International Journal of Genetic Engineering 2024, 12(5): 59-61
DOI: 10.5923/j.ijge.20241205.01

Anatomical Structure Plant of the Seed of Bitter Pumpkin, Bitter Melon – *Momordica Charantia* L.

Turgunov Jaloliddin Rahmonali[1], Naraliyeva Nasibakhan Mamanovna[2]

[1]Andijan Institute of Agriculture and Agrotechnologies, Andijan, Republic of Uzbekistan
[2]Andijan State University Doctor of Biological Sciences Professor, Uzbekistan

Abstract In recent years, consistent reforms have been implemented in the republic Uzbekistan on the protection of medicinal plants, the rational use of natural resources, the construction of plantations for the cultivation of medicinal plants and their processing. 750 of the more than 4.3 thousand plant species of the local flora are considered medicinal, of which 112 species are registered for use in scientific medicine, of which 70 species are actively used in the pharmaceutical industry. *Momordica charantia* L, is used in folk medicine as a lipid-lowering agent. The medicinal plant *Momordica charantia* L is known for its medicinal properties since ancient times in India. This plant is also grown in the climatic conditions of Asian countries, including Uzbekistan. In this article, for the first time in Uzbekistan, the anatomical structure of the seeds of bitter gourd or bitter melon plant - *Momordica charantia* L. (*Cucurbitaceae* Juss.) has been studied. Anatomical analysis established the diagnostic characteristics of the species, that the seed is endosperm, the seed coat consists of many layers, and nutrients are located in the endosperm cells. Also, based on an analysis of the literature, the medicinal properties were studied.

Keywords *Momordica charantia* L., (*Cucurbitaceae* Juss.), Bitter gourd, Bitter melon, Seed, Endosperm, Anatomy

1. Introduction

Momordica charantia L. herbaceous vine with tendrils grows up to 5 m (16 ft) long. It has simple regular leaves 4-12 cm (1.6-4.7 in) in diameter with three to seven deeply divided lobes. Each plant bears separate yellow male and female flowers. In the Northern Hemisphere, flowering occurs from June through July and fruiting from September through November. It is a hardy annual in the temperate zone and a perennial in the tropics. It grows best in USDA zones 9 through 11.

The fruit has a distinct warty surface and an oblong shape. It is hollow in cross-section, with a relatively thin layer of flesh surrounding a central seed cavity filled with large, flat seeds and a core. The fruit is most often eaten green or when it begins to turn yellow. At this stage, the flesh is crisp and watery in texture, similar to a cucumber, chayote or green bell pepper, but bitter. The skin is tender and edible. In unripe fruits, the seeds and core appear white; they are not very bitter and can be removed before cooking.

Some sources state that the pulp (rind) becomes somewhat tougher and more bitter with age, but other sources state that, at least in the common Chinese variety, the rind does not change and the bitterness decreases with age. The Chinese variety is best harvested light green, perhaps with a slight yellow tinge or just before. The core becomes sweet and bright red; In this state it can be eaten raw and is a popular ingredient in some Southeast Asian salads.

When fully ripe, the fruit becomes orange, soft and breaks into segments that curl up, exposing the seeds covered with bright red pulp.

Today, in the cultivation of medicinal plants, in their reproduction, in the study of seed germination, in increasing their productivity, attention is paid to the important role of the seed and its mineral substances and natural compounds.

Momordica charantia L. (*Cucurbitaceae* Juss.) - bitter gourd or bitter melon is grown in many tropical and subtropical regions of the world, its unripe fruits are eaten as a vegetable, rich in chemicals, saponin substance, used in folk medicine to treat stomach, intestinal, diabetes diseases, pharmacological properties are known from the literature [1,2,3]. However, the anatomical structure and useful compounds in the seeds of this species have not yet been sufficiently studied.

The seeds of *Momordica charantia* L., which have medicinal properties, are initially green in color and turn pale yellow or orange when ripe. The seed can be uneven and different: cylindrical, egg-shaped, oval-shaped. The dimensions are 3-15(40) × 2-5(8) cm. Ripe seeds are red-brown in color [4].

2. Materials and Methods

The seeds of *M. charantia* plant were fixed in 70% ethanol according to the generally recognized method, and the

Received: Jun. 20, 2024; Accepted: Jul. 15, 2024; Published: Jul. 18, 2024
Published online at http://journal.sapub.org/ijge

anatomical structure was studied in the cross-section of the fixed material [5].

In the study of anatomical features, preparations prepared by cutting a cross section by hand and a Motic V1 microscope were used. The preparations were stained with safranin. Cells and tissues were measured using a micrometer MOB-15. Quantitative measurements of several characters: seed diameter, seed coat thickness, seed coat thickness, and endosperm thickness were performed using a conventional method [6].

Statistical analysis of the data was calculated using a personal computer (MS Excel) using generally accepted methods. Photomicrographs were taken using a digital camera and mathematical analyzes were calculated using a Motic microscope.

3. Results and Discussion

When the anatomical structure of the seed of *M. charantia* plant was studied under a microscope, it was observed that the seed coat was thick and multi-layered (figure).

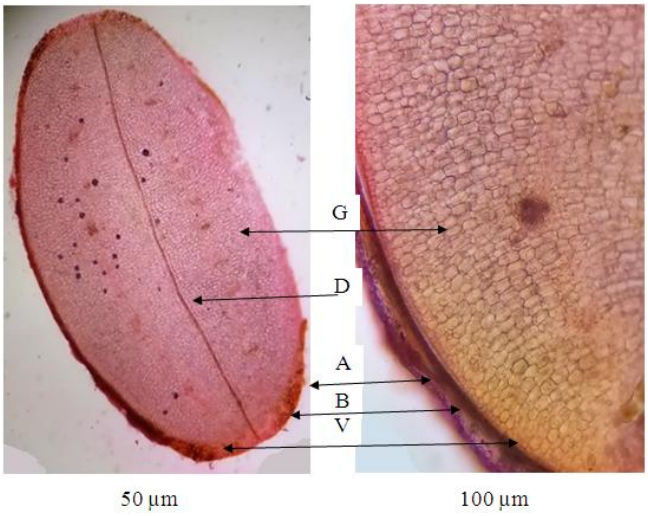

Figure 1. General view of the transverse section of the seed of *Momordica charantia* L.: A- epicarp, B - mesocarp, V - endocarp, G – endosperm, D – embryo axis

M. charantia seeds have a complex internal structure consisting of several layers according to their anatomical structure (figure 1):

Seed coat: It is the outermost layer of the seed and protects the embryo inside. It usually does not pass harsh effects and water. Endosperm: this layer serves as a source of nutrients for the developing embryo. It contains carbohydrates, proteins and lipids. Embryo: A young plant inside a seed. It consists of an embryonic axis. *M. charantia* seed outer layer (epidermis): The outer surface of the seed is covered with an epidermal layer, which can vary in texture and thickness depending on the ripening of the seed.

Epicarp: In the seed of *Momordica charantia*, the epicarp lies beneath the epidermis and protects the internal contents of the seed.

Mesocarp: The middle layer of the seed structure, located between the outer epicarp and the inner cavity of the seed. It is composed of parenchyma cells and fibrous tissue.

Endocarp: is the innermost layer of the wall surrounding the seed cavity. Seed cavity: is the central cavity inside the fruit that contains the seeds. In *Momordica charantia*, this cavity is filled with many gelatinous seeds.

Placental Tissues: These are the tissues that nourish the seeds inside the embryo. They can attach to the inner wall of the fruit and extend into the seed cavity. The structure of the seed coat is highly specialized to protect the developing embryo and ensure its survival until favorable conditions for germination are created.

The main parameters of *Momordica charantia* seed structure are seed diameter, seed coat thickness, endosperm thickness, seed diameter is 17.8±0.8, seed coat thickness is 3.5±0.3, and endosperm thickness is 14.3±0.5 µm. can be seen (table).

Table 1. Anatomical indications of seed structure of *Momordica charantia*

No	Symbols	Indicators,µm
1	Seed diameter	17,8±0,8
2	The thickness of the seed coat	3,5±0,3
3	The thickness of the endosperm	14,3±0,5

As we know, endosperm is a nutrient-rich tissue that develops in the seed of a plant. In some plants, for example, wheat, onions, tulips, chives, and others, the seed coat is so small that almost the entire interior of the seed is occupied by the endosperm (protein). These types of seeds are called endosperm seeds.

For the seed to ripen, it is necessary to go through certain processes, that is, it takes time. It depends on many external and internal factors. The most important among external (environmental) factors; are water, air (oxygen) and temperature. Light is also needed for the germination of small seeds.

Ripe seeds are usually very dry. Their relative humidity is 5-20%. That is why the seeds cannot germinate until they absorb the necessary water. As a result of water absorption, the seed swells. The activity of enzymes in its composition increases, respiration accelerates and nutrients are broken down. As a result of the activity of ribosomes, protein and other substances are synthesized. The stem divides again, the cells elongate. It requires constant water and nutrients. If there is a lot of moisture in the soil at this time, it becomes difficult for the seed to breathe, because the seed will not germinate due to the lack of oxygen. The lowest (minimum) temperature limit for the germination of seeds of most plants is around 0 +5 ℃, the highest (maximum) +45 +48 ℃, and the average (optimum) +25 +30 ℃. Some seeds will not germinate even if all external conditions are favorable.

The term of seed germination is different, it also depends on the storage conditions of the seed and the mineral compounds in its anatomical structure [7]. Such seeds are called dormant or dormant seeds because the germ that germinates from the seed absorbs the endosperm material and then its cells are digested. In the literature, the effect of

pre-sowing seed treatment on increasing the yield has been studied, the seed has a strong endosperm with essential oils, so the germination period depends on the soil moisture, that is, the oil is impermeable to moisture, and it is also recommended to pay attention to the seed moisture and soil moisture to get a good onion yield [8,9,10].

The seeds of *Momordica charantia* usually germinate easily under favorable conditions, the pod emerges from the seed coat and becomes a seedling. The seeds of the plant contain a large amount of useful substances, which makes them a truly unique product. It is known from the literature that the seed contains protein, carbohydrates, vitamins and minerals, lipid and fat, omega-3, stearin, olein, linoleic fatty acid, extract oil [11,12].

Information on morphology and anatomy of vegetative organs of *Momordica charantia* species, geographical distribution, ecology, phytochemical composition, systematics, taxonomy, importance in medicine and economy [13].

4. Conclusions

In conclusion, it can be said that from the analysis of the literature, it was found that the anatomical structure of the seed of the plant is not sufficiently studied. Also, it is not an exaggeration to say that the internal structure of the seeds of this species and the identification of diagnostic signs are being studied for the first time in the conditions of Uzbekistan.

In the process of studying the anatomical structure of the seed of *Momordica charantia* plant in the conditions of Uzbekistan, the fact that the seed is endosperm, that the skin is composed of many layers, and that nutrients are located in the endosperm cells are the diagnostic signs of the species.

REFERENCES

[1] Samadov B.Sh., Jalilova F.S., Jalilov F.S., Murodova N.A. Pharmacological properties and chemical composition of medicinal plant raw material "Momordica Charantia L". A new day in medicine. Scientific-abstract, spiritual-educational journal. 1 1 (29), 2020. January-March. S. 379-381.

[2] S.P. Tan, K.W. Vuong, K.E. Stathopoulos, S.E. Parks and P.D. Roach, "Optimized aqueous extraction of saponins from bitter melon to produce saponin-enriched bitter melon powder", Journal of Food Science, vol. 79, no. 7, pp. E1372–E1381, 2014.

[3] Serhat S Çiçek 1 Momordica charantia L.-Diabetes-Related Bioactivities, Quality Control, and Safety Considerations. 2022.

[4] Basch E., Gabardi S., Ulbricht C. Bitter melon (Momordica charantia): a review of efficacy and safety (English) // American Journal of Health-System Pharmacy: journal. – 2003. – Vol. 60, no. 4. – P. 356-359.

[5] Trankovsky D.A. Workshop on plant anatomy. – M.: Higher School, 1979. – 221 p.

[6] Dospehov B.A. Methodology of field experience (with the basics of statistical processing of research results) - M.: Agropromizdat, 1985. - 351p.

[7] Claudia Giuliani, Corrado Tani, Laura Maleci Bini. Micromorphology and anatomy of fruits and seeds of bitter melon (Momordica charantia L., Cucurbitaceae) Claudia Giuliani, Corrado Tani, Laura Maleci Bini. 2016. 1-7 p.

[8] Jeffrey K. Review of Cucurbitaceae. Bot Jay Lynn Social. 1982; 81:233–234.

[9] Yakubov Sh. M., Akhmedov E.T., Berdibayeva D.B.., Ergasheva I.T. Anatomical structure of the seed of medicinal plant Allium motor (Allium tschimganicum B. Fedtsch) Journal of agriculture & Horticulture International scientific journal. UIF = 8.1 | SJIF = 5.69. 2023. 11-16 p.

[10] Aguoru CU, Okoli BE. Seed coat anatomy of Momordica L. (Cucurbitaceae) in parts of tropical Western Africa. International Journal of Tropical Agriculture and Food Systems. 2008; 2(1): 29–33.

[11] Grover JK, Yadav SP. Pharmacological actions and potential uses of Momordica charantia: a review. J Ethnopharmacol. 2004; 93(1): 123–132.

[12] Heneydak S, Khalik K.A. Seed coat diversity of some Cucurbitaceae tribes: implications for taxonomy and species identification. Acta Bot Brasilia. 2015; 29(1): 129–142.

[13] Bharathi LK, Joseph JK. Momordica genus in Asia: an overview. New Delhi: Springer; 2013. https://doi.org/10.1590 /0102-33062014abb3705.