

## ADAPTATION OF THE MORINGA PLANT TO DIFFERENT CONDITIONS

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**Annotatsiya:** Ushbu maqolada *Moringa oleifera* o'simligining morfologik, fiziologik va ekologik moslanishlari batafsil yoritiladi. *Moringa* – issiq iqlim sharoitida yaxshi o'suvchi, qurg'oqchilikka chidamli va oziqaviy qiymati yuqori bo'lgan o'simlik bo'lib, uning moslanish mexanizmlari global iqlim o'zgarishi sharoitida muhim ahamiyat kasb etadi. Maqolada *Moringa*ning ildiz, barg, urug' va boshqa organlarining moslanish xususiyatlari ilmiy manbalar asosida tahlil qilinadi.

**Kalit so'zlar:** *moringa oleifera*, moslanish, qurg'oqchilik, fiziologik moslanish, morfologik moslanish, ekologik moslanish

**Аннотация:** В этой статье подробно рассматриваются морфологические, физиологические и экологические приспособления растения *Moringa oleifera*. *Моринга*-это растение, которое хорошо растет в жарком климате, устойчиво к засухе и имеет высокую пищевую ценность, и его механизмы адаптации становятся все более важными в условиях глобального изменения климата. В статье анализируются адаптационные особенности корней, листьев, семян и других органов *Моринги* на основе научных источников.

**Ключевые слова:** *Moringa oleifera*, адаптация, засуха, физиологическая адаптация, морфологическая адаптация, экологическая адаптация

**Annotation:** this article will cover in detail the morphological, physiological and ecological adaptations of *moringa oleifera* your plan. *Moringa* is a plant that grows well in your hot climates and is drought tolerance, and has high nutritional value, and its adaptation mechanisms are important in global climate change conditions. The article analyzes the characteristics of the adaptation of root, leaf, and other organs see your size based on the scientific npr.

**Keywords:** your *moringa oleifera*, adaptation, drought, physiological adaptation, morphological adaptation, ecological adaptation

The overall importance of your plant description and npr. Your *moringa oleifera* npr – belonging to the family *Moringaceae*, mainly in tropical and subtropical regions grow. It is popular with nutritional and medicinal properties, have the ability to grow in arid regions. Leaves of this plant, seeds and roots are rich in various medicinal and nutritional substances, agricultural and applied widely in the pharmaceutical industry. *Moringa* is your fast-growing, drought-resistant and requires less care of a plant, its moslanish global food security and environmental sustainability is important for the study of the properties. Following the systematic classification has *moringa oleifera* your npr:

World: the world of plants

Be: Floral plants (Magnoliophyta)

Class: Two urug'pallali (the Eudicotyledons)

Order: karamdoshlar to close (Brassicales)

Family: Moringadoshlar (Moringaceae)

Category: Your Npr

Type: npr oleifera your

Npr is your family moringaceae belonging to this species includes a total of 13 families. Most popular and common type your npr oleifera, sometimes it “miraculous tree are called. This type mainly in india, pakistan, africa and south-east asia occurs. If there are other unwanted plants to your type npr, npr and npr is your peregrina stenopetala your mashhuri most of them. They also moslanish in terms of specific environmental characteristics.

Npr occurs where in your plant?

1. Natural areal distribution. Originally oleifera is grown in the regions of india and pakistan, your npr, although currently it is common in tropical and subtropical regions. Mainly south asia, africa and occurs in the countries of central america.
2. Planted areas. Grows well in hot and arid regions, your npr, so it food, medicine and environmental planted in various places for the purpose of recovery.
  - Arid regions: Africa, in order to ensure food security in the region, which is less precipitation were planted.
  - Which is sufficient moisture in tropical regions: south-east asian and south american countries with high yields grow.
  - Saline soil areas: the middle east and north africa to be resistant to saline were planted.

Even if your npr came mainly from india and pakistan, currently in africa, south asia, southeast asia, and is common in warm regions, such as central and south america. It is resistant to drought and various environmental conditions in different areas of the reason o'stirilmoqda planting.

Npr moslanish of your oleifera plant.

#### 1. Your oleifera plant morphology moslanish npr

Npr oleifera is a plant that can adapt to your different climate and soil conditions, and its morphology is mainly moslanish roots, stems, leaves, flowers, seeds and fruits, such as appears in the body. This moslanish him, drought, and salinity allows you to live in severe conditions such as high temperature.

- The root system will moslanish.
  - a) Deep root system. Your basic common and very deep npr (shpindel) to root it. This will help you to get from the water layer and the deep roots of the plant ensures survival in drought conditions.
  - b) Auxiliary side considered the development of the roots. The side roots are well developed, the different layers of soil nutrients and moisture from the substance gives you the chance to win.
  - c) The presence of tissue in the roots which store water. The roots of turnips or carrots moringaning the root part is similar to a storage cell consists of partial water and nutritive substances. This feature makes it viable in the conditions of deficiency of water.
- The stem moslanish
  - a) Soft and fibrous structure. Your stem is soft and stringy npr, if there are cells, which store the water in the internal parts. The mechanism of this plant gives to help withstand drought for a long time.

- b) The ability to grow quickly. The stem has a feature called rapid growth can grow to 3-5 feet per year. This allows you to survive in difficult conditions and biomass yield faster moringaga.
- c) Yog'ochlashmagan stem. Partial yog'ochlashgan of the stem if it is flexible and light. This allows you to easily grow with the effects of the wind and protects from him.
  - The leaves moslanish
- a) Tiny and complex leaves. Moringaning leaves patsimon complex has a structure helps to reduce evaporation of water. Transpirasiya minimallashtiriladi loss through the leaves finely.
- b) The maximum of light is the ability to win. Leaves are adapted to quickly and efficiently carry out the process of photosynthesis. This allows it to grow even better in low soil fertility.
- c) Shedding leaves in the dry season feature. Npr is your long-continued drought conditions and will help to keep leaves in the water shed. Leaves of plants that can live without this feature it will become one.
  - The flower moslanish
- a) Early flowering and very fertile. Flowering can be your npr a few times a year. This ensures its spread quickly.
- b) Structure adapted to be pollinated. Flowers mostly self-changlantiruvchi, even if you also can be using insects and wind pollinated. This increases its various ecosystem viability.
  - However the fruits and seeds moslanish
- a) Light and floating seeds. Npr light and is adapted to move in the air if your seeds, water, or can be spread long distances with the help of wind.
- b) Drought-resistant seeds, bark. The seeds are covered with a thick protective layer this long-term drought conditions will help to maintain viability.
- c) The ability to sprout out very quickly. Seeds may sprout out in 3-5 days while this allows them to survive in natural conditions.

Npr plant your roots, stem, leaves, flowers and seeds through drought, soil salinity and are perfectly adapted to temperature changes. Its morphological features of the plants that survive in important areas that have difficult living conditions, it will become one. Moringani this aspect of agriculture, food security and very important in maintaining the ecological balance as a single crop creates the basis of the estimate.

## 2. Your oleifera plant physiological moslananishlari npr

From a physiological aspect of your oleifera plant npr have the ability to adapt to different environmental conditions. This moslanish his save water, give to withstand the temperature, effective stress increases the chances of mastering and living in conditions of nutriyentlarni. Detailed information about the basic physiological moslanish moringaning is given below.

- Moslanish water-saving and drought. Npr is known as a drought-resistant crop of your plants. To save water moslanish focused its physiological consists of the following:
  - a) Stomatalarning be effectively managed. Your stomatalar npr in the leaves (strap) the reduction of the daylight hours of the night will open. This will reduce water loss and helps to prevent transpirasiya. Additionally, only to the extent necessary stomatalar opened, and adapted to the process of saving water.
  - b) Metabolic moslanish are. Some conditions your npr CAM (Crassulacean metabolism aci) can be applied to the elements of photosynthesis, that CO<sub>2</sub> to collect the night, in the daytime will continue the process of photosynthesis. This feature would allow you to reduce the loss of moisture to it.

- c) Vakuol competence development. If there are any available big vakuol leaf and stem cells, serves to protect the plant and water them in dry storage conditions.
- The temperature-resistance. Your npr 40°C and can grow at higher temperatures. Thus, the physiological reason moslanish are:
    - a) To protect against heat shock. In plant cells heat shock protein (HSP – Heat shock protein antibodies. This protein protects cells from excessive overheating. Ensures the stability of hsp proteins, enzymes and structural components of cells.
    - b) Transpirasiya control technique. While it is reduced in through the leaves in the hot days stomatalarning transpirasiya with closure prevents loss of excess water.
    - c) Yog'ochlashmagan tissue. If yog'ochlashgan half of the stem of the plant heat stress and heat helps to reduce the effects of moisture during storage.
      - Moslanish to saline. Some can grow well in saline soil your npr. The physiological properties associated with this is the following:
        - a) The control mechanisms of ion. Npr nor your<sup>+</sup> my and cl<sup>-</sup> ion to the root from the leaves of saline through the redirection you will be protected from stress. Antitranspirant sodium ions reduces the harmful effects of substances in the leaves.
        - b) Osmotik compatibility. Npr produces the effects of saline substances osmoprotektant in your cells. These cells will help to keep the water in. Pro ritalin among Osmoprotektantlar sorbitol and glitsin-beta-like substances that are there.
      - Mastering moslanish of nitrogen and nutrients. Moringaning associated with less fertile soil, good growth in its adaptation to its nutrients, in particular:
        - a) Make fiksatsiya nitrogen. Bacteria lives in the roots of some nitrogen moringaning fiksatsiyalovchi simbioz. This will help adopters bacteria the nitrogen in the air. This process provides less Moringaning in the development of soil nitrogen.
        - b) Likelihood, which has a large root system. Moringaning have common roots, phosphorus, potassium and micronutrients from the soil gets separated effectively.
        - c) Substance absorbing nutrients through the leaves. Allows Moringaning fed through the leaves of the plant to the leaves. In which case it cannot microelements from the soil enough substance from the surface of the leaves can be absorbed.
      - Moslanish growth and regeneration. Regeneration is the ability of a plant and its growing very fast npr is your very powerful.
        - a) Vegetative reproduction. Npr gets out through your cuttings grow too, this is the plant which makes him spread quickly. Cut the stem and branches after new shoots will appear soon.
        - b) Tuksoniz (dormantlik) switch to the on position. Your tuksoniz npr severe drought conditions (that is, cease to grow time) may take the position. Upon the completion of the restoration of soil moisture, he quickly and the stem will grow new leaves.

Npr has a wide range of physiological moslanish your oleifera plant this drought, salinity and the deficiency of nutritive substances such as plants adapted to live in adverse environmental conditions will become one. Its water-saving mechanisms, availability to withstand high temperature, resistance to saline and feature not only the rapid growth of food and as a medicinal plant, but is also converted to crops also important to stabilize the ecological environment.

### 3. Environmental npr moslanish of your plant

Npr oleifera is a plant that can adapt perfectly to your different environmental conditions. Its drought, salinity, heat, low soil fertility and the ability to withstand a wide range of environmental stress caused to spread in range. Below moringaning moslanish more environmental coverage.

- Moslanish drought. Well this arid regions environmental and grow your following in his moslanish associated with npr:
  - a) Deep root system. The roots penetrate soil layers deeper to moringaning main adopters and moisture will help. Competence the development of the root system well because of water deficiency conditions, plants can live in.
  - b) Water-saving the leaf structure. Npr reduces the evaporation of water through leaves your tiny patsimon and complex. Vakuol zaxiralaydi large leaves in water in the required time.
  - c) Transpirasiya be the limit of the technique. In the daytime stomatarlar closing and opening night, this prevents the loss of water through transpirasiya.
  - d) Have shed leaves in drought conditions. Npr is your long-continued drought conditions, the leaves are shed, this prevents loss of water. But conditions improve quickly if new leaves grow out.
- Moslanish to saline. Npr best in soil that can grow your salinity level is high. This is associated with the following environmental moslanish:
  - a) Remove the engine out of salt. Excess sodium ions and chloride accumulation in the leaves of the plant, through the shedding of saline after the fight against is. As a result, the accumulation of harmful salts in the root system would not let me.
  - b) Saline through the ion exchange reduce stress. Npr osmoprotektantlar in your cells (glitsin-beta may be pro ritalin, sorbitol) is produced, the disinfection of the members of the sodium ions of these compounds, increases the plant's ability to live.
  - c) Vakuol are resistant to saline. Leaf and stem cells to be tolerant to saline and salt are brought together in vakuol reduces the damage reaches.
- Moslanish to change the temperature. Npr perfectly adapted to the conditions of hot climate, but is able to withstand low temperature and a short period of time.
  - a) High temperature resistance. Your npr 40-45°C. it can grow at a temperature which is even better. The heat conditions in plant cells heat shock protein (HSPs) in the production of proteins keeps it stable and protects the cell structure.
  - b) Moslanish to low temperature. Npr can survive freezing temperatures on your levels, but short-term from the cold then from the stem and stem can grow. During the winter months in some areas, vegetative held the position of rest.
- Moslanish his low productivity of the soil. Npr ozuqali your little can live in the soil, and this is his moslanish related to the following environmental:
  - a) Mastering the ability of nitrogen. The bacteria live in the roots with nitrogen fiksatsiya simbioz, this is less nitrogen in the soil allows it to grow.
  - b) Search for food through the large root system of the ingredients. The roots from the deep layers of the soil phosphorus, potassium and micronutrients are adapted to receive.
  - c) To be resistant to soil erosion. Npr is bound to your roots in the soil, this will help to reduce erosion while. Plant for the recovery of the territory which he and saline is used as fitomeliorativ degradatsiya occurs.
- Moslanish to environmental stress. Your npr better adapted to natural disasters and environmental stress:
  - a) Fast recovery ability. New shoots from the root and the stem grow out quickly with the onset of rain. Also in the case of the cut of the stem, the plant was quickly restored.
  - b) Beneficial effects to the ecosystem. Helps to increase the fertility of your soil npr. The leaves enriches the soil humus and improved it.
  - c) The effectiveness of pollination. Insects and wind pollinated using your npr, helps to maintain biological diversity in this ecosystem.

Your oleifera npr drought, salinity, low soil fertility, one of the plants to adapt to environmental stress and heat is important. Its roots, leaves, stems, and regeneration ability allows him to live in natural conditions in different physiological processes. The npr project as a result of your agroekologik fitomeliorativ moslanish this environmental and climate change resistant crops as well as extensive in the restoration of ecological balance can be applied.

Also, there are many useful aspects of your plants in the npr. So it is used in many areas.

1. Moringaning useful aspects. Your oleifera npr – plant, which is rich in biologically active substances, human health, agriculture and ecology has important properties.
  - a) For its health benefits. Rich in vitamins and minerals. Npr leaves your a, c, e vitamins, iron, calcium and rich in essential micronutrients such as potassium. 7 times more vitamin c from orange 100 g dry leaf in the structure, sutmikidan 4 times more calcium.
  - b) Antioxidant properties. Npr in your content quercetin, chlorogenic aci and the beta-carotene antioxidant substances like are there, they protect the body from free radicals.
  - c) Blood pressure and protect the heart. Moringaning norms leaf extract to bring blood pressure, reduce cholesterol and helps in the prevention of cardiovascular diseases.
  - d) Against the effects of diabetes. According to studies, npr natural compounds which help in reducing the amount of sugar in the blood includes your leaves. Anti-inflammatory effects. Bioaktiv substances in its structure, arthritis, asthma, chronic bowel diseases, such as effective against inflammatory processes. Strengthen immunity. Npr natural substances which protect your body from infections (flavonoidlar, polifenollar) is enriched with.
  - e) Kosmetolog and beauty benefits. Yoshari to skin. Npr namlantiradi oil in your skin, reduces wrinkles and renews the skin cells. Has antiseptic properties against skin disorders.
  - f) Hair strengthening. Npr oil feeding the hair roots, makes pouring and solid was saved by them.

## 2. Application areas check out:

- Medical and pharmaceutical
  - a) Of medicines. Moringadan prepared of natural plant extract, blood pressure, diabetes, cancer, and are used as drugs against inflammatory disorders.
  - b) Biological adds. Your npr tablets, and capsules to boost immunity in the form of powder is used.
    - The food industry.
      - Superfood (biologically active supplement). Products your npr leaf powder to a healthy diet (smoothie, tea, sweets) are added. Superfood is one of the products in the international market as valuable.
      - Feed supplement for animals. Leaf powder is used as livestock feed your animals npr and their health will improve.
- Agriculture and ecology
  - The organic fertilizers and improve soil. Npr in increasing the fertility of the soil as humus your leaves is used.
  - Environmental stability. In arid regions, plant, planting, reduce erosion plays an important role in improving and green environment.
  - The water's clean. Plays the role of a natural filter. The prepared powder filtered water your seeds npr qualification demands bacteria and impurities, makes it unsuitable to drink. This technology is used to clean drinking water in developing countries.
- Fat and industry production bioyoqilg'i

— Ben Oil (oil npr). Get your seeds npr fat qualification demands a high quality cosmetics and food industry. This fat is also used in the manufacture of bioyoqilg'i.

Your npr oleifera medicinal, food, cosmetics, agriculture and ecology are widely used in different areas such as. His biological structure that allows you to contribute to improve the health of environmental protection and sustainable development.

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