THE DISTRIBUTION AND BIOECOLOGICAL CHARACTERISTICS OF ABELMOSCHUS (ABELMOSCHUS ESCULENTUS L.)

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Abelmoschus (Abelmoschus esculentus) or "lady's finger" belongs to the Malvaceae family and is widely distributed in tropical and subtropical climates. Its historical origin and various names show how significant it is in different parts of the world. Each culture has given it different names based on its expertise: in India, it is called bhindi, in the USA, it is known as gumbo, in the UK, it is referred to as lady's finger, and in Africa, it is called abelmoschus. This vegetable is not only used in cooking but also in the textile, cosmetics, and pharmaceutical industries.

Uses of Abelmoschus. Abelmoschus has extensive culinary uses. It can be used not only fresh but also in processed forms. Its pods are commonly used in soups, sauces, salads, pilafs, and side dishes. The characteristic taste and mildly acidic flavor of abelmoschus contribute to its popularity. Additionally, abelmoschus can be dried, canned, or frozen for long-term use. Dried abelmoschus is especially common and is used in many countries by cooking it or using the skin and liquid. This is an example of how versatile this vegetable is.

Added Processing and New Uses. Abelmoschus seeds are known for their unique properties. Abelmoschus seeds contain up to 20% protein and fats, making them useful not only in the food industry but also as substitutes for cumin, tea, and coffee. In particular, roasted seeds in hot climates can be used as coffee substitutes or for various infusions and medicinal purposes.

The leaves of abelmoschus are also used in some countries like spinach. They can be consumed fresh or dried, and in some regions, they are valued for their high content of essential vitamins and minerals. In countries such as Yugoslavia or South Korea, abelmoschus is widely used not only in food but also in cosmetics and as biological active supplements.

Genetic Selection and Efficient Use of Abelmoschus. The selection of abelmoschus is being improved through modern genetic research. Programs are improving the yield, pesticide resistance, and shelf-life of abelmoschus. The

shape of the abelmoschus fruit and its quality are highly valued, as they help reduce the shelf-life of the fruit. This research also helps reduce the likelihood of the formation of toxins, such as cyclopropenoids, in the seeds.

Origin and Composition of Abelmoschus. Several hypotheses exist regarding the origin of abelmoschus. Vavilov, in his studies, attempted to determine that it was domesticated in Ethiopia, but many studies show that its origin lies in India. Modern genetic research indicates that abelmoschus may have multiple origins from several regions, including Southeast Asia, India, Ethiopia, and West Africa.

Botanical Characteristics of Abelmoschus. Abelmoschus thrives in tropical and subtropical climates and has the ability to grow and branch effectively. Its roots are deep, allowing it to efficiently absorb moisture and nutrients. The plant grows to a height of 1-2 meters, with some species having larger branches and beautiful flowers. Abelmoschus flowers are large, yellow to red in color, and open for a single night. During its active growing phase, abelmoschus can develop for several days. Proper cultivation and harvesting at the right time are crucial for its optimal use.

Ecological Requirements. Abelmoschus varieties are sensitive to photoperiod, with some varieties being neutral to this factor. Two major factors influencing the flowering process of abelmoschus are temperature and photoperiod. These factors work together to ensure flowering. High temperatures can delay flowering. The minimum temperature required for abelmoschus growth is above 20°C, and the optimal temperature range is between 30-35°C. If the temperature falls below 15°C, growth significantly weakens, and at 10°C, the plant can suffer cold damage. Temperatures above 42°C can cause flowers to fall and affect the plant negatively.

Abelmoschus grows best in productive, well-drained soils. Sandy or clay soils are ideal as they are suitable for irrigation. Abelmoschus is somewhat sensitive to soil acidity, and a pH range of 6.0-7.0 is generally preferred. While the plant is drought-tolerant, insufficient moisture during the flowering period can negatively impact the yield. The plant requires approximately 50 mm of moisture per week. Due to its high nutrient absorption ability, it needs various mineral fertilizers, which should be applied 2 or 3 times for best results.

Propagation and Agricultural Techniques. Abelmoschus is propagated by seeds. The germination rate significantly decreases when the temperature is below 17°C, and the optimal temperature for growth is between 29-30°C. The seeds have a hard shell, so it is recommended to soak them in water for 24 hours

before planting to improve germination. Acidic scarification can also improve this process. Seeds are planted at a depth of 2-3 cm, and seedlings typically emerge within a week. Usually, excess seeds are planted and later thinned to maintain a spacing of 20-30 cm between plants and 100 cm between rows. The number of plants per hectare can range from 50,000 to 150,000, with high plant density limiting the formation of new branches and complicating the harvest.

Harvesting and Processing. The harvesting of abelmoschus typically begins 7 weeks after planting. Harvesting can be somewhat uncomfortable, as the fine hair-like structures on the leaves and pods can irritate the skin and cause dermatitis. When manually harvesting, the pods should be carefully twisted and separated from the roots. If the pods are cut off completely, less damage will occur to the pods and stems.

As the pods grow larger, they become tougher. The optimal tenderness of the pods is reached 4-7 days after harvesting. During this period, the formation of fibers in the pods begins. Harvesting is usually done every 2-3 days, although in high temperatures, daily harvesting may be required. Delayed harvesting can lead to the growth of fibers in the pods and delay the blooming process. Regular harvesting of young pods helps maintain the plant in a vegetative state and prolongs the harvesting period. During the first half of the 50-55 day harvest period, the main yield is collected. A healthy, vigorous plant can produce up to 100 pods. Yields typically range around 6 tons per hectare, and yields of 10 tons per hectare are considered very good, though the overall potential can be 3-4 times higher.

Storage and Quality Preservation. Abelmoschus has a high respiration rate and is very sensitive to damage, making it prone to dehydration. Therefore, it must be handled carefully. For local markets, it is necessary to cool the abelmoschus to 10°C within a few hours after harvesting. Cooling is typically done in refrigeration chambers, and hydro-cooling is rarely used. Storing abelmoschus below 7°C can degrade its quality, and at temperatures above 10°C or with low humidity, it begins to dry out.

Diseases and Pests. As abelmoschus belongs to the same family as cotton, it is susceptible to similar diseases and pests. Major diseases include:

- Alternaria hibiscinum - Alternaria leaf spots
- Cercospora abelmoschi, C. hibiscina, C. malayensis - Cercospora, leaf and flower spots
- Pythium, Rhizoctonia, Fusarium spp. - Root rot
- Macrophomina phaseolina - Dry rot

- Phytophthora parasitica - Pod rot
- Fusarium oxysporum f. uasinfectum - Fusarium wilt
- Ascochyta abelmoschi - Pod spots
- Erysiphe cichoracearum - Powdery mildew
- Verticillium dahliae - Verticillium wilt

Major pests include:

- Heliothis armigera - Flower borer
- Nisotra gemella - Pod borer
- Amrasca biguttula - Leafhopper
- Aphis gossypii - Melon/cotton aphid
- Pectinophora gossypiella - Cotton bollworm
- Tetranychus spp. - Spider mites
- Earias biplaga, E. insulana - Stem borers
- Bemisia tabaci, B. argentifolia - Whiteflies

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