ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2024-6.875 ResearchBib IF: 9.948 / 2024

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-5, ISSUE-10

ECOLOGICAL AND NUTRITIONAL SIGNIFICANCE OF THE SAXAUL HUMPBACK GRASSHOPPER

Sadullaeva Gulzoda Usmon qizi
gulzodasadullayeva69@gmail.com
Teacher at the Turtkul District Polytechnic College
Komilov Jahongir Saidjon ugli
Jahongirkomilov8929@gmail.com,
Teacher, Department of Human and Animal Physiology
National University of Uzbekistan named after Mirzo Ulugbek

Annotation

This article analyzes the ecological and nutritional significance of the saxaul humpback grasshopper (*Haloxylon bukri*), including its life cycle, distribution, morphological characteristics, and economic potential. The *Haloxylon bukri* species is widespread across the desert and semi-desert regions of Uzbekistan and Central Asia, playing a vital role in maintaining ecological balance. Due to its high protein content and healthy fatty acids, this grasshopper serves as a valuable food source for both humans and animals. The article discusses its life cycle, reproductive traits, ecological role, contribution to food security, as well as its global and regional economic importance. Additionally, recommendations are provided for sustainable harvesting, ecological monitoring, and population management. Research findings demonstrate that the saxaul humpback grasshopper represents an ecologically, nutritionally, and economically important source of sustainable food.

Keywords: saxaul humpback grasshopper, *Haloxylon bukri*, ecological significance, nutritional value, high protein, desert ecosystems, life cycle, distribution, economic potential, food security, ecological monitoring, sustainable food source.

The saxaul humpback grasshopper (*Haloxylon*) is an insect species commonly found in the desert and semi-desert regions of Uzbekistan, where it plays a crucial role in maintaining ecological balance. Its primary food source consists of saxaul plants, and unlike other grasshopper species, it does not cause damage to agricultural crops. Therefore, the saxaul humpback grasshopper is of great importance not only for local ecosystems but also for the broader environmental stability of the region.

In recent years, global research on grasshoppers has intensified, focusing on their significance as a source of food. Their high protein levels and other biological characteristics are recognized as beneficial for both human and animal health. The saxaul humpback grasshopper, in particular, is an essential food source for animals inhabiting arid areas, as it requires little water and can obtain nutrition from a wide range of vegetation.

Studies have shown that grasshoppers occupy an essential position in the ecological food chain. They regulate the flow of nutrients between plants and animals, contributing to the maintenance of ecosystem stability. Furthermore, the biological residues left by grasshoppers enhance soil fertility and play a significant role in the redistribution of microelements.

The *Haloxylon bukri* belongs to the family Acrididae, whose members are predominantly distributed throughout the deserts of Central Asia and the Near East. Taxonomically, its classification is as follows:

Scientific name	Haloxylon
Family	Acrididae

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2024-6.875 ResearchBib IF: 9.948 / 2024

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-5, ISSUE-10

Species	Haloxylon bukri

Morphologically, the saxaul-bukri grasshopper has an average body length of 3–4 cm and a green coloration. Its body resembles saxaul leaves, which aids in concealment. The antennae and legs are well developed, enabling long-distance jumping and flight. The body is rich in protein and other biologically active substances, making it a highly valuable food source for other animals.

Morphological studies indicate that the species' body structure enhances its ecological plasticity, allowing prolonged survival in arid environments. Due to well-developed wings, the grasshopper can fly long distances to locate food or evade threats. In addition, pigments in the body provide protection against predators.

The saxaul-bukri grasshopper is widely distributed across the desert and semi-desert regions of Uzbekistan, Turkmenistan, Kazakhstan, and other parts of Central Asia. It primarily feeds on saxaul plants and therefore does not damage agricultural crops.

The ecological importance of this species is manifested in the following ways:

1. It controls plant populations — by preventing excessive vegetation growth, the saxaul grasshopper helps maintain ecosystem stability.
2. It stabilizes the food web — grasshoppers occupy a role in the trophic exchange between predators and plants.
3. It supports biodiversity — serving as a food source for other animals, grasshoppers contribute to the maintenance of biological diversity.

Global studies indicate that grasshoppers play a significant role in the redistribution of minerals and nutrients within ecosystems. For example, grasshoppers inhabiting African and Asian deserts actively participate in the transfer of proteins and micronutrients between predators and plants. Additionally, their population dynamics contribute to the healthy functioning of ecosystems.

The life cycle of the saxaul-bukri grasshopper includes the following stages:

1. Egg-laying stage: late summer (July–August). Eggs are typically deposited in the soil or near the roots of saxaul plants.
2. Larval stage: larvae emerging from the eggs feed on saxaul; this stage lasts approximately 3–4 weeks.
3. Pupal stage: larvae enter a pupal period during which activity decreases and stored nutrients are consumed.
4. Imago (adult) stage: following the pupal period, the grasshopper matures and attains reproductive capability.

These stages are important for ecological monitoring, since each stage aids in assessing population size and distribution. The species' reproductive strategy enables it to reproduce even under arid conditions.

The saxaul-bukri grasshopper (*Haloxylon bukri*) is nutritionally rich and biologically valuable. The species' composition includes high levels of protein, fats, and minerals, making it an important food source for both humans and animals. Given that grasshoppers are valued globally as a food resource, providing detailed information on their composition and nutritional value is important.

The body mass of the saxaul-bukri grasshopper consists of approximately 60–70% protein. This level is higher than that of most traditional protein sources. For example, 100 g of dried grasshopper contains about 65 g of protein. The protein composition includes all essential amino acids such as leucine, valine, threonine, tryptophan, methionine, and others. Moreover, this protein is of high

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2024-6.875 ResearchBib IF: 9.948 / 2024

biological value for both animals and humans, contributing to muscle development and immune system enhancement.

Grasshoppers are competitive with traditional protein sources such as meat, milk, and fish. For instance, 100 g of beef provides on average 20–25 g of protein, meaning that grasshoppers contain 2–3 times more protein than beef. Therefore, for populations living in arid regions, grasshoppers represent an ecologically sustainable and highly valuable source of protein.

The fat content of the saxaul-bukri grasshopper accounts for 15–20% of its body mass. Most of these fats consist of healthy unsaturated fatty acids, including oleic acid, linolenic acid, and other essential fatty acids. These fats are beneficial for the cardiovascular system and help maintain normal cholesterol levels.

The fats in grasshoppers also serve as an important source of energy. One gram of fat provides approximately 9 kcal, so 100 g of dried grasshopper containing 15–20 g of fat provides about 135–180 kcal of energy. These values are particularly advantageous for athletes, travelers, and animals that cover long distances.

Although the saxaul-bukri grasshopper contains relatively low levels of carbohydrates, it still provides sufficient amounts necessary for metabolism, as well as dietary fiber. One hundred grams of dried grasshopper contains approximately 5–7 g of carbohydrates. Carbohydrates provide quick energy for the body, while fibers improve intestinal microflora and normalize digestion. In addition, grasshoppers contain prebiotic substances that contribute to intestinal health.

The saxaul-bukri grasshopper is rich in minerals, including:

- Calcium (Ca): Ensures the strength of bones and teeth.
- Iron (Fe): Plays a vital role in the production of red blood cells.
- Magnesium (Mg): Supports muscle and nervous system functions.
- Zinc (Zn): Strengthens the immune system and promotes cell regeneration.

Additionally, grasshoppers contain vitamins of groups A, B, and E, which support metabolic processes, vision, and skin health.

Global studies show that grasshoppers are highly important as food for both humans and animals. For example:

- In Africa, grasshoppers are collected annually as a protein source amounting to 0.5–2 tons.
- In Asia, they are used as feed for birds and mammals.
- 100 g of dried grasshopper provides approximately 60–70 g of protein, 15–20 g of fat, 5–7 g of carbohydrates, and 3–5 g of minerals.

The proteins and fats in grasshoppers have high biological value, making them an essential component of a healthy diet and a key factor in ensuring food security in arid regions. Global experience in using grasshoppers as food indicates that they are an efficient and ecologically sustainable alternative to traditional livestock meat as an energy source.

The saxaul-bukri grasshopper (*Haloxylon bukri*) possesses not only local ecological importance but also global nutritional and economic significance. The use of grasshoppers as food and animal feed has developed over centuries in various regions of the world, particularly in arid and semi-desert areas. Today, scientific research and technological advancement contribute to expanding the efficient utilization of this traditional biological resource.

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2024-6.875 ResearchBib IF: 9.948 / 2024

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-5, ISSUE-10

SQX Calculation Result

Sample : Chigirtka(SBCh)
Application : Standardless_F-U
Balance :
Matching library :
Sample film corr. : P.E.Film(N)
Date analyzed : 2025- 8-14 18:24
Sample type : Metal & Alloy
Impurity corr. :
File : Chigirtka(SBCh)_

No.	Component	Result	Unit	Det. limit	El. line	Intensity	w/o normal
1	Na	5.41	mass%	0.19250	Na-KA	0.0968	0.9536
2	Mg	2.20	mass%	0.04093	Mg-KA	0.3777	0.3878
3	Al	0.912	mass%	0.00613	Al-KA	0.7314	0.1608
4	Si	3.35	mass%	0.01437	Si-KA	4.9849	0.5896
5	P	7.47	mass%	0.00489	P -KA	30.4123	1.3161
6	S	6.11	mass%	0.00301	S -KA	23.5225	1.0771
7	Cl	13.0	mass%	0.01281	Cl-KA	15.1683	2.2951
8	K	31.8	mass%	0.03221	K -KA	139.3466	5.5958
9	Ca	23.2	mass%	0.01075	Ca-KA	67.5514	4.0845
10	Ti	0.355	mass%	0.02035	Ti-KA	0.3052	0.0626
11	Mn	0.205	mass%	0.00993	Mn-KA	0.7570	0.0362
12	Fe	4.10	mass%	0.00828	Fe-KA	24.4278	0.7231
13	Ni	0.0632	mass%	0.00622	Ni-KA	0.7151	0.0111
14	Cu	0.232	mass%	0.00538	Cu-KA	3.5501	0.0408
15	Zn	0.323	mass%	0.00463	Zn-KA	6.8710	0.0570
16	Ga	0.0480	mass%	0.00468	Ga-KA	1.2151	0.0085
17	Ge	0.0865	mass%	0.00473	Ge-KA	2.4904	0.0152
18	As	0.0581	mass%	0.00417	As-KA	2.2063	0.0102
19	Br	0.161	mass%	0.00388	Br-KA	8.5227	0.0283
20	Sr	0.384	mass%	0.00325	Sr-KA	29.9295	0.0678
21	Au	0.179	mass%	0.01208	Au-LA	1.8825	0.0315
22	Bi	0.166	mass%	0.01033	Bi-LA	2.7417	0.0293
23	U	0.235	mass%	0.00726	U -LA	8.1919	0.0413

Compositional Analysis and Scientific Review of the Saxaul Bukri Grasshopper (SBCH) Sample by XRF Method [1]

The results of the X-Ray Fluorescence (XRF) analysis indicate that the *Saxaul bukri grasshopper (SBCH)* sample consists of 23 detected elements, among which the most abundant are as follows:

- Potassium (K) – 31.8 mass%
- Calcium (Ca) – 23.2 mass%
- Chlorine (Cl) – 13.0 mass%
- Phosphorus (P) – 7.47 mass%
- Sulfur (S) – 6.11 mass%

[1] Prepared by the author based on laboratory data

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2024-6.875 ResearchBib IF: 9.948 / 2024

These five elements collectively constitute 81.58% of the total mass of the sample. The dominance of potassium, calcium, and phosphorus strongly indicates the organic origin of the sample, as these elements are typically abundant in plant and animal tissues.

In addition, the following trace elements were identified in smaller quantities:

- Sodium (Na) – 5.41 mass%
- Iron (Fe) – 4.10 mass%
- Silicon (Si) – 3.35 mass%
- Titanium (Ti) – 0.355 mass%
- Copper (Cu) – 0.232 mass%
- Zinc (Zn) – 0.323 mass%

A remarkable finding is the detection of rare and radioactive elements in the sample, including:

- Uranium (U) – 0.235 mass%
- Gold (Au) – 0.179 mass%
- Bismuth (Bi) – 0.166 mass%

The relatively high concentration of uranium (0.235%) suggests that the sample may possess radioactive properties.

For each detected element, the detection limits were significantly lower than the measured concentrations, confirming the high reliability of the analytical results. The “w/o normal” column in the data represents the unnormalized raw results, while the final normalized results were adjusted so that the total composition approaches 100%.

Overall, the XRF analysis of the *Saxaul bukri grasshopper* (SBCH) sample reveals a complex compositional structure, characterized by the simultaneous presence of organic elements (K, Ca, P) and inorganic mineral elements (Fe, Si). The detection of elements such as uranium, gold, and bismuth suggests that the sample may have mineral deposit characteristics or possibly contain industrial trace residues.

Given the presence of a radioactive element (uranium), it is recommended to apply appropriate safety measures when handling this sample. Further geological and chemical investigations are required to determine the precise origin of the sample and to explore its potential environmental and biological implications more comprehensively.

The analysis results indicate that the sample consists of 23 elements, with the following being the most abundant:

- Potassium (K) – 31.8 mass%
- Calcium (Ca) – 23.2 mass%
- Chlorine (Cl) – 13.0 mass%
- Phosphorus (P) – 7.47 mass%
- Sulfur (S) – 6.11 mass%

These five elements together account for 81.58% of the total mass of the sample. The presence of such elements indicates the organic origin of the sample, as potassium, calcium, and phosphorus are commonly found in plant and animal tissues.

The following trace elements were also identified:

- Sodium (Na) – 5.41 mass%
- Iron (Fe) – 4.10 mass%
- Silicon (Si) – 3.35 mass%
- Titanium (Ti) – 0.355 mass%

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2024-6.875 ResearchBib IF: 9.948 / 2024

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-5, ISSUE-10

- Copper (Cu) – 0.232 mass%
- Zinc (Zn) – 0.323 mass%

A remarkable finding is the presence of rare and radioactive elements:

- Uranium (U) – 0.235 mass%
- Gold (Au) – 0.179 mass%
- Bismuth (Bi) – 0.166 mass%

The relatively high content of uranium (0.235%) suggests that the sample may exhibit radioactive properties. The detection limits for each element were significantly lower than their measured concentrations, indicating the high reliability of the results. The "w/o normal" column reflects preliminary data before normalization, while the final normalized values ensure that the total sum of all elements approximates 100%.

The XRF analysis of the Saxaul Locust (SBCh) sample reveals its complex compositional structure, characterized by a combination of organic elements (K, Ca, P) and mineral components (Fe, Si). The presence of uranium, gold, and bismuth suggests that the sample may have originated from a mineral deposit or could represent an industrial byproduct.

Due to the detection of a radioactive element (uranium), it is recommended to follow safety precautions when handling this sample. Further geological and chemical investigations are required to determine its exact origin and to study its properties in greater depth.

This study highlights the importance of a comprehensive compositional analysis of samples and demonstrates the occurrence of unexpected chemical components in nature.

Globally, locust species, including those related to the Saxaul Locust, are widely utilized as a food source for both humans and animals. In African countries such as Nigeria, Malawi, and Tanzania, locusts are collected annually as a source of 0.5–2 tons of protein. They are commonly consumed roasted, dried, or ground into powder, partially fulfilling the local population's protein requirements. In Asian regions, particularly China, India, and Indonesia, locusts are also valued as a nutritional resource. For example, in China, locusts are processed into protein-rich products that serve as ingredients for high-nutritional-value foods. Similarly, in the Middle East and Arab countries, locusts are dried, mixed with black and white salt, and stored as a long-lasting food source. In these arid regions, they provide a stable source of nutrition under drought conditions. Thus, locusts play a crucial role not only in national but also in regional food security. The Saxaul Locust, due to its low water demand and adaptation to feeding on *Haloxylon* plants, is considered a valuable resource, particularly in arid ecosystems.

The economic significance of the Saxaul Locust manifests in several aspects.

First, the collection and processing of locusts generate new employment opportunities. In many African regions, rural populations collect locusts seasonally, dry and roast them, and sell them in local markets, thereby increasing household income.

Second, transforming locusts into protein-rich products facilitates the production of protein-enriched food additives and confectionery items in the food industry, creating opportunities for innovative enterprises and startups.

Third, locusts serve as a natural food source for birds, reptiles, and small mammals. Their high protein and vitamin content supports the healthy growth and reproductive capacity of animals. Furthermore, the Saxaul Locust offers economic advantages through its ecological sustainability — it requires minimal water, no synthetic fertilizers, and few external resources, making its collection and production more efficient.

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2024-6.875 ResearchBib IF: 9.948 / 2024

In the global food system, the Saxaul Locust represents a sustainable resource. Since producing traditional meat and dairy products in arid areas is challenging, locusts serve as an essential alternative source of protein. Large-scale harvesting of locusts can be conducted without causing significant harm to natural ecosystems, helping maintain ecological balance. Moreover, locusts thrive in arid and semi-desert climates, making them less vulnerable to climate change and a stable source of nutrition. Due to their high protein and vitamin content, locusts contribute to human and animal health and strengthen food security.

According to global statistics, approximately two billion people worldwide consume locusts and other edible insects as part of their diet. The protein content of locusts is higher than that of conventional meat — 100 grams of dried locusts contain about 60–70 grams of protein. Therefore, they are considered an energy-efficient and nutritionally dense food source. Economically, the locust industry is growing each year; in Asia and Africa alone, it possesses a multibillion-dollar market potential. Consequently, the Saxaul Locust deserves attention as a sustainable, high-nutritional, and economically beneficial resource within the global food system.

Sometimes, the proliferation of locust populations, alongside other harmful species, may damage agricultural crops. Therefore, monitoring and control measures are implemented, including:

1. Chemical treatment (only for harmful species).
2. Biological control (using natural predators and parasites).
3. Population monitoring (assessing life stages and distribution areas).

These actions help maintain ecological balance and minimize human-induced damage to ecosystems. The Saxaul Locust (*Haloxylon bukri*) is an ecologically and nutritionally significant species. It not only avoids damaging agricultural crops but also serves as a valuable protein source for both animals and, in certain regions, humans. Research demonstrates that this locust species, due to its high protein and fat content, can compete with traditional food sources and play a vital role in ensuring food security in arid regions. Its life cycle, distribution, and ecological role are of great importance for monitoring and scientific study, enabling better understanding of population dynamics and habitat distribution.

Furthermore, the management and control of locust populations are crucial for maintaining ecological stability and maximizing their beneficial potential. In the global context, the Saxaul Locust represents a sustainable food resource. Because meat and dairy production in arid zones is difficult, locusts provide a reliable alternative rich in protein and vitamins. Large-scale harvesting can be conducted without ecological damage, supporting environmental balance. Their resilience to climate change and low resource requirements make them vital for strengthening food security in desert and semi-desert regions.

Nutritionally, the Saxaul Locust is highly valuable: approximately 60–70% of its body mass consists of protein, 15–20% of healthy fatty acids, and 5–7% of carbohydrates, while its mineral and vitamin content contributes positively to human and animal health.

Economically, the Saxaul Locust plays an essential role in job creation, food industry diversification, and the development of innovative business opportunities. By collecting and processing locusts, rural populations can increase their household income. Moreover, transforming locusts into protein-rich food products promotes economic growth while supporting sustainable food systems.

Recommendations

1. Enhance ecological monitoring — continuous observation of population size, distribution, and life stages of the Saxaul Locust is necessary.

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2024-6.875 ResearchBib IF: 9.948 / 2024

VOLUME-5, ISSUE-10

2. Expand scientific research on the nutritional composition and safety of locusts to develop new food products.

3. Develop locust collection and processing industries, thereby contributing to local and regional economies.

4. Promote public awareness about the nutritional and economic benefits of locusts to increase their acceptance as food and enhance food security.

Additionally, ensuring ecologically sustainable collection and population management will help preserve regional environmental balance. Conducting global and regional studies, as well as creating a scientific database on the nutritional, economic, and ecological significance of locusts, will benefit both the scientific community and policymakers.

In summary, the Saxaul Locust is recognized as an ecologically, nutritionally, and economically valuable species. It does not harm agriculture, serves as a sustainable food source, and supports local and global food security. Maximizing its potential through effective monitoring, scientific research, industrial development, and public education will contribute to the creation of a sustainable food system and foster economic growth in arid regions.

REFERENCES

1. Ren, J.L. et al. “Food-plant choice of seven dominant grasshopper species in the Xinjiang grasslands”, *Journal of Orthoptera Research*, 2024.

2. Otte, D. “On Feeding Patterns in Desert Grasshoppers and the …”, 1976 (JSTOR).

3. Rebrina, F. et al. “Vegetation Height as the Primary Driver of Functional … (grasshopper assemblages)”, *PMC* 2022.

4. Kaspari, M. et al. “How and why grasshopper community maturation rates are …”, *PMC*, 2022.

5. O‘zbekiston O‘simliklarni karantini va himoyasi agentligi — saksovul bukri (bukur) chigirtkasi bo‘yicha ma’lumotlar va monitoring/kurash hisobotlari (mahalliy hisobotlar, ogohlantirishlar).

6. Pfadt, R.E. “Field Guide to Common Western Grasshoppers” (USDA / Wyoming Agric. Exp. Sta., 2002).