The Melon

Short paleobotanical and historical-linguistic review

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Abstract. *Vegetation occupies a special place on the Earth. It was easily recognized by our remote ancestors who worshipped plants and animals together with the visible world. From the biblical viewpoint about the origin of the world and living organs and resulting from further scientific conceptions, origin and evolution of plants and their special function have always been given great importance. Plants are an unconditional source of life on earth. With their development, early humans changed their ideas about and relationship with the changing environment. After the formation of convenient natural conditions, in different regions of the earth humans started developing a new form of production – land farming and cattle breeding and began creating new firm settlements. Consequently, there emerged new concepts –cultivated plants and domesticated animals - in economic activity. Improved species of plants and animals were created by means of human interference, which is why their majority have preserved only the gene and some characteristics of their wild ancestors. One of such cultivated agricultural plants is the melon with its very interesting history of evolution.*

Key words: *archaeologist, gora, layer, fruit, taste*

Topicality of the subject. Wild and cultivated species of the melon have been eaten as food from the earliest times. Based on centuries-old selection, humans have cultivated many improved varieties of the melon adapted to soil and climate – sweet, aromatic, early and late-season. There is much demand for the melon in the world, which is why it is grown both in the open air and in greenhouses. Plants are studied by natural sciences, although data of humanitarian (for instance, history) disciplines are equally important. Foreign scholarly works do not provide much outcomes of paleobotanical, historical-archaeological and other surveys conducted in Georgia. Therefore, it is necessary to call attention to them.

As a plant species, the melon was first described by a Swedish naturalist Carl Linnaeus, creator of binomial system of flora and fauna in 1753. He investigated the plants grown in Uppsala Botanical Garden according to properly elaborated classification and gave the melon the name *Cucumis melo* L.SP.PL.1011,1753 [C. Linaei, 1753: 1011-1012]. The melon is described in Georgian and other countries' dictionaries, encyclopedias and different works, according to which it is one of the oldest annual trailing herbaceous garden plants belonging to the gourd family and that of Cucurbitaceae. Its chromosome number is $2n=24$ [J. H. Kirkbride 1993:159]. The ramous soft hairy greenish trailing stem grows 2-4 meters long; the main root reaches up to one meter in the soil around which the root system branches out. Melons are monoecious, but some varieties are dioecious too. There are exceptions of polygamous varieties too [L. Alpaidze et al. 2015:22]. Male yellow flowers of the melon are set in the fold of the leaf, while female ones are scattered. Melons reproduce both sexually and asexually [R. Dzidzishvili 2009:166]. Insects pollinate female flowers with male pollen and fruit is produced, while male flowers fall off [Z. Kanchaveli 1933:270]. The melon consists of the thin rind, juicy flesh and seeds accommodated in the hollow. In this respect the melon significantly differs from the watermelon [T.W.Whitaker, G.N. Davis G.N. 1962; W.R. Robinson and D.S. Decer-walters. 1997]. Melon seeds are

light in color, flat, oval or elliptic, while their shape is mainly roundish, pear-shaped, elongated or cylindrical-elliptical depending on a variety. Surface of the melon is smooth, wrinkled, warty, netlike and segmented; there are yellow, orange, pinkish, greyish-greenish melons [I. Mchedlidze, 2020].

Melon plants love heat, so they grow best in tropical, subtropical and temperate climates. Due to their exoticism and nutritious benefits, they were grown in greenhouses of cold Eurasian countries from as early as the 17th -18th centuries [Ж. И. Орлова; 1986: 5-222]. In the spring melon seeds germinate at 15° C. Natural season for ripening and harvesting is from August to the beginning of autumn. According to varieties, average period of time for flowering and ripening lasts for 2-4 months, while that for so-called winter melons is 6 months. The melon is sweet, aromatic and very nutritious food which contains 25 useful vitamins and substances, much more iron than milk and milk products. Due to a variety of beneficial qualities, the melon has positive effects on different illnesses; it drives many harmful matters out of the body [I. Mchedlidze, 2020]. The melon is widely used in culinary, pharmacology and perfumery; high quality sugar [H. Курдюмов, 2018] and oil [G. Paraidze, 2018:31] is produced from its flesh and seeds, but its production does not expand because of insufficient crop capacity. Therefore, areas for growing melons and their crop yield are on the increase in the world. According to the data provided by FAOSTAT, in 2012-2016 melon production in the world grew by 9% - from 28.6 m tons to 31.2 m tons, and the planted areas – from 1.16 m ha to 1.25 m ha [А. А. Дробишевский и др., 2018: 25]. In order to reduce hunger in the world, presently great attention is directed to the enhancement of efficiency of agriculture, fight against plant diseases and protection of wild ancestors of domesticated plants [N. Sakvarelidze, 1950:141-158; M. Akhalkatsi, 2015:4]. This problem has always existed and people have been trying to address it by means of centuries-old experience. Therefore, it is interesting to find out about traditions of growing the melon in some countries. Taking climatic conditions and scientific recommendations for prevention of harmful effects caused by insects into consideration, efficient guidelines of growing and protecting the melon have been worked out in different countries. For instance, in dry areas of Turkmenistan they used to chop the long-rooted stem of camelthorn and accommodate the melon sapling in it. The sapling would absorb the necessary liquid and grow; in other cases, they harrowed the sites of dried-up pools and threw melon seeds into it to germinate. In Tunisia, they threw copped cactuses and melon seeds into the soil cracks, from where the seeds absorbed necessary liquid and germinated [H. Курдюмов, 2018]. In Transcaucasia a very interesting method of preventing the melon from harmful insects, known as ‘dutma’, was employed [С. Зелинский 1888: 131-133]. In order to protect the fruit from flies, they used to bury it in the soil where a small vent was arranged so that the fruit continued growing [I. Javakhishvili, 1986:275]. It was a traditional way of protecting the fruit from harmful insects – ‘dutma’ translates as ‘protection’ [H. Курдюмов, 2018].

Varieties and groups of the melon. As a result of many centuries of selection, today many varieties of cultivated melons are known. A species means a plant organism with its genetic characteristics and inherited features that have adapted to various soil and climatic conditions over a long period of time. A variety is an agricultural concept rather than botanical. There are two categories of varieties - local and selective; in Latin it is indicated by term Cultivar [T. Samadashvili, G. Kapatadze 2008:809]. Afro-Asian area of the origin of the melon was first suggested by Aug. de Candolle and Ch. Naudin [Aug. de Candolle, 1828:287-320; Ch. Naudin, 1859:5-87]. According to the majority of scholars, the primary area of the origin of cultivated varieties of the melon are Near and Central Asia with adjacent territories [Robinson R.W., Decker- Walters D.S., 1997:5-97,152-163]. Accordingly, thanks to the climate and the soil, many new varieties received by means of interbreeding with the melon species of this area thrive in many different regions. As a result of observations on wild varieties, botanists gave

priority to the Afro-Asian area of origin of the cultivars where there still grow over 30 wild varieties of the melon. Yet as early as in the 1850s, in Sudan, Ch. Naudin divided them into 10 groups based on the studies of diverse forms of naturally growing wild and cultivated melons [Naudin Ch. 1859:5-87]. Later several authors tried to make changes to Naudin's classification [T.W. Whitaker, G.N. Dawis 1962:2,63,68, 182-183; H.M. Munger, R.W. Robinson. 1991: 43-44]. New classification of the melon occurred in compliance with the basic taxonomic range of International Code of Botanical Nomenclature. Considering the new data, at first seven specific groups were identified: Cucumis melo Agrestis - wild, Cantalupensis - sweet, Inorodus - winter, Flexuosus – snake cucumber melon, Conomon – pickling melon, Dudaim – mango or pomegranate melon, Momordica- sourish, salad melon [E.L.Tahir, I. M, Taha M. Yosif 2018:36-42] and a new salad variety of Tibish – studied by Mohamed and Pitrat [E. L. Mohamed, M. Pitrat M. 1999:21-23]. The latest classification provides 19 garden groups: agrestis, kachri, chito, tibish, acidulus, momordica, conomon, makuwa, chininsis, flexuosus, chate, dudaim, chandaliak, indicus, ameri, cassaba, ibericus, inorodus, cantalupensis [M. Pitrat, at ell., 2000:25-60]. In his recent work Pitrat points out 42 groups and subgroups [M. Pitrat, 2017:25-60]. Like Africa, wild melon grows widely in Central Asia, India, Sri-Lanka, Afghanistan, Iran and northern Australia. According to recent data, Asia and Australia are recognized as the first home of the wild and cultivated melon. The wild melon (Cucumis Trigonus) is described as a variety of the gourd family or cucumber family (Cucurbitaceae). The wild melon was first discovered by a British doctor and botanist William Roxsburgh. A single plant of the wild melon, unlike the cultural one, bears 40-100 small – 4-12 cm – whitish-greenish, bitterish, but seldom sweetish fruits [W. Roxsburgh, 1832:722].

Popular varieties of the melon grown in Georgia and in the world. In Georgia scientists and specialists have always paid close attention to the varieties of the melon and their cultivation [G. Esitashvili, 1954>171-183] (pl. III.6-9). According to some authors, in modern Georgia a total of three species are described: local Megrelian – Megruli Nesvi, local Mukhianuri – Mukhianuri and Taktakishvili - cultivated through cross-breeding. All three are early or mid-season varieties, are less aromatic and sweet and we have insufficient information about their annual sewing and growing [I. Mchedliudze, 2020]. However, R. Dzidzishvili lists the following varieties: Megrelian melon (Ucha Shinka), Megrelian tetri, Murasa, Mukhianuri, Gourd-melon or Black Melon [R. Dzidzishvili 2009:166]. Central Asia, Asia Minor and Near East are distinguished by their natural-climatic conditions. Based on the opinions of famous researchers, e.g., K. Pangalo, A. Filov and others, E. N. Sinskaya distinguishes the following endemic groups of the melon: Melo Adana Pang, M. Adzur Pang, M. Cassaba Pang, M. Cantelupe Pang., and a weed variety - M. Figari Pang – in Syria, Palestine and eastern Africa [E. Н. Синская; 1969: 117]. T. Vakhtangadze suggests that the melon is divided into 4 botanical varieties: 1) ordinary melon (Cucumis melo), 2) snake melon (Cucumis flexuosus), 3) decorative melon (Cucumis microcarpus), 4) Chinese melon (Cucumis chinensis). The same researcher groups the early and late varieties of the melon as follows: 1) Adana group, elongated, with smooth and netted surface, dry, friable flesh; 2) Khandaliak - early variety, relatively small fruit, light pink, juicy and sweet flesh; 3) Kasaba - late variety, middle-sized with white, sweet, juicy flesh; 4) Ameri – late variety, cylindrical-ellipsoid, sweet, with firm flesh; 5) Zardi – less sweet, without aroma; 6) Cantaloupe – early variety, longish-roundish, middle-sized, with thick rind, reddish-yellowish, aromatic, with sweet flesh [T. Vakhtangadze, 2016].

Short history of the study of plants. Plants are the source of life for humans, which is why the latter permanently depend on them. Sumerian -Akkadian, Egyptian, later biblical, Greco-Roman and other sources provide plenty of interesting accounts about plants. The origin of plants dates to 3.5 billion years. The realm of plants comprises over 350,000 species and is divided into three major

taxa: red algae – Rhodobionta, real water plants – Phydobionta and land plants – Embryobionta [G. Ghvaladze 1984:250]. There are two necessary factors for plants to exist: for life – warmth, light, air, mineral substances adopted from space and earth, and environmental conditions – cosmic, atmospheric, soil, phytobiological (pests, diseases, weeds), human and agrotechnical resources [L. Alpaidze et al. 2015:4]. Weeds – wild plants - are distinguished by their resistance against various diseases, but they are irreplaceable in terms of studies of genesis and receiving new varieties; therefore, nowadays, many international institutes are intensively working towards their protection and conservation [M. Akhalkatsi, 2010:4]. Regrettably, humans regard plants mainly as consumer products, but they bear a different responsibility on earth. In order to produce oxygen, plants adopt 170 billion tons of carbon dioxide and other elements by means of photosynthesis with sunlight. A human consumes 500 liters of oxygen per day; accordingly, it is necessary for 10-12 fully-grown trees to function to provide one individual with oxygen yearly [R. Dzidzishvili, 2009:4]. Plants express positive and negative emotions their own way, just like other living beings do. In addition, there exist 'lazy' plants, predators, etc. [L. Adikashvili, 2016].

They started scientific study of plants in ancient Greece and Rome. For instance, in his *Causes of Plants* comprising 6 books and *The Enquiry into Plants* 'comprising 9 books, Theophrastus (371-392 BC) classified plants into 4 groups – trees, shrubs, subshrubs and herbs [R. Gagnidze, 1985:392]. However, the study of plants in Europe went up a new level from the Renaissance. In this regard most outstanding was an Italian botanist, Andrea Cesalpino. Prior to 1583, he wrote 16 books in which he morphologically (seed, flower, fruit) described 840 species of plants, divided them into 14 classes and two – trees and herbs – groups. According to scholars the classification offered by Cesalpino-Linnaeus was still artificial because of grouping plants randomly based on few features.

On the other hand, French Antoine Jussieu grouped plants by many common features using a system of natural classification. In his work 'Genera of Plants' (1789), he described 100 families and gave details of each new family by transitional features [R. Gagnidze, 1985:392].

Contribution made by Vakhushti Batonishvili (1170-1844) to creating the classification system of botanical-geographical areas and zonal distribution of plants is significant. Iv. Javakhishvili thought that Vakhushti created the system of the areas and zoning of plants a century earlier than A. de Candolle; however, he justly gave priority to de Candolle, who generalized this doctrine across the world [Iv. Javakhishvili, vol. IV, 1996; 337].

In this regard really prominent were Swiss botanists, father and son Augustin Pyramus de Candolle (1778-1843) and Alphonse Louis Pierre Pyramus de Candolle (1806-1893). Augustin was the first scholar to put forward the idea of 'nature's war', which explained geographical distribution of natural plants by different species competing and fighting each other for space and resources. Later Darwin referred to this idea of Augustin as 'natural selection'. According to Augustin, multiple species of plants may develop similar characteristics that did not appear in a common evolutionary ancestor and nowadays it is known as convergent evolution. de Candolle was the first to notice that plant leaf movements follow a near-24-hour cycle in constant light and discovered a biological clock. Furthermore, he challenged Linnaean artificial classification and suggested the natural classification system of plants. He claimed that taxa do not fall along a linear scale, they are discrete and not continuous. Augustin managed to characterize a hundred families of plants, and made great contribution to laying the empirical basis for general botany. His works were first published in two volumes of *Regni vegetabilis systema naturale*, and then in seven volumes of *Systematis Naturalis Regni*. In addition, he occupied different scientific positions and was elected an honorable member of some universities. August's fruitful scholarly activity is remembered in the plant genera *Candolea*, *Candolleodendron*, *Eugenia candoleana*,

Diospuros candolleana, mushroom - *Psathurella candolleana* and a botanical journal *Candollea*. His son Alphonse worthily followed his father's pursuits and formulated the first Laws of Botanical Nomenclature, which was adopted by the International Botanical Congress in 1867. Alphonse explained different geographic distribution of plants not only by ecological-historical reasons, but by the shape of continents in the early geological periods and long lifespan of plants. He studied basics of the wild forms of cultivated plants and their wild relatives. He considered the areas where their wild relatives grew as the centers of the origin of cultivated plants. Alphonse characterized 247 species of cultivated plants. Prior to N. Vavilov's coming on the scene, as many as 1194 species had already been characterized, including wild and 27 semi-wild relatives. He successfully continued publishing scientific volumes started by his father. Alphonse's major work is 'Geographie botanique raisonne' (1855), whose more perfect edition was published in 1886 under the title 'Origine des plantes cultives' [FRE Britania Kids. 2021; С. Резник, 2017:1].

Major contribution to further advance of natural sciences and humanitarian fields was made by a famous English scientist Charles Darwin (1809-1882). He sailed around the world aboard the HMS Beagle, collected a large amount of botanical material which he published occasionally: 'Journal of Researches' (1826), 'On the Origin of Species by Means of Natural Selection or the Preservation of Favored Races in the Struggle for Life' (1842), 'The Variation of Animals and Plants under Domestication' (1868), 'The Descent of Man, and Selection in Relation to Sex' (1871). According to Darwin's evolutionary thesis, new forms of organisms are formed by means of regular, ambiguous hereditary variations and natural selection [Wikipedia, 2020; D. Jokhadze 2004].

Achievements of natural sciences were employed by representatives of humanitarian fields. In particular, in his work 'Prehistoric Times' English anthropologist and archaeologist John Lubbock (1834-1913) divided the primitive society into two periods and coined the terms Paleolithic and Neolithic [Википедия, св. энциклопедия, 2020].

In the field of natural science one of the successors of the de Candolles and Darwin was a famous Russian naturalist Nikolai Vavilov. In 1916-1939, he travelled around all the continents, except for Australia, and collected diverse material about wild and cultivated plants. Among Vavilov's works most remarkable are: "Центры происхождения культурных растений (1926) "Учение о происхождении культурных растений после Дарвина", vol 5 (1965). He identified seven geographical centers of origin of cultivated plants on the continents of Eurasia, Africa and America: 1) southern Asian tropical, 2) eastern Asian, 3) south-western Asian, 4) the Mediterranean coast, 5) Ethiopian, 6) central American, 7) the Andes, or South American. In terms of primary origin of grains and other cultivated plants, he emphasized the south-western Asian center, which he divided into Caucasian and Near Asian (inner Syria and Palestine, Transjordan, Iran, northern Afghanistan and Central Asia centers [Н. И. Вавилов 1987: 21-23]. As a result of observations on archaeological excavations, N. Vavilov recognized south-western Asia as the earliest center of cultivation of one part of cultivated plants (mainly grains) and he was not mistaken. It was in this center that remnants of wild and cultivated plants have been discovered at multi-layer settlements dating from the VIII millennium BC to the VI-V millennia BC [Е.Н. Лисицына, Л.В. Прищепенко. 1977: 23-52].

As a consequence of scientific-technical advances, together with traditional methods of research of biological organisms, they exploited methods of genetic engineering and chemical research, which extended and specified the time and space of their existence, evolution, relations. Such studies brought more clarity to establishing the origin, geographical areas and remote relatives of some fruits, including melons.

One of such projects was carried out by the group of P. Sebastian [P. Sebastian et al., 2010:14269-

14273]. Based on nuclear and mitochondrial analysis of DNA on 100 representatives of the Cucurbitaceae family, the scholar concluded that the center of origin of cucumbers is Asia, while its wild relatives grew in Australia and the islands of the Indian Ocean. They identified 25 wild species in Asia and Australia – five of them were new. This substantially changed the concept about the family of Cucumis. *Cucumis picocarpus* from Australia appeared to be the closest relative and the ancestor of the melon. They believed that the melon got separated from this Australian species three million years ago. However, the Australian melon parted from the Asian family 10 million years ago. South-east Asian *Cucumis huystix* turned out to be the relative of the cucumber and they got separated from each other 4.6 million years ago. 30 varieties of cucumbers grow in Africa too. Some 12 million years ago, geological movement caused the African-Arabic platform to merge with Asia, while Australia drifted away. Intensive relocation and movement from Africa and Eurasia began in the opposite way [P. Sebastiam et al., 2010:14269-14273].

Among other authors, remarkable is the research of the origin of the melon with the same method by the group of J. Endl. Based on recent research, the Asia-African region was added the Australian one. In order to find out the DNA, the group used nearly 90%, including major cultivated species, of the family of the melon from seven regions. According to the authors, modern species of the melon are represented from two branches separated two million years ago. One is Asian (*Cucumis m. subsp. Melo*), the other – African (*Cucumis m. subsp. Meloides*). Nowadays, from the point of view of consumption and commerce, most common are cultivated groups of Asian origin, while the African ones cover the region of Sudan and meet local demands. *Cucumis trigonis* is an Indian species of *Cucumis melo*, which is perfectly adapted to local climate and soil. According to DNA studies, the melon has been cultivated at least twice. Among the species characterized after C. Linnaeus, the most important are *C. ambigua* Fenzl ex hook, f. from Sudan; *C. cognata* fenzl ex Hook f. from Sudan, *C. colossus* Rotl. Cogn. (rather than *callosus* – author), *C. pubescens* wild and *C. trigonus* Roxsb from India, and *C. jucundus* F. Muell. *C. picocarpus* F. Muell. from Australia. Authors emphasize the credit of French botanist Ch. Naudin, who differentiated wild and cultivated species of India and Africa by the size, taste, leaves and flowers of the fruit. He defined Indian species as *C. melo* var. *agrestis* single variable taxon. In the same 1859, Ferdinand von Mueller characterized the wild melon in Australia [F. Mueller, 1859:40-63], which Naudin had not seen. Ch. Naudin was the first to recognize more than one domestication of the melon and pointed out that his melon *Soviga de linde* could be an extended relative of the nutritious Asian melon, while the North African melon species – off-springs of its melon [Ch. Naudin, 1859:5-87]. Naudin's opinion was underpinned by Chevalier, who found new species of the wild melon in the regions of Egypt and Sudan [A.J. B. Chevalier, 1901, 284-287].

Authors side with the opinion that part of researchers [K. Pangalo, 1933:520-543; I. Grebenshikov. 1953:121-123; C. Jeffrey. 1990:77-95; J. H. Kirkbride, 1993:121] ignored Naudin-Chevalier concept and narrowed *Cucumis melo* down to two species. The basic point was length of the hair on ovaries. They referred to those with long hair as *Cucumis melo* subsp. *Melo*, and with short hair as *Cucumis melo* subsp. *agrestis* [J. H. Kirkbride. 1993:121].

According to recent survey carried out by J. Endl group and other authors, cultivated melons expose different types of ovaries and the garden system of 19 cultivated groups distinguished presently, which contradicts with the presently recognized concept of sub-species and the system developed by Pangalo and Kirkbride [M. Pitrat, 2013:273-278; 2017:25-60]. Being a polyphilous taxon, *Cucumis melo* subsp. *agrestis* supports the idea of cluster geographical origin rather than that of morphological [A. Stepanski and et al., 1999:313-332; A.J. Mlik and et al., 2001:587-597; E.j. Nakata and et al., 2005:405-419; P. Sebastian et al., 2010:14269-14273; J. Blanka and et al., 2012:280; L. Seres-Giandi

and Dogimont 2012:254-263; C. Esteras et al., 2013:1285-1303].

According to J. Endl group, their aim was to create the DNA database for Cucumis by the selection of domesticated species, which would facilitate search for links and origins among the populations of wild and cultivated *C. melo* in Asia, Africa, Australia.

The group concluded that geographically the wild melon comprises three different branches and their closest relatives are found in Australia and India. By phylogenetic estimation, according to the samples of *C. Melo*, three distinct geographical areas of the origin of the melon were identified. The first is African – *C. melo* subsp. *meloides*. Molecular analysis showed that Eastern and Western African lines were divided some 1.4 million years ago, while the vegetation of Cape Verde got separated from the Western African continental one 0.6 million years ago.

The second line is formed by merging of the wild melon of Australia and New Guinea – *C. juncundus* F. Muell, while the third one – Asian - is the biggest, which comprises all the wild melons of Asia, including the samples of Madagascar, islands of the Indian Ocean and southern states of America [*C. melo* var. *Texsanus*]. Based on molecular analysis, interruption of the lines of African and Asia-Australian melons date to approximately 1.9 million years, while 2.8 million years ago the branch of the melon got separated from its closest relatives *C. Picrocarpus* from Australia and *C. trigonus* from India.

They suggest that modern species of the melon derive from two branches. Merging of the samples of the wild melon and all the major cultivated groups clearly shows the sharp partition of African and Asia-Australian wild melon. Main group of the cultivated melon, including 'Inorodus', 'Cantaloupen-sis', 'Retikulatus', 'Adzur', 'Conomon', 'Makuwa' and several species of the African melon – 'Moussa', 'Tirama', fall within the line of Asian 'Agretis'. Despite the difference in DNA and morphology, remote relationship between the perennial *C. trigonus* and annual *C. picrocarpus* makes the discovery of the hidden melon diversity in south-eastern Asia presumable. Up to the present day Tibish and other wild species of the melon thrive in Sudan and other regions. A hidden taxon can be identified in Africa too which might cover Sahel region from western Africa to Sudan and southern Sahara Desert [J. Endl et al., 2018:1-10]. Furthermore, wild *C. trigonus* can easily be interbred with other species and is irreplaceable for cultivating new species [J.S. John et al., 2013:1037-1046].

Archaeological, historical and linguistic review. According to scholars, comprehensive research is a modern form of the history of origin of domestic plants (botany, gardening, culinary, philology, archaeology, iconography, etc.). Term 'iconography' was introduced in genetic-selective studies by J. Janick, 2010:11-23]. Thanks to the resemblance of the fruit of the Chinese sub-species of the pumpkin – *Cucurbita maxima* – with the headdress turban, in botany the term 'turban-like shape' was introduced [Л.В. Цаценко. 2018:62]. One of the Turkish names of the melon – 'kavun' means a 'round hat' (ПГАУ-МЦХА). A well-preserved archaeological artefact helps estimate not only the species of a plant, but also the area and time of its domestication [H. Paris. 2015:133-148]. Archaeological excavations demonstrated the earliest area of one group of cultivated plants and their ancestor wild ones, which is known as the above-mentioned center of south-western Asia [H. И. Вавилов; 1987: 21-23]. It is in this center, in the area of Near East and Caucasia, that settlements of archaeological cultures of the ninth-sixth millennia BC which were based on productive economy have been revealed. J. Malaart distinguished four centers of formation of productive economy according to the early agricultural settlements discovered in the Near East: 1) Palestine-Lebanon, 2) Zagros highlands (Iran, Iraq, Transcaucasia), 3) Southern Anatolian plateau, 4) eastern Kopet Dag north of Hindu Kush [J. Malaart. 1967:5-7], while G. Lisitsina, L. Prishchepenko – seven centers with separate local sub-centers: 1) southern Anatolian, 2) eastern Mediterranean, 3) eastern Anatolian, 4) Zagros, 5) Transcaucasia, 6) Mesopotamia, 7) Caspian. Remnants of wild and domesticated plants have been evidenced at the settlement-sites of

these centers through paleobotanical analysis [Г. Н. Лисицына, Л. В. Прищепенко 1977: 31-52]. A lot of research has been done on this subject, including that of the melon. The majority of scholars share the idea of Asian origin of the wild ancestor of the domesticated melon [Y. Akashi et al., 2002:385-396; N.P.S. Dhillon et al., 2007:1267-1283; K.L.Y. Tanaka et al., 2007:233-247; W.K. Dwivedi et al., 2010: 442-452]. Unfortunately, only a few remnants of the melon have been discovered on archaeological sites. According to authors, the earliest fact of the melon penetrating Asia took place in China 3000 years ago [W. Uotson 1969:397-402; E.S. Luan et al. 2008:445-461]. In the Indus Valley melon remnants date to 2300-1600 [Vishny-Mytre, 1974:3-30]; the melon seed discovered in eastern Iran is 2000 years old [L. Costatin 1997:326-333]; while in Africa the melon seed found in southern Egypt is older than that of Asia and dates back to 3700-3500 years [W. van Zeist and A.J. Roller. 1993:179-185; El M.N. Hadidi et al., 1996:31-44]. Therefore, because of diversity of the species and chromosomes of the wild melon, its African origin was not excluded either [T.W. Whittaker and G.N. Davis. 1962; R.W. Robinson and D.C. Decker-Walters. 1997]. Australian wild melon was used by locals for medicinal purposes as well as fruit [J.F. O'Connell et al. 1983:80-109]. However, due to objective reasons, it lacks archaeological evidence.

Among paleobotanical studies especially remarkable is the work by G. Lisitsina, L. Prishchenko, which discusses every site of Caucasia and Near East containing botanical materials and provides the catalog, date and the list of botanically defined species. Among the sites we should emphasize a damaged settlement-site 'Dangreuli Gora' of the Neolithic-Early Bronze Age, which is situated in Marneuli Municipality, Georgia (pl. I). Regrettably, the authors made an unintentional mistake and referenced another settlement called 'Gadachrili Gora' [Г. Н. Лисицына, Л. В. Прищепенко, 1977:63.83].

The lower Neolithic layer of 'Dangreuli Gora' belongs to the Shulaveri-Shomu tepe culture of the VI millennium BC. Here a 1.2-1.4 m-diameter hole plastered with clay yielded shards at different levels and a paleobotanical mix – on the bottom. Professor G. Keshelashvili and assistant N. Seperteladze identified the following plant species: grape seed, melon – *Cucumis melo* L., sorrel – *Rumex crispus* L., bristle – *Setaria viridis* L., orache – *Atriplex patulum*, amaranthus – *Amarantus retrofractus* L., black bindweed – *Polygonum convolvulus* L., Johnson – *Andropogon urlepenis* Brot., fumitory – *Tumaria officinalis* L., goosefoot – *Chenopodium album* L., thistle – *Onopordum acanthium* L. [Kvemo Kartli..., 1975:124-127; T. Kiguradze 1976:72; T. Kiguradze 1986:60, 104]. Such an early discovery of the melon in the regions of Caucasia and Near East seems isolated, but it increases the region's significance on intercontinental scale. Therefore, it is necessary to continue intensive research in this direction in Caucasia. Also important is the discovery of the watermelon – *Citrullus edulis* Pang. at the seventh-sixth centuries BC city-site of Karmirblur in Armenia and that of the cucumber – *Cucumis* sp. -at the V millennium BC settlement-site of Korju tepe in Turkey. Other finds of the watermelon, melon and cucumber from Oren Kala (Azerbaijan) and Rustavi (Georgia) date to the 8th -13th centuries [Г. Н. Лисицына, Л. В. Прищепенко; 1977: 74-75, 94, 101]. Notable is the discovery of apricot, peach, plum, grape and melon seeds together with rye, barley and wheat seeds at the fourth-second centuries BC site on the delta of the rivers Oxus and Jaxartes in Central Asia [С.П.Толстов; 1962: 86], while a melon seed discovered in a second-century BC vessel from Stavropol is preserved in the museum in Chersonesus [ПГАУ-МЦХА].

Historical accounts, iconographic samples and linguistic data are equally important for the study of evolution of domesticated plants. In this respect, significant data are provided about the melon and other garden plants. According to scholars, samples of the elongate melon – Adzhur (Chate) and the long melon – Flexuous are preserved in 3000- year-old Egyptian depictions from Egypt [J. Janick et al. 2007:1441-1457. Pl. II. 1], while the melons of the same group depicted in Roman period mosaics and bas-reliefs are referred to as Greek – sikyos, Latin – *Cucumis* and Jewish – qishuim in classical litera-

ture. Apparently, alongside other melons, these groups were popular in the Mediterranean in Greco-Roman period. Beside the taste and sweetness of the melon, ancient authors appreciated its medicinal qualities as well; however, the melon seems to have been smaller and relatively tasteless at the time [A. Dalby, 2003]. Presumably, by the time they had already been aware of the round melon too, but, according to sources, in Classical and medieval epochs it hardly ever appears in iconographic and literary sources compared to elongate and long species [J. Janick et al., 2007:14541-1457; H.S. Paris et al., 2012a:31-38]. A. de Candolle believes that the lack of interest expressed in Roman epoch could have been the melon's low quality [A. de Candolle, 1886:262]. In addition, in medieval times the majority of illustrations of plants is of such bad quality that they are invalid for taxonomic identification. However, by the late Middle Ages accurate illustrations of plants had been accumulated sufficiently which made their identification easier (pl. II. 2). Furthermore, from the 16th century authors delightedly speak about the taste and the aroma of the melon [H.S. Paris et al., 2009:1187-1205; 2011:471-484]. According to scholars, primary reason for such response was penetration of the sweet melon *Cantalupensis* from Near East first into Italy and then into other countries of Europe in the 16th century [U.P. Hedrik, 1919:203; M. Pitrat et al., 2000:20-36; C. Jefri, 2001:1510-1557; A. Goldman, 2002]. The scholars observed that authors often made mistakes in the names of the melon and the watermelon. Leaving alone an earlier period, in the late medieval times *pepo* used to indicate the watermelon in the south, and the melon in the north. The situation is similar in the works of medieval Asian authors. For instance, the Arabic for the watermelon was *battikh*, but during the Islamic Empire, it meant the melon across the region from remote areas of Persia to Andalusia of the Pyrenees including [H. S. Paris et al., 2012b:23-33].

Georgian sources and oral tradition show that the situation concerning the melon is similar to the accounts described above. In Classical Greek 'melo*pepo*' - melon denotes the apple, and *pepon* – ripe cucumber. Persian *kharbooza* melon entered Greek and Slavic languages as 'arbooz-garbooz' – watermelon – through Turkish or Turkish-speaking nations, while under Aramaic influence *aviatakh* was established in Arabic as *battikh* [И. Дубинский, 2014]. Slavic *дыня* means swollen, whereas in Turkish-speaking peoples 'kavin, govun' melon indicates dark yellow, 'kovun, kaun' – a round hat. The word melon has entered from Latin and means 'spherical'. Simultaneously, in some European countries *pepon*, *pepen*, *pipon* indicate the pumpkin [РГАУ- МСХА]. In ancient Greece this name was sometimes used to refer to the melon, at other times – to the watermelon. Unfortunately, this confusion continued through the Middle Ages too [H. S. Paris et al., 2012b:23-33].

As is known, in Caucasia, specifically in Georgia, archaeologically investigated settlement-sites expose advanced early productive economy from the IV millennium BC and remnants of wild and cultivated plants have been discovered [Н. Ш. Русишвили. 1990: 11; G. Chikovani et al., 2015:8]. Here facts of later period productive activities are reflected in the records of writers, travelers and diplomats of Classical, medieval and late medieval times.

Great is the contribution of Acad. I. Javakhishvili (1876-1940) to the study of history of garden-farming in Georgia. He thoroughly considered ancient oriental, Greco-Roman, European and Georgian accounts about the subject. He relied on works of Georgian hagiographic and secular authors which provide local names of domesticated plants or those borrowed from foreign languages, as well as sophisticated terminology of economy [I. Javakhishvili, vol. IV: 169-432].

Georgian oral tradition and writing hold few, but rather interesting accounts about the melon. The earliest is still found in the Georgian translation of the Bible. *Nesovan, nesu, nesvi*: "we ate... cucumbers, melons (*nesu*), leek, onions and garlic" [G. the Book of Numbers., 11,5], [I. Abuladze, 1973:327-328]. I. Javakhishvili did a thorough survey of Georgian and, in his opinion, interesting foreign liter-

ature. According to the scholar, the term *nesvi* first occurs in the Georgian translation of Genesis, where it is isolated and does not correspond to any name of the melon in the familiar languages of ancient east or west. It is probable that it points to the oldness of the culture of the melon in Georgia. I. Javakhishvili separately examines each account about the melon provided by different authors. A famous poet and playwright R. Eristavi (1824-1901) lists species and varieties of the melon common in Georgia: *gogra-nesvi*, *guli-Shamama*, *dastambo*, *dutma*, *turaji*, *mukha*. All the names listed belong to eastern Georgia. In Imereti it is referred to as *pumpula*, while in Megrelia they call it *shinka* [R. Eristavi, 1884:43]. I. Javakhishvili discusses each of these names, except for *gogra-nesvi*. He cites S. Zelenski and says that the orange-sized melon which was tasteless, had orange lines and was referred to as *shamam* in Arabic was grown in the 19th century just for amusement and its aroma [С. Зелинский. 1888: 133]. In Persian *guli* means rose and, therefore, *gulishamam* means the melon with rose aroma. *Gulishamam* does not appear in Turkish-Persian-Arabic dictionaries as the name of the melon and, presumably, in botanical terms it must be *Cucumis melo* L. F. Dudain Naud. sun. *Cucumis...dudain* L.,... *Cucumis odorantissimus*. Arabs refer to it as *shemmam* [Becker-Dillingen. 1924:670]. The French and Germans call it *Cocombre de Perse*, *persische melone*, or *Apfelmelone* [I. Javakhishvili. Vol. V. 1986:276]. The author cites a pharmacological work by A. Muvafak translated from Arabic by A. Akhundov and that of H. Hubschman, where it is noted that *shamam* is known from Mkhitar's Armenian fables and the Arabic *shamam* is a small variety of *pumpula*-like melon which Persians refer to as *dastambo* – *colocynthis instar* [A. Akhundov. 1892:209; H. Hubschman 1904:272-273]. In addition, here is a poem 'Praise to Georgian Coquettes' by an Armenian poet Nakash Hovnatani (1661-1722), translated by I. Grishashvili: "Daring and beautiful Georgian ladies have a bath in warm sulphury baths, and they smell like *shamam*" [A. Alerdashvili 2016].

There is another verse from a folk poem about Arsena Odzelashvili:

"Arsena is strong; he can throw that boy down on his back and punch him and split him like a *karpuz* (watermelon) [Z. Kiknadze, 2001].

In the poem *karpuz* derived from Persian *kharbuza* means watermelon. According to I. Javakhishvili, the melon was given the name *mukha* (oak) due to its color and uneven skin and Germans call it *Netz-Melonen* [I. Javakhishvili, 1986; vol. V, 277]. As for *turaj* and *dutma*, the author shares S. Zilinski's opinion that *turaj* was given the name because of its resemblance to the bird's color, while *dutma* is used in Armenian as well and the name must come from Turkish [Зелинский 131- 133]. In order to determine the sameness of *dastambo* and *pumpula* varieties, I. Javakhishvili cites Galen's opinion about 'pepon' being inedible and backs this opinion by M. Janashvili's account according to which in Saingilo they used to gather aromatic *dastambua* for young people's entertainment [M. Janashvili, II. 1913:104]. In short, I. Javakhishvili regards *gulishamam*, *dastambo*, *pumpula* as different names for inedible species of the melon. He associates the name *pumpula* with Italian *popone* which Byzantines referred to as *pepon* from the eleventh century, while modern Greeks call it *ta peponia*.

Ivane Javakhishvili links Megrelian *shinka* and the Chanian name for the cucumber – *shuka*, *suka* -with the Greek name for the melon – *sikvia*, and that for the cucumber – *sikvia*, or *sikvi*. In addition, he concludes that like in Megrelian-Chanian, in ancient Greek the melon and the cucumber were referred to by a common name. He also cites F. Gorgijanidze's (1626-1696) account about the Arabic name of the melon - *batiq* and Persian – *kharbuza* [F. Gorgijanidze, 1896:155]. However, in modern Arabic the melon is called *saфра*, in Egyptian – *paqu*, while the watermelon is called *battikh*, *battiha* [I. Javakhishvili, 1986:274-277]. I. Javakhishvili points out that, while living in Megrelia in 1630-1649, Italian traveler A. Lamberti saw three spans long melons in gardens [A. Lamberti, 1938:59]. He had not missed other authors either; according to A. Batonishvili (1770-1844), they grew the melon, *melsapopeni* and *pum-*

pula in the Berduji Valley, Kvemo Kartli, while in Imereti melsapopeni and pumpula grew without tending. Here Batonishvili cites the accounts provided by Russian ambassadors Mishetski, Tolochanov and Yevlev about growing the melon and watermelon in Kakheti and Imereti [A. Batonishvili, 1895:155]. According to Vakhtang VI (1675-1737), the melon and watermelon grew in the environs of Tbilisi and were also brought to the market from regions and other countries [Vakhtang VI, 1886:104-105]. Growing the melon was popular on the plains along rivers in eastern Georgia, including Hereti and Saingilo [M. Janashvili, 1906: vol. 2 104]. A. Guldenschedt (1745-1781) had encountered melons, watermelons and pumpkin-melons in various communities of Georgia and even in mountainous Racha [A. Guldenschedt, 1791:305, 400]. Relying on the Book of Numbers 11.5, Sul Khan-Saba Orbeliani (1658-1725) describes the melon as the fruit of grasses. In his opinion, dastambo is Persian, while in Georgian it is called pumpula and is a small many-colored melon. Without explanation he also mentions nesupumpula. From the translation of the Book of Genesis, S. Orbeliani explains the word nesovani mentioned in Isaiah 1 as an orchard where melons grow [S. Orbeliani, 1991:590-591].

On the name of the melon and the cucumber shinka-shuka common in Megrelia-Chaneti

Iv. Javakhishvili shares the then accepted opinion about the Afro-Asian (Indian) origin of the melon and cites an account from the Bible how the Jews who had fled Egypt were missing the melon and other vegetables. He also notes that some think the Jewish 'kishuim' is the cucumber, rather than the melon. Then he discusses Greco-Roman authors and remarks that Hippocrates and Theophrastus referred to the melon as 'sikva', while Dioscorides called it 'pepon'. According to its name, Romans adopted the melon from Greeks. Pliny the Younger did not clearly distinguish cucumber and melon from each other. While speaking about the cucumber (Cucumis), he says that when it grows it is called 'pepon'. Pliny's account shows that in his times a new variety of the melon with the color, aroma and shape of the quince was bred. Moreover, the fruit was not hanging, but lay on the ground and when it became ripe, it came off the stem. According to Gallen, people ate 'melo-pepon, rather than 'pepon [I. Javakhishvili, vol. V. 271-278].

The Megrelian name for the melon is discussed by I. Bebia. While comparing it with Greek sikva he cites S. Zhghenti's opinion about the natural development of sound 'n' in shinka [S Zhghenti, 1953:100]. In terms of the shape, I. Bebia points out lagindzia and kvarkvalia melons [I. Bebia. 2008:25]. As far as one of the Greek names of the melon sikva, and Megrelian-Chanian shinka-shuka-suka are concerned, it seems that as early as from Greco-Roman times it is spread along a narrow line of Near and Central Asia (Uighurs, Kitans, the people of Juchi) and appears in China under the name of 'si kva'. This Chinese name of the melon denotes 'western melon, west'. However, the word 'si kva' itself is considered to have derived from 'si ju kva' and is interpreted as 'the melon of Turkmenistan' [L. Bertold, 1919:445].

Conclusion. So far, the earliest seed of the melon has been discovered in Georgia, Kvemo Kartli, on the Neolithic settlement-site of 'Dangreuli Gora', while the earliest samples of cucumber seeds were found in Turkey, on the settlement-site of Koruju tepe. Based on these discoveries, primary cultivation of the family of cucumbers seems to have occurred in the area of Transcaucasia and Asia Minor. One of the Georgian names of the melon has not been found an equivalent of in the Caucasian and ancient Eastern world, which increases importance of the topic. However, the second name shinka corresponds to the classical Greco-Roman and Chinese areas. Furthermore, Greco-Roman and Arabic-Persian names of the melon-watermelon begin to spread in medieval Georgia but, like other countries, they do not express the real name of the species. It is interesting and quite possible to identify species of the melon, specifically, mukha and turaji, common in Georgia in the late medieval period, with well-known species. The subject seems to be very interesting and promising; therefore, it is necessary to carry on with research.

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Pl. I

Pl. 2.1

Plate 2.2.

Plate 3