Review

Symbolism and Semantics Colors in Kazakh Culture

Sarmanbetova Ulbossyn1*, Rajiv Mandal2
1School of Foreign Language, Wuhan University of Technology, Wuhan, China, 430070
2School of Art and Design, Wuhan University of Technology, Wuhan, China, 430070.

*Corresponding Author
Sarmanbetova Ulbossyn
E-mail: ainra485@hotmail.com

Published online : 06 April, 2019

Abstract: This paper focuses on symbolism colors in phraseologies in Kazakh culture identity. Symbolism colors and Kazakh phraseologies consist greatly from Kazakh national traditions and culture as well as Kazakh national lifestyle. There are six colors which are widely using in phraseologies; сары – yellow, көк – blue, жасыл – green, қызыл – red, қоңыр– brown, ақ – white, қара – black. These six symbolism colors are widely related with Kazakh’s world cognition. This article analyzes color phraseologies by etymological analyze. According to the etymological analyze, colors do not show or mean the colors, it describes the shape, character and Kazakhs’ world cognition.

Keywords: Kazakh World Cognition, Color, Phraseology, Etymological Analyze.

Introduction

Color has an important role in human beings’ life. Colors carry deep meaning with them in every culture. For instance, in some cultures, white represents innocence, but in others, it can represent death. The symbolism of colors often stems from religious, spiritual, social or historical events. Colors also have symbolic meanings. Historic colors use to relate the object and nature, between nature and human, between human and with universe.

According to V.I. Karasik symbol can be describing as the polysemy of symbol and not only represents variety interpretation, on the contrary it can represent plurality of interpretation. The symbol characterizes semantic depth and various works, it has a possibility to devote the definition and generate the new meanings (V.I. Karasik. 2012).

Kazakh language is a rich with phrasal words like other Turkic languages (Turkic is a collection of ethno-linguistic tribes, they speak related languages belonging to the Turkic
languages, as Turkish people, Kazakh people, Azerbaijanis, Turkmens and Kyrgyz), which using the different stylistic purposes in oral and written languages.

In order to men get to know their surrounding world, or national worldview with established language culture, customs and traditions that the most vividly drawn not from separate words, but from phrase words as wealth and depository of ethno-culture to save and develop language culture. In phrase words reflected the traditional system of knowledge of the people – native language speaker, society and nature.

Our investigation is devoted to color symbolism and color semantics. Color semantics signified sacral system of senses as a culture component and it becomes embodiment of definite cultural values. On other hand, color words constitute as a linguistic cultural phenomenon.

The phrase words materialized as the sacramental words which expressing Kazakh people’s world outlook. Kazakh nationalities’ world outlook closely related with atmosphere and nature. Kazakh people expressed their, aesthetic world-view and emotions by the colors. The environment, creation of the world and any object material world’s culture, clothes will disappear without perceiving the colors. The denomination of the colors use to reflect the peculiarity of national world-view in phrase words, therefore the colors phrase words consider as the holistic nominative concepts.

Kazakh archaeologist and ethnographer A. Margulan wrote about symbolism color: “Blue color is a symbol of a sky and a symbol of a worship in a sky, red color is a symbol of a fire and a sun, white color stands for the verity and happiness and gladness, yellow color is a symbol of an intellect, black color stands for a hearth, and green color represents spring and symbolizes youth, fertility, and new life” (A. Margulan. 1982).

Research Objectives

Our ancestry ideated a world in a form of a quadrangle and each side of a quadrangle represented in a certain color. For example, blue color represents East, red color represents South, black color represents North, and white color represents West. Suchlike the colors’ distribution built upon the direction of a sun on a horizon sky. (These colors are accordance to the direction of Kazakh perception, beliefs and culture).

Yellow color is associate with movement, anguish, endless life and vast in Kazakh culture. Thus, yellow color in Kazakhs’ understanding symbolized long and continuous form of movement. In phrase words yellow color expressed anguish feeling, for example, yellow is
sadness – painful sorrow; wait until yellowing – looking forward and yearning for a long time. On other hand, in other cultures – yellow color represents happiness, intellect, hope, delicate, joy, logical thinking, visibility, cautionary, cowardice and joy. It is a color of sunshine. From this point of view yellow produces arouses cheerfulness and warming effect. But for Kazakhs, gold color is associated with the sun, and with the happiness, cheerfulness and energy. Gold color symbolizes wealth, prestige, happiness and good health because it is the color of the sun, and sun is the source of life, from gold sun takes healthiness, warming effect and energy.

(a). In India blue represents with Krishna’s skin which symbolizes love, truth and infinite and the immeasurable. (b). For Turkey world– cognition blue symbolizes healing and evil repellant.

In Kazakh culture, blue color was used widely from the different meanings. So, a blue sky symbolizes the define beginning to the sky in Kazakhs’ understanding. Blue indicates sky, freedom, the flight to the future and power. At the same time, the meaning of the word blue means different in different phrase words. For instance, көк тұман– blue storm means very strong, powerful; көк есек – a blue donkey, here blue means stubborn and tells about a person can easily manage or manipulate him; көк өсекші – gossip (a blue chatterer); көк ми – a blue brain, here is telling about a person who cannot catch or understand anything what saying about it. Then there is also phrase word which using for denote the imprecation, for example, “высохни синим– dry up blue”, here this phrase word means to die without growing up or to die without getting up one’s feet. For North America blue signifies trustworthy, official business, philosophy, and for Latin America blue is associate with mourning and they wear blue when someone dies. In Puerto Rico culture, blue represents pirate and death. Blue indicates judgement, heaven, mourning and purity in Italy culture.
(a). As for Kazakhs blue represents the national flag that the endless sky as well as water. (b). In many religious blue represents heaven. (c). Blue color is associate with death, mourning in Italy and Mexico cultures.

For Kazakh culture, green color is associated with obstinate and diligent towards a freedom, this green color represent achiever, purposeful, egoism and selfishness people who is selflove person. Green color describes a person who gives a high position as “only me”. Thus this color is a symbol of highly self-mind, green color gives assuredness and confidence to human beings. And green is associated with a money in America culture. Mostly green color symbolizes youth, nature, life, spring and health in many cultures. For Muslims green is sacred color. As for Kazakhs lifestyle and mentality green color and blue color use the same meaning. These two colors can use interchangeably. For example, жасыл шықты – көктеді, this phrasal word means green came – became blue, құқ тұскен – (blue came and became blue) spring came and grasses grown, құқ шөп – (blue vegetable) means all kinds of vegetables.

(a). Red color symbolizes beautifulness, gorgeousness and fabulous beautifulness in Kazakh culture. Red color represents all beautifulness like roses. (b). The significance of red color stands for purity and this color preferred by brides. Red bindi and wedding dress symbolizes fertility and prosperity and demands positive energy.

Red color was originally associated with the color of the sun and the fire. Until today red color considers the sacred color in many nations. Then red color symbolizes young and
newborn: a red eagle. The red color designation use to connect Kazakh culture and traditions in phrase words. For example, according to the Kazakh customs, a house where it was just born a camel colt tied a red flag because it was a symbol of a silent, in order to come without noise because the noise could ruin a camel colt. From this standpoint, red associates a sign of danger and warning. A red flag signified the concept of “immature and newborn”. On the other hand, red color symbolized beauty, gorgeous, beautiful face, beautiful appearance, beautiful emotion. Red color is associate differently in different culture. And we can see clearly that red color is different in Kazakh culture than other cultures. For instance compare with other cultures.

(a). For Chinese culture red stands for celebration, good luck, joy, happiness and good fortune. (b). Red color stands for fruit and nature in Turkey culture.

Brown color represents silence, comfort, warmth and safeness for Kazakhs. The component of brown color is associate with the other words and turns into a stable phrase words. Brown color signifies the meaning of “neutral”. For example, velvet (brown) evening, it is a touch of velvet evening, soft (brown) autumn, velvet (brown) voice, here it means soft voice, soft – spoken voice and etc.

**The Category of Black And White in Kazakh Cognition**

The most complex relations among Kazakh peoples’ understanding white and black colors symbolize by the deep consciousness and the language culture of the people. First of all white and black colors designation were used to distinguish good and bad. If white color is a symbol of the exalted character: equal a mother’s hopefulness, fulfil the parents’ expectation or dream. And black color is a symbol of negative, and bad: there is one phrase word in Kazakh culture, “қара жерден тұрды, fell down on the black ground” – basely descend. For Kazakhs, white and black is a symbol of day and night.
White color is a symbol of positive and good, purity and innocence for Kazakhs until present. For example, ақ келін - white daughter-in-law, ақ жұрек – (white heart) kind heart, ақ ыяет – (white wish) good wishes, ақ жан – (white soul) pure soul.

White color is a sign of cleanliness and safety. Compare than black color white has more positive connotation.

White takes an essential place in Kazakh culture. It associates not only with colors, it associates with a sacred. Kazakhs never passed or jumped from any white thing. Kazakhs never wasted white or poured any white on the anywhere. Kazakhs cannot tell a lie in front of white. Specially such like white milk, white kefir, white flour, white sugar. White is a valuable for Kazakh people, because it symbolizes the sacredness.

White color is a symbol of a gladness and welfare: ақ түйенің қарны жарылды – good news, to be happy; ақ тілек - pure whishes; ананың ақ сүті – mother’s milk; white is a symbol of beauty, ақ майдай - white as a snow (white beautiful faced); else is a symbol of Khan’s generations: ақ сүйек – aristocrat; ақ орда – Khan’s white castle; ақ киізге көтерді – elected as a governor; and white is a symbol of a honor and respectfulness.

In some cultures, as India and china, white represents with death and mourning. And western bride wears white to mean the chastity. And Kazakh bride wears white with ornamental gold color to represent that she will give her warming effect, and give her happiness and prestige to her new family. Kazakh groom wears with gold ornamental to represent his wealth and good health.

In Kazakh culture, black represents the suffering. Kazak people were used black color to exaggeration of the bad and meant negative and else to hyperbolize of good and positive. According to Russian scientist and ethnographer Victor Grosse, black is a poly-semantic color for Kazakh people. The main meaning of the word black is a coal. In this sense, it was appeared in many phrase words with the meaning of unpleasant, shameless, villain, unthankful, insolent and etc., else with the meaning of a curse. For example, a black flag, black intention, a black heart.

In the most cases, the word black associates with death and painfulness in Kazakh world – knowledge. But black color is associates with anger, laziness and intolerance in India world- knowledge. For Asia Pacific cultures black symbolizes water, stability, life, the unknown.
(a). Kazakh bride and groom wears white clothe with gold traditional ornamental pattern “koshkar-muiz” (the horns of the ram) to represent the happiness, joy, good health and prestige. (b). Chinese people wear white when someone dies and to represent mourning.

Kurbanali Khalid wrote in his book “Taharauyih hamsat” that Kazakhs established black grave stone after burial a decedent and tied up the end with the long material signs. If a decedent was a young then tied up red material, for adults tied up white material, and for middle age tied up from one side black and from another side white or red material (Kh. Kurbanali 1999).

In Kazakh linguistics, the character of cognitive phraseology pertains the national vision, the essential ethnos in the linguistic world, the national spirit, the national traditions, the consciousness, the ethnics cognition. The nature feature of the theoretical linguistics considers the collection of information and specification. According to give the cognitive characters of the word black with correlate semantics, the word black with the correlate semantics may define the following meaning: the unknown color, sadness, cruelty, saintliness, and simplicity. These words meaning of black expresses the concept and cognitive characters of Kazakh culture and consciousness, to be more precisely, it expresses the essential symbol. It should be noted that cognitive contents of the component black in the combination of the essence distinguishes semantic colors in the complex nomination component or toponymic component or anthroponomic nomination.

Simultaneously, the word white uses to the antipodal kind of the word black in Kazakh phraseology, which draws up the binary system to white – black. Like that, white is a symbol of a day and black is a symbol of a night. According to this, Kazakh cultureologist Zh. Karakuzova and M. Sh. Hasenov considered these two colors that they have female and male characters. In national world cognition, every essence consists of the contradiction, and
for example, movement and evaluation or development cannot exist without the contradiction. It was proven with the dialectical principle. To be precise, white and black express the distinction between the language concepts, such as decency and indecency, uprightness and infamy, graciousness and brutality, advantage and disadvantage, happiness and unhappiness etc. The same way, if a life ideates the unity and the contrary contention, then the concept fits in semantic words white and black in Kazakh over-world-view.

According to the well-known Kazakh ethnographer O. Zhanibekov “the earlier centuries Kazakh people raised a black flag with black-and-white tassels, and close friends and relatives were dressed in black, and they were in mourning, and deceased’s horse was covered with black horsecloth, and people trotted round to nomadize for one year”. When establishing a black sign then considered a deceased’s age. Like that, phrase word a black sign established for sorrowful home or sorrowful village which means someone was died in somewhere. A black material, a black cloth and the other combination of words were used to mean mourning or an affliction in Kazakh human beings. For instance, “A Kazakh political figure Makhambet Otemisuly (the name of a hero in ancient Kazakh) ran away from Ansary (a village in Kazakhstan), then imprisoned Kurayisha (a person) to the Mount Hood. Two people died from the stones, and while establishing black died Hamza” (K. Abdykadyrov). “He established a black banner on the right side of the white house of the deceased after burial of the deceased by his own hand” (M. Ayezov).

But there is no categorical predication that black means bad or negative in combination with phraseology. In national world-view may distinguish a positive side of black color. The original meaning of black color is a color which opposite to white. This is the main meaning. But it is nominative meaning cannot be fundamental for connotative inferred meaning more latter. For example, collocation black water does not relate with water in Turkic toponomy system, on the contrary it relates with the ground. There is a term “black nation” in some medieval Turkic monument, but it is not concern with color or people’s appearance, on the contrary it is concern with society, position – simple (lower, inferiority nation). It is also known the division of social origin derivation: қара (қара ел – black nation) inferiority society and ақ сүйек – white bone means aristocracy which based on these symbols (A. Kononov 1954).

The Conceptual Concept of Kazakh Nations

The nomination of black has a symbolic meaning of the sanctity and the sacredness. The combination “қара шанырак” (black shanyrak) – black hearth (literally) means saint and
sacramental and has the meaning of a large and a beginning. For example, the combination қара шаңырақ (Shanyrak) – (black hearth) means the sacred and holy house. It has a big meaning. Shanyrak uses to mean a big house and happy family, it has a deep meaning and a concept. Firstly, the word shanyrak (house or hearth) use to mean a big house or large and to mean a beginning in Turkic world mentality. Shanyrak means hearth which Turkic world cognition and has a deep concept, for example, shanyrak means hearth or house which was inherited from grandfather to father, from father to his son, the house was left to the younger son, youngest son always inherits the house. The symbolic signs of the round form of the shanyrak (hearth) in the unlimited system means the continuation of the family name always inherit the house. The round shanyrak symbolize a sign of the meaning the continuation family.

Many Turkic language researchers noticed that the word black used to mean big, many (a lot), and good. For example, in phrase word of a black Qypchaq (member of a nomadic Turkic tribal confederation), here the word black does not characterize the image of Qypchaq, and used as a periphrasis to mean numerous people, multinational, and multi – tribal. In this case the word black uses in Kazakh phrase word: қара сөз – (black words) hallow words, sapiential words; қара күш – (black or big) juggernaut; ауыр қара – (black) very heavy etc. In present black also symbolizes sophistication and formality, but it also represents evil, mourning, magic, fierceness, illness, bad luck and mystery.

![Image of Shanyrak](image-url)

**Shanyrak:** The round shanyrak represents black holy house and continuation family.

In the national cognition of a world cognition explores the special features which associate with the concept of black to symbolize the saint and be born. Because of cognitive ability manifestation of interconnection in ancient Turkic and the modern Kazakhs worship in the ground. Because Kazakhs worship in Motherland.
The worship in Motherland kept a lot of traditions in Kazakh culture, and these related with forbidden words and imprecation which reflect phrase words. Before it was in ancient Turkic, then later Kazakh nomads deified in the same way, like a sun, a sky, a fire and water: black land/ground (literally) – Holy Land.

Ancient nomads wore black tumar (as an amulet) with inside a handful of native ground, because native land brings fortune, safety and it provides themselves a better future by the decades. The word tumar originated from Turkic’s word “tuma–er” which meaning Motherland. Researchers associated etymology with the combination of the word tumar (amulet) which means native land or native ground.

The қазан – (kazan, large cooking pot) has an essential role in Kazakh world–knowledge and culture. It does not show an object of the material culture, but it got a deep symbolic meaning which putting together the concept. The word black including in this compound to impart holy and sacramental significance and verify the meaning in the language formulation. The black sacramental kazan emanated from the symbolic meaning of sufficiency, wealth and peaceful life. The kazan establishes in the middle of the yurt (nomads’ tent) on the heart being that a fire is a symbol of the beginning of life. The worship in the fire is a main starting concept of the worship. According to this concept, the worship of fire has been the main incipience in Turkic people and including Kazakhs too.

(a). Tumar. (b). Black kazan is a symbol of wealth and sacramental in Kazakh culture.

Kazan takes the main place in the national socio–historical events. The wholeness of the Kazan destroys, it means family breakdown, and turn the Kazan is a sign of disgrace and hunger. For example, in “Seven Charters” (was the set of laws introduced in the Kazan Khanate by Tauke Khan c.1680-1718) if a person who was sentenced to death may buy seven
tokens. Firstly, he must pay for black large cooking pot (kazan). In earlier times, in epoch and war period and bloodletting period, black horse was giving as a gift to the attacker to mean other’s surrender or accept defeat. For the time being, Kazakhs use the black color to mean a sorrow, painful life, rigidity, dourness, poverty, to be of low condition, evil, crime, deception, and lawlessness or social inferior. A study of the sources and the materials of unrelated languages demonstrate on a common symbolic meaning of the concept black. (A. U. Toktabaev 1992). When the word black use alone, it may express the meanings, for example, contour, image, human being, shape, derivation, sort and etc.

The word қараптық (Karashyk – black eyes) is derived from the word қарақ means black – pupil of the eye, black eyes. Accordingly, қарагым, қарагым (dear, sweet) is a non-derivate word from the name of the bird ‘crow’ and relate to above-mentioned meaning. The full meaning of the word қарагым, қарагым – dear, sweet. Such the phraseology combination with the word black, as black kazan (large cooking pot), black shanyrak (hearth or house) use to mean saint and holy. The phraseology combination which use to mean to not bedevil children’s life, on the contrary to protect the peace of the family. Black kazan are expressed to live by looking after a son.

There is legacy Kazakh’s song:

1. We were against Makhambet (Kazakh warrior’s name), in order to protect our holy hearth (house) and to save our children’s life.

The combination қара қазан бай (black large cooking pot is wealth, the winner of the black large cooking pot) contain information about a beggar who got rich. For example, “Zhylkybai (the name) has only recently been grown rich beggar, his virtue distributes only on people who he is afraid of moneybags”. (G. Mustaphin).

So, the word black broad differentiates use and peculiarity with semanticist in Kazakh language. Black is the color in Kazakh language which have a lot of figurative meanings, conditional meanings and symbolic meanings.

Many sustainable combinations of Turkic languages which relate to this word, has many meanings:

1. Firstly, this is due to show itself that it is prevalent, meaningful and complicated color in the nature;

2. Secondly, there are many phenomena shows social life with the similarities with the betrayal color. For example, the kind of black (dark) thing, the image of the unknown
Satan – evil spirit or devil, black (dark)days – sorrow and sadness, the image of poor people, the water running through the black mournful earth, shape of human who was punishment for atrocities, and black deeds. Accordingly, for Kazakhs logic, all these phrase words characterize with black color.

When the Kazakh people go into a sad time or sad dark (black) times (black streak, black days literally) used such kind of phraseologies, for example, қара кошпенділер – black nomads, қара жамылды – despair days or black moments (to put on black literally), қара ойлар – dark thoughts (black thoughts).

A myth about a swallow bird (Why swallow bird’s tail is cut?)

When needs to introduce the black color from positive perspective, than used the following phraseologies, for example, қара батыр – a black warrior (real and worthy), қара қемпір – a black old woman (sophisticated from the life experience), қара домалық бала – a black round boy (children), қара ұзын шаш – a black hair (wonderful, lovely), қара қозді қыз – a girl with black eyes (gorgeous), қара қасы қылған – black eyes fit match for black eyebrows (perfect look, lovely appearance).

There is one phraseology according to Kazakh ethnic culture legend which demonstrates a girl who took from the nature shyness and quietness. For example, “a black Kazakh swallow bird” – because a black swallow is a symbol of loyalty and kind – heartedness.

Once upon time a deathly ill dragon assembled all the animals and gave an order to find a medicine from his illness. Then a fox suggested to a dragon, in order to be cure to drink a baby’s blood. After that, a dragon entrusted a mosquito to find the blood. A mosquito sucked a baby’s blood who was lying in the cradle, and it was going to fly back. When a swallow bird heard a baby’s cry, a swallow moved down and followed a mosquito. A swallow hit a vessel with the wings. Then a blood spilled. A mosquito informed a dragon
about the incident. The furious dragon snatched a swallow, but a swallow bird got away from
the dragon. Since a tail of a swallow bird is an essential. The Kazakh people honor a holy
swallow bird, that even lost a part of a tail, but did not allow to deliver human’s blood for a
dragon. Because of this, people do not destroy the swallows’ nest. Since people says that
қарлығаш (swallow bird) is a holy swallow bird. There is an information in the different
sources. So, a black swallow bird use to describe a Kazakh girl with black eyes and kind –
heartedness. The meaning of the combination “to cut black hair” (literally) comes from the
figurative, emphasis and correlative, so they say about an honest and a fair people.

Swallow birds nest bring safeness to the home.

It is difficult to distinguish between black and white. Because black cannot mean only
bad or only good in Kazakh world perception. It has so fine distinction, that equal only how
to cut a hair in the middle. It was based in the old days and became one of the traditions.
People searched a difficult decision and had the debates in front of Biy (Kazakh ruler) in
earlier times and brought a rope which twined from the hair. When the both sides agreed with
a decision of Biy, then a rope was cut in the middle. It indicted an agreement with a decision
of Biy, and an agreement that a person given the decision, to cut the hair justify, equally in in
the middle. The word and expression which implying an adjustment, said is like cut off, -
decide, cut off – resolved, - connect with cutting the ropes which twined from the hair. In
Kazakh language, the positive semantics of black color is a kind of cognitive peculiarity and
artistic meaning the following form:

1. Honesty, fairness
   • қара қылды қақ жару (to cut the hair in the middle) – resolve the dispute by rights.
2. Sanctity, holiness
   • қара шаңырақ (a black hearth and house) – holy house.
• қара домбыра (a black dombyra Kazakh musical string instrument) – a holy dombyra;
• қара қазан (a black large cooking pot) – sufficiency and affluence;
• қара сөз (the black word) – wise word;
• қара жер (black earth) a holy earth, the ground which nourish.
3. Positive and good
• қара қазан көтеру (to lift a black kazan) – prosperity;
• қара сойып той жасау (to have a party by immolate) – sacrifice and a big black animal;
• қара канат болу (to become the black wing) – to help to be ascend, confirmation;
• қара құш (black power) – smash power and powerful which has ability to protect.
4. Beauty, loveliness
• сүмбілдей қара шаш – as very long and as very thick black hair;
• қара қасы қиылып (black eyebrow is highlighted) fair and glorious;
• ботадай қара көздері – (camel’s black eyes) – a big beautiful eyes as a camel has;
• қарагер жылқы – a black mare.
5. Tender emotion
• Қарғалым (my dearest, my sweet, my unique);
• Қарғалым (my dearest, my sweet, my unique);
• Қарашығым (my dearest, my sweet, my universe);
• Қара домалағым (my dearest, my sweet, my cutest and my purest );
• Қаратайым (my dearest, my sweet, my youngest, closest and dearest).

Mostly, grandparents and parents use these words to their grandchildren and children. Because in earlier Kazakh culture, grandparents did not call their children’s names by their names. But still many Kazakh culture keeps this tradition until now. Using the word “қара – black” with the emotion combination of phrasal words to not mean only my dear, my sweet or my unique, it has a deep meaning. Because black means a treasure in these phrasal words.

Conclusion

In conclusion, color characterize Kazakh’s tradition, world mentality, customs, culture and character that color symbolism shows every ethnic nations’ world outlook. Generally, the combination of phrase words represents Kazakh tradition and culture which expressing color to cognize stylistic and semantic meanings, because it is a part of component in natural
phenomena and appearance. Thus, the peculiarity of symbolism to define the pertinence. So, colors play importantly the main role in Kazakh lives. Colors can remind the people of Kazakh that colors also define about literate and symmetric meaning of other part of the world. It defines about a place, a time of year, or our favorite traditions, and can also shape the way we feel. But when it comes to what different colors symbolize in cultures around the world, these associations can vary greatly.

References


© 2019 by the authors. TWASP, NY, USA. Author/authors are fully responsible for the text, figure, data in above pages. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (http://creativecommons.org/licenses/by/4.0/).