, 79°30'44.4"E, 26.08.2016, EV Rakhimova.

Phyllachorales M.E. Barr**Phyllachoraceae** Theiss. & P. Syd.

Phyllachora graminis (Pers.) Fuckel – on *Leymus paboanus* (Claus) Pilg., Dardamty gorge, 1371 m a.s.l., 43°25'37.0"N, 80°04'23.7"E, 29.08.2016, EV Rakhimova.

Woronichina tranzschelii (Woron.) Naumov – on *Caragana aurantica* Koehne, Komirshi gorge, 2136 m a.s.l., 43°06'51.2"N, 79°37'54.9"E, 06.07.2017, EV Rakhimova.

Xylariales Nanf.**Xylariaceae** Tul. & C. Tul.

Rosellinia sp. – on *Ribes nigrum* L., Avat gorge, 1733 m a.s.l., 43°19'00.6"N, 79°41'19.2"E, 25.04.2015, N Zhakhan.

Taphrinomycetes O.E. Erikss. & Winka**Taphrinales** Haeckel**Taphrinaceae** Gäm.

Lalaria tormentillae (Rostr. ex Sacc.) Kurtzman, Fell & Boekhout – on *Geum urbanum* L., Kuluktau mountains, Uzyn-Bulak gorge, 1723 m a.s.l., 43°07'21.0"N, 79°00'44.4"E, 24.08.2016, EV Rakhimova; Avat gorge, 1733 m a.s.l., 43°19'00.6"N, 79°41'19.2"E, 25.04.2015, N Zhakhan.

Recently, the mycobiota of the Ketmen ridge has 151 species belonging to Ascomycota (Table 1). The ascomycetes are represented by 14 orders from 5 classes. The highest number of orders is characteristic of the class Sordariomycetes. The largest order is the order of Erysiphales from the class Leotiomycetes, with 38 species from 8 genera. The largest genera are *Erysiphe* (13 species), *Podosphaera* (9 species) and *Golovinomyces* (8). Several genera (*Blastotrichum*, *Fumago*, *Myxofusicoccum*, *Phragmotrichum*, *Camarosporium*, *Coniothecium*, *Cylindrosporium*, *Diplocarpon*, *Torula*, *Melomastia*, *Strickeria*, *Thyronectria*, *Acremonium*) have an unclear systematic position.

Table 1

Taxonomic structure of the biota of ascomycetes of the Ketmen ridge					
Class	Order	Family	Genus (number of species)		
Dothideomycetes	<i>Insertae sedis</i>		<i>Blastotrichum</i> (1)		
			<i>Fumago</i> (2)		
			<i>Myxofusicoccum</i> (1)		
			<i>Phragmotrichum</i> (1)		
	<i>Insertae sedis</i>		<i>Asteromella</i> (2)		
	Botryosphaerales	<i>Insertae sedis</i>	<i>Camarosporium</i> (1)		
		Botryosphaeriaceae	<i>Dothiorella</i> (1)		
			<i>Phyllosticta</i> (6)		
	Capnodiales	Davidiellaceae	<i>Cladosporium</i> (3)		
		Mycosphaerellaceae	<i>Cercospora</i> (1)		
			<i>Fusicladiella</i> (1)		
			<i>Mycosphaerella</i> (1)		
			<i>Ovularia</i> (2)		
			<i>Phacellium</i> (1)		
			<i>Phaeoramularia</i> (1)		
			<i>Polythrincium</i> (1)		
			<i>Ramularia</i> (9)		
			<i>Rhabdospora</i> (1)		
			<i>Septoria</i> (8)		
			<i>Sphaerulina</i> (1)		
			<i>Stigmina</i> (1)		
			Dothideales	Dothideaceae	<i>Scirrhia</i> (1)
				Dothioraceae	<i>Selenophoma</i> (2)
				Cucurbitariaceae	<i>Cucurbitaria</i> (4)
			Pleosporales	Didymellaceae	<i>Ascochyta</i> (1)
					<i>Phoma</i> (4)
					<i>Piggotia</i> (1)
	Leptosphaeriaceae	<i>Coniothyrium</i> (1)			
	Lophiostomataceae	<i>Lophiostoma</i> (2)			
	Phaeosphaeriaceae	<i>Ampelomyces</i> (1)			
		<i>Sphaerellopsis</i> (1)			
		<i>Stagonospora</i> (3)			
	Pleosporaceae	<i>Alternaria</i> (1)			
		<i>Lewia</i> (1)			
		<i>Macrosporium</i> (1)			
		<i>Pleospora</i> (1)			
		<i>Pyrenophora</i> (1)			
		<i>Stemphylium</i> (2)			
		Venturiaceae		<i>Lasiobotrys</i> (1)	
		<i>Venturia</i> (1)			
Chaetomellales	Marthamycetaceae	<i>Propolis</i> (1)			
Erysiphales	Erysiphaceae	<i>Blumeria</i> (1)			
		<i>Erysiphe</i> (13)			
		<i>Golovinomyces</i> (8)			
		<i>Leveillula</i> (2)			
		<i>Neoerysiphe</i> (2)			
		<i>Oidium</i> (1)			
		<i>Phyllactinia</i> (2)			
		<i>Podosphaera</i> (9)			
		Helotiales	<i>Insertae sedis</i>	<i>Coniothecium</i> (1)	

			<i>Cylindrosporium</i> (3)
			<i>Diplocarpon</i> (2)
		Dermateaceae	<i>Pseudopeziza</i> (1)
	Rhytismatales	Rhytismataceae	<i>Meloderma</i> (1)
			<i>Rhytisma</i> (1)
Pezizomycetes	<i>Insertae Sedis</i>		<i>Torula</i> (2)
			<i>Melomastia</i> (1)
		<i>Insertae Sedis</i>	<i>Strickeria</i> (4)
			<i>Thyronectria</i> (1)
	Diaporthales	Diaporthaceae	<i>Phomopsis</i> (2)
		<i>Insertae Sedis</i>	<i>Acremonium</i> (1)
		Clavicipitaceae	<i>Claviceps</i> (1)
	Hypocreales		<i>Epichloe</i> (1)
		Glomerellaceae	<i>Colletotrichum</i> (2)
Sordariomycetes			<i>Vermicularia</i> (1)
		Nectriaceae	<i>Nectria</i> (2)
			<i>Cytospora</i> (3)
	Phomatosporales	Valsaceae	<i>Cytosporina</i> (1)
			<i>Leucostoma</i> (1)
			<i>Phyllachora</i> (1)
	Phyllachorales	Phyllachoraceae	<i>Woronichina</i> (1)
	Xylariales	Xylariaceae	<i>Rosellinia</i> (1)
Taphrinomycetes	Taphrinales	Taphrinaceae	<i>Lalaria</i> (1)
Total	14	24	73 (151)

The greatest number of species of Ascomycetes (109 species) is noted in the steppe belt of the Ketmen ridge: on the northern macroslope 51 species from 44 genera, on the southern macroslope 42 species from 25 genera (Table 2). The number of species of fungi decreases in the shrub belt and the belt of dark coniferous forests with meadows. In the bush belt there are 19 species of ascomycetes from 16 genera on the northern

macroslope, on the southern macroslope – 30 species from 19 genera. For the belt of dark coniferous forests with meadows, 5 species of fungi are characteristic on the northern macroslope; on the southern macroslope – 14 species from 11 genera (Table 2).

Table 2

Characteristics of Ascomycetes biota of the Ketmen ridge						
Options	Northern macroslope			Southern macroslope		
	the steppe belt	the shrub belt	the dark coniferous forests with meadows	the steppe belt	the shrub belt	the dark coniferous forests with meadows
Number of species	51	19	5	42	30	14
Number of genera	44	16	4	25	19	11
Ratio of species and genera	1.2	1.2	1.2	1.7	1.6	1.3

It is interesting to note that in the steppe belt of Ketmen, many species of fungi (15 species) occur both on the northern and southern macroslopes. For the shrub and forest belts of the northern and southern macroslopes are characterized by different species of fungi.

Ascomycetes attack 183 species of vascular plants and mushrooms. The following species are widely distributed in the territory of the study: *Neoerysiphe galeopsidis* on representatives of the family *Lamiaceae*, *Podosphaera aphanis* on representatives of the family *Rosaceae*, *Erysiphe polygoni* on representatives

of the family *Polygonaceae*, *Leveillula taurica* on representatives of different families.

Acknowledgements

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CHEMICAL SCIENCES

SYNTHESIS AND STUDY OF SURFACE-ACTIVE SALTS OBTAINED FROM THE REACTION OF 1,2-DIAMINOETHANE WITH CIS-9-OCTADECANOIC ACID AND TETRADECANOIC ACID

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Abstract

In this research work comparative analysis of four different surfactants has been given. The identification of these products has been made by IR- and UV- spectroscopy. The physical and chemical properties of the formed surfactants including interfacial tension and specific electroconductivities have been determined. From these measurements, the maximum surface excess concentration and the minimum area of the molecule at the water /air interface, the surface pressure, the standard thermodynamic parameters of adsorption and micellization have been calculated. Moreover, petrocollecting and petrodispersing properties of these substances have been measured and maximum values of petrocollecting coefficients have been determined. Some correlations between these parameters of the synthesized surfactants and their ability to collect thin petroleum films from the water surface have been obtained.

Keywords: tetradecanoic acid, Cis-9-octadecanoic acid; 1,2-Diaminoethane; surfactant; petrocollecting, petrodispersing, electroconductivity, micellization

Introduction

The expanding request to crude oil and item of its refining comes about in environmental problems and dis-balance [1, p 87-116]. Large spills like these are frequently the result of pipeline breaks, oil ship sinkings, or poor drilling techniques. Lean oil layers on the surface of the water gotten to be one of such biological issues which may happen amid transportation of rough oil and its refining items [2, p 3-48]. Surfactants frame a special course of chemical compounds. Surfactants have physical properties such emphasizing their ability to profoundly change surface and interfacial properties and to self-associate and solubilize themselves in micelles [7, p 9]. These properties give opportunity to apply surfactants in wettability adjustment, detergency, and the uprooting of liquid phases through permeable media [6, p 1189-1196]. These in turn lead to a tremendous cluster of practical application ranges which are outlined in terms of mineral and petroleum processing, biological frameworks, wellbeing and individual care items and nourishments [3, p 11-21; 4, p 3-7; 5, p 24-34]. It is known that recently the application of surfactants to high technology, such as printing, magnetic recording, electronics, biotechnology, as well as microelectronics, has become widespread. Surfactants are consumed in large quantities every day in the world. Thus, the demand for high-performance surfactants is constantly increasing, as a reduction in the amount of surfactants used can help reduce the load on the natural treatment system. Therefore, new surfactants have been

successfully designed and developed [8, p 200; 9, p 199; 10, p 621-630; 11, p 444].

Experimental part

Cis-9-octadecanoic acid was a product of Moscow's "ComponentReactant" Joint Stock Company (Russia) with $\geq 98\%$ purity. Tetradecanoic acid is a fatty acid found in nutmeg, palm oil, coconut oil, butter fat, and spermacetin, the oil from the sperm whale. It has a variety of uses in the beauty industry, including as a: Fragrance Ingredient; Opacifying Agent; Surfactant; Cleansing Agent; and Emulsifier. 1,2 ethane diamine was used as received from chemical suppliers (Aldrich), molar mass is 60.1 g mol^{-1} , colourless liquid, ichthyal (fishy) or ammonia calodor, density is 899 mg mL^{-1} , boiling point is $117-119^\circ\text{C}$ and refractive index is 1.4565.

In our research work 1,2-Diaminoethane entered the reaction with tetradecanoic acid and Cis-9-octadecanoic acid at different ratios. Two salts in different composition were synthesized and learnt comparatively. The first salt was a product of reaction between tetradecanoic acid and 1,2 ethane diamine at equimolar ratios. The reaction was carried out at $70-80^\circ\text{C}$ and equimolar proportion of components. The ultimate item was yellowish strong, like solidified greasy oil. The duration of the reaction was 9-10 hours.

The other salt which was the product of the reaction between 1,2 ethane diamine and cis-9-octadecanoic acid at equimolar ratio was carried out at $55-60^\circ\text{C}$ during 9-10 hours at equimolar ratio. The final product

at equimolar ratio was brownish and viscous oily product.

The reaction salts were synthesized using the same acid and amine at 2:1 ratio of acids to amine. The reaction continued 9-10 hours at 65-70 °C, 2:1 ratio of cis-9-octadecanoic acid and ethylene diamine, while the second reaction was carried out at 2:1 ratio of cis-9-octadecanoic acid and 1,2-Diaminoethane and the reaction continued 9-10 hours at 50-55 °C. The final products were yellowish solid, like frozen fatty oil and dark-red for the first and second product respectively.

Surface tension and conductivity measurements

Surface tension of aqueous solutions of obtained surfactants were recorded with Du Nouy ring KSV Sigma 702 tensiometer equipped with Pt ring (Attention Biolin Scientific, Finland). Surface tension of the double distilled water used for preparing solutions was 71.5 mN/m at 25 °C. γ CMC values of surfactant was determined based on these measurements.

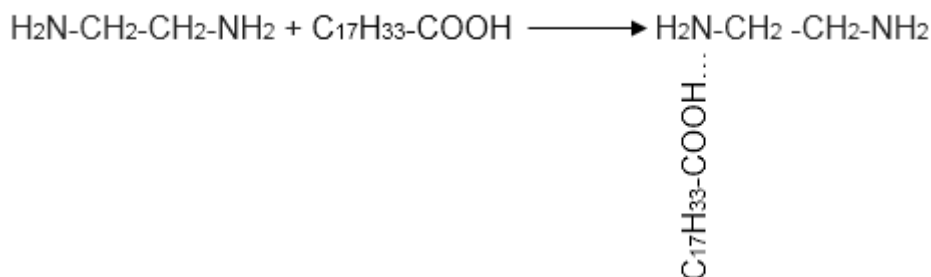
Electrolytic conductivity of aqueous solutions of surfactants were measured with VWR® pHenomenal®

CO 3000 L benchtop conductivity meter (Germany). All the measured values were referenced to 25 °C and were accurate to ± 1 %. Conductivity of the double distilled water used for the experiment was lying in the interval 2-2.8 $\mu\text{S}/\text{cm}$. CMC values of surfactants were determined from the plots of conductivity vs. molar concentration [4, p 3-7; 5, p 24-34; 6, p 1189-1196].

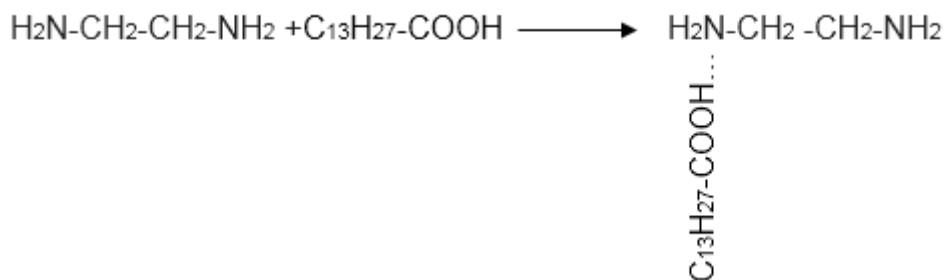
Petrodispersing property of the surfactants was determined according to the known procedure described in [8, p 200]. 40 ml of water are placed in a Petri dish. 1 ml of crude oil (in this work, of "Azeri Light" trade mark) is spread over the water (thickness of the film is ~ 0.17 mm). Then, 0.02 g of the surfactant (or its 5% wt. solution) is added to the film from the sideways. The surface area of the initial oil film and current areas of the formed oil slicks are measured at certain time intervals. The coefficient K_d denoting the degree of the surface cleaning is calculated (in %).

Result and discussion:

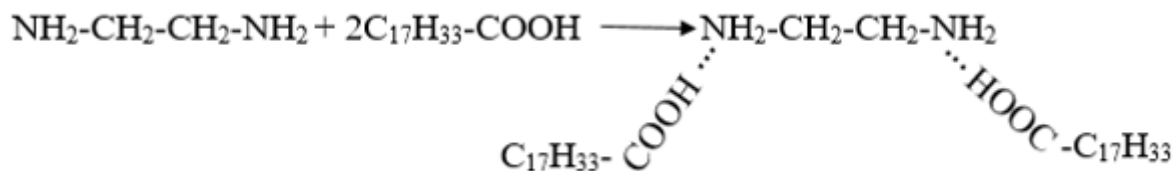
The schemes of the reactions are shown below.



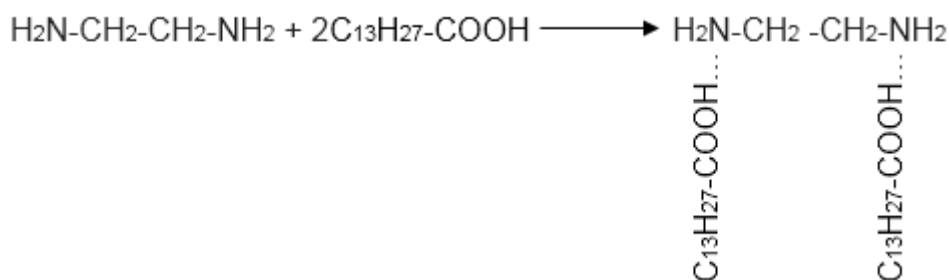
Salt 1



Salt 2



Salt 3



Salt 4

The structure and composition of the synthesized salts were confirmed by IR spectroscopy.

Results of FTIR data. The chemical structure of cis-9-octadecanoic acid and tetradecanoic acid complexes with 1,2 ethane diamine were identified by FT-

IR spectroscopy as showed in Figure 1-4. The FT-IR absorption spectra for 4 salts showed an absorption band at the 1547.4-1551.4 cm⁻¹ region characteristic for δ COO-stretches. This proves formation of the target complexes.

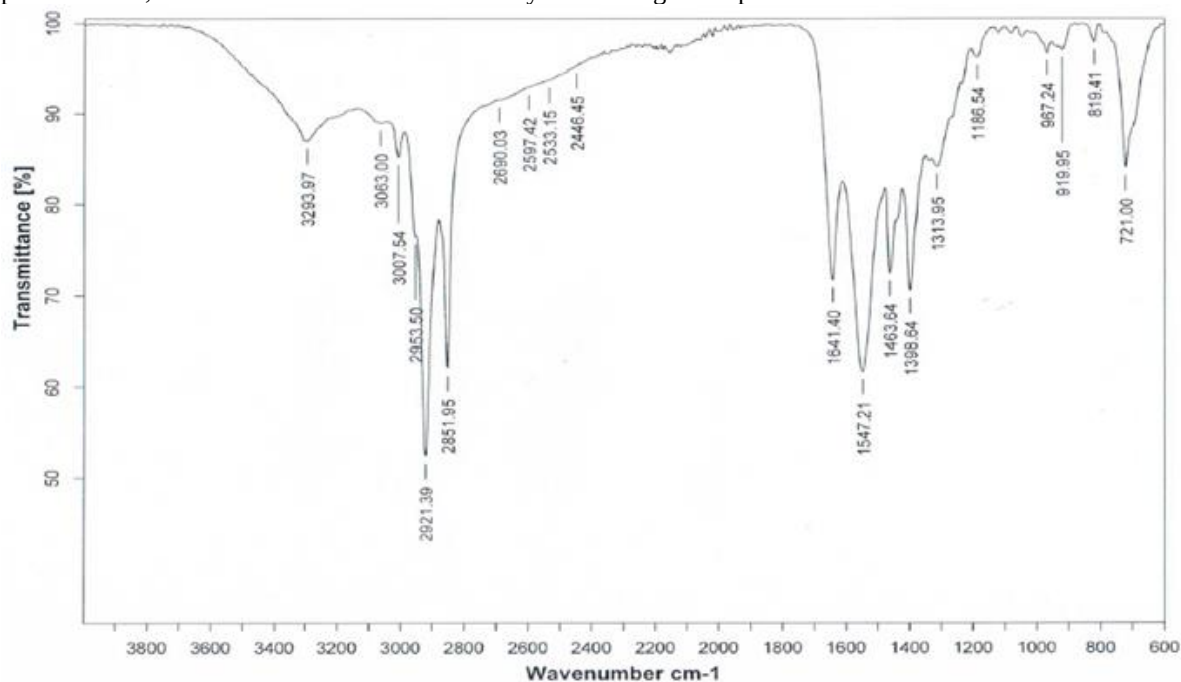


Figure 1. Cis-9-octadecanoic acid and 1,2 ethane diamine 1:1 (Salt 1)

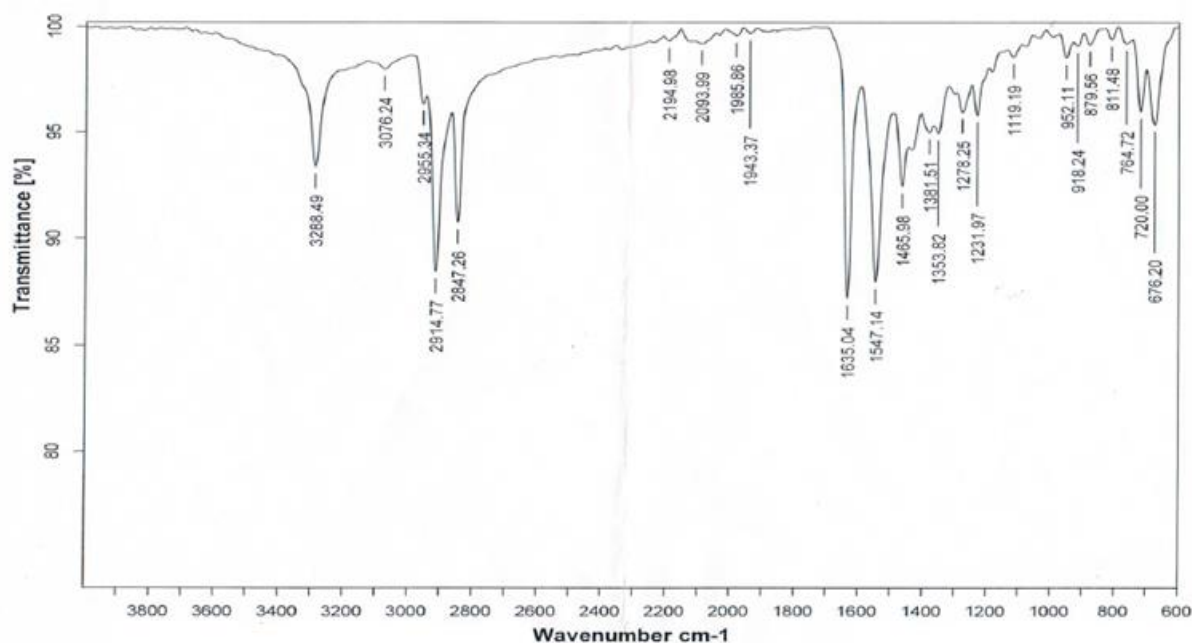


Figure 2. Tetradecanoic acid and 1,2 ethane diamine 1:1 (Salt 2)

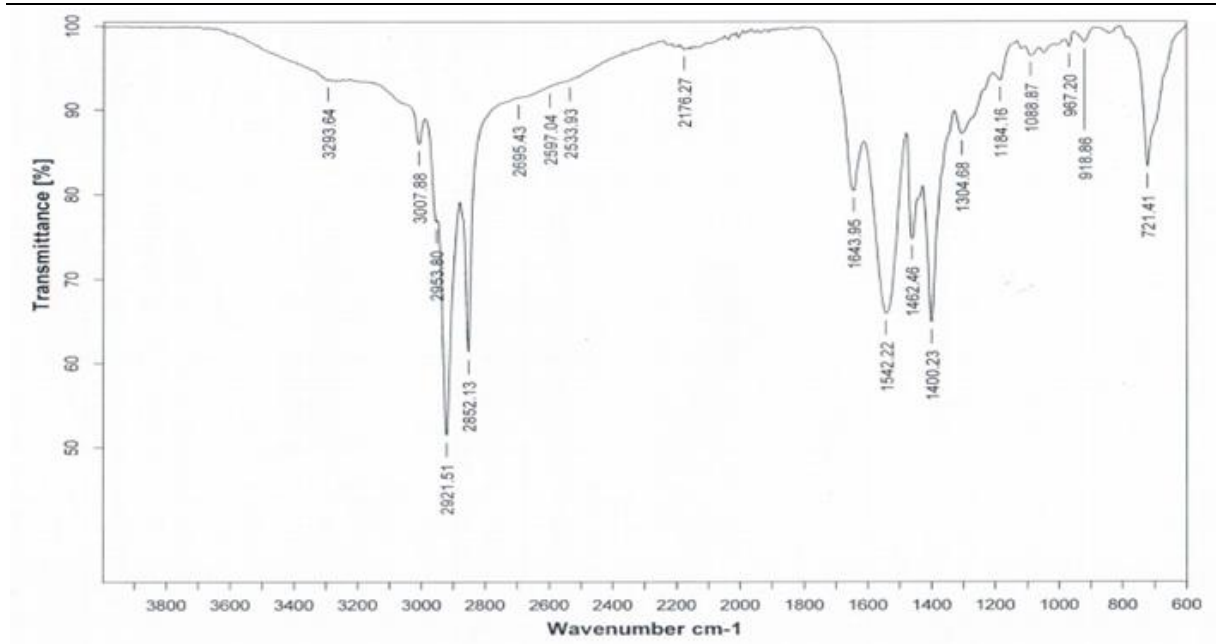


Figure 3. Cis-9-octadecanoic acid and 1,2 ethane diamine 1:2 (Salt 3)

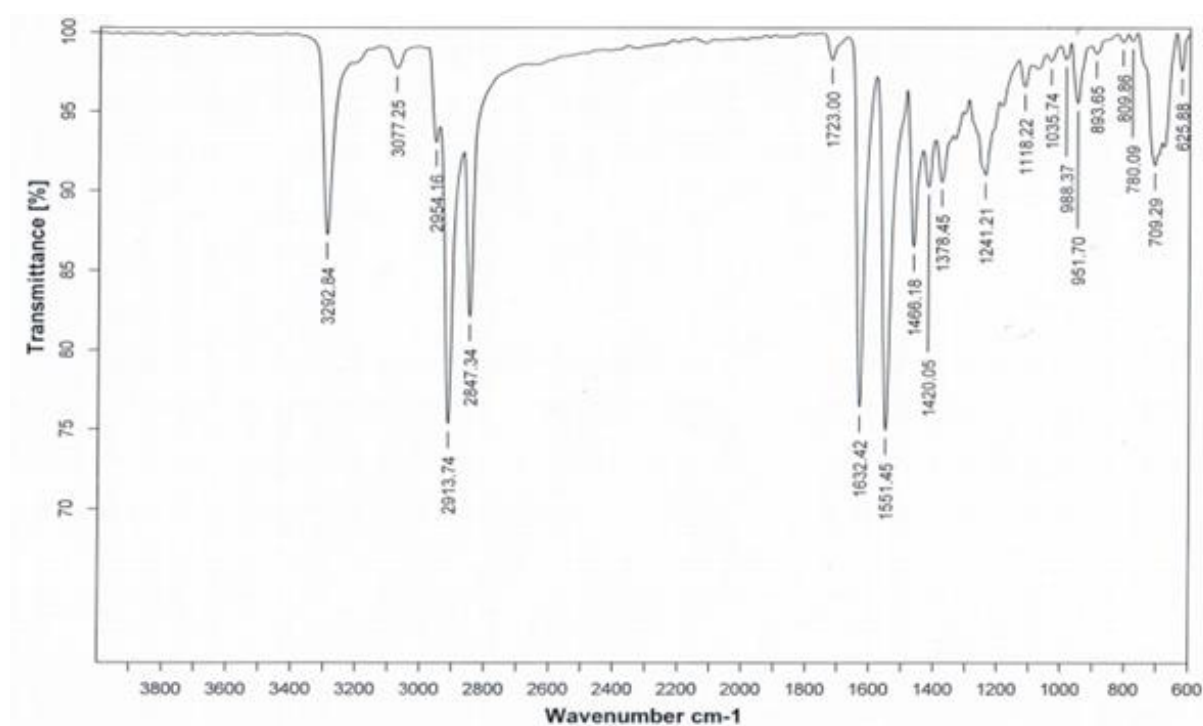


Figure 4. Tetradecanoic acid and 1,2 ethane diamine 1:2 (Salt 4)

In Figure 5-8, UV spectra of the obtained salts were given.

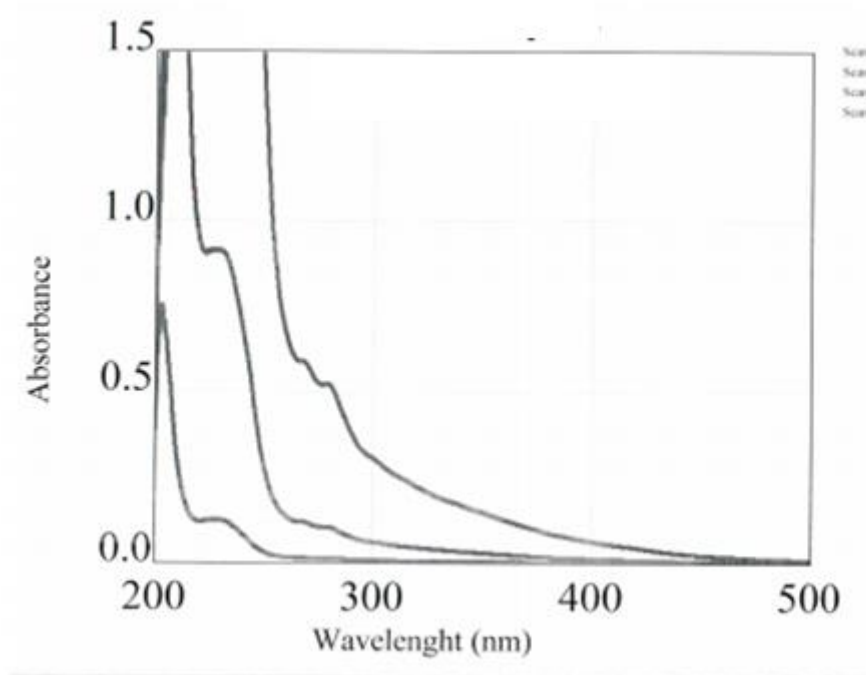


Figure 5. UV spectrum of Salt 1

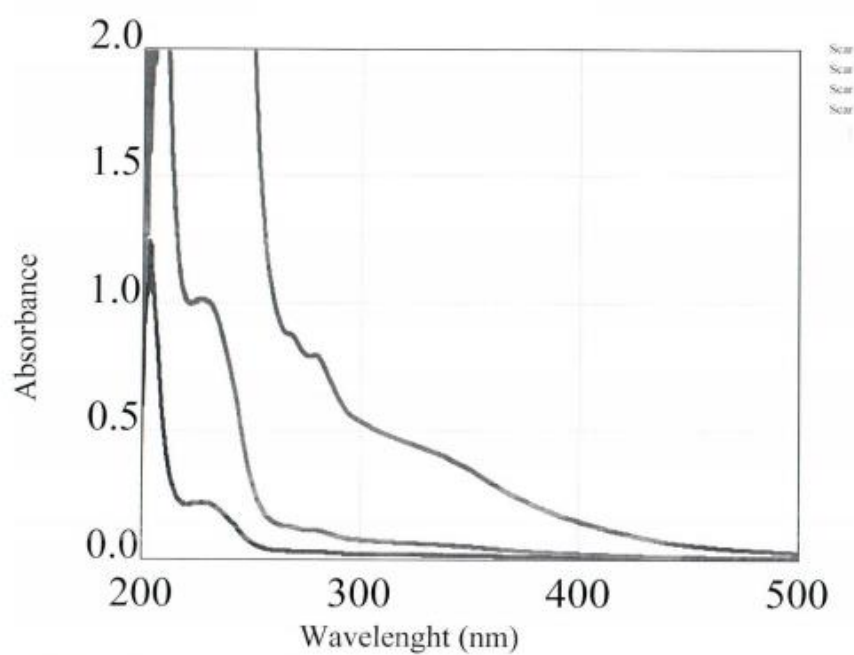


Figure 6. UV spectrum of Salt 2

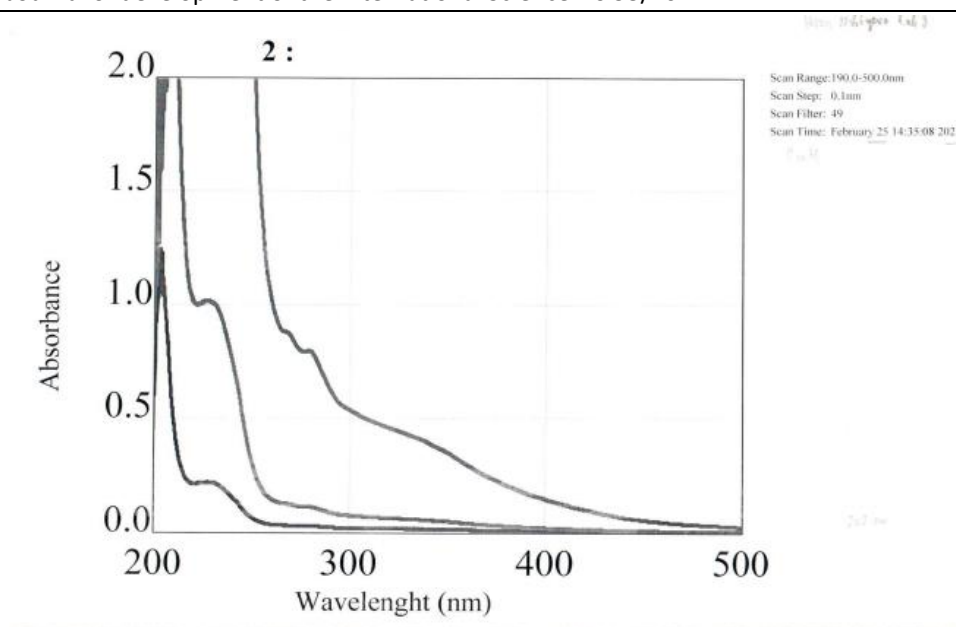


Figure 7. UV spectrum of Salt 3

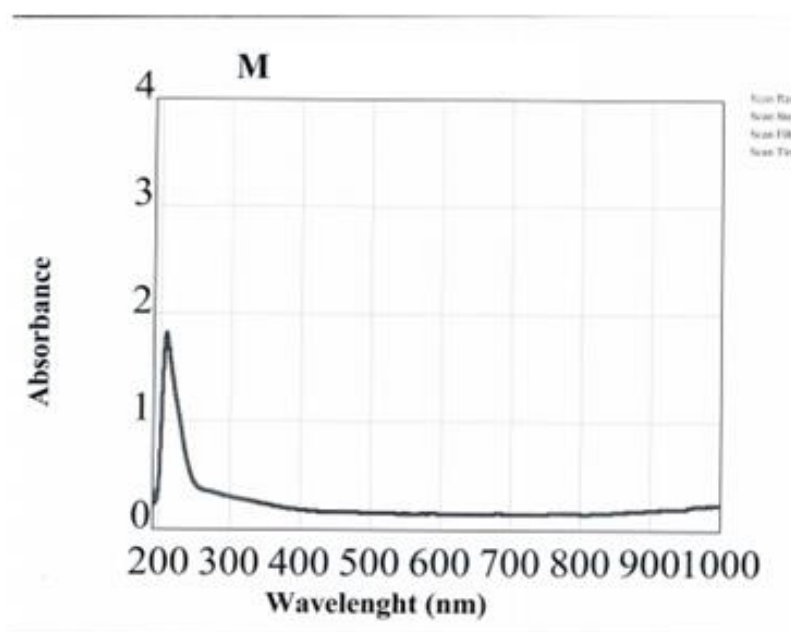


Figure 8. UV spectrum of Salt 4

The melting points of Salt 1 and Salt 2 are 57°C and 75°C, while it is 52°C, and 67°C for Salt 3 and Salt 4. As is seen from the melting point of the final products we can conclude that because of the double bond in the second salt it has lower melting point. Increasing the amount of acid even enhances the decreasing melting point.

The surface activity parameters were measured using Tensiometer in air-water border. The surface tension of the obtained salts depending on different concentrations have been measured and from the graph in Fig. 9, CMC (critical micella concentration) which the point where the change in the surface tension is negligible. Using the data obtained from Fig. 9, surface activity parameters of the synthesized surfactants were determined and shown in Table 1. CMC of the obtained salts were determined, besides

that, γ_{CMC} , surface pressure (π_{CMC}), C_{20} (the concentration for decrement of γ by 20 mN/m), adsorption efficiency ($pC_{20} = -\log C_{20}$), as well as CMC/ C_{20} (interfacial activity) parameters of obtained surfactants were determined. Maximum surface excess concentration (Γ_{max}) and minimum area of one surfactant molecule at water-air border (A_{min}) were calculated using the given equations.

$$\Gamma_{max} = \frac{1}{n * R * T} * \lim_{c \rightarrow CMC} \frac{dy}{d \ln c}$$

where n is the number of dissociated ions which is 2 and 3 respectively for Salt 1 and Salt 2, R is universal gas constant (8.314 J/mol*K) and T is absolute temperature;

$$A_{min} = \frac{1}{N_A * \Gamma_{max}}$$

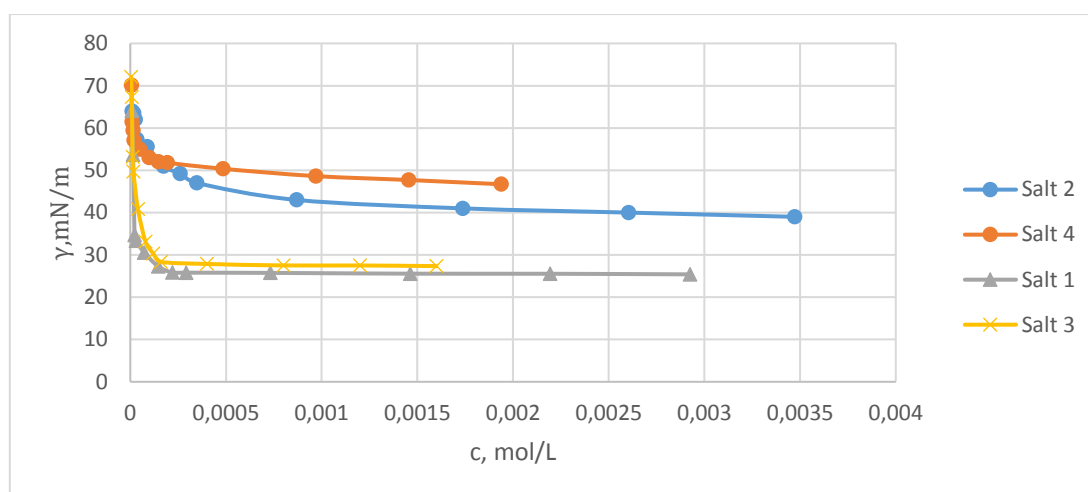


Figure 9. Surface tension at water-air interface versus concentration of the obtained salts

Table 1

Surface activity parameters of the synthesized surfactants

Surfactant	CMC*10 ⁴ (mol/L)	γ_{CMC} (mN,m)	π_{CMC} (mN,m)	C_{20} *10 ⁴ (mol/L)	pC_{20}	CMC/ C_{20}	Γ_{max} *10 ¹⁰ (mol/cm ²)	A_{min} *10 ² (nm ²)
Salt 1	2.19	25.84	46.54	1.09	4.96	20.04	2.1	47.6
Salt 2	3.47	47	24	0.0002	3.76	2	0.95	175.32
Salt 3	1.60	28.37	44.01	1.96	4.70	8.18	1.65	60.6
Salt 4	1.45	52	19	0.0003	3.46	0.42	0.73	227.48

As it seems from the table above the salts obtained using cis-9-octadecanoic acid are more surface active than the surfactants synthesized from tetradecanoic acid. From the above table we can see that minimum CCM value and maximum area for one molecule on surfactant is observed in Salt 4. In more detailed, the best surface activity is observed in the salt 1, which is the product of the reaction between cis-9-octadecanoic acid and 1,2-Diaminoethaneat equimolar ratio.

Electroconductivity values of the different concentrated solution of the synthesized salts have been measured and the graph of the conductivity versus concentration has been plotted in Figure 10. Considering the plots some thermodynamic parameters of the electroconductivity have been calculated and given in Table 2.

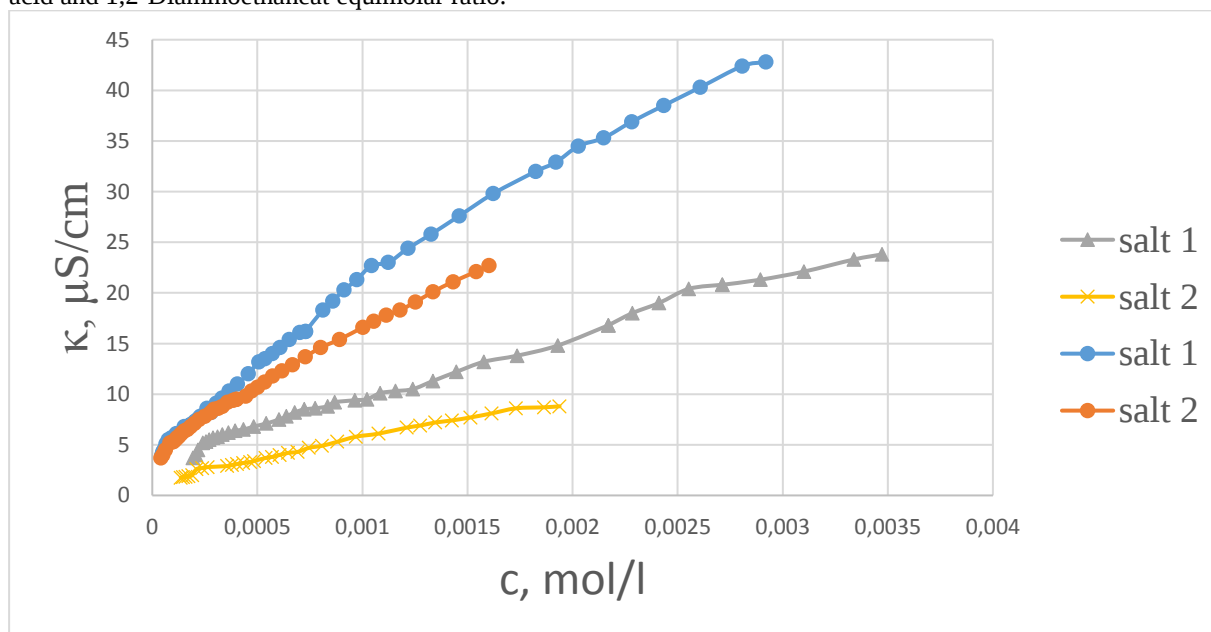


Figure 10. Electroconductivity of the synthesized salts.

Table 2

Electroconductivity parameteres

Surfactant	α	B	ΔG_{mic} , kJ/mol	ΔG_{ad} , kJ/mol
Salt 1	0.72	0.28	-26.72	-28.05
Salt 2	0.37	0.63	-31.6	-34.13
Salt 3	0.51	0.49	-32.25	-33.87
Salt 4	0.89	0.11	-23.99	-26.59

As for both salts Gibbs free energy of micellization (ΔG_{mic}) and Gibbs free energy of adsorption (ΔG_{ad}) is negative, both micelle formation and adsorption of surfactants in air-water border is spontaneous. In each case (ΔG_{ad}) is more negative than (ΔG_{mic}) and it is explained as the preference of adsorption of surfactants than micelle formation. Referring to datas given in the Table 3 we can note that the micelle formation for all salts is less spontaneous than adsorption of surfactants.

One of the most important properties for surfactants are petrodispersing or petrocollecting characteristics depending on chemical composition of them.

The petrodispersing property of the salts was examined applying the salts in solid state, 5% wt. aqueous solution and 5% wt. ethanolic solution on the film of "Azeri Light" Crude Oil on the surface of waters with different salinity which are Caspian Sea water, tap water and distilled water. Firstly, 40 ml of water in different salinity is added to Petri dishes, crude oil with 1 mm thickness is added on the water surface. After 30-60 minutes, water is treated with different solution with 0,02 g. K and Kd coefficients are calculated. K is a petrocollecting coefficient and it is the decrease of the oil surface, while Kd is a petrodispersing coefficient and meaning is the percentage of clean water surface to compared to maximum clean water surface.

Table 3

The results of study of petrocollecting and petrodispersing property of the synthesized salts

Ratio	State of surfac- tant	Sea water		Tap water		Distilled water	
		K _d	Duration- τ, hours	K _d	Dura- tion- τ, hours	K _d	Dura- tion- τ, hours
Cis-9-octadecanoic: 1,2-Diaminoethane 1:1	5 wt. % aque- ous solution	95%	0-27	86%	0-27	9,6	0-2
		98,5%	27-51	95%	27-123	86%	2-3
		spilling		spilling		90%	3-27
						94,8	27-123
	spilling						
	5 wt. % etha- nolic solution	95%	0-27	87%	0-27	12.82	0-2
		98,5%	27-51	95,71%	27-123	95%	2-27
		drying		drying 86%		97,14%	27-123
						Spilling	
	Solid	93%	0-2	93%	0-2	90%	0-2
		95%	2-27	95%	2-27	95%	2-27
		97,14	27-123	97,14	27-123	94,28%	27-123
spilling		spilling		Spilling			
Tetradecanoic: 1,2-Dia- minoethane 1:1	5 wt. % aque- ous solution	6,4	0-1	8,54	0-1	21,37	0-144
		8	1-2	10,12	1-144	Drying	
		9	2-144	drying			
		drying					
	5 wt. % etha- nolic solution	25,64	0-144	25,6	0-144	29,59	0-144
		drying		drying		Drying	
	Solid	10,99	0-144	19,2	0-144	10,1	0-144
		spilling		spilling		Spilling	
Cis-9-octadecanoic :1,2-Diaminoethane 2:1	5 wt. % aque- ous solution	95%	0-50	88%	0-2	88%	0-2
		86%	50-74	93%	2-50	92%	2-178
		84%	74-178	90%	50-74	Spilling	
		spilling		84%	74-178		
				spilling			
	5 wt. % etha- nolic solution Solid	95%	0-50	88%	0-2	6,6	0-2
		87%	50-178	93%	2-50	93	2-178
		spilling		86%	50-74	spilling	
				40%	74-178		
				spilling			

	Solid	95	0-2	93	0-2	88	0-2
		93	2-50	95	2-50	95	2-178
		90	50-74	84	50-74	spilling	
		88	74-178	60	74-178		
		spilling		spilling			
Tetradecanoic: 1,2-Diaminoethane 2:1	5 wt. % aqueous solution	1	0-1	1	0-1	1	0-1
		1,36	1-4	1,36	1-4	1,96	1-28
		2,77	4-28	3	4-28	3	28-52
		34	28-76	34	28-76	7,24	52-76
		10,99	76-100	19	76-100	19	76-100
		spilling		drying 7,63		drying 19	
	5 wt. % ethanolic solution	90%	0-4	21,37	0-1	25,64	0-28
		10,99	4-28	21	1-28	34	28-52
		13,77	28-52	34	28-76	19	52-76
		13	52-76	19	76-100	15	76-100
		10,99	76-100	drying 85%		drying 15	
		spilling					
	Solid	1	0-1	1	0-1	1	0-1
		3	1-4	1,36	1-4	1,36	1-4
		12,25	4-28	3,78	4-28	2,77	4-28
		9,6	28-100	12,25	28-100	8,5	28-52
		spilling		drying 5,54		15	52-100
						drying 15	

As it seems from the table above products obtained from tetradecanoic acid shows petrocollecting while is petrodispersing for the salts synthesized from cis-9-octadecanoic acid. This can be explained by differences in Gibbs free energy of micellization (ΔG_{mic}) and Gibbs free energy of adsorption (ΔG_{ad}).

By examining the values in the Table 1 we can conclude that the Salt 1 exhibits the best petrocollecting property in sea water when treating with aqueous and ethanolic solution, while the Salt 2 shows its best property in distilled water treating with aqueous and ethanolic dispersion. Similar to the Salt 1, Salt 3 also shows good property in sea water but treated with ethanolic solution and solid form. Finally, Salt 4 gives very good results both in sea water and tap water treating with aqueous solutions. When we compare the Salt 2 and Salt 3 it is obvious that Salt 3 is better petrocollector than Salt 1. How it is for cis-9-octadecanoic acid? As it seems there is no striking differences between Salt 1 and Salt 4. Both give higher Kd coefficients. As the main aim of using surfactants in petroleum industry is cleaning the water surface from oil spills in sea water, we can recommend the Salt 2 as a good petrocollector and Salt 3 and Salt 4 as a good petrodispersant for cleaning water surface from petroleum slicks.

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CULTURAL SCIENCES

STUDY ON EDUCATION AND INHERITANCE OF RED MUSIC CULTURE AMONG CONTEMPORARY CHINESE TEENAGERS IN THE CONTEXT OF GLOBALIZATION

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Abstract

Focusing on the dissemination of red music culture under the globalization background, this paper discusses the educational significance of red music from many aspects based on the current political and economic situation. Additionally, relevant teaching strategies and communication strategies are put forward centering on the inheritance of red music culture among Chinese teenagers.

Keywords: Globalization; Red music culture; Education; Inheritance

Introduction

Globalization is a natural outcome of the development of human society. It is a process of integration and competition among ethnic groups in different fields such as economy, trade, politics, ideology, culture and art. So far, this phenomenon has penetrated into every aspect of our social life. From China's perspective, a major historical point in the process of globalization can be traced back to the Opium War in 1840. As China was defeated in the Opium War, it was forced to open up the door. Unfortunately, under the decadent ruling environment of the Qing government at that time, the country's land and assets were gradually forced to be shared by the domineering western countries. As a result, China became a semi-colonial and semi-feudal society. From the colonial history of the western countries such as Britain and the United States, the form of globalization features the expansion and hegemony of the western and other capitalist countries. Until now, the global environment seems to be equal and civilized, but the concept of globalization dominated by the interests of western developed countries has always survived. Such "Western Globalism" has eroded the interests of many developing countries. By considering such inequality problem existing in the globalization, Han Yuan said, "the international competition in the era of globalization has gone far beyond the traditional competition of military power, but the competition of comprehensive national strength. However, culture is essential to the composition of comprehensive national power because of its crucial strategic position[5,P2]." Culture (including art) is not only a spiritual force of a nation, but also an important strategic factor to export national values and enhance national influence. For example, western developed countries made use of the "Universal Value" centered on capitalism to deliver a wide range of economic effects. It can be seen that the unique "Soft Power" of cultural products is immeasurable.

The globalization is controversial as it has brought national security threats to a certain extent while expanding human horizons. The "Threat" here does not only mean the threat of foreign military forces, but also the control and influence of foreign information on people's values in the era when the world is connected by information technology. Historically, it has been the

unity of the Chinese nation that enabled China to overcome difficulties and obstacles. It has proven that culture enables social integration and serves as a foundation for national unity and social order. From the perspective of nationality, culture education are also the basis for the stability of the political and economic situation within a country, and convey the ideology under the political system. Furthermore, national cohesion promotes well-organized and unified movement at the critical moment. To sum up, it is very important to master the ideology.

Red music vividly reflects the red spirit. It is a culture and art that best represents the Communist values of China. Teaching students red music can achieve both artistic aesthetic education and ideological and political education. As teenagers are the focus of Chinese education and the main force to create the nation's future, it is a timely measure to spread the spirit of red music culture to them at the critical moment of realizing the great rejuvenation of the Chinese nation.

By leveraging the power of red music culture, we can fight against the "Value Hegemony" of developed countries led by the United States, further enhance our discourse power in the international community, improve the negative impact on China caused by the biased rendering and reporting of western media. Only in this way, can a more equal and objective globalization pattern will be established. In addition, red music culture can be embodied in the quality education for our teenagers, making them always believe the advanced political ideology and value proposition of the Communist Party of China, and safeguard national security. Only by realizing above two aspects, the significance of red music culture can be realized globally.

When China is struggling to find its place in a foggy future, the birth of the Communist Party of China has brought light and hope to the Chinese nation, as well as a red music culture with historical memories and the Party's ideological and political propositions. Born at the moment when China was in peril, red music has followed every stage of China's development since modern times. Beyond a great ode to the Chinese nation, it is also a lasting art and spiritual food for the people. The world where globalization is advocated from multiple dimensions has considered culture and art an

indispensable topic. In the current of cultural globalization, various arts contend for attention, broadening the vision and aesthetic orientation of people worldwide. Under the time of opportunities, the education and inheritance of Chinese red music should take the ride by centering the concept of globalization, depending on the trend of national politics and economy, to develop red music education in the new era.

I. The Educational Significance of Red Music Culture

(I) Pass on National Spirit

Red music culture is of profound historical significance as it contains the historical ups and downs of the Chinese nation in the past century, and has led several generations of Chinese people to forge ahead and overcome difficulties. It carries the belief of the unity and hard work of the Chinese nation. As the epitome of historical events, it is one of the main cultural products that spread the red spirit in different times and stages. In the early days when the Communist Party of China was established, red music spread among the broad masses of the people with its strong rendering power, thus awakening our whole nation. During the Long March of the Red Army, its spread maintained the unity of the army and the people. In the War of Resistance against Japan, red music inspired the whole nation to struggle indomitable and fight for survival from desperation. During the socialist construction period after the founding of New China, it encouraged the Chinese people to perform active production for economic development. On the journey to modernization of socialism with Chinese characteristics, it highlights the socialist core values and eulogizes the bright outlook for the new era as it always does. Undoubtedly, red music culture is indispensable for China's national revitalization.

The globalization of culture and art can unify universality and particularity. As cultures worldwide are seeking integration and innovation in conflicts, neutral culture and art is inevitable in the process of globalization. However, if a culture and art is out of balance between its nationality and cosmopolitanity, it will gradually lose its national individuality. As Kodai, a famous Hungarian music educator, said, "the purpose of music education is to carry forward and inherit the music cultural tradition of our nation". He believes that the best solution to promote patriotism and culture is to spread music education. Yunde said: "among the contemporary contents of culture, those reflecting the direction of historical progress and showing the vitality of national life form the national spirit, while such national spiritual culture that shows this particular era is expected to become a milestone of the current national culture[3,P7]." The eternal truth pursued by a nation is behind the national culture. The demise of national culture leads to the demise of national spirit and the mediocrity of human thought, culture and aesthetics.

In this industrialization and globalization-based era, the country's economic level has leapt to a new stage in just a few decades. With a good national development trend, people's attention has gradually focused on the material economy and entertainment, resulting in the lack of spiritual belief. However, national belief is the centripetal force and pillar of a nation, and the

hope and motive force for a nation to trace back its history and look forward to the future. A nation without faith is a tall but crumbling building without a good foundation. All thanks to the strong unity, spirit and faith of the whole nation for a hundred years, the Communist Party of China has led the whole country to go to rise out of hard time and greatly develop the country's comprehensive strength. The red spirit as the soul of the Communist Party can help to unify the whole nation as the core force. Therefore, to realize the great rejuvenation of the Chinese nation, we should attach great attention to educating adolescents who are lack of national faith so that they can carry forward the spirit of patriotism.

(II) Deliver aesthetic education

Aesthetic education (AE) is also known as a way to develop learners' sense of beauty. In China, AE is developed to serve for building students' socialist spiritual civilization and cultivating their beauty of mind and behavior. With AE, we can cultivate teenagers' good character and moral sentiment, and enlighten them with truth, goodness and beauty[8, P61].

Aesthetic experience is a process where we can re-create our imagination. By experience and feeling of the artistic image, audiences can form a subjective understanding in their minds. While red music is used for aesthetic education, teenagers can individually feel the emotion and story under specific historical background. This mode can drive their feeling and imagination in a better way than the oral teaching and indoctrination. As a result, the connotation of the artistic image can be more intuitive and rooted in their minds. Taking the most classic musical work Embroidered Red Flag (Xiu Hong Qi) collected in the opera Sister Jiang (Jiang Jie) as an example, this song is created based on Jiang Zhuyun's deeds of refusing to betray the Party and making glorious sacrifices when she was tortured by the Kuomintang. It describes the scene of Jiang Zhuyun and others embroidering red flags in prison to express their joy after being informed the good news of the founding of the People's Republic of China, and reflects Jiang Zhuyun's deep and firm revolutionary feelings. When learners are experiencing this song aesthetically, they feel the patriotic feeling of revolutionary martyrs represented by Jiang Zhuyun as this work has shaped the artistic image of Jiang Zhuyun martyr to move audiences with feeling in artistic works.

Because of its strong revolutionary color, red music education is easy to be regarded as a means to serve politics in a centralization and utilitarianism way. In this case, the aesthetic education function of red music itself, which is based on cultivating tough will and noble moral character, is ignored. However, red music for aesthetic education can enable teenagers to inherit the fine quality of the Chinese nation, form a correct cultural attitude in the culture and information-based globalization, and cultivate their spiritual outlook of noble righteousness and national spirit in the new era.

Cai Yuanpei, a famous educator in China, once put forward "On Replacing Religion with Aesthetic Education". To a certain extent, religion can influence the form and content of art and serve the purpose of ideo-

logical education. However, the development of science allows us to know the world clearly, and science has become the main basis for interpreting various phenomena in the world, thus lessening the influence of religion on human beings gradually. Indeed, foreign religions have exerted influence on China, but China does not take religion as its ideological center as always. This is because the Chinese nation has been developed with prosperous philosophy and artistic aesthetics since ancient times. For example, the great educator Confucius deeply influenced the national charm with Confucianism for thousands of years. Such continuous cultural heritage has created the spiritual integrity of the Chinese nation. Clearly, it is an incorrect stereotype in the West that China is a nation without faith. The author believes that the aesthetic education based on the Chinese nation is a good way to cultivate students' temperament and noble quality, to allow them to carry unique charm of the Chinese nation. This is also the mission of red music education.

Schiller, the great German philosopher, believed that the core idea of aesthetic education was "to establish complete human nature"[9,P109]. If aesthetic education works to only pursue aesthetics in the perceptual sense without considering the development law of the world or to only pursue aesthetics in the rational sense for meeting the needs of the world, it will lead to separated and broken personality. In this case, it will be hard to build a society in a harmonious and orderly state. According to Schiller's aesthetic education thought, real education should seek balance and unity in the contradiction between "Rational Needs" and "Perceptual Needs". Such education can maintain social stability, promote the development of economy and science and technology, while it can cultivate students' good quality, and transfer the humanistic spirit. Red music education can drive the development in the sense of sensibility and rationality as it contains the humanistic spirit of pursuing truth, goodness and beauty and has the political significance of promoting the development of socialism with Chinese characteristics. Therefore, the aesthetic education of red music culture is the important factor to construct our harmonious society.

Today, the development of national economy has brought the lag of national cultural industry, and worldwide digitalization and information technology have made the cultural ecosphere more complex and diverse, where cultural schools with different values and political ideas interact with each other. This, to some extent, has an impact on the ideas of teenagers. As the great Chinese nation has always been valuing collective interests. On the contrary, the western "Individualism" and "Liberalism" brought by information globalization have run wildly in the youth group, which has contributed to forming bad values such as egoism. The belief of Chinese nation focuses on the national unity with the feelings of family and country as the core, which is based on the profound historical background of China. In the era of deepening cultural globalization, China should strengthen the aesthetic education of red music culture to guide primary and middle school students

from the ideological aspect and rebuild their faith, improve their aesthetic interest and establish a correct outlook on life.

II. Study on the Inheritance of Red Music Culture (I) Communication Strategies

The inheritance of red music culture is the theme of literature and art in this Times. Beyond teaching red music culture in schools and units, the communication in all aspects of society is also indispensable. To spread red music culture in the society with suitable means can create a good learning setting for teenagers and stimulate their motivation to explore red music culture.

1. Communication Concepts

In terms of the traditional strategies and communication concepts of red music culture, mostly communication is a form of transmitting cultural and artistic content to the audience by "Disseminators". Such dumping-based transmission, which depends on the top-down of official institutions, is rigid without understanding the audience. It is formalism and dogmatism. As early as 2000, many local authorities have performed activities and measures to promote red culture. Clearly, such movement only shows limited effect; especially teenagers still have vague understanding of the concept of red music culture.

Functional communication strategies should be two-way, interactive, and built on respect for the audience, instead of following a arrogant and self-satisfied communication logic. Only when both sides are in an equal position can cultural transmission be truly accepted. Therefore, in terms of the communication strategies, it is necessary to observe the ideological dynamics and life of the young people, and acts appropriately to the situation, so as to get desired results.

The traditional communication mode with the official as the main body, such as relevant education policies issued by the government, reports released by the official media, and activities held by schools, has limited acceptance degree and communication scope of the masses, which easily makes the audience feel distant. However, to maximize the communication effect of red music culture in the youth group, we should never stick to the form. Naturally, the concept of "Pan-media" comes in. "Pan-media" means that in addition to using traditional mainstream media such as television, radio and newspaper, we should mobilize emerging new media platforms as carriers for communication, and establish diversified communication channels in the era of multiple communication, and build a more modern cultural ecosystem.

2. Red Music Culture and New media Communication

Nowadays, at the new stage of network technology developed, what people want is to access to information in a more real-time, convenient and intuitive way. The traditional media in spreading culture has limited efficiency, where people need to obtain the required content in a specific period and on a specific media carrier, further affecting the universality of communication. As the rise of media industry brings out a wave of related industries in China, various cultural information can be displayed and exported on broader and richer platforms.

New media has younger audience, low cost and wide dissemination, good dissemination effect and strong rendering power. Bilibili, for example, is mainly aimed at teenagers aged between 14 and 25. Based on 2021 data analysis, its average monthly active users reached 267.2 million, up 35% and 36% from the same period in 2020, respectively. Therefore, culture spread via new media platforms can be seen by teenagers in a targeted way, which is also the most acceptable communication method for teenagers.

Growing up in an era of rich material life and widespread education, teenagers have a more tolerant and open mind and hold a more respectful attitude towards different cultures and groups, as well as a curious, courageous personality. They are the mainstream who makes comments and exchanges opinions on new media platforms, and they can adapt to the setting of traffic and data well.

New media delivers such a strong traffic effect as "Short Term" and "High Frequency". In the rational use of new platforms, we should also identify the taste and interest of young group. When promoting red music culture, we should keep its original artistic characteristics while integrating the current popular elements. Only in this way can we detonate the topic and traffic among the youth group.

For instance, "Zide Guqin Studio" is a we-media to spread traditional Chinese classical instruments, culture and music. The planned video content allows people have excellent aesthetic experience in terms of viewing and music. Its planning team works to promote traditional Chinese musical instrument culture in a way that young people like by combining traditional music culture with modern music culture as well as western music. They use classical instruments to compose and play music that young people are familiar with, and popularize the original mysterious Chinese classical instruments. Their works published on Chinese platforms such as "Bilibili", "Douyin" and "Weibo", as well as foreign platforms such as "Youtube" have attracted plenty of young people at home and abroad, igniting their love for Chinese classical instruments. Statistically, the number of streams has exceeded 200 million in 2021.

In terms of the concept of "Popularizing" national traditional culture mentioned here, the author believes that such popularization within a reasonable range can better get close to the target audience. As red music culture industry lags behind, we should actively innovate and design it on the principle of respecting national culture to popularize it instead of holding a haughty and old-fashioned attitude. After all, taking red music only as "National Cultural Heritage" can not achieve good dissemination effect.

Logically, red music culture should be spread by using new technologies in this era. Aiming at teenagers, we should create innovative and excellent content to attract them to seek and develop red music culture and spirit in the new generation.

(II) Instructional Strategy

As schools are the most direct source for young people to access to knowledge, the basic measure to inherit red music culture is to develop education and aesthetic activities in schools. The social communication

enables the young people's learning power, which is a potential mode to cultivate their interest and aesthetic accomplishment. School teaching, as the core component of red music education, allows teachers to systematically and professionally impart red music culture. Real cultural inheritance is more than the appreciation of works and arts. Ultimately, inheritors should further explore the historical source and theoretical knowledge in culture and art. Otherwise, all of that is armchair, deviating from the purpose of "Cultural Inheritance". Schools, as serious teaching institutions, can organize aesthetic education activities to change teenagers' role as a participator from a bystander for the purpose of inheriting red music culture. In this regard, the author proposes relevant strategies for the teaching of red music.

In most cases, choral singing of red music is adopted as a teaching activity in schools. Such effort indeed leads teenagers to deepen their cognition of red music to a certain extent, but boring and inanimate. However, at an energetic and athletic age, teenagers have active brains biologically. The interestingness of education is the key to stimulating learning motivation. Therefore, the research by schools should focus on driving teenagers' love for red music and delivering them profound aesthetic experience.

Tao Xingzhi, an Chinese educator and thinker, once put forward that "We should free children's minds, hands, feet, space and time, so that they can fully enjoy a free life and get real education from life". In terms of cultural and art education, we should emancipate the body and brain of learners to allow them to integrate their soul and nature with teaching activities. In the field of music education, the famous three music teaching methods (Orff's method, Kodaly's method and Dalcroze's method) are widely used. These methods fully mobilize the sensory experience of learners so that they can truly participate in music, to inspire their souls and improve their artistic perception ability. The author holds the opinion that we can follow some excellent music education methods to teach red music to improve the teaching effect, deepen learners' understanding of music works and improve their knowledge and skills in music.

The knowledge and skills of music is complement to the cultural education of red music. On one hand, the combination of cultural education of red music and functional teaching methods can enhance young people's music knowledge and skills, which enables them to understand connotation in red music from writing level. For example, the teaching content of game methods in red music education, such as the strength training of Orff's teaching method and the body rhythm of Dalcroze, can help students to master the rhythm and stress of music, and feel the red spirit and emotion in the melody. Colvin gesture training, solfeggio training and singing training in Kodaly teaching method can improve students' sound sensation, intonation and singing ability. In this way, they can sing red music works relatively accurate and acquire cultural and music skills education.

The classroom teaching form should be flexible to avoid copying the teaching method from books without

consideration. To do so, educators should actively innovate and collect the opinions of students to satisfy their learning needs with suitable measures and constantly obtain inspiration in practice to make a progress.

In addition to improving the interest of the classroom, normative and systematic standards for the course of red music should also be developed, such as special red music textbooks for teenagers. These books should be designed with text and pictures, where the content should be matched with red music works consistent with the theoretical knowledge of music based on the progressive education principle. These books can guide the students to appreciate and learn red music, and gradually master the theoretical knowledge of music. Therefore, it satisfies practicing the curriculum standards of music education and transmitting the spirit of red music culture.

Red music culture is an integrated culture and art. After teenagers have laid a basic foundation of red music culture, teachers can organize them to create stage plays and musicals of red culture. This can empower them to exert their imagination in activities and leads them to enter the artistic world of red music culture actively.

For the purpose of inheriting red music culture, we should spread it in the social scope to reach teenagers and teach them in schools, so as to build an ecological circle of red music culture in an all-round way. The combined efforts can enhance the influence of red music culture in the youth group, deeply implanting the red spirit into their souls.

Conclusion

On the basis of the background of globalization and the theme of education and inheritance of red music culture, this paper explains the educational significance of red music, and gives relevant strategies for the inheritance of red music with considering the development status of The Times. As red music is of historical and educational significance, it is an important way for teenagers to review historic culture and inherit our national spirit. However, red music as a traditional culture

is very easy to be ignored by them in this ever-changing world. Therefore, under the background of economic and cultural globalization, we should enhance our consciousness on cultural security, attach great importance to the education of red music culture, and the ideology and national aesthetic education for young group, so that they can inherit the glorious belief in red music culture, and promote the great rejuvenation of Chinese nation in future.

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MEDICAL SCIENCES

THE INFLUENCE OF COMPLEX THERAPY ON PARAMETERS QUALITY OF LIFE AND DYSFUNCTIONS CARDIORESPIRATORY SYSTEM IN PATIENTS WITH BRONCHIAL ASTHMA

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Abstract

To study the dysfunctions of cardiorespiratory system and medical aspects of quality life in patients with remodeling the right ventricle of hearts at patients with bronchial asthma. The more severe disadaptation of the disorders of cardiorespiratory system in bronchial asthma. The significant increase in the functional state of the lungs, increase of blood oxygen saturation and increase of physical tolerance in the patients with bronchial asthma who took complex therapy resulted in improved clinical parameters and quality of life. As a result of research Infringements of cardiorespiratory system and QL are negatively correlate PAPav condition and remodeling of the right ventricle of hearts.

Keywords: quality of life, of physical tolerance in the patients, clinical parameters, bronchial asthma, cardiorespiratory system,

The medicosocial importance of the bronchial asthma (BA) problem steadily grows last years. In the USA with asthma suffers 7,2 % of the population or 20 million Americans, in the countries of the European Community prevalence with asthma makes 2-7 %. In England 50 % of patients can be referred to chronic obstructive illnesses of lung and only 9 % - referred to bronchial asthma [4,6]. Formation of cor pulmonale (CP) is the heaviest complication of lung diseases. Cor pulmonale in many respects predetermines the failure of disease, except for sharp reduction in quality of life (QL). It is substantially caused by, that the bronchial asthma concerns to group psychosomatic diseases, as in its origin mental and somatic factors are closely bound, creating complex relationships of cause and effect [5,7,8]. The reason of growth of prevalence and death rate from BA complicated with cor pulmonale in Uzbekistan is the hypodiagnosis and later revealing. To adjust the early diagnosis, adequate preventive maintenance and treatment CP, it is necessary to specify pathogeny of this disease and the factors resulting and aggravating its current [2,3]. At the same time still there is obscure the mechanism of remodeling development right ventricle (RV) of hearts at patients with cor pulmonale.

With this relationship, the complex estimation of the broad audience parameters of the structurally-functional condition of cardio-respiratory system, represents interest. These parameters determine the functional status and medical aspects of quality of life in patients with cor pulmonale [5].

At BA, special interest represents studying changes at the vegetative and microcirculation link

level of blood circulation at various stages of the illness development, and it is important not only for more full disclosing of the pathogenetic mechanisms of this disease, but also for the development of complex adequate treatment [1]. One of the such methods of therapy at patients with BA, complicated with cor pulmonale and probably inhalationotherapy gliserozini.

The purpose of research. Studying the interrelations of the structurally-functional condition of cardiorespiratory system and medical aspects of quality life in patients with remodeling the right ventricle of hearts at patients with bronchial asthma, complicated cor pulmonale.

Materials and methods. 32 patients with BA, complicated with cor pulmonale and 30 healthy persons (HP) were surveyed. At patients were estimated pulmonale hypertension (PH) without dilatation of right ventricle (DRV) - (the level average of pulmonare arterial pressure (PAPav) more than 25 mm.hg.c.) on dopplerechocardiography (DopplerEchoCG) parameters and with DRV (thickness of forward wall of RV is less than 5 mm, at front-back size RV is more than 2,5 sm).

Patients BA, complicated CP with pulmonale hypertension (1st group) and patients BA, complicated CP with dilatation of right ventricle (2nd group) were surveyed.

Depending on methods of treatment patients were divided into the following 2 groups: 1st group (12 patients) and 2nd group (20 patients) received basic therapy (BT) on (GINA, 2006 y.) and inhalationotherapy (IT) with gliserozini.

Besides specific methods of treatment, all patients received the following general medical complex: respiratory gymnastics, hydroaeroionization with iods, medical (expectorating) herbal tea drinks, circular shower, massage of a thorax, a session of psychotherapy.

Researching the patients were carried out at the arrival day and after 10 procedures.

Studying the quality of life parameters of BA patients complicated with cor pulmonale was carried out on specialized Seattle questionnaire and estimated by marking system. Seattle questionnaire allows to estimate the level of a physical, emotional condition, professional suitability and satisfaction treatment at the patients.

1. Parameters of physical condition (FC) were estimated on 18 questions which allow to estimate physical activity and to characterize appearing the decrease degree in a physical condition. 2. Parameters of emotional condition (EC) of the patient were estimated on 5 questions which defined the degree of internal surviving and emotional loading of patients at falling ill. 3. Parameters of QL in professional suitability (PS) were estimated on 4 questions which allowed to estimate reactions of patients to extreme conditions for them, short wind and the complicated breath. 4. Parameters QL of satisfaction were estimated by treatment (ET) on 2 questions, reflecting an estimation of mutual relations of the doctor and the patient from a position of training programs.

According to the recommendations of American echocardiographers society (on Hatle and Angelson, 1985 y.) the following parameters of a diastolic fillings spectrum of diastolic function (DF) RV were calculated with DopplerEchoCG's help: E/A-ratio of early and auricular fillings' speed; TF (m/s) - time of early filling delay; TIR (m/s) - time of isovolumic relaxations and auricular filling's fraction (AFF, %). Analyzed the level of average pulmonare arterial pressure.

Functional condition of ventilating ability pulmonare (VAP) defined on Medikor (Hungary) device, with the estimation of forced exhalation volume for 1 sec (FEV1, %), lung's vital capacity (FVC, %) and index Tiffno (FEV1/FVC, %).

Results are processed with the help Excel software package, using t - criterion Student. Distinctions between investigated parameters were authentically recognized at $p < 0,05$.

Results and discussion. Results of research before treatment at BA patients complicated cor pulmonale with PH and DRV, parameters quality of life and also expressiveness of changes in the specified groups were reduced ambiguously. So BA patients complicated CP with dilatation of right ventricle were worse adapted to all fields of activity. The analysis of results has shown the decrease in points on physical condition scale and software on $1,9 \pm 0,08$ and $3,16 \pm 0,04$ point that was lower in 2,7 and 2,2 times than the greatest possible point (5,2 and 7 points), and emotional condition and estimated by treatment have been reduced to $2,87 \pm 0,05$ and $2,32 \pm 0,06$ points, at the greatest possible estimation in 5,2; 7 and 5,3 points, ($p < 0,05$). Patients of this group had fear of physical activity, to carry out

usual professional duties and a dissatisfaction with treatment.

At bronchial asthma patients complicated CP with pulmonale hypertension parameters of FC, EC, PS and ET have been reduced to $2,96 \pm 0,09$; $2,57 \pm 0,05$; $3,09 \pm 0,05$ and $2,59 \pm 0,04$ points ($p < 0,05$). It is necessary to note, that at bronchial asthma patients complicated PH with DRV the tendency of QL reduction was more expressed on a physical condition and satisfaction by treatment, at BA patients complicated CP with PH on emotional condition and professional suitability in restriction of ability to live ($p < 0,05$) were observed.

Before treatment in parallel with disfunction of ventilating ability pulmonare, was observed the infringements of lung hemodynamics and quality of life patients. So, the increasing of PAPav, volume of the forced exhalation for 1 sec, vital capacity of lung were observed and index Tiffno were reduced in comparison with similar parameters of HP ($p < 0,005$).

In treatment dynamics at BA patients complicated PH parameters of a quality life: FC, EC, PS and ET were the best in comparison by patients CP with DRV, reliability of parameters after treatment ($p < 0,05$).

It was established, that quality of life parameters in therapy dynamics in all groups adaptation to active physical activity was authentically improved and was increased. Also improvement of the psychological condition that is expressed in authentic reduction of depression and disturbing, improvement of the emotional control and memory, satisfaction by life, improvement of social adaptation of patients were established. Comparising the dynamics of QL parameters in 1st group, that increasing of the physical, emotional status parameters and professional suitability appeared a little bit significant, than in 2nd group.

Reduction of TF, TIR, AFF and PAPav, and also increase of E/A ($p < 0,05$, reliability of distinction with parameters before treatment) were defined. The received facts shows, that at the surveyed patients pressure decreasing in lung arteries conducts to the reduction of pressure in RV hearts. At the result there is a reduction of TIR, TF and AFF duration and the gradient decreasing of pressure between the ventricles. From this, positive shifts in RV essentially influence to the activity of heart and remodeling endotelium of cardiovascular system.

Carrying out the correlation analysis between QL, VAP parameters, indexes lung hemodynamics and remodeling of RV hearts it was marked, that with the improvement of FEV1 bronchial passableness, FC, EC, PU and ET parameters improved ($r = 0,64$ have improved FC, EC; $0,45$; $0,26$ and $0,21$, $p < 0,03$). Decreasing PAPav level resulted to the improvement of FC, EC, PU and ET ($r = -0,74$; $-0,65$; $-0,58$ and $-0,27$, $p < 0,01$). The interrelation between the increasing of E/A and FC, EC, PU and ET ($r = -0,57$ is established; $-0,49$; $-0,38$ and $-0,19$, $p < 0,05$) was established.

The received data testifies that including inhalationotherapy gliserozini into the complex therapy of BA patients complicated cor pulmonale on the background of basic therapy, allows to increase ventilating ability of lung, to lower hemodynamic loading on the right departments of heart, and to improve the structure

of RV hearts diastoles. It is necessary to note, the inter-connected infringements of respiratory system and at QL patients remodeling heart's right ventricle improved after the holding procedures, and also weight of illness is reduced and collaterally raises QL of these patients.

Researches showed changing of the quality of life patients sphere before treatment are parallel to infringements of bronchial passableness, pulmonale hemodynamic and DF of right ventricle. Progressing of pulmonale hypertension and development of cor pulmonales at BA patients are closely connected to the development of psychovegetative factors' dysfunction of regulation, and it is necessary to note producing the plan of treatment patients of this category [8]. Mutual burdening and progressing of DF RV infringements and pulmonale hemodynamic are based on a generality of some parts of patogenesis: development of hypoxia, infringements of cardio pulmonale microcirculation and pulmonale hypertension [5]. It was marked collaterally improvement QL and VAP, PAPav levels, and also DF RV conditions at BA patients complicated cor pulmonale, coming after complex treatment with applying inhalationotherapy gliserolini on the background of basic therapy.

Conclusions. At bronchial asthma patients complicated CP with dilatation of right ventricle is more expressed the reduction of quality of life on a physical condition and satisfaction by the treatment, at BA patients complicated CP with pulmonale hypertension on an emotional condition and professional suitability ($p < 0,05$), that is necessary to note during the adequate treatment. Infringements of respiratory system and quality of life are positively correlate ventilating ability pulmonare, average of pulmonare arterial pressure

condition and remodeling of the right ventricle of hearts; inhalationotherapy on the background of basic therapy improve the above stated pathogenetically inter-connected infringements ($p < 0,05$).

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CLOSED OSTEOSYNTHESIS OF VERTICAL FRACTURES AND INJURIES OF THE PELVIC RING**Khabibyanov R.,***Doctor of Medical Sciences, Head of the Research Department,
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Hospital of the Ministry of Health of the Republic of Tatarstan"***ЗАКРЫТЫЙ ОСТЕОСИНТЕЗ ВЕРТИКАЛЬНЫХ ПЕРЕЛОМОВ И ПОВРЕЖДЕНИЙ ТАЗОВОГО КОЛЬЦА****Хабибьянов Р.Я.***Доктор медицинских наук,
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здравоохранения Республики Татарстан»
<https://doi.org/10.5281/zenodo.7121152>***Abstract**

The paper presents a brief review of surgical methods for the treatment of pelvic ring injuries. The original technology of osteosynthesis for fresh displaced polyfocal vertical fractures and injuries of the pelvic ring using the "Device for the treatment of displaced pelvic fractures" is described. Surgical intervention is less traumatic. The technique of surgical intervention, the stages of osteosynthesis, the features of the operation and the tool for its implementation are presented. The principles and stages of patient management are determined.

Аннотация

В работе представлен краткий обзор хирургических методов лечения повреждений тазового кольца. Описана оригинальная технология остеосинтеза при свежих смещенных полифокальных вертикальных переломах и повреждениях тазового кольца с использованием «Устройства для лечения смещенных переломов костей таза». Хирургическое вмешательство малотравматично. Представлена техника оперативного вмешательства, этапы остеосинтеза, особенности операции и инструмент для ее проведения. Определены принципы и этапы ведения больных.

Keywords: pelvic ring injuries, surgical treatment**Ключевые слова:** повреждения тазового кольца, хирургическое лечение

Переломы костей таза встречаются в 5-10 % случаев закрытой травмы [2, с.6; 3, с.30], а в 15,0-36,8% из них - тяжелые переломы таза сочетаются с повреждениями органов брюшной полости и малого таза [1, с.215].

Переломы костей таза в основном являются следствием так называемой, «высокоэнергетической травмы», частота которой в последнее время неуклонно растет.

Переломы костей таза относятся к наиболее тяжелым повреждениям, сопровождающимся, как правило, явлениями шока и кровопотерей в остром периоде, а в последующем приводящим к стойкой инвалидности больных в 30-60% случаев [5, с.533].

Фиксированная посттравматическая деформация таза, неустранимое смещение отломков вертлужной впадины вызывают стойкое нарушение постурального баланса, что с большой вероятностью приведет к развитию необратимых статико-динамических нарушений в целом.

С момента появления первых работ R. Judet, E. Letournel, M. Tile и до настоящего времени, способы хирургического лечения переломов костей таза и в том числе вертлужной впадины радикально не изменились [4, с.533].

До 50-60 годов XX в. основным методом лечения указанных повреждений считался консервативный с применением скелетного вытяжения. Однако анатомичная репозиция и стабильная фиксация от-

ломков при лечении скелетным вытяжением достигается далеко не всегда, особенно при сложных смещенных переломах костей таза.

Активно развивающиеся в нашей стране методы оперативного лечения переломов костей таза с применением закрытого чрескостного остеосинтеза наряду с несомненными достоинствами, такими как малая травматичность и возможность стабильной фиксации в условиях разгрузки тазобедренного сустава, имеют и определенные недостатки. К таковым относится не всегда достигаемая закрыто репозиция отломков, особенно при сложных переломах, возможность ятрогенного повреждения сосудов и внутренних органов при введении спиц и стержней, возможность миграции спиц.

С другой стороны, способы лечения, предлагаемые в большей степени западными авторами, технически сложны, достаточно травматичны, требуют использования большого количества специальных инструментов и имплантатов.

В силу своей травматичности открытое вмешательство не всегда выполнимо на ранних сроках, особенно у больных с множественными и сочетанными повреждениями, ввиду больших объемов кровопотери на фоне травматического шока.

На сегодняшний день остается недостаточно ясным вопрос о выборе того или иного метода лечения, сроках и типе хирургического вмешательства. В литературе имеются немногочисленные публикации о возможности таких методов лечения: сочетание внешней и внутренней фиксации.

В связи с этим, разработка новых подходов к восстановлению тазового кольца с помощью известных методов остеосинтеза с целью увеличения анатомичности и стабильности фиксации при относительно небольшой травматичности операции, обобщение полученных данных и определение места каждого из способов лечения указанных повреждений представляется актуальной задачей.

Разработана технология остеосинтеза вертикальных переломов и повреждений тазового кольца, отличающаяся своей универсальностью, так как позволяет оказывать хирургическую помощь при всех вертикальных повреждениях тазового кольца (при ротационных, вертикальных смещениях и их комбинациях). Применение технологии у шоковых больных при сочетанной и политравме позволяет производить окончательную

репозицию в отсроченном варианте вне операционной.

По представленной технологии прооперировано за 2013 г. по 2020 г. 67 пациентов на сроках от 1 суток до 3 недель с момента травмы. Срок наблюдения до 8 лет.

Данная технология показана при свежих смещенных полифокальных вертикальных переломах и повреждениях тазового кольца (до 14 дней с момента травмы) при изолированной, поли- и сочетанной травме.

Противопоказаниями к применению могут служить:

- смещенные вертикальные переломы и повреждения тазового кольца с массивным повреждением кожных покровов передней брюшной стенки и области гребней подвздошных костей с инфицированием;

- несвежие смещенные вертикальные переломы и повреждения тазового кольца (свыше 14 дней с момента травмы) с признаками достаточно устойчивой консолидации в смещенном положении (случаи, требующие мобилизации зон переломов).

Описание технологии при ротационном смещении.

После катетеризации мочевого пузыря больной располагается на операционном столе. Под поясничный отдел позвоночника устанавливается валик диаметром 8-10 см. Оперативное вмешательство выполняют под спинальной или общей анестезией.

В основу методики положено «Устройство для лечения смещенных переломов костей таза» (патент Российской Федерации RU 2160065 C1, выданный 10.12.2000).

Устройство используется при лечении свежих и застарелых смещенных переломов костей таза и состоит из опор, выполненных в виде сегментов кольца (тазовых опор из комплекта аппарата Илизарова) с перпендикулярно закрепленными на них планками, опоры обеих сторон соединены между собой с возможностью их сближения и отдаления, а также подъема, низведения и разворота каждой половины таза с последующей фиксацией распорками, установленными в различных направлениях и выполненными раздвижными в виде трубок с разнонаправленными резьбами в концах их каналов и установленных в них штанг с ответными резьбами (рис. 1).

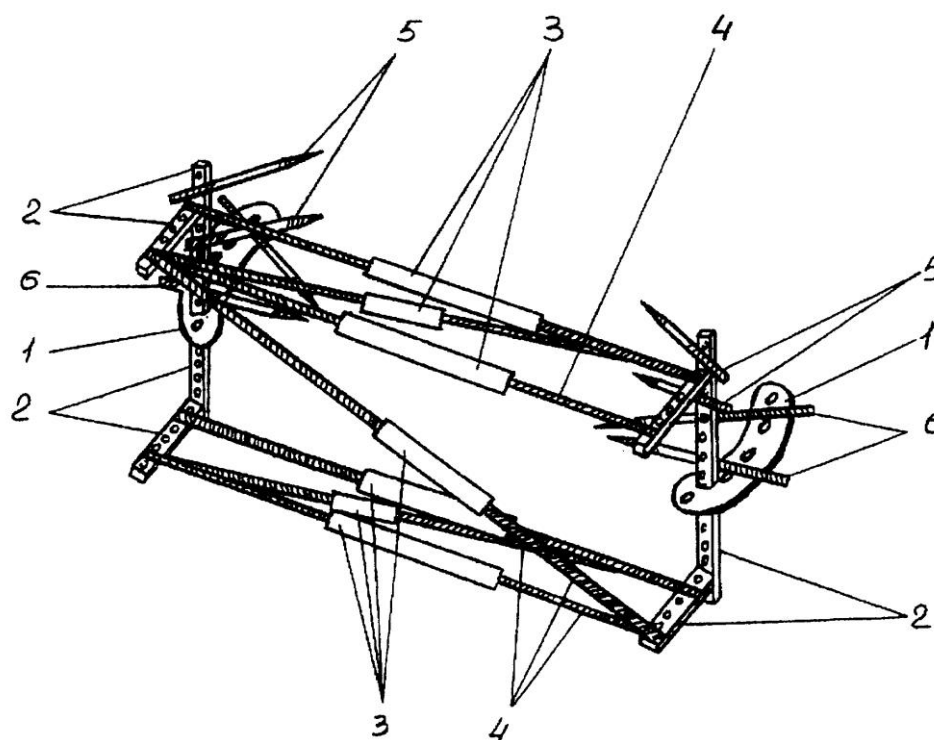


Рис.1. Устройство для лечения смещенных переломов костей таза.

После обработки операционного поля в проекции передневерхних остей подвздошных костей по ходу гребней скальпелем производят разрез длиной до 4-6 мм и шилом, диаметром 3-4мм, формируют костный канал. Причем канал формируется между наружным и внутренним кортикалом подвздошных костей. Длина его у среднестатистического пациента составляет 5-7 см. Таким же образом проксимальнее этого канала по ходу гребней подвздошных костей на 1 см. и 2 см. формируются два канала. В каналы устанавливаются стержни, диаметром 6 мм. Установка каждого стержня производится контролем жесткости установки. С использованием секторов тазовых дуг из комплекта аппарата Илизарова длиной 10-15 см и кронштейнов формируются опоры с обеих сторон. С учетом размера смещения производят сближение опор («закрывают») и стабилизируют аппарат (штангами, пластинами). Рентгенконтроль - стандартные проекции - прямая, каудальная и краниальная. Оценивается степень репозиции. При достижении репозиции производится окончательная стабилизация аппарата.

При наличии вертикального смещения гемипельвиса.

Катетеризация мочевого пузыря. Больной располагается на ортопедическом столе. Оперативное вмешательство выполняют под спинальной или общей анестезией.

Упор ортопедического стола в промежности в большей степени ориентирован на стабильный гемипельвис. Нижняя конечность с этой стороны устанавливается в положении отведения 10-15° и

держатель стопы ортопедического стола вместе с конечностью опускается вниз на 15-20° от плоскости стола.

С поврежденной стороны – стопа фиксируется в держателе стопы. Конечность предварительно отводится на 15-20°, ось стопы устанавливается вертикально или стопа ротируется во внутрь в зависимости от выраженности наружного ротационного смещения гемипельвиса. Конечность поднята от плоскости стола до угла сгибания в тазобедренном суставе 20 градусов. Симметричная тракция за обе конечности. Рентгеновский контроль – стандартные проекции. Оценивается степень репозиции переднего и заднего полуколец. При необходимости увеличивают тракцию по осям конечностей или изменяют степень ротации конечности. Рентгенконтроль.

Формирование опор на подвздошных костях производится аналогично описанию формирования опор при ротационном смещении. Единственное отличие – установка стержней и формирование опоры со смещенной стороны, соединение опор производится с возможностью гиперкоррекции во избежание вторичного смещения при снятии больного с операционного стола.

Пример клинического применения

Пациентка С. 41 г., в ДТП получила закрытый перелом крыла левой подвздошной кости, левых лонной и седалищной костей со смещением (рис. 2); закрытый перелом левой бедренной кости на уровне средней трети и нижней трети со смещением; сотрясение головного мозга; травматический шок III степени.



Рис. 2. Перелом крыла левой подвздошной кости, левых лонной и седалищной костей со смещением.

Переведена в травмцентре ГАУЗ «РКБ МЗ РТ» на сроке 17 дней с момента травмы после остеосинтеза левой бедренной кости стержневым аппаратом. На 2 сутки после перевода произведена репозиция смещенного вертикального перелома костей таза и стабилизация в стержневом аппарате (рис. 3).

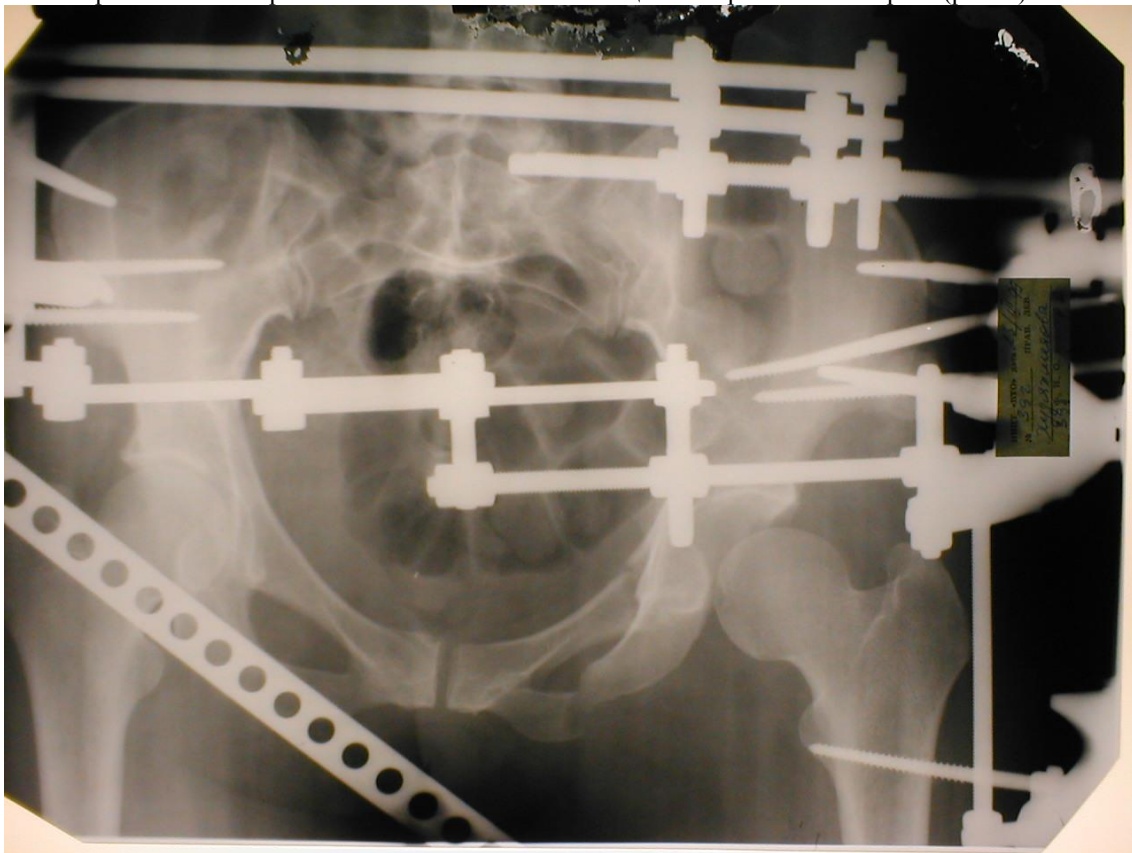


Рис. 3.

Репозиция смещенного вертикального перелома костей таза и стабилизация в стержневом аппарате.

На 2 сутки после операции - вертикализация. С 3 суток – ходьба на костылях. Через 7 недель произведен демонтаж стержневого аппарата с костей таза. Объем движений в тазобедренных суставах в

полном объеме. Через 13 недель со дня операции – демонтаж стержневого аппарата с бедренной кости (рис. 4).



Рис. 4. После демонтажа стержневого аппарата с костей таза.

При выполнении оперативного лечения с применением предложенного устройства и соблюдении всех технологических этапов осложнений не отмечалось. Важно пространственно представлять характер смещения гемипельвиса и в соответствующем объеме производить репозицию. Формирование каналов в крыльях подвздошных костей производится по траектории хода крыла подвздошной кости, определяемой пальпаторно и с пошаговым контролем нахождения рабочей части шила между кортикальными пластинками (контроль – попытка раскачать шило). При положительной «пробе» производится коррекция направления инструмента. Таким же контролем сопровождается установка стержней. Недостаточная первичная жесткость установки стержня или стержней может привести к потере стабильности аппарата внешней фиксации и к развитию воспалительных процессов мягких тканей вокруг стержней, что может определить необходимость переустановки стержня или стержней.

По истечении 1 суток после операции больной активизируется. Сидит в постели, опускает ноги. При отсутствии ортостатических явлений встает, держась за балканскую раму. При хорошей физической форме пациент самостоятельно встает несколько раз в течение дня. Со 2 дня – обучение ходьбе на костылях с симметричной нагрузкой на обе конечности. На 5 день после операции производится рентгенография таза в стандартных проек-

циях. На фоне «спокойной» кожи вокруг установленных стержней больной выписывается на амбулаторное лечение на 6-8 недель. перевязки самостоятельно через 2-3 дня.

Через 6-8 недель производится рентгенография таза в стандартных проекциях. Клиническая проба – демонтаж соединений между опорами. Пациент в пределах 1 часа ходит с опорой на костыли и без опоры. В сомнительных случаях (боль, субъективно – ограниченная опороспособность нижней конечности) производится рентгенконтроль. Окончательный демонтаж стержневого аппарата. Объем движений в тазобедренных суставах не ограничен уже на момент демонтажа аппарата.

Отмечены преимущества предложенной технологии лечения смещенных вертикальных повреждений тазового кольца с применением «Устройства для лечения смещенных переломов костей таза»:

1. лечение (закрытый остеосинтез) не сопровождается кровопотерей;
2. в послеоперационном периоде не наблюдается невропатии бедренного и седалищного нервов;
3. аппарат внешней фиксации, наложенный по технологии в шоковой операционной для стабилизации отломков, позволяет производить окончательную репозицию в отсроченном варианте вне операционной;
4. больные самостоятельно встают и ходят с дополнительной опорой (костыли) со 2 дня после

операции при отсутствии сочетанных и сопутствующих патологий.

Технология достаточно проста для выполнения и не требует дорогостоящих расходных материалов и инструментария.

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MECHANOGENESIS OF ROTATIONAL UNSTABLE FRACTURES AND INJURIES OF THE PELVIC RING

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МЕХАНОГЕНЕЗ РОТАЦИОННО-НЕСТАБИЛЬНЫХ ПЕРЕЛОМОВ И ПОВРЕЖДЕНИЙ ТАЗОВОГО КОЛЬЦА

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Abstract

The article presents a detailed analysis of the mechanogenesis of rotationally unstable fractures and injuries of the pelvic ring with the anatomical conditionality of the nature of displacements during disintegration in the sacroiliac joints.

Аннотация

В статье представлен детальный анализ механогенеза ротационно-нестабильных переломов и повреждений тазового кольца с анатомической обусловленностью характера смещений при дезинтеграции в крестцово-подвздошных сочленениях.

Keywords: pelvic ring, unstable fractures and injuries, disintegration.

Ключевые слова: тазовое кольцо, нестабильные переломы и повреждения, дезинтеграция.

Наиболее часто нестабильные переломы и повреждения тазового кольца имеют место в результате дорожно-транспортных происшествий, несчастных случаев на производстве, падения с высоты [1, с.165; 2, с.52; 3, с.373; 4, с.339].

При прямом воздействии внешнего агента характер переломов и смещений, их сочетание бывает разнообразным (рис. 1).

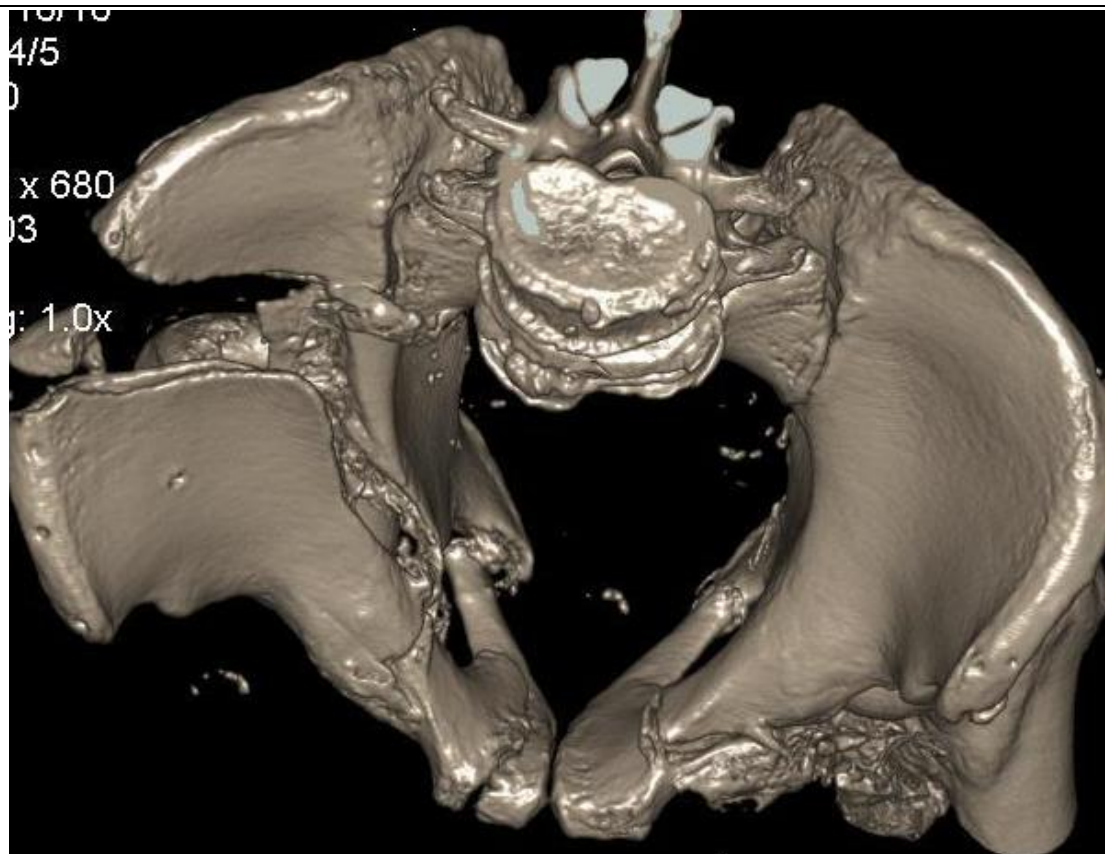


Рис. 1. Полифокальный перелом костей таза. Высотная травма.

Лечение нестабильных переломов костей таза (тип В и С - классификация по принятой международной системе AO/ASIF) с ротационной и ротационно-вертикальной нестабильностью, особенно при значительных смещениях или в не свежих случаях представляет трудности. Если не учитывать исходное состояние пациента (стабильное или не стабильное), сложности заключаются в производстве предварительной и окончательной репозиции с последующей надежной стабилизацией тазового кольца [5, с.8].

Традиционно принятый термин «ротационная нестабильность» таза к ротации (*Ротация [лат. rotatio - круговое вращательное движение] – в функциональной анатомии круговое движение, например в плечевом, межпозвоночном и пр. суставах*) имеет крайне ограниченное отношение. Низкоамплитудные пассивные вращательные движения скользящего характера в КПС в норме происходят вокруг фронтальной оси ниже второго сакрального сегмента S-2 [6, с.2326] и имеют отношение к смене физиологических положений крестца от контрнутации до нутации. При переломах и повреждениях та-

зового кольца с ротационной нестабильностью происходит смещение гемипельвиса относительно крестца в латеральном или контрлатеральном направлении в горизонтальной плоскости.

Повреждения тазового кольца с ротационной нестабильностью и латеральным смещением (рис. 2) по нашим наблюдениям составляют 84% от повреждений тазового кольца с ротационной нестабильностью. Причем разрыв симфиза с расхождением и повреждением КПС в 96% случаев являются результатом травмы ускорения (ДТП) с непрямым механизмом воздействия. При этом пострадавшие – как правило, пассажиры автотранспортных средств. Их положение к моменту столкновения – сидя, бедра умеренно разведены, при лобовом столкновении автомобиля по инерции симметрично или асимметрично упираются обоими коленными суставами с препятствием в виде панели автомобиля или спинок впереди расположенных кресел. Остальные случаи – падение с незначительной высоты, в том числе высоты собственного роста, обвалы грунта в траншеях, мотоциклетная травма при столкновении с препятствием, расхождение симфиза более 1,5-2 см при родах и т.д.



Рис. 2. Ротационно-нестабильное повреждение тазового кольца с латеральным смещением.

С учетом конвергирующих вниз, внутрь и кзади суставных поверхностей КПС (рис. 3, 4) при ротационной нестабильности с латеральным смещением происходит в большей или меньшей степени неравномерное соскальзывание суставной поверхности подвздошной кости относительно ушковидной поверхности крестца кзади. Пояснично-подвздошные связки обеспечивает меньшую степень соскальзывания верхних отделов суставной поверхности подвздошной кости относительно ушковидной поверхности крестца кзади. Соскальзывание нижних отделов суставной поверхности подвздошной кости происходит в большей степени в соответствии с конвергирующими кзади суставным поверхностям крестцово-подвздошного сочленения (КПС). Более того, соскальзывание в нижних отделах КПС обусловлено влиянием на передний

отдел таза поясничной мышцы. Причем объем смещения кзади зависит от степени повреждения передних и межкостной связок КПС. Чем больше степень смещения суставной поверхности подвздошной кости кзади в КПС, тем больше расхождение в переднем полукольце таза. При двухстороннем повреждении КПС с латеральным смещением гемипельвисов эти смещения ничего общего с положением крестца – нутация (*Нутация [от лат. nutare – кивать] означает движение крестца, аналогичное киванию головы*), при котором на симфиз влияют растягивающие усилия, не имеют. Дезинтеграция задних отделов таза приводит к тому, что под влиянием поясничных мышц происходит увеличение угла наклона таза кпереди, что само по себе в норме должно было бы привести к относительной вертикализации крестца – контрнутации, что обеспечивает устойчивое равновесие тазового кольца.

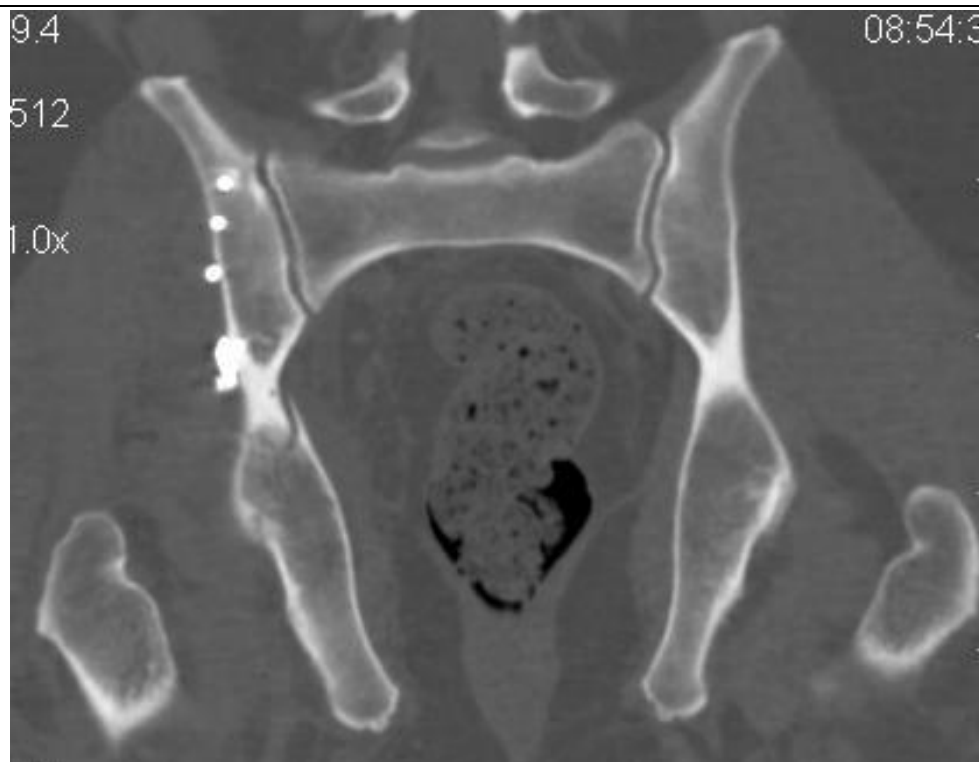


Рис. 3 РКТ таза пациента Б. после остеосинтеза чрезвертлужного перелома с переходом на тело и крыло подвздошной кости, фронтальный срез на уровне S-2.

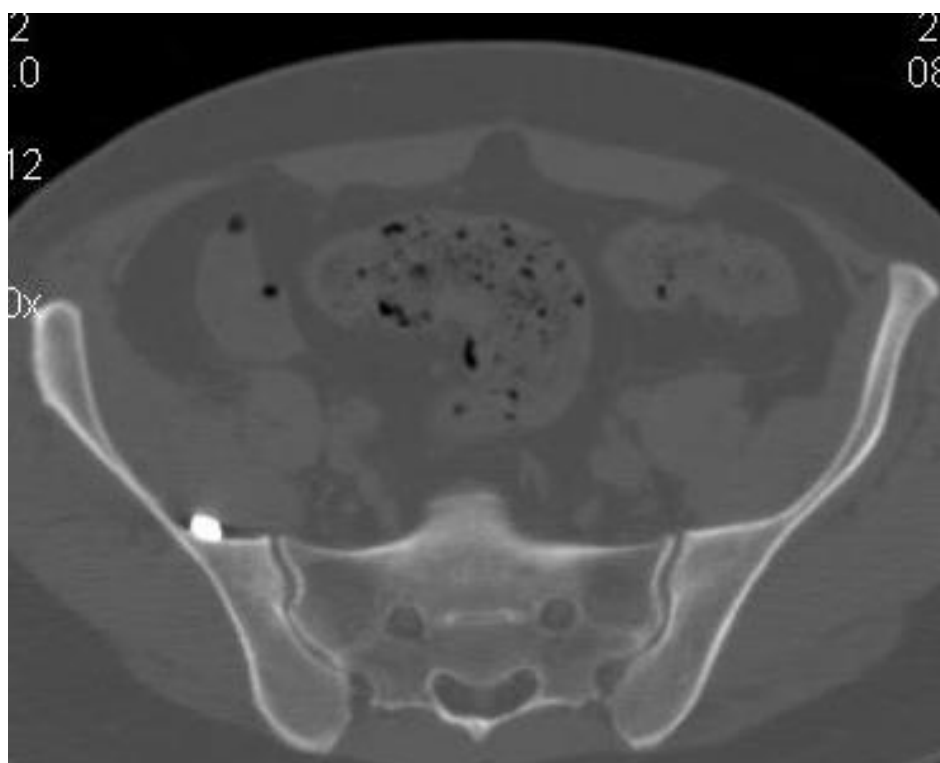


Рис. 4. РКТ таза пациента Б. после остеосинтеза чрезвертлужного перелома с переходом на тело и крыло подвздошной кости, горизонтальный срез на уровне S-2.

При ротационно-нестабильных переломах и повреждениях тазового кольца с латеральным смещением, смещения происходят во фронтальной, сагиттальной и горизонтальной плоскостях.

Ротационно-нестабильные повреждения с контрлатеральным смещением имеют иную картину разрушений. Связки КПС в целом остаются

интактными. Происходят переломы лонной и седалищной костей с одной или с обеих сторон, а также краевой перелом Ala Sacralis, имеющий отношение к КПС. Причем характер краевых переломов Ala Sacralis при контрлатеральном смещении гемипельвиса зависит от положения крестца на момент воздействия внешнего агента. Краевой перелом на уровне S1-S2 позвонков (рис 5а, 5б) происходит

при положении крестца в контрнугации или близком положении к нему, поскольку именно в этой зоне происходит плотное соприкосновение и упор переднего края крестцово-тазовой поверхности подвздошной кости с Ala sacralis (рис. 6).

Краевой перелом на уровне S2 – S3 позвонков (рис. 7а, 7в) происходит при положении крестца в нугации или близком положении к нему.

При нугации крестца верхние отделы его ушковидной поверхности, отвечая конвергирующим назад суставным поверхностям КПС, скользят кле-

реди. При этом скручивается межкостная крестцово-подвздошная связка, что приводит к миграции оси вращения в КПС, и неравномерно «стаскивает» назад ушковидную поверхность подвздошной кости в соответствии с конвергирующими назад суставным поверхностям. Нижние отделы ушковидной поверхности крестца в меньшей степени скользят кзади. Уменьшение угла наклона таза кпереди приводит к контакту нижних отделов ушковидной поверхности крестца с передне-нижними отделами крестцово-тазовой поверхности подвздошной кости (рис. 8).

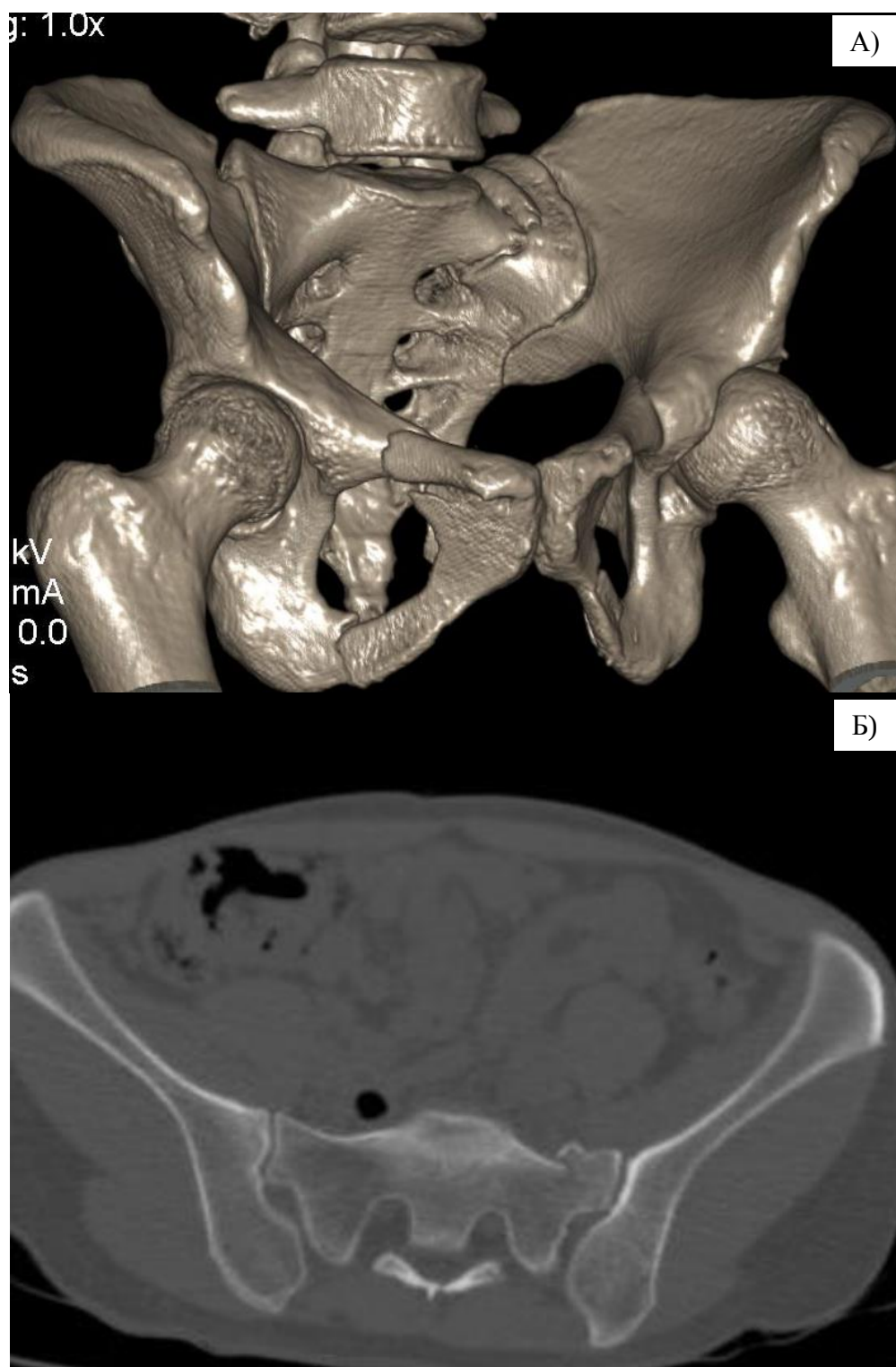


Рис. 5. Краевой перелом Ala sacralis на уровне S1-S2 позвонков.



Рис. 6. Тазовое кольцо. Положение крестца – контрнутация. Пограничная линия таза непрерывная.





Рис. 7. Краевой перелом Ala sacralis на уровне S2- S3 позвонков.



Рис. 8.

Тазовое кольцо. Положение крестца – нутация. Пограничная линия таза прерывается на уровне КПС.

При воздействии внешнего агента в таком положении крестца и происходит краевой перелом в зоне S2-S3 позвонков.

С 2007 г. травмоцентре ГАУЗ РКБ МЗ РТ оказана помощь 87 пострадавшим с ротационно-нестабильными повреждениями тазового кольца с дезинтеграцией в КПС в виде краевых переломов Ala sacralis или переломов боковых масс крестца, причем взаимоотношение переломов на уровне S1- S2 позвонков и S2- S3 позвонков составило 3 к 1.

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THE ROLE OF THE PUBIC JOINT IN STABILIZING THE PELVIC RING**Khabibyanov R.,***Doctor of Medical Sciences, Head of the Research Department,
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Hospital of the Ministry of Health of the Republic of Tatarstan"***РОЛЬ ЛОННОГО СОЧЛЕНЕНИЯ В СТАБИЛИЗАЦИИ ТАЗОВОГО КОЛЬЦА****Хабибьянов Р.Я.,***Доктор медицинских наук,
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<https://doi.org/10.5281/zenodo.7121171>***Abstract**

The article presents and substantiates the equivalent role of the symphysis in the stability of the pelvic ring with the sacroiliac joints with the efforts of compression in them in the initial position (counternutation of the sacrum).

Аннотация

В статье представлена и обоснована равнозначная роль симфиза в стабильности тазового кольца с крестцово-подвздошными сочленениями с усилиями сжатия в них в исходном положении (контрнута́ция крестца).

Keywords: sacroiliac joint, external fixation device, stability.**Ключевые слова:** крестцово-подвздошное сочленение, аппарат внешней фиксации, стабильность.

Терминологический словарь: нута́ция крестца означает движение крестца, аналогичное киванию головы (от лат. nutare – кивать); контрнута́ция крестца - контрнаклон.

Свод таза с крестцом в качестве его ключа [1, с.212], стабильно функционирует при безусловном сохранении геометрических параметров (рис.1) тазового кольца.

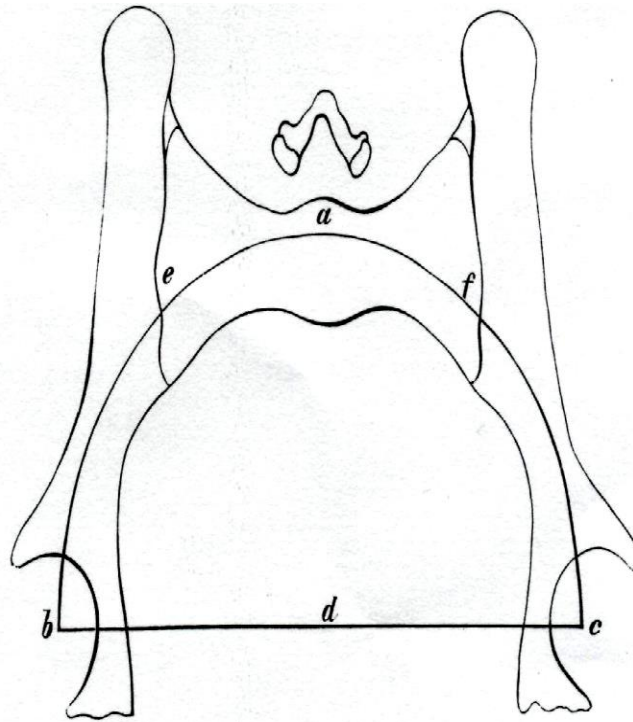


Рис. 1. Фронтальный распил таза. Схема сферического или эллиптического свода (Лесгафт П.Ф., 1927).

Движения крестца – физиологическая нутация и контрнутация, скользящие по своему характеру. Несмотря на то, что эти движения резко ограничены по объему, они достоверно визуализируются на уровне мыса крестца относительно дугообразных линий подвздошных костей.

Высокие значения прочности тазового кольца обусловлены тем, что суставные поверхности крестца и подвздошных костей помимо рельефности конвергируют внутрь и вниз, что четко прослеживается на уровне S-2 позвонка. Более того, они конвергируют и назад.

То, что суставные поверхности сочленений конвергируют кзади сказывается при контрнутации и нутации крестца на изменениях размеров входа в малый таз и, соответственно, выхода из него.

Как видно на рис. 2а. тазовые кости относительно крестцово-подвздошного сочленения (КПС)

O1 и O2 функционируют как рычаги 1 рода (*Рычагом первого рода называется рычаг, ось вращения которого располагается между точками приложения сил и силы направлены в одну сторону* [3, с.73]). Рычаг опирается на зону S-2, S-3 позвонков (ось вращения рычага – O), на уровне которых расположены ушковидные поверхности КПС. В соответствии с основным законом рычага: рычаг находится в равновесии в случае равенства моментов приложенных к нему сил - формируется интегрированная целостность – тазовое кольцо. На короткое плечо рычага воздействует задняя порция крестцово-подвздошной связки L1 и L2. На длинные плечи воздействуют сближающие симфиз многокомпонентные силы S1 и S2.

На рис. 2б. видно, что при потере части стабилизирующих ресурсов системы (разрушение симфиза и повреждение крестцово-подвздошных.

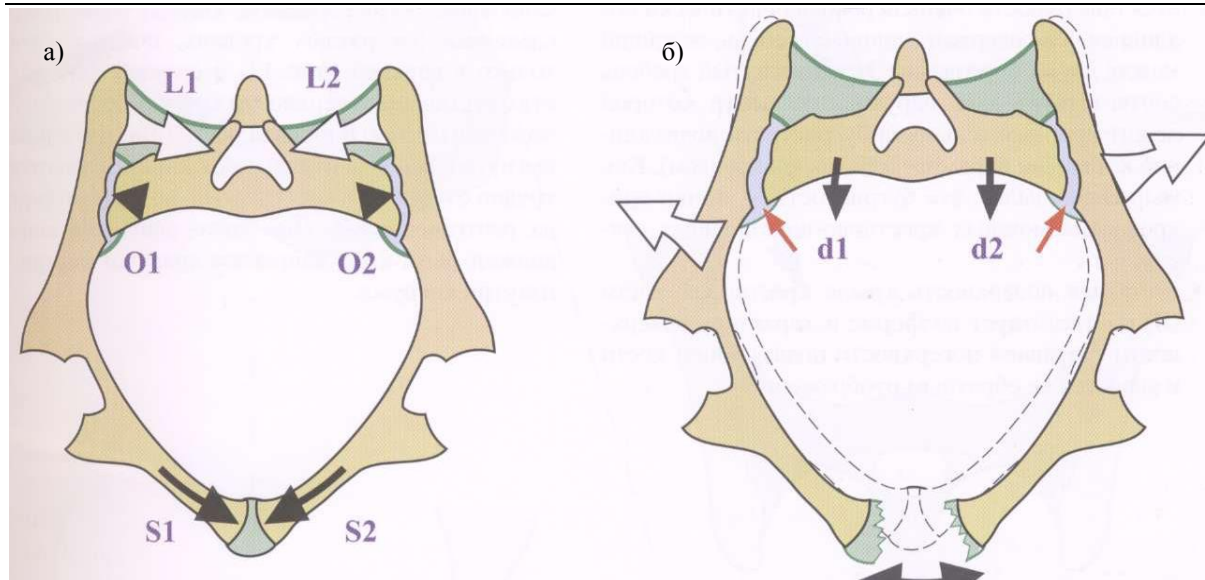


Рис. 2. Устойчивое положение свода таза (а) и потеря его стабильности (б) (Капанджи А.И., 2009).

Таз передает усилие с позвоночного столба на нижние конечности и оно распределено и направлено на вертлужные впадины. Причем передача нагрузки от веса тела на вертлужные впадины и головки бедер происходит по дугообразным линиям подвздошных костей от ушковидных поверхностей крестца. Реакция опоры на вес тела передается на вертлужные впадины через головку и шейку бедра. Частично это усилие передается через горизонтальные ветви лобковых костей и нивелируется на уровне лобкового симфиза такой же силой противоположной стороны [2, с.268]. При этом моменты многокомпонентных сил S1 и S2 превышают таковые, действующие в направлениях L1 и L2. Это приводит к тому, что гемипельвисы в норме, подобно раскрывающимся пролетам разводных мостов, обладающих небольшой неуровновешенностью от собственного веса в сторону разводного пролета, что в наведенном положении обеспечивает плотное прилегание разводного пролетного строения к опорным частям (симфиз и КПС в нашем случае, длинные оси которых параллельны) в закрытом положении моста [4, с.2] обеспечивают сжимающие усилия как в симфизе, так и в КПС, чем и определяется стабильность тазового кольца.

Анатомо-функциональные особенности лонного сочленения стабильного тазового кольца в исходном его положении сформировались под влиянием сжимающих усилий в сочленениях, моменты сил которых в симфизе превышают таковые в одном КПС (пример с плотным прилеганием разводного пролетного строения к опорным частям в наведенном положении моста).

Симфиз образован волокнисто-хрящевой межлобковой пластиной и связками: верхней и нижней или арочной, передней – Лушка и задней. Лонное сочленение спереди вдвое шире, чем сзади. У арочной связки оно шире, чем в верхних отделах (Waldeyer) [5, с.325]. По Лушка сочленяющиеся поверхности лонных костей состоят из двух отделов:

задние – эллиптической формы, выпуклые и передние, более длинные и узкие. Между ними находится межлобковая пластина, более широкая в передних и нижних отделах сочленения, чем в верхних и задних [5, с. 325].

Детальное описание прозектором Лушка лонного сочленения свидетельствует о значительном вкладе симфиза в стабильность тазового кольца. Повторяющая формы сочленения, в том числе эллиптически выпуклых сочленяющихся поверхностей лонных костей межлобковая пластина, наряду со связками, постоянно поддерживает центрацию сжимающих усилий симфиза, предотвращая его разрушения как при статических, так и динамических нагрузках. Более широкие размеры сочленения спереди и внизу соответствуют степени потери максимальной контрнугации крестца у трупа на прозекторском столе.

Описанное выше свидетельствует как о равнозначной роли симфиза, наряду с КПС, в поддержании стабильности тазового кольца, как системы, так и о наличии физиологических низко амплитудных движений в симфизе на фоне симметричных перемещений в КПС. Иных перемещений в сочленениях таза в норме нет.

Таким образом, лонное сочленение в исходном положении испытывает сжимающие усилия, свойственные для положения крестца – контрнугации. Этим симфиз «контролирует» конгруэнтность сочленяющихся поверхностей КПС и, соответственно, стабильность в них, обеспечивая устойчивое равновесие в системе тазовое кольцо в статике.

Закрыто в АВФ сопоставить анатомично лонное сочленение при выраженной дезинтеграции в задних отделах таза и, соответственно, со значительным латеральным смещением гемипельвиса (во фронтальной и сагиттальной плоскостях) не всегда удается (рис. 3, рис. 4). Особенно, когда произошли множественные повреждения переднего полукольца (рис. 5, рис. 6).



Рис. 3. Обзорная рентгенограмма таза б-й В., 5 лет.

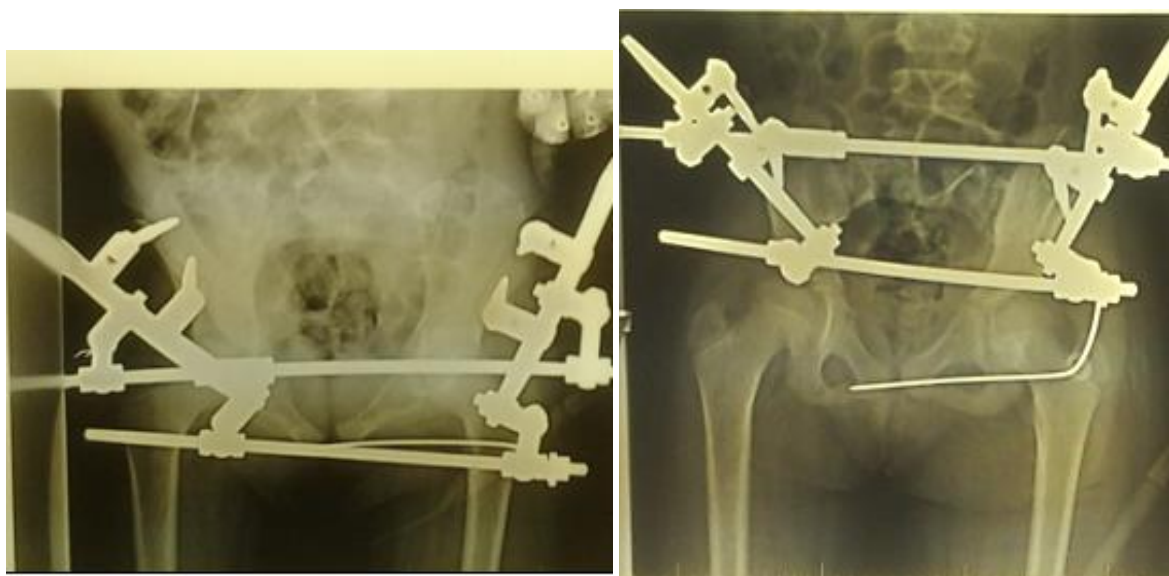


Рис. 4. Рентгенограммы таза б-й В., 5 лет, после репозиции и стабилизации АВФ.



Рис. 5. Обзорная рентгенограмма б-го X., 45 лет. На рентгенограмме: повреждение симфиза, левого КПС, переломы левой лонной и седалищной костей со смещением левого гемипельвиса.

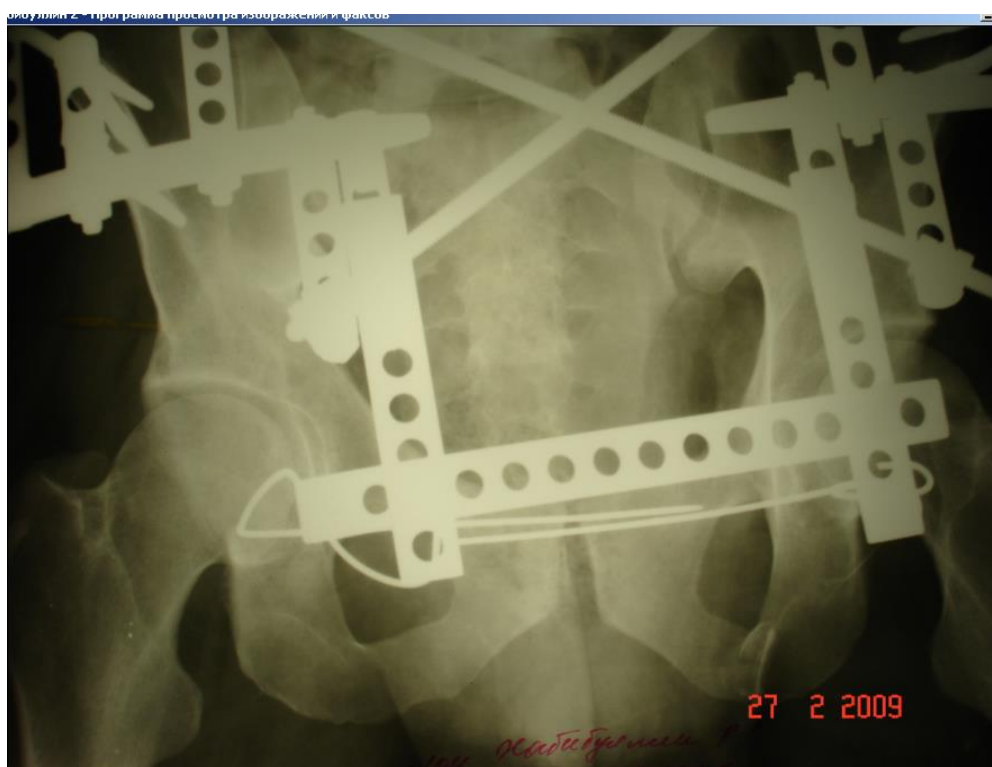


Рис. 6. Обзорная рентгенограмма б-го X., 45 лет, после репозиции и стабилизации тазового кольца.

В таких случаях накладывается АВФ в соответствии с его общей концепцией для лечения переломов костей таза [6, с.62]. С учетом особенностей конвергирующих вниз, с наружи – внутрь и кзади сочленяющихся поверхностей КПС производится его вправление. После этого окончательно сопоставляют сочленяющиеся поверхности симфиза. Для этого осуществляется надлобковый доступ протяженностью 5-6 см. Для профилактики

вторичного смещения в пределах переднего полукольца при компрессии в лонном сочленении проводятся 1-2 спицы в лонные кости под основанием лонных бугорков с фиксацией свободных их концов к АВФ (рис. 6). Этим соблюдается центрация сжимающих усилий симфиза, в норме обеспечиваемой связками лонного сочленения и его диском.

При исключении реакции опоры на вес тела в положении «лежа», часть усилий которой в положении «стоя» передаются на симфиз в виде сжимающих усилий - теряются. Соответственно этому условия равновесия рычага 1 рода (тазовые кости относительно крестцово-подвздошных сочленений) меняются. Равновесие в тазовом кольце, с учетом того, что сочленяющиеся поверхности КПС конвергируют внутрь, вниз и назад, обретает характеристики больше безразличного. При этом нижние конечности в тазобедренных суставах - выпрямлены, положение крестца - контрнугация. Безразличное равновесие тазового кольца приближается к неустойчивому, когда нижние конечности в тазобедренных и коленных суставах согнуты. Тем более, когда к ним приложены внешние силы, направленные на максимальное сгибание, например в процессе родов.

Устойчивое равновесие тазового кольца устанавливается, когда при малых отклонениях от состояния равновесия срабатывают силы и их моменты, стремящиеся вернуть таз в равновесное состояние. Например, принятие исходного положения, при котором крестец устанавливается в положение контрнугации с устойчивым равновесием тазового кольца.

Характер равновесия в тазовом кольце от устойчивого до безразличного и крайнего - неустойчивого поступательно меняется в процессе снижения контрнугации крестца.

Таким образом, прямохождение человека, непосредственно влияющее на формообразование

скелета, определило контрнугацию крестца с максимальной конгруэнтностью сочленяющихся поверхностей КПС и симфиза, поддерживаемых усилиями сжатия, как исходное положение, обеспечивающее устойчивое равновесие в интегрированной целостности - тазовое кольцо. Нугация же крестца, особенно когда она максимально представлена, к прямохождению отношения не имеет и является одним из механизмов, обеспечивающих физиологию человека - родов и других отправлениях.

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POLITICAL SCIENCES

WHY DO WOMEN REMAIN UNDERREPRESENTED IN POLITICS IN KAZAKHSTAN?

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Statements and declarations

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Abstract

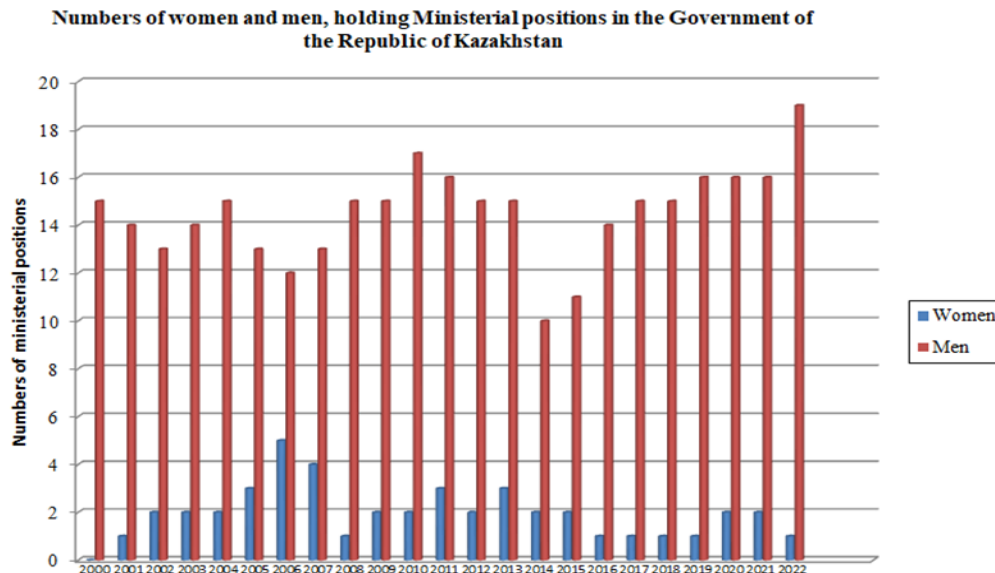
From the first days of the Independence of Kazakhstan, the state committed and ratified various acts and conventions regarding gender equality in employment to ensure women's participation in economic, social and political life. Yet, high politics is not within the grasp of female representatives, and this article focuses on the roots of women's underrepresentation in the political life of Kazakhstan. The discussion is organised around the historical domains, societal processes, and recent research in this area. The article discusses how the state's historical background and religion affect the current situation concerning the underrepresented female representatives in decision-making bodies.

Keywords: gender equality, female representatives, Kazakhstan, parity.

Introduction

In the country, according to the National Census of the Republic of Kazakhstan 2021, the sex ratio of the total population is 94.37 men per 100 women [1], the significant chasm between the numbers of male politicians and female politicians has been an acute problem, even though the state has made a significant breakthrough in terms of recognition of the international standards in gender equality. As a matter of fact, the Kazakhstani Parliament ratified the 'Law of State Guarantees of Equal Rights and Equal Opportunities for Men and Women' in December 2009 [2], which means the political representation of women should have been seemingly guaranteed to some extent by this law. Also, the country has adopted the Concept of Family and Gender Policy until 2030 [3] to promote equal rights and eliminate gender-based discrimination. In addition, the National Commission for Women's Affairs and family and demographic policy under the President of the Republic of Kazakhstan has become the first national body to foster gender equality in Central Asia, demonstrating positive changes regarding

gender equality [4]. However, these alleged improvements did not make any difference in reality when it comes to women's empowerment in politics. More precisely, in the female political empowerment sub-ranking, Kazakhstan ranked at 69th in 2006, while, in 2018, the state lost the previous indicator and was at 94th position [5]. This is evidence that no progress has been made to retain its place in the ranking and improve the overall positioning. According to the data, the women's representation in 2006 was 10 per cent in the Parliament and 18 per cent in ministerial positions [6]. In other words, there is no expansion in women's representation in senior political roles (Graph 1). In contrast to the previously mentioned numbers, administrative and lower-level positions have demonstrated opposite trends for women's participation, showing a constant growth throughout the considered period of time. In 2018, the rate of women working as civil servants was 55 per cent (50.5 thousand); however, this percentage did not lead to a significant number of female representatives at higher decision-making levels [7]. This discrepancy might have made input on worsening gender gaps across the country.



Graph 1. Comparison between the numbers of male and female ministers over a period of 22 years [8].

Literature Review

Kazakhstan is a highly hierarchical, male-dominated country where the role of a woman is to be a good mother, daughter, sister, and wife, and this kind of narrative causes concern among not only layers of the grassroots but also researchers. As expressed in Cynthia Werner's research paper [9]: "As throughout Central Asia, gender relations are being redefined as Islamic values are reinstated as the 'guiding ethic for society', national histories and national traditions are rewritten and revived, and patriarchal authority is reasserted". Therefore, it is critical to have active women's representation in politics — bearing in mind the aforementioned patriarchal propensity within the society — to promote gender balance to ensure the government's receptivity to its citizens' needs and societal changes. Thus, by increasing the number of women in leadership roles, the government will progress towards inclusivity. By doing so, the main principle of democracy will be fulfilled: the participation of each social category — women are one of the social categories who have been infringed upon politically — is a prerequisite for a functioning democracy [10]. Taking into account that more than half of the population is women (51, 29%) [11], it is, therefore, vital to increase their numbers in legislatures to address all the possible societal matters.

The issue of inclusivity in Kazakhstani political life is a contributory factor to the problem of composition in legislatures. Karekurve-Ramachandra *et al.* (2020) found that less privileged women are unlikely to secure offices in decision-making bodies; so, it leads to comparatively more significant numbers of women representatives from privileged backgrounds [12], so-called 'upper-class' citizens. The scope of the research covered only India, and 'upper-class citizens', in the case of India, were the Hindus' upper castes (the system which divides Hindus into rigid hierarchical groups). However, it is also viable in Kazakhstan's case, which can be one of the reasons behind the issue of females' frail political representation. In the case of Kazakhstan, instead of the Indian caste system, there are establishments' families to deprive women of less privileged

backgrounds of political power. Karekurve-Ramachandra *et al.* (2020) claimed that the provision of quota led to the limitation of other underrepresented minorities, providing access to the electoral positions of so-called proxy candidates ("women who are running for office in name only and are really stand-ins for their husbands"). Proxy candidates or female politicians from privileged backgrounds tend to overlook issues of marginalised women in Kazakhstan — which is clear from policies that cannot meet female grassroots' needs — displaying some sort of unwillingness in taking actions as regards fostering political activity amongst not only a few female parliamentarians but also women from middle and low-class groups. As a result, women across the state struggle due to being ignored, secluded, and, more important, not being protected by the letter of the law. To give an example of the latter, it is enough to recall the fact that domestic violence, namely "battery" and "infliction of light bodily harm" towards women, was decriminalised in July 2017 [13]. It shows that women's affairs were not protected by those few female politicians in power. To give an example, Kaka-bayeva (2021) conducted interviews [14] with women with political agendas and women in politics. There is one quote from the interview with an, as the author stated, 'upper class' citizen: "I keep questioning myself, what and why do I need this? I have everything; I am not in jail; why should I be disturbed by this? Conversely, I envy the feminists who are concrete in their claims". As it can be seen it is obvious that in order to meet needs and live up to grassroots expectations, it is not enough to have qualified specialists but it is strongly recommended to include people from all the strata of society in political activity to provide inclusivity. The best example of this can be the United Kingdom, where female politicians make a difference for ordinary people even though they can be from deprived backgrounds. Take as an example the Labour Member of Parliament Angela Rayner [15], who is also serving as Shadow Chancellor of the Duchy of Lancaster, Shadow Minister for the Cabinet Office and Shadow Secretary of State for the Future of Work since 2021.

Even though Kazakhstan has made progress in meeting international standards, it is evident from the number of female politicians [16] that the pace of progress is slow and unchanging. One of the reasons, to explain why the government needs to expand women's representation, is the fact that women tend to pay attention to matters where men seem to be reluctant to take decisive actions. Gender theorists, Mona Lena Krook, Richard Fox and Jenifer Lawless, also stood for the increase of women in formal institutions [17], claiming that it would improve affairs of state. Take as an example India and Norway, where, according to UN Women, the matters of potable water and childcare coverage were tackled effectively because the number of female representatives was higher in decision-making roles compared to male counterparts [18]. On the other hand, Dahlerup (1998) realised that the main focus should be put on the critical acts in lieu of the issue of parity [19]. In other words, the main goal is to include women in the discourse. In turn, critical acts, as stated in Dahlerup's manuscript, rely upon the "willingness and ability of the minority to mobilize the resources of the organization to improve the situation for themselves and the whole minority group". Moreover, the main initiators of the critical acts may be not only women but also men. Yet, in the case of Kazakhstan, female politicians, along with male politicians, fall short of doing so. As reported by Kakabayeva (2021) [20], female politicians "do not politicise their gender identity and engage in political struggle on equal positions with male representatives". The reason for that, it is explained in Kakabayeva's research, is mainly due to the state appropriation of the gender equality agenda. Plainly put, according to Johnson (2016), "women are "boxed" in roles that suit the needs of the regime and, more importantly, are tightly controlled in those "boxes" by the informal — virtually all-male — elite, whose purposeful push for "traditional values" of narrow heteronormative roles for women and men" [21]. As an example, it is interesting to consider the first female candidate for the presidency in 2019, Dania Yespayeva, who had a well-fit profile as a former banker, possessing all the needed features to fulfil some sort of a tokenistic role. Even so, the candidate lacked prior political visibility to ensure the electorate votes. Meaning that, the number of female politicians is not a guarantee leading to equality and prosperity. In Kakabayeva's research interviews (2021), one respondent resorted to the Rwanda case, in which 50 per cent of Parliament is women, drawing attention to the fact that this number contributed to nothing. As it can be seen, this is in line with Dahlerup's position regarding the parity issue. In addition, some of the respondents emphasised that professionalism should come first rather than gender. In detail, the respondent stressed that feminist claims could limit the scope of supporters, which is why the respondent does not consider herself a feminist [20]. Another respondent went even further, explaining her position as regards feminism "When you say "women's, women's", it scares me, although I am sure there would be many men who share feminist aspirations. The feminist movement, due to the sometimes very radical views of

some members, is rejected by the male part of the population. I do not want to split up anymore, but to unite, to find common ground" [20]. It is clear that there is an air of feminist fear and threat among not only males but also females on the grounds of the radical views of some feminist representatives and societal cleavage. Khairullayeva *et al.* (2022) argue that the perception of feminism as a threat is one of the current trends in Kazakhstani society, and this can be one of the reasons why women's empowerment faces many challenges in terms of realisation [22]. The underlying reasoning for this might be explained in the context of history and the ill implementation of gender equality policies across the country.

Looking through the historical prism

Historical events affect not only the formation of a political entity but also political dynamics within society. That is why it is vital to delve into history to form a whole picture of women's agency in society. Besides, it is difficult to understand the current trends in society without prior knowledge of how women were emancipated in this region and historical and regional idiosyncrasy in order to evaluate the current situation. This is the main driver behind this historical analysis of women's roles in the nomadic confederation and the Soviet Union's policy regarding women in the Kazakh steppe. As a German politician, Martin Schulz, wisely noted, "We cannot walk away from our history, and today's politics are of course, related to events that happened in the past" [23].

Therefore, this section excavates the domain of history in an attempt to scrutinise the main trends in Kazakh society and its historical ancestors concerning women's political engagement. The section fleetingly covers the period when the Saka confederation (also called "Scythians") inhabited the Eurasian Steppe and then the period when the Soviets promulgated the idea of emancipation amongst Kazakh women.

In general, Kazakh women bore the brunt of material production and household work during their nomadic life. There was no possibility to reconsider and contemplate the order of things in their society because of ongoing predicaments. Moreover, the diversity of the tribes made it difficult for Kazakh women to unite and reflect upon their position within their society [24], let alone the historical events such as the Kazakh famine of 1930-1933. Additionally, in the case of Kazakhstan, it is notable that practised belief before Islam had been Tengrism (a polytheistic religion), which was a mixture of shamanism and animism (a vast system of animistic beliefs and practices) [25]. Perhaps, this affected the perception of women's position within society. Most often, Kazakh women possessed to some extent, unrestrained will and did have a say due to the fact above. While as an example, the Arab Middle East's Islamic norms are different from those that we might observe in Kazakhstan, and this was mentioned in Weller's research paper (2013), saying that "In traditional Kazakh culture the influence of Shamanism, Zoroastrianism, and Tengrism is more predominant than Islam" [26]. For this reason, the role of women in Kazakh society may not be compared and analysed within the realm of Islamic countries, irrespective of the fact

that the majority of the population nominally holds Islam as the main religion.

The Kazakhs underwent several historical changes in how society perceives women regarding their role and function. Nonetheless, cultural norms had been evolving since the period of Tengrism, and then, the adoption of Islam, the tendency for constant changes in women's roles in society prevailed. Therefore, this lays the foundation for the idea that subjugated women were not prevalent. Moreover, there is a plethora of historical evidence that women rulers were popular within the nomadic pastoral confederation and attained military glory.

One of them was Tomyris — the Queen of the Massagetae and Saka — who defeated the ruler of the Achaemenid Empire, Cyrus the Great in 530 BC [27], following the refusal of marriage to the Persian ruler. This historical event was described in the ancient Greek historian and geographer Herodotus's work and the Flemish artist and diplomat Peter Paul Rubens's famous painting "Head of Cyrus brought to Queen Tomyris" under the commission of Archduchess Isabella, ruler of the Southern Netherlands. Another Saka woman ruler was Zarinae (7th BCE) [28], from the northern and the eastern Eurasian Steppe's confederation. Zarinae was, following historical accounts, an accomplished warrior, a prominent politician, and last but not least, a bringer of settlement and civilisation. The tribes under Zarinae thrived on engineering and architecture. Thus, based on historical accounts, women in Central Asia were equal to men, participating in battles and governing tribes just like men did.

Moving forward to the XXth century, Kazakh people still had an idea of equality in mind; it is clear from the Alash Orda party's programme of equal rights for all citizens regardless of their origin, religion and sex in 1917 [29]. The Alash party consisted of the Westernised Kazakh elite, who represented and protected Kazakh interests following the collapse of Tsarist Russia. It is known as the Great October Socialist Revolution of 1917 in history. Regardless of the Alash Orda party's programme, in the Turgai region, women's rights were addressed differently, pursuant to Koran suras [30]. According to *Hosking* (2006), after the Great October Socialist Revolution, the main agenda for the Soviets was to create a "new personality" in order to support the regime [31]. The main precondition for that was to change women's mindset as to their agency in society to change other social structures in Central Asia. Some researchers, for example, *Zhetybayev et al.* (2020) note that to incorporate the new Soviet ideology into people's mindsets, the Soviet regime disseminated the progressive ideas of women's emancipation among Islamic regions to introduce a new Soviet reality [32]. The stumbling point was religious authorities, which had a significant influence on people's minds. *Ghassanova et al.* (2002) outlined: "We suppose that in any case, the greatest obstacle on the way to women's liberation would be the aggressive opposition of religious authorities if they themselves were subjected to repression from Bolsheviks" [29], proving that a Muslim religious belief was deep-rooted in ordinary peo-

ple's ideology. During the Soviet period, it is noteworthy that the Central Party saw Central Asian countries as a threat because all the countries of this region might have been united under the ideology of Pan Islamism and that is where the Soviets used Russification policies to tackle the probable uniting of the Islamic republics of Central Asia. By doing so, the Soviet Union introduced the provision of the 30 per cent quotas for women representatives across the state to bolster women's emancipation. Despite these policies, after the Soviet regime had decayed, identity politics came on the scene, putting women on the sidelines.

After the dissolution of the Soviet Union, *Tatari et al.* (2010) note that religious revivalism took place in Central Asian countries, including Kazakhstan [33]. Also, *Cornell et al.* (2018) argue that the Kazakhstani government was concerned as regard rising foreign religious influence competing for this region [34]. Meaning that, within the state, some strata of the society sympathised and would not be opposed to revitalising their cultural beliefs and traditions after the Soviet Union's oppression of religious beliefs and traditions. Although the government devised policies that pushed the process of secularisation among citizens irrespective of what had been expected after the fall of the Soviet Union. *Tolsdorf* (2017) claims that the level of religiosity is strongly correlated with decreased public participation, and, thereby, the increase in Kazakh society's connection to its foundational nomadic, pastoral roots causes the decline of women's political activity [35]. As a result of the patriarchal nature of Kazakh society under the influence of religion, it is primarily true that Kazakh women are prone to believe in men's superiority and defer to men in any matters, including political matters.

Discussion

Nowadays, the Kazakhstani government has officially committed to delivering gender equality and eliminating any discrimination based on gender, age, religion, nationality and race. As an example, in 2016, the government adopted the Concept of Family and Gender Policy in order to remove any probable hindrance on the career ladder for women. On top of that, in 2021, the first women's march was held in Almaty on 8 March [36], which was for the first time when the local authorities had permitted such an event. These kinds of events are paramount because it nudges women to be involved in politics, and make women more visible across the country, encouraging them to speak out about their matters. In the Gender Mainstreaming Toolkit for Co-operation Projects [37], one of the prerequisites for Gender Equality and Political Participation is "Addressing the male-dominated culture of politics and the functioning of the political fora which, in turn, would allow more women to enter and remain in politics". On this basis, I assume that if Kazakhstani women were politically involved in the affairs of state, expressing their opinions regarding policies, this would help rise the question of who represents women's affairs at the decision-making level. *Profeta* (2017) put emphasis on the fact that lacking women's representation at the decision-making level might be a reason for problems in social, healthcare, education and

women empowerment in the country [38]. As it was claimed:

"Equality between women and men is a matter of human rights and a condition for social justice and is also a necessary and fundamental prerequisite for equality, development, and peace. A transformed partnership based on equality between men and women is a condition for people-centred sustainable development."

(Beijing Platform for Action [26])

In other words, women's voices in Parliament might have helped to develop policies regarding gender equality if there were a sound representation. In spite of the acts and conventions adopted, the religious revival in Kazakhstan is underway, as it was claimed in the research of Junisbai *et al.* (2017) [39]. Hence, I assume that this societal change — as it was discovered in the corresponding section of historical evidence on the societal inclination towards religious revival — since the dissolution of the Soviet Union, cultural and religious revival has been gaining momentum and contributing to feeble women's political participation because a Muslim woman is mostly perceived as a person who has no agency in any sort of aspects of life. This is one of the main contributors to the perceived impartiality when it comes to parity in Parliament. For instance, one of the respondents of Kakabayeva's research [20], who held a ministerial position and was a member of the ruling party Nur Otan, revealed: "It is very important to remember about the preservation of the cultural code because, in order to preserve the nation, it is very important that women and girls have traditional values. It is vital that a woman understands her role in preserving the nation because language, culture, and traditions start with the family. If in a democratic society this notion is not significant, precisely traditional upbringing is a factor in preserving the cultural code, and here it is important to maintain this balance". As a result, the question rises regarding which kind of traditional values should be preserved. As I discussed in the previous part "Looking through the historical prism", whether it should be a legacy of women warriors, who were equal to men and were rulers of the nomadic confederations, or a warped, patriarchal view of Islam, where women are subservient. In my opinion, that is where there is a stumbling stone for Kazakhstani society.

In the light of the recent event that happened in January 2022 in the Kazakhstani two cities, the unrest that took place in Almaty (the financial capital of Kazakhstan) and Zhanaozen (the oil-producing city), how the trends in the region may eventuate is still a huge question. Storm (2017) claims that socio-economic grievance might incite mistrust in policies and cause a new wave of religious revitalisation [40]. Meaning that women's empowerment is at threat of being ousted from the current improvements, and this might lead to the deterioration of women's political involvement. Ramadhan (2020) explains that according to the Holy Quran, women are equal to men; however, Muslim patriarchal societies try to devalue women's role in any area, most notably in politics [41]. On the other hand, keeping in mind that the President of Kazakhstan

Kasym-Jomart Tokayev's one of the important questions on the agenda is women's empowerment [42]; there is room for a belief that political representation of women in Kazakhstan, including other gender equality issues, will be addressed effectively. For example, recently, Kazakhstan's Chair of Commission for Women Affairs held a roundabout with senior representatives of the United States Agency for International Development (USAID) on Women's economic empowerment via Education, showing Kazakhstan's commitment to gender equality. To be specific, the initiatives discussed during the meeting were in the area of entrepreneurship, such as a resource centre for the support of women entrepreneurs and Kazakhstan's initiative to enlarge the work of the American Academy for Women Entrepreneurship. Moreover, the main achievements during Tokayev's presidency were noted at the meeting in Washington. One of the achievements was the amendment of the election's law, introducing 30 per cent quotas for women and young people in electoral candidates lists of political parties and its application for the distribution of parliamentary mandates, alongside the action plan for the implementation of UN Security Council Resolution 1325; the abolition of the list of prohibited professions for women [43]. Therefore, there is hope for amelioration in gender policies and women empowerment across the board. Yet, this quota is designed not only for women but also for the youth, which means that the share of women might be less than it is supposed to be. At the level of the populace, it can be deleterious when a woman part of the society does not have a voice in the faces of active female politicians at the decision-making level; it might render the majority of the population voiceless, which comprises 51.4 per cent of the population [44], excluding them from the equation of democracy.

Conclusion

Generally speaking, I arrived at the conclusion that Kazakhstan has gone through different historical changes, approaching the modern Kazakhstani society and still has ill gender problems as a heritage of the past because of diverse historical backgrounds and clashes between ideas, different religious practices, and opinions in the region.

I believe that for the country, where, according to the Report on International Religious Freedom 2021, 70 per cent of the population practices Islam [45], it is crucial to ensure women's role in society by providing voices in legislative. For example, by introducing policies related to the educational system, it would be possible to transmit knowledge, debunk the false impositions on women's roles or misperceptions within the community and prevent any misleading interpretations of the principles of Islam. From my point of view to some degree, this is the underlying reason behind the low numbers of female politicians and poor implementation of gender policies within the country. Secondly, religious institutions should engage in societal changes in terms of sharing and disseminating knowledge to remove avenues for possible attempts to distort the fundamental principles of Islam and to eradicate the stereotypes regarding women among the members of society. After all, social stability hinges upon a policy of

the state towards women, which in turn guarantees political and social-economic stability, and that is why it is sensible to address gender inequality in politics to furnish stability, peace and prosperity for all members of the society. However, it is crystal clear that the government is still inefficient in tackling gender-related issues because, despite all these international commitments and programs such as the UN's Beijing Platform of Action, high-level politics is still occupied by mostly male politicians and sometimes with a few female political elites (members of the establishments' families). Thirdly, it would be better to introduce policies focusing on women's representation at the decision-making level, separating other groups from women. To summarise, the government attempts at the international level to adhere to international standards and norms; however, all attempts have made a veneer of movements toward gender equality rather than making those attempts a reality.

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