Foxtail millet (*Setaria italica* (L.) P. Beauv.) culture in Georgia, South Caucasus

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Review

Abstract

Background: Historical sources, archaeological and botanical, as well as ethnobotanical data indicate on well-developed agriculture in Georgia since ancient times. Highly diverse climate, almost all types of soils and their multiple combinations created a good base for natural and folk selection, resulted in a true cultural heritage of the nation - cultural flora of Georgia. Close relation between people and plants in every aspect of life is well illustrated by rich ethnobotanical material. Unfortunately, ethnobotanical knowledge is being lost along with the diversity of agrarian cultures. One of the examples of this is foxtail millet. Before the introduction of corn culture in Georgia in the XVII century, millets occupied an important place in the country's economy; the main cereal crop was foxtail millet ghomi (in Georgian), *Setaria italica* L. (*Panicum italicum* L.), and an everyday meal, a porridge ghomis-ghomi was used as bread. The article presents botanical and ethnobotanical data related to the distribution, cultivation, food, medicinal and ritual uses of foxtail millet.

Methods: The review paper is based on literature sources deposited at the National Parliamentary Library of Georgia (NLPG). Literature searches were performed through the NLPG catalog (https://www.nplg.gov.ge/geo/Catalogues) with diverse keywords related to foxtail millet, crop cultivation history in general, names of known researchers of cereal crops, ethnographers, historians, travelers, etc.

Results: Along with historical, archaeological and botanical data, ethnographic materials confirm the antiquity of the foxtail millet culture in Georgia, and for the most part in western Georgia reflected in the great number of its varieties. The sources reviewed show diversity of uses of this crop as food, medicine and an important component of various folk rituals as a symbol of wealth.

Conclusions: Ethnobotanical knowledge is being lost along with the diversification of agrarian culture. One of the examples is foxtail millet. Before the introduction of corn culture in Georgia in the XVII century, millets occupied an important place in Georgia's economy; one of the main cereal crops was foxtail millet, **ghomi** in Georgian, as an everyday meal used as bread and widely symbolizing wealth in folk rituals.

Keywords: Ghomi, Sakartvelo, ancient grains

Background

Foxtail millet, which is called ghomi in Imeretian and Gurian dialects of the Georgian language, ghumu//ghumush-ghumu//chkhveri in Megrelian, nchkhva'r'i in Lazian (Chikobava, 1938; Kalandia, 2005; Machavariani, 2006; Sarjveladze, Chachava, 2007), was the major food crop in Georgia, particularly, its western part, until the 17th century, i.e. the time of corn introduction. Almost a century ago, Javakhishvili (1930), a prominent Georgian historian, emphasized the lack of knowledge on cereal crops of the millet group in Georgia and necessity to conduct botanical and linguistic research on these plants. In 1944, N. Ketskhoveli, and I. Bakhtadze launched studies of the millet crops in west Georgia. In the 1940s, 73 samples of foxtail millet were collected in home gardens in west Georgia (Imereti, Guria, Samegrelo, Adjara) and sown on the collection plot of the Ajameti experimental station of cereal crop studies (Sadunishvili et al. 2021).

A number of well-known scientists contributed to studies of Georgian foxtail millets: L. Dekaprelevich, I. Lomouri, V. Menabde, N. Maisuryan, A. Kasparyan, A. Eritsyan, N. Chkhenkeli, V. Gordadze, M. Ghvinjilia, A. Iakobashvili, A. Gorgidze and others (Maisaia, 1987; Sarjveladze, Chachava, 2007).

Foxtail millet (*Panicum italicum* L.) was first described by K. Linnaeus (1753). In 1812 A. M. F. J. Palisot de Beauvois introduced the genus *Setaria* and translocated the species into the new genus with the name *Setaria italica* L. The Latin name of the genus *Setaria* is derived from the root *Seta*, which indicates to bristly inflorescences characteristic to the genus. G. Alefeld (1866) left the species in the genus *Setaria* P. Beauv. but divided it into two subspecies: (a) *S. italica* ssp. *maxima* Alef., which is Ghomi in Georgian, and (b) *S. italica* ssp. *mocharica* Alef., kvrima in Georgian.

In 1948 V. Menabde and A. Eritsyan accepted the subspecies as two independent species: a) *S. italica* and b) *S. mocharica* (Alef.) Menabde & Ericzjan (Menabde, Eritsyan, 1948).

Taxonomy

The taxonomic study if Georgian foxtail millets revealed that Georgian specimens represent *Setaria italica* ssp. *colchica* Maisaia & Gorgidze (Maisaia, 1987). Menabde and Eritsyan (1947) described a wild species of foxtail millet in the crop field of Zemo Imereti: Orkiba, Chkhari, Zestaponi as *Setaria ketzchovelii* Men. & Ericzjan.

Synonymy

***Setaria italica* (L.) P. Beauv.:** *Alopecurus caudatus* Thunb.; *Chaetochloa germanica* (Mill.) Smyth; *Chaetochloa italica* (L.) Scribn.; *Chaetochloa italica var. germanica* (Mill.) Scribn.; *Chamaeraphis italica* (L.) Kuntze; *Chamaeraphis italica var. elobulata* Kuntze; *Chamaeraphis italica var. germanica* (Mill.) Kuntze; *Chamaeraphis italica var. macrochaeta* (J.Jacq.) Kuntze; *Echinochloa erythrosperma* Roem. & Schult.; *Echinochloa intermedia* Roem. & Schult.; *Ixophorus italicus* (L.) Nash; *Oplismenus helvolus* (L.f.) P.Beauv.; *Oplismenus intermedius* (Vahl ex Hornem.) Kunth; *Panicum aegyptiacum* Roem. & Schult.; *Panicum asiaticum* Schult. & Schult.f.; *Panicum chinense* Trin.; *Panicum compactum* Kit. ex Schult.; *Panicum elongatum* Salisb.; *Panicum erythrospermum* Vahl ex Hornem.; *Panicum germanicum* Mill.; *Panicum germanicum* Roth; *Panicum globulare* (J.Presl) Steud.; *Panicum glomeratum* Moench; *Panicum helvolum* L.f.; *Panicum intermedium* Vahl ex Hornem.; *Panicum italicum* L.; *Panicum italicum var. brevisetum* Döll; *Panicum italicum var. californicum* (Kellog) Körn.; *Panicum italicum var. compactum* (Kit.) Eichler; *Panicum italicum var. erythrospermum* Körn. & F.A.Werner; *Panicum italicum var. germanicum* (Mill.) Koeler; *Panicum italicum var. inerme* Döll; *Panicum italicum var. italicum; Panicum italicum var. italicum; Panicum italicum var. longisetum* Döll; *Panicum italicum var. mitis* Alef.; *Panicum italicum var. nigrum* Körn.; *Panicum italicum var. pabularis* Alef.; *Panicum italicum var. praecox* Alef.; *Panicum italicum var. violaceum* Alef.; *Panicum itieri* (Delile) Steud.; *Panicum macrochaetum* (J.Jacq.) Link; *Panicum maritimum* Lam.; *Panicum mel-frugum* Schult. & Schult.f.; *Panicum miliaceum* Blanco; *Panicum moharicum* (Alef.) E.H.L.Krause; *Panicum panis* (Jess.) Jess.; *Panicum pumilum* Link; *Panicum serotinum* Trin.; *Panicum setaceum* Trin.; *Panicum setosum* Trin.; *Panicum sibiricum* Roem. & Schult.; *Panicum verticillatum var. majus* Thunb.; *Panicum viride subsp. italicum* (L.) Asch. & Graebn.; *Panicum viride var. italicum* (L.) Backer; *Panicum vulgare* Wallr.; *Paspalum germanicum* (Mill.) Baumg.; *Penicillaria italica* (L.) Oken; *Pennisetum erythrospermum* (Vahl ex Hornem.) Jacq.; *Pennisetum germanicum* (Mill.) Baumg.; *Pennisetum italicum* (L.) R.Br.; *Pennisetum macrochaetum*

J.Jacq.; *Setaria asiatica* Rchb.; *Setaria brachystachya* Borbás; *Setaria californica* Kellogg; *Setaria compacta* Schur; *Setaria erythrosperma* (Vahl ex Hornem.) Spreng.; *Setaria erythrosperma* Hornem. ex Rchb.; *Setaria flavida* Hornem. ex Rchb.; *Setaria germanica* (Mill.) P.Beauv.; *Setaria globulare* J.Presl; *Setaria globularis* J.Presl; *Setaria helvola* (L.f.) Roem. & Schult.; *Setaria italica subsp. colchica* Maisaya & Gorgidze; *Setaria italica subsp. germanica* (Mill.) Douin; *Setaria italica subsp. germanica* K.Richt.; *Setaria italica subsp. maxima* Dekapr. & Kaspar.; *Setaria italica subsp. moharia* (Alef.) H.Scholz; *Setaria italica subsp. nigrofructa* F.T.Hubb.; *Setaria italica subsp. rubrofructa* F.T.Hubb.; *Setaria italica subsp. stramineofructa* F.T.Hubb.; *Setaria italica subvar. densior* F.T.Hubb.; *Setaria italica subvar. germanica* (Mill.) F.T.Hubb.; *Setaria italica var. barbata* Gammie; *Setaria italica var. colchica* Dekapr. & Kaspar.; *Setaria italica var. compacta* Beck; *Setaria italica var. germanica* (Mill.) Schrad.; *Setaria italica var. italica; Setaria italica var. longiseta* (Döll) B.Fedtsch.; *Setaria italica var. mitis* (Alef.) Hyl.; *Setaria italica var. moharia* (Alef.) A.Zimm.; *Setaria italica var. nigrofructa* (Körn. & H.Werner) L.H.Bailey; *Setaria italica var. nuda* N.H.F.Desp.; *Setaria italica var. purpurea* Gammie; *Setaria italica var. rubrofructa* (F.T.Hubb.) L.H.Bailey; *Setaria italica var. stramineofructa* L.H.Bailey; *Setaria itieri* Delile; *Setaria japonica* Pynaert; *Setaria macrochaeta* (J.Jacq.) Schult.; *Setaria maritima* (Lam.) Roem. & Schult.; *Setaria melinis* Link ex Steud.; *Setaria moharia* (Alef.) Menabde & Erizin; *Setaria moharica* Menabde & Erizin; *Setaria multiseta* Dumort.; *Setaria panis* Jess.; *Setaria persica* Rchb.; *Setaria violacea* Hornem. ex Rchb.; *Setaria viridis subsp. italica* (L.) Briq.; *Setaria viridis var. multiseta* (Dumort.) T.Durand; *Setariopsis italica* (L.) Samp.

Botany and Ecology

***Setaria italica* (L.) P. Beauv.:** Annual. Culms robust, erect, up to 150 cm, nodes glabrous. Leaf sheaths glabrous or pubescent, ciliate; leaf blades linear-lanceolate, 15–45 × 0.6–2 cm, usually glabrous; ligule 1–3 mm. Panicle dense, lobed, 6–40 × 0.5–5 cm, very variable, erect or pendent when mature; spikelets subtended by several bristles 1–5 times spikelet length; axis villous. Spikelets elliptic to ovate or subglobose, 2–3 mm, yellow, brown, orange or purple; lower glume 1/3–1/2 as long as spikelet; upper glume about as long as spikelet, 5–7(–9)-veined, obtuse; lower lemma equal to spikelet, 5–7-veined; lower palea absent or narrow, up to 1/2 as long as lemma; upper floret yellow or orange-yellow, oblong or ovate-oblong, cartilaginous, deciduous at maturity, finely rugose to smooth and shiny. Flowering and fruiting summer to autumn. (Wu et al. 1994-2013). (Fig. 1-8).

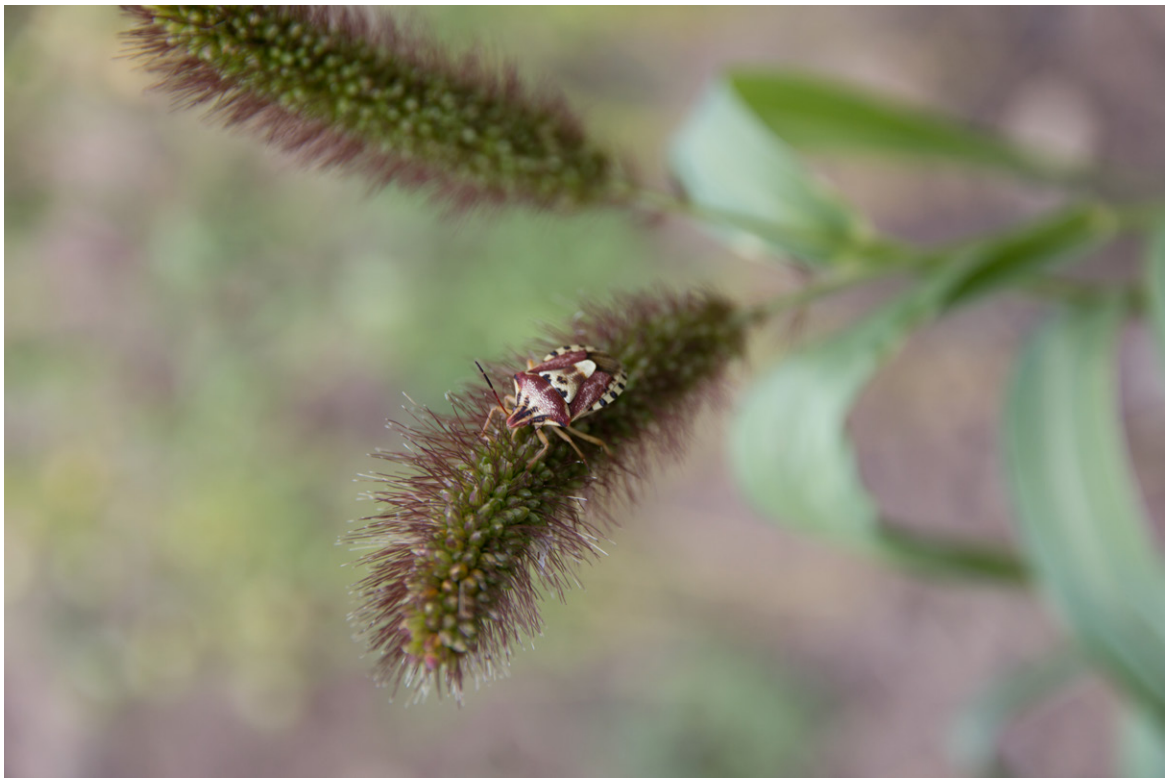

Fig. 1. *Setaria italica* (Poaceae), National Botanical Garden of Georgia, Tbilisi, Georgia (Photo RW Bussmann & NY Paniagua Zambrana)

Fig. 2. *Setaria italica* (Poaceae), Tbilisi, Georgia (Photo RW Bussmann & NY Paniagua Zambrana)

Fig. 3. *Setaria italica* (Poaceae), Tbilisi, Georgia (Photo RW Bussmann & NY Paniagua Zambrana)

Fig. 4. *Setaria italica* (Poaceae), National Botanical Garden of Georgia, Tbilisi, Georgia (Photo RW Bussmann & NY Paniagua Zambrana)

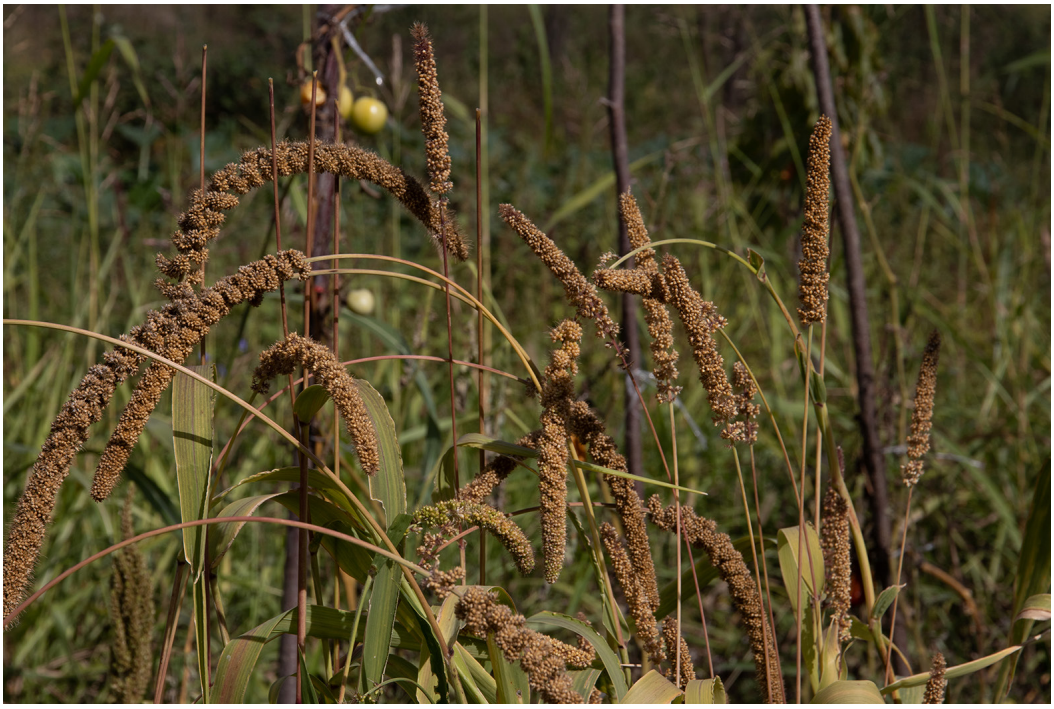

Fig. 5. *Setaria italica* (Poaceae), National Botanical Garden of Georgia, Tbilisi, Georgia (Photo RW Bussmann & NY Paniagua Zambrana)

Fig. 6. *Setaria italica* (Poaceae), Lagodeghi, Georgia (Photo RW Bussmann & NY Paniagua Zambrana)

Fig. 7. *Setaria italica* (Poaceae), Martvili, Georgia (Photo RW Bussmann & NY Paniagua Zambrana)

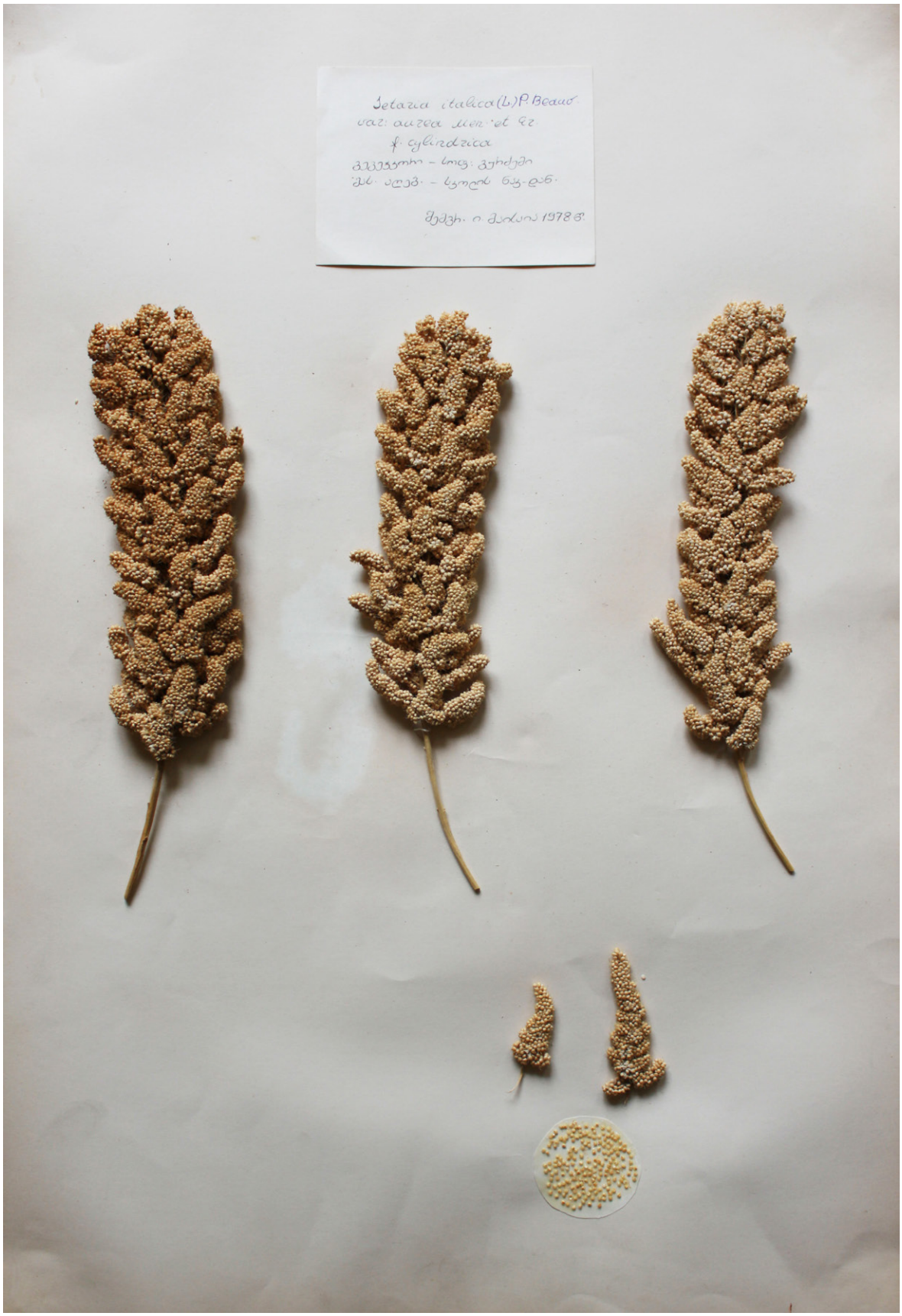

Fig. 8. Herbarium specimen of the cultivar ajametis okromartsvala, *Setaria italica* ssp. *colchica* var. *aurea* Men. & Ericzjan f. *cylindrica*, school plot in the village Gurdzemi, Gegechkori district, Samegrelo, 1978. Collected by I. Maisaia. From private herbarium of I. Maisaia _IMG 4744 to 4749 (same specimen)

Results and Discussion

The aim of the present study was to review existing literature on history of foxtail millet uses in Georgia, the South Caucasus. The majority of relevant literature sources are in Georgian language, deposited at various libraries, most comprehensively accumulated at the National Parliamentary Library of Georgia (NLPG) and are in the most part unavailable in digital form. The NLPG catalog (https://www.nplg.gov.ge/geo/Catalogues) was searched for books and scientific papers with various keywords related to cereal crop and, particularly, foxtail millet cultivation in Georgia; searches were performed for papers by authors who were known to focus on various aspects of foxtail millet (including taxonomic aspect) and its cultivation history such as e.g. L. Dekaprelevich, V. Menabde, A. Eritsyan, N. Beridze and others. Besides, searches were conducted for sources by Georgian ethnographers describing diverse aspects of folk lifestyle in particular regions of the country, e.g. S. Makalatia, G. Jalabadze, as well as historical sources of the Georgian origin such as that by V. Batonishvili or those published in foreign languages or their Georgian translations, namely, books by travelers such as J.A. Güldenstädt, K. Koch, F. DuBois de Montpérreux, Russian ambassadors, or Catholic missionaries such as A. Lamberti, Ch. de Castelli issued or related to the Georgian household and agriculture of the 17th-18th centuries. About 90 literature sources found with this approach were reviewed and the data on history of cultivation and distribution of foxtail millet in the Caucasus with focus on data for Georgia, uses of foxtail millet as a food, medicinal and ritual plant in Georgia, Georgian varieties of foxtail millet, its local cultivation techniques were summarized and presented in separate chapters (Sadunishvili *et al.* 2021).

Historical data on foxtail millet culture in the Caucasus and beyond

Foxtail millet is an ancient plant of the millet group. According to written sources, the foxtail millet culture is the earliest indicated for China and mentioned under the name Liang in the Book of Jogun, written in 1072 BC. According to the book, foxtail millet is one of the five cereals that were sown by the ruler of the country, Emperor Shen Nun, during the national spring festival established in the 27th century BC (DeCandolle, 1885); The antiquity of the foxtail millet culture in China is also confirmed by archaeological works near the city of Xian, were an ancient clay pot with millet grains was found (Varenitsa, 1958; Sadunishvili *et al.* 2021).

Of the southeastern countries, Mongolia, Korea, Manchuria are considered the foxtail millet early cultivation countries. In the high mountains of the Himalayas, the crop is recorded at elevations about 1800 m a.s.l. (Kovalevsky, 1929; Sheibe, 1958). Since ancient times, it was grown in Afghanistan, Iran, Arabia (Zhukovsky, 1933; Sadunishvili *et al.* 2021).

A. Decandolle in his work “The place of origin of derived plants” concluded based on historical, linguistic and botanical data that the species *Setaria italica* existed in China, Japan and Indonesia several thousand years BC. Later it spread westwards, where its remains were found in vessels from the Stone Age in Switzerland (DeCandolle, 1885; Sadunishvili *et al.* 2021).

According to V. Komarov's research (1938), foxtail millet grains were found not only in Switzerland, but also in the plant remains found in buildings in Northern Italy, also dating back to the Neolithic period. The great biological and economic value of the crop lies in its ability to adapt to a wide variety of climatic and soil conditions. It was cultivated both in warm and humid areas (for example, West Georgia) and in relatively cold and dry areas (Northern Manchuria, Mongolia, etc; Sadunishvili *et al.* 2021.).

Foxtail millet is also considered one of the most ancient crops in the South Caucasus: grains found in Karmirblur in Armenia date back to the end of the VI century – the beginning and IV-V centuries BC (Tumanyan, 1944). In Azerbaijan, in the Khaldan region, grains of foxtail millet pertain to the III millennium BC, and those found in Mingechauri to the IV-I centuries BC (Lisitsyna, Prishchepenko, 1977; Sadunishvili *et al.* 2021).

From the republics and regions of the former Soviet Union, traces of sowing and cultivation of foxtail millet are found in Kazakhstan, Kyrgyzstan, Uzbekistan, Turkmenistan, Tajikistan, Siberia and the Far East, Ukraine, Moldova, the North Caucasus, South Ossetia, Azerbaijan, Armenia; in Georgia, especially in its western regions: Apkhazeti, Adjara, Guria, Samegrelo, Imereti, Racha (Maisaia, 1987; Sadunishvili *et al.* 2021).

Jean-Chardin (1975) listed foxtail millet cultivation locations in the Caucasus: “...Circassians, Megrelians, Georgians paying tribute to Turkey, Abkhazians, residents of the Caucasus, all those who live on the Black Sea coast from the Meotid swamp channel towards Trabzon, eat only this porridge. This is their bread; they have nothing else. They are so accustomed to the grain that they even prefer foxtail millet to wheat bread.” “..in Armenia and Georgia I saw many noble Turks and Georgians, including the head of Tbilisi and the pasha of Akhaltsikhe, who brought this grain and ate it with pleasure; during meals it is

necessary to drink holy wine in order to slow down the cooling and dissolving of the porridge, which the foxtail millet eaters do with pleasure (Sadunishvili *et al.* 2021).

"Foxtail millet is a common food grain among the Megrels. Its grain is as clean as the coriander seed and reminiscent of millet. It is sown in the spring in the same way as rice. They make a hole in the ground with their finger, put the grain there and cover it with soil. Foxtail millet is harvested in October and immediately hung for drying on a fence erected in a high and sunny place. It is dried for twenty days on the fence, then they are tied in bundles, and threshed only before cooking. They cook foxtail millet only at mealtime; preparation takes less than half an hour. When the water in which grains are placed begins to boil, it is slowly stirred with a small wooden shovel. Even if you mix it very lightly, you still end up with a thick porridge. When all the grains are squashed and the porridge is well kneaded, the flame is weakened. On low heat, the water dries out and the porridge remains dry in the pan. This porridge is very white. Sometimes they make it white as snow. It is served with special small wooden shovels. The Turks call this bread pasta, and the Megrels call it ghomi; it is easy to pick up with fingers. It is cooling and laxative" (Chardin, 1975; Sadunishvili *et al.* 2021).

Distribution of foxtail millet culture in Georgia

The antiquity of Georgian agricultural plants, including the foxtail millet culture, is confirmed by records of ancient Greek philosophers. As reported by Dekaprelevich and Kasparyan (1928) as well as Varenitsa (1958) "Xenophon saw foxtail millet in Armenia, and according to the Byzantine historian Procopius of Caesarea, the Laz of the river Rioni basin relied only on this crop. However, the Georgian historian I. Javakhishvili considers these data suspicious. According to Javakhishvili's explanation, in the 6th century, Procopius of Caesarea writes about the Greek army sent by the Byzantine emperor to stay at fortresses of Skanda and Shorapani in Lazika in West Georgia, which left the fortresses on account of the food shortage and unsuitable conditions. According to the Byzantine author, the Laz, like the Colchians used to eat elvimos as survival food. From the above it is clear that the local population in Skanda and Shorapani had some kind of grain for food, which Procopius calls elvimos. As explained by Javakhishvili (1930), here we can talk not about ghomi, i.e. *Setaria italica* but qvrima, i.e. *S. mocharica* (Alef.) Menabde & Ericzjan, because ghomi has higher nutritional value compared to qvrima. According to the research of Javakhishvili (1930), ghomi is found for the first time in Georgian written sources by Jacob, the "Deacon of the Great Monastery" of the time of David Narini. The document mentions three carts of wine to come from the peasants of Maglaki and Parsmanakanevi, and wheat, millet and foxtail millet from Tke (possibly Tkibuli, a town in West Georgia; Sadunishvili *et al.* 2021).

Based on the lack of historical data on foxtail millet culture in East Georgia, Javakhishvili guesses that ghomi must have penetrated into Imereti from the west, not from the east. This is evidenced by the fact that in Meskheti and Kartl-Kakheti foxtail millet was not sown anywhere and is not sown now. As a proof of this, Javakhishvili (1930) cites the records by Vakhushti Batonishvili (1941), who, in his description of East Georgia of the first half of the 18th century, noted that in Kakheti "they do not sow ghomi". Describing the Khepini gorge, he says: "here is more ghomi than anywhere in Kartli". These words show that at the end of the 18th century in Kartli, ghomi was cultivated in places, but apparently in such small amount that the author did not consider it necessary to name clearly the places of ghomi distribution (Maisaia, 1987; Sadunishvili *et al.* 2021).

As Rukhadze (1976) notes, foxtail millet is mentioned in Georgian written sources of the 13th century, which proves that the crop was cultivated in Georgia even before that time. In Samegrelo, only foxtail millet is mentioned of cereals in the church and monastery duty documents of the end of the 18th century (Gugushvili, 1954). According to Maisuryan (1929), millet and foxtail millet were mentioned in the manuscripts by the monks of Mt. Athos. The same author reports that the Russian-Georgian dictionary compiled by Bakar Batonishvili in 1725 and published under the name Vakapa, includes the words for millet and foxtail millet. At the end of the 18th century, in the Italian-Russian dictionary was compiled by an unknown Italian missionary, the word panigo was translated as foxtail millet. The exact time of the publication is unknown, but according to indirect evidence, it can be attributed to the period of King Heraclius (around 1780) (Maisaia, 1987; Sadunishvili *et al.* 2021).

L. Dekaprelevich (1938) in his work "Material culture of Shota Rustaveli epoch" notes that foxtail millet was cultivated in West Georgia in the 12th century. In the records by Italian travelers of the 15th century: Josaphat Barbaro and Ambrosio Contarini, the crop is described among the main foods in West Georgia of that time (Javakhishvili, 1930). In the 17th century, an Italian missionary Archangelo Lamberti, describing Samegrelo, noted: "Ghomi (the same as our panico), is prepared only for the major Holidays. Grain is cleaned in a special vessel, then washed, placed in a small pot ("kardala"), put on fire for cooking some time before dinner, and when the meal is ready with water almost dried out, they knead it to a fairly soft dough, and then put into bowls for the people sitting around the table; they eat it instead of bread because wheat grows

scanty there. When eating soup, e.g. when fasting, ghomi is scooped out with a spoon and soup is poured into the hollow on the porridge. Women usually have dinner separately from men. Only during feasts, they eat together but women gather on the one side and men on the other. From kitchen, they bring a cauldron of ghomi. The cauldron is hung on a bar placed on the shoulders of two men. They are followed by a person who must distribute the porridge to the bowls. The person has a shovel over his shoulder, and with that shovel he takes ghomi out of the cauldron. Another servant carries a smaller pot, which also contains ghomi, but whiter and more thoroughly prepared. A baker comes next. He brings five or six loaves of bread in a leather bag and gives the bread to the host and most respected guests. Before serving ghomi, first the supraji (a person who looks after guests), with great trembling and genuflection, gives the host a piece of bread, and if there is someone there who is worthy of the bread, he offers a small piece of this bread to those guests as well. Then the servant with a shovel begins to distribute ghomi: he takes gomi from the cauldron, walks quickly around the table and puts large portions of ghomi into everyone's bowls. After that, the person with white ghomi distributes small portions of that ghomi with a small spoon to the guests sitting close to the host as addition to those large portions they already received. "...Megrelians usually eat ghomi and not bread, and foreigners know that even if they bring bread there, they will not be able to sell it," and "no people respect agriculture as much as Megrelians". Everywhere on earth, only people of humble background and uneducated peasants cultivate crops. In Samegrelo, even noble men cultivate their fields and grow food. They do not consider this an issue or a cause for concern. Every prudent householder and nobleman puts more effort into this work. The Megrelians grow ghomi, which is like panigo, with great skill, and this is their usual food. In Samegrelo, as in our country, everywhere instead of large trees you can find bushes so that the shadow of the trees does not harm foxtail millet. Tree branches are cut off in a way that all that remains is the trunk of a tree, which vines can barely climb; Having cut down the trees, they begin to plow and plow the land four or five times with a plow of the same size as our plow..." "...When they prepare the ground, they begin sowing, which they finish for St. Peter and St. Paul Holiday. But after this, a lot of work begins: because of high moisture, bad grass grows quickly there, and hard work is required for weeding. If one stops weeding for a few days, the grass growth strengthens so much that the crop dies out completely. Therefore, if foxtail millet crawls out of the ground, the ground must be loosened with hoe immediately. Since the matter is urgent and the owner's and his people's effort is no longer sufficient, he has to call his neighbors who have already sowed the field..." "As a person has to carry out this hard work in terrible heat, to make it easier, they came up with such a method that the whole village seems to have a party. This method consists of three components: "nadi" [gathering of villagers to help one in agricultural works], singing and serving rich table by the owner of the estate. To cheer the workers up, the owner starts to work with hoe together with others. To work quicker, they sing a special song, to the sounds of which they position the hoe work as if they were dancing with a musical instrument. As much as they speed up the song, they speed up the hoe. To do this, two singers take the lead and begin to sing... With the onset of darkness, a luxurious dinner is prepared in the owner's house" (Lamberti, 2011; Sadunishvili *et al.* 2021).

The Italian missionary of the same century, Don Cristoforo de Castelli, describing Colchis, writes: "...there is abundance of necessary crops such as foxtail millet, millet, rice, broad bean, common vetch, etc." "...Farmers support their livelihood with these crops" (De Castelli, 1976; Sadunishvili *et al.* 2021).

Ghomi is also mentioned in reports sent to Moscow by Russian diplomats (1650-52) Stolnik Tolochanov and Diak Evlev. They write that in West Georgia they sow mainly foxtail millet, as well as some wheat and barley (Polievktov, 1926; Sadunishvili *et al.* 2021).

Vakhushti Batonishvili in his economic description of the Colchis lowland (1745) also mentions ghomi and emphasizes that ghomi is sown most widely of all the crops and "the native people subsist on ghomi" (Vakhushti Batonishvili, 1941; Sadunishvili *et al.* 2021).

Don Giuseppe Giudice de Milano (1964) wrote in the first half of the 17th century: "... On soil of Samegrelo all those kinds of vegetables and fruits thrive that love marshy places, such crops are rice, foxtail millet, millet, etc. … They eat foxtail millet instead of bread (they call it ghomi), which is like Italian Panigo" (Sadunishvili *et al.* 2021).

The German scientist Johann Anton Güldenstedt (1962), who traveled through Georgia in 1768-74, wrote in his economic description of Imereti: "... in Okriba, Salortkipanidzeo, Samikeladzeo and Vake nothing is sown except foxtail millet and millet" (;adunishvili *et al.* 2021).

In the big list of peasants of the Bishop of Abkhazeti, the following cereal crops are mentioned: "puri" [wheat], barley, foxtail millet, "ipkli" [another name for wheat], millet. Among them, ghomi was the most widespread in West Georgia (Gvritishvili, 1965; Sadunishvili *et al.* 2021).

In the first half 19th century, Eichwald (1825-1826), Koch (1836-1838) and Spencer (1836-1837) named foxtail millet and millet among of the major food crops of Guria, Samegrelo and Imereti (Eichwald, 1837; Koch, 1843; Sadunishvili *et al.* 2021).

The "Ustari" compiled by David Dadiani, the last prince of Samegrelo, in 1852 says: "…Since ancient times foxtail millet has been sown in Samegrelo. It is sown intensely, used for food instead of bread, as well as sold in Abkhazeti, Guria and Imereti. The amount sold cannot be determined due to abundance, as the crop gives rich harvest and multiplies five hundred times. Ghomi straw is used as food for cattle and people hoes the crop fields twice before harvest time. There are two kinds of ghomi: one is Motsorozi with early but poorer harvest, and the other is Mogvianebo with rich October harvest and sown until mid-June (Meunargia, 1939; Sadunishvili *et al.* 2021).

Dubois de Montperreux names ghomi as one of the common grain crops of Lechkhumi (Dubois de Montperreux, 1839). Litvinov during the census of Imereti in 1804, mentions ghomi among other cereals common there (Gugushvili, 1954; Bregadze, 1969; Rukhadze, 1975; Sadunishvili *et al.* 2021).

Archaeological excavations carried out on the territory of Georgia have proven that even in ancient times, foxtail millet culture was widespread in Georgia. A number of researchers (Lisitsina, Prishchepenko, 1977; Gorgidze, 1979; Bregadze, 1983; Gorgidze, Rusishvili, 1984), based on archaeological research, note that in Arukhlo I and II (the 6th millennium BC) wheat, oats, barley, foxtail millet, millet and pea seeds were discovered. Charred grains of foxtail millet were found in other Georgian archaeological sites as well, e.g. in the areas of Natsikhvari, near Kutaisi, Imereti, and Bichvinta, Apkhazeti. It dates back to the 3rd century AD (Bregadze, 1969). Ghomi, along with other crops (wheat, rye, millet), is also found in the archaeological materials of Upper Svaneti (Etseri, 1st millennium BC) (Chartolani, 1974; Sadunishvili *et al.* 2021).

In 1975, the 4th archaeological expedition of the I. Javakhishvili Institute of History, Archeology and Ethnography of the Academy of Sciences of Georgia discovered the remains of cultivated plants along with various ancient household and agricultural items in Vani district. Among plant seeds, grains of foxtail millet and wheat predominated. The archaeological items dated back to the 2nd-1st centuries BC (Maisaia, 1978; Sadunishvili *et al.* 2021).

The charred remains of foxtail millet were found on the territory of Nokalakevi (4th-3rd centuries AD) and Vani (5th century AD). Foxtail millet and millet were widely used during this period (Pruidze et al., 2016; Sadunishvili *et al.* 2021).

According to statistical data of 1917, foxtail millet was sown were noted in various mazras [administrative divisions of that time] of Georgia: Akhalkalaki, Akhaltsikhi, Borchalo, Gori, Dusheti, Sighnaghi, Telavi, Tbilisi, Tianeti, Zugdidi, Kutaisi, Lechkhumi, Ozurgeti, Racha, Senaki, Shorapani, Gudauta, Gumista, Kodori, Samurzakano (Sadunishvili *et al.* 2021).

Some researchers consider 600-750 m a.s.l. as the vertical distribution limit for foxtail millet (Dekaprelevich, Kasparyan, 1928). According to Ketskhoveli (1957), vertical area for cultivation of fruit-trees, field crop and viticulture, ranges from 500 to 1500 m a.s.l. The area is also considered the best range for foxtail millet cultivation. In the 1970-80s foxtail millet crop fields were recorded by N. Ketskhoveli in the three elevational belts within the mentioned range. The lower belt is located between 500-600 m a.s.l. (Samegrelo, coastal region); the middle belt between 700-900 m a.s.l. (mountainous areas of Samegrelo, Guria, Imereti), the upper belt up to 1200 m a.s.l. in Imereti (Tkibuli), Racha. In mountainous regions Svaneti, Javakheti, etc. foxtail millet fields were not found (Maisaia, 1987; Sadunishvili *et al.* 2021).

Along with historical, archaeological and botanical data, ethnographic materials confirm the antiquity of the foxtail millet culture in Georgia. Ethnographic samples related to the cultivation, and consumption of ghomi have been preserved to this day. In this regard, the ancient tools used in cultivation of ghomi are interesting, of which hand, foot, and water " (Fig. 9), grain threshing machines, can still be found in West Georgia (Sadunishvili *et al.* 2021).

The abundance of tools intended for sowing, growing and eating ghomi, and their local names are indicators of the antiquity of foxtail millet culture in the country. (adunishvili *et al.* 2021)

Uses of foxtail millet as a food, medicinal and ritual plant in Georgia

In ancient times there was a widespread belief in the population of West Georgia that ghomi porridge made of foxtail millet the so-called ghomis-ghomi (chkhveri) porridge made of foxtail millet was distinguished by its high nutritional value, and those who ate ghomis-ghomi were always hardworking and cheerful. It should be noted that ghomi is the name of both the

crop (foxtail millet) and porridge made of it. Similar porridge is made of corn and that porridge is also called ghomi. To differentiate between the two, the name ghomis ghomi is used to indicate porridge of foxtail millet. The crop but not the porridge is also called chkhveri. Foxtail millet was traditionally threshed in "***chamuri"*** (Fig. 9), and milled in "***skibu***", grain-hand mills (Fig. 10; Sadunishvili *et al.* 2021).

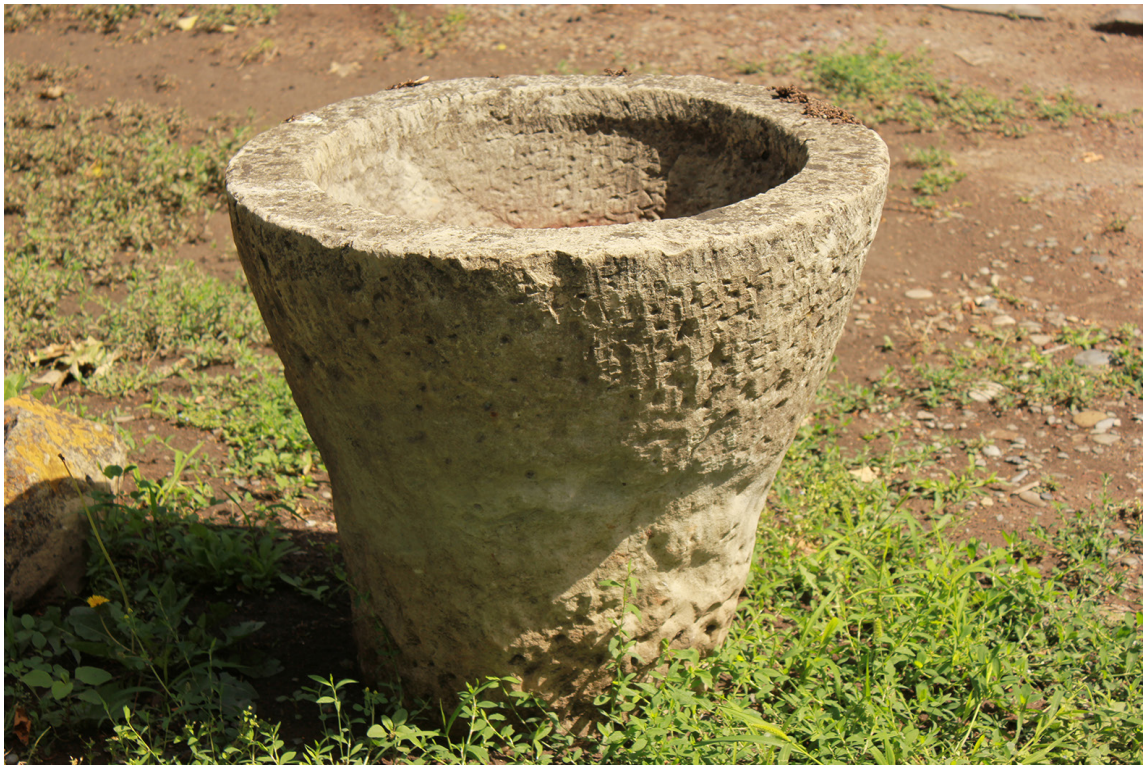

Fig. 9. Chamuri, a grain hand threshing vessel, Tbilisi folk market at the Mtkvari (Kura) riverbank

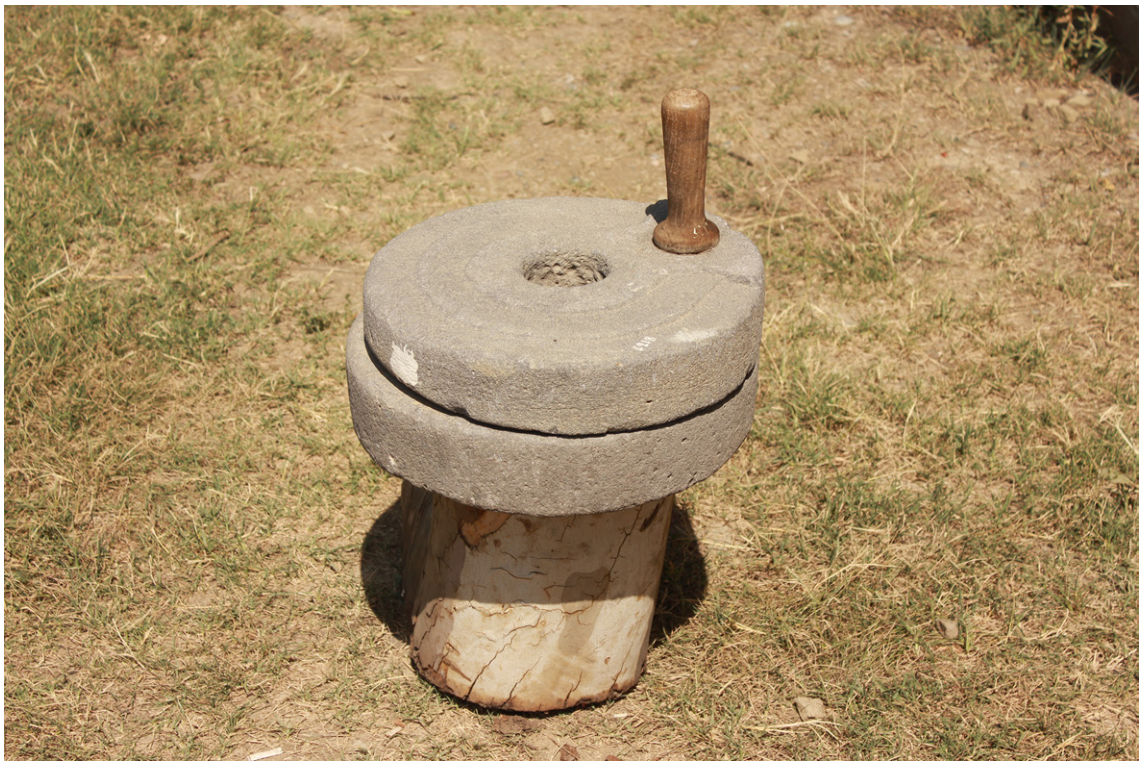

Fig. 10. Skibu, a grain hand-mill, Tbilisi folk market at the Mtkvari (Kura) riverbank

Alefeld F. Landwirthschaftliche Flora: Unveränderter Nachdruck der Ausg. Berlin 1866. Koeltz, Königstein-Taunus, Deutschland. 1966.

Bakhia-Okruashvili S. 2010. Problems of ethnic history of Abkhazians (historical-ethnological examination). Universali, Tbilisi, Georgia. (in Georgian)

Baramidze A. 1983, 1987. From the recent past (memories). Metsniereba, Tbilisi, Georgia. (in Georgian)

Barjadze G. 2004. Itkhvisi (historical-ethnographic essay). Aisi, Tbilisi, Georgia. (in Georgian)

Batonishvili V. 1941. Description of the Kingdom of Georgia (Geography of Georgia). in Lomouri I, Berdzenishvili N. (eds.) Geography of Georgia. Tbilisi State University, Tbilisi, Georgia. (in Georgian)

Berdzenishvili D, Bandzeladze I, Suramelashvili M, Churgulia L. 1983. Lechkhumi. Metsniereba, Tbilisi, Georgia. (in Georgian)

Beridze R, Fritsch R, Pistrick K, Sakvarelidze I. 1984. Report of a collecting mission to the Georgian SSR of 1983 for the study of indigenous material of cultivated plants. Die Kulturpflanze 32(2): 217–227.

Beridze R, Hanelt P, Fritsch R. 1983. Report of a collecting mission to the Georgian SSR of 1982 for the study of indigenous material of cultivated plants. Die Kulturpflanze 31(2):173-184.

Bregadze N. 1968. Some issues of folk agricultural technology. III, Problem of Georgia's Ethnography. Metsniereba, Tbilisi, Georgia.

Bregadze N. 1969. Mountain farming in Western Georgia. Metsniereba, Tbilisi, Georgia. (in Georgian)

Bregadze N. 1983. About the biological nature and area of origin of the initial species of cultivated wheat. Bulletin of the Academy of Sciences of the Georgian SSR 110(2):437-440. (in Georgian)

Bussmann RW, Paniagua Zambrana NY, Sikharulidze S, Kikvidze Z, Kikodze D, Tchelidze D, Batsatsashvili K, Hart RE. 2018. Unequal brothers – Plant and fungal use in Guria and Racha, Sakartvelo (Republic of Georgia):Caucasus. Indian Journal of Traditional Knowledge 17(1):7-33.

Bussmann RW, Paniagua Zambrana NY, Sikharulidze S, Kikvidze Z, Darchidze M, Manvelidze Z, Ekhvaia J, Kikodze D, Tchelidze D, Khutsishvili M, Batsatsashvili K, Hart RE. 2020a. Form the sea to the mountains - plant use in Ajara, Samegrelo and Kvemo Svaneti, Sakartvelo (Republic of Georgia):Caucasus. Ethnobotany Research and Applications 20(9) doi: 10.32859/era.20.9.1-34

Bussmann RW, Paniagua Zambrana NY, Sikharulidze S, Kikvidze Z, Kikodze D, Tchelidze D, Khutsishvili M, Batsatsashvili K, Hart RE. 2020b. An ethnobotany of Kahkheti and Kvemo Kartli, Sakartvelo (Republic of Georgia):Caucasus. Ethnobotany Research and Applications 19:48. doi: 10.32859/era.19.48.1-28

Bussmann RW, Paniagua Zambrana NY, Ur Rahman I, Kikvidze Z, Sikharulidze S, Kikodze D, Tchelidze D, Khutsishvili M, Batsatsashvili K. 2021a. Unity in diversity - Food plants and fungi of Sakartvelo (Republic of Georgia):Caucasus. Journal of Ethnobiology and Ethnomedicine 17(72). doi: 10.1186/s13002-021-00490-9

Bussmann RW, Paniagua Zambrana NY, Sikharulidze S, Kikvidze Z, Kikodze D, Tchelidze D, Batsatsashvili K, Hart RE. 2021b. An ethnobotany of Upper Imereti, Ukana Pshavi, Meshketi and Pankisi gorge, Sakartvelo (Republic of Georgia):Caucasus. Bocconea 29:33-54. doi: 10.732010.7320/Bocc29.001

Chanturishvili S. 1973. Labor songs related to foxtail millet culture in Samegrelo. Bulletin of the Academy of Sciences of the Georgian SSR 69(1):217-220. (in Georgian)

Chardin J. 1975. Jean Chardin's journey to Persia and other Eastern countries (notes about Georgia). Text translation from French, research, comments by Mgaloblishvili M. Metsniereba, Tbilisi, Georgia. (in Georgian)

Chartolani M. 1961. From the history of the material culture of the Georgian people. Academy of Sciences of the Georgian SSR, Tbilisi, Georgia. (in Georgian)

Chartolani M. 1996. Old Svaneti. Kera, Tbilisi, Georgia. (in Georgian)

Chikobava A. 1938. Chanian-Megrelian-Georgian comparative dictionary. Georgian Branch the Academy of Sciences of the USSR, Tbilisi, Georgia. (in Georgian)

Foxtail millet is used to prepare milk porridge and elargi, cheese porridge (Eliava, 1978). “One kilogram of threshed and well-washed chkhveri grains are cooked. While cooking 1.5 kg of soft cheese was added to the porridge, which was considered an excellent dietary product” (L. Sigua, village Lepochkhve, Martvili district, 1978). Other ghomi meals were: iapopkhi, a thin flatbread similar to khachapuri [a traditional Georgian cheese-pie], baked from ghomi flour, sprinkled with crushed walnuts and onions; punchkhuli, boiled gomi grain mixed with walnuts and butter; khavitsi porridge, prepared with honey and ghomi flour, often served especially to pregnant women (Sharashidze et al., 1938; Sadunishvili *et al.* 2021).

Porridge chkhuka was prepared of chkhveri following a special technique: one kg of chkhveri was cooked to make very thick porridge, half a cup of honey poured into it, a cup of fresh chopped walnuts and a little salt added. According to the elders, chkhuka was considered an excellent concentrated food. According to folk belief, it was more nutritious than milk porridge (R. Injia, village Sergieti, Martvili district, 1986; Sadunishvili *et al.* 2021).

Ghomi porridge made of chkhveri increased in volume while boiling so that two pounds of chkhveri grains were equal to 30 pounds of corn (village Kotianeti, Senaki district; Sadunishvili *et al.* 2021).

Alaq’urt’i was prepared of chkhveri grains. Alakurti was ghomi-like porridge made of roasted and finely ground ghomi, flax or yellow corn with honey, well kneaded and coated with walnut oil or ghee. Even today in upper Samegrelo alaq’urt’i is synonymous with well-cooked ghomi. Well kneaded ghomi is said to be “like alaq’urt’i” (Soselia, 1955; Sadunishvili *et al.* 2021).

Ghomi was the main crop in Guria as well (village Gonebiskari): “Ghomi is the main crop at our place. Brinjula was made of ghomi, finely kneaded bread pasta or ghomi is poured onto a heated baking sheet, sprinkled with grated cheese and baked. Easter “tabla” was prepared as follows: ghomi was kneaded in hot water, stirred with lapera, a shovel, poured onto the heated pan to its half depth, sprinkled with grated young or boiled cheese, covered with the other half of the finely kneaded dough on top and baked. Iapopkhi was prepared in the following way: ground ghomi was thinly kneaded, slightly salted, poured into a heated stone pan, and covered with the other heated pan, … and baked. Khavitsi is prepared with honey water as follows: one third of good harmless honey is dissolved in two thirds of water, boiled for half an hour with a little wine added. It is then cooled, mixed with ground gomi or wheat flour, stirred well with a lapera, a shovel, and cooked for almost an hour until a crust forms at the bottom of the pan. Khavitsi is most often prepared for women in labor and fed while she is in bed, since it is very nutritious and healthy (Materials on the history of domestic industry and crafts of Georgia, 1986; Sadunishvili *et al.* 2021).

In Colchis, West Georgia, chkhveri seeds were also used for specific medicinal purposes. “Tibu”, a medicine for cold and flu treatment was made of it. According to the storytellers, they washed a glass of chkhveri seeds, boiled about 2-3 liters of water, put the washed chkhveri into the boiling water, added a medium-size head of chopped garlic, 1-2 spoons of crashed savory, pepper, more bitter would be the best to kill the germs, half a liter of wine precipitate from clay vessel or Ojaleshi wine. It was taken in the evening to induce sweating. Tibu steam was also good to inhale. After the disappearance of the ghomi culture, corncobs were used instead of chkhveri, but they did not have the same medicinal properties as chkhveri’s tibu (R. Injia, village Sergieti, Martvili district, 1986; Sh. Zarkua, village Nokalakevi, Senaki district, 1978; Sadunishvili *et al.* 2021).

Foxtail millet was a necessary element of some religious and family rituals. “Gomis-ghomi was prepared especially on Christmas and Easter days (village Kotianeti, Senaki district). In religious rituals, gomi grain was used as a symbol of wealth (Abakelia, 1999; Makalatiya, 1927). “...During Holidays, especially Christmas and New Year, a ritual bread with the image of a cross was made from chkhveri grain flour” (Martvili, Mthr. G. Eliava, 1988; Sadunishvili *et al.* 2021).

According to storytellers, New Year's greetings have been known in Samegrelo since ancient times, during which a first-foot with chichilaki, a special wooden craftwork made for the New Year celebrations, and a plate of chkhveri, i.e. foxtail millet (on which silver money, eggs and raw hazelnut branches lie) circles the yard several times and scatters millet grains as a symbol of wealth. Today corncobs are used instead of chkhveri grains (M. Kekelia, village Bandza, Martvili, 2004). “On Christmas Eve, a singing group congratulated the family on the advent of the Nativity of Christ. In reply, the owner gave them a bowl of chkhveri. The Chrsitmas singers had a bag khurjini into which they poured the chkhveri nuts (grains). This was the greatest gift for them. The family which gave the chkhveri nuts was considered wealthy” (K. Maisaia, village Mukhurcha, Martvili district, 2003; Sadunishvili *et al.* 2021).

A well-known Georgian ethnographer T. Sakhokia provides interesting information about foxtail millet culture: “When chichilaki is already crafted, then they display it; chichilaki, dressed as a bride, is first put in a corner, and next to it they put a plate, on which they lay out the head of a pig slaughtered for the New Year, a piece of pork prepared for frying as “mtsvadi”, a traditional barbecue, fried cock, one plate of ghomi (chkhveri) grain and an egg embedded in it. The egg, along with other listed items, is a symbol of completeness, fertility and abundance, which is brought to the New Year, kalanda, brings to the family of Megrelians. A makuchkholi gets up at dawn, goes to the spring and washes his face with cold water. When he takes his hands out of the water, he takes a handful of ghomi grains and puts the hand into water again. He takes his hand out of the water, spreads it out and observes; if water had run between his fingers and wetted ghomi, this is a sign of enough rain this summer for the harvest. If the grains are dry, then the summer will be dry as well. When he moves with chichilaki to enter the house, he is followed be the male members of the family but not the females. Then with his free hand he takes grains of ghomi from a bowl and starts throwing it, while praying: "Kalanda, let our sons and future multiply, give us much luck, much joy, much money, cattle, poultry." ...When the head of the family finishes praying for his home, he starts praying for all the buildings around: cowshed, pigpen, henhouse, corn house, khula [a small wooden or cane building for dry fruit, nut, various grain storage, Fig. 11]. In one hand he holds a chichilaki, and with the other hand he scatters the seeds of ghomi and prays like this: "Thus multiply and multiply in this way... Saint Vasiliy, please multiply our son and the future in this way and give us so much good." They slaughter hen for dinner. The blood of a slaughtered hen is spilled out on chkhveri. Then they give the chkhveri wetted in chicken blood to chicks. These chicks will not eat grapes when they grow up. For supper the ghomi porridge must be cooked of ghomis-ghomi, i.chkhveri grains, not of corn. And a keen eye must be kept on its preparation. Cooking ghomi was used as a means for fortune telling. If it starts boiling from the middle of the pot, then a rich harvest is expected this year only in this village, and if it starts boiling from the edge, which symbolizes the outskirts of the village, then a good harvest is expected everywhere" (Sakhokia, 1956; Sadunishvili *et al.* 2021).

Fig. 11. Khula, a small wooden building for dry fruit, nut and grain storage, in the Giorgi Chitaia Open Air Museum of Ethnography Tbilisi, Georgia

Ghomi as a symbol of wealth and abundance was also a part of the ritual when the bride entered the house, and the bride sowed it as a symbol of fertility (Chanturishvili, 1973). On the wedding day, the mother-in-law gave the bride a bowl full of chkhveri with an egg in the center as a symbol of perfection. The bride walked around the fireplace three times, sowing ghomi grains. And the mother-in-law or one of the relatives declared at each act of sowing a wish for childbearing and wealth for the family. Ghomi here was a symbol of wealth (Nanobashvili, 1988; Jolokhava, 2004; Sadunishvili *et al.* 2021).

In West Georgia there was a so-called ghomi shrine called gumushi okhvameri (in Megrelian; Sadunishvili *et al.* 2021).

When the ghomi grew its spikes, people baked special pies, took them out to the field, buried them in the ground, put a cross on them and prayed to God: "Give us a lot of ghomi". When the ghomi harvest ended, the head of the family baked a tabla, a ritual bread, of freshly ground ghomi, the core of which was mixed with walnuts, onions and spices, and slaughtered an old cock. He would give the cock's head to mekhvave, a person who then distributed the tabla and prayed for the wealth in the next year (Makalatia, 1941; Rukhadze, 1968, 1976; Sadunishvili *et al.* 2021).

The name of the month of October is also associated with the ghomi culture: guma-tuta in the Chanian language and gima-tuta in Megrelian. Harvesting of ghomi, a process call gimua in Megrelian was mainly carried out in September or October (Makalatia, 2006) ; Sadunishvili *et al.* 2021.

Georgian proverbs also indicate the antiquity of ghomi culture in Georgia (Pkhakadze, 1955; Sadunishvili *et al.* 2021).

On ghomi sowing day, all neighborly relations were prohibited in order to prevent a bad harvest. Sowing was carried out on Monday, a tutashkha happy day, or Thursday, which was considered kvatieri, i.e. smart days. Phases of the moon were also considered. Sowing had to be started on the full moon, since a worm could appear on what was sown on the new moon (Rukhadze, 1976; Sadunishvili *et al.* 2021).

Georgians used ghomis-ghomi as dietary food to treat gastrointestinal diseases (Pkhakadze, 1955; Sadunishvili *et al.* 2021).

Ghomi porridge has been cooked from threshed grains. Whole grains were used to feed chicks. Ghomi straw was the best feed for livestock and was sold at a high price (Meunargia, 1939; Sakhokia, 1950). It is also worth noting that ghomi was used as a building material for covering various agricultural buildings (Gordadze, Chkhenkeli, 1950; Maisaia, 1987). It was because of this versatile use that ghomi was included in the penal tax and was a tax of the highest quality (Meunargia, 1939; Makalatia, 1941; Sadunishvili *et al.* 2021).

Georgian varieties of foxtail millet

Georgia was distinguished by its diversity of foxtail millet cultivars. As a result of folk selection, the Georgian farmers created local varieties adapted to specific natural conditions, which was reflected in the cultivar vernacular names: the early harvest foxtail millet was called shvidk'virias (variety of seven weeks) or ormosavalas (variety of two harvests), etc. The noteworthy early harvest cultvars are: k'udala ghomi, boboq'vauri, dzirdabalas, mglis k'uda, k'vezhua ghomi, khot'ora, imeruli; sashualo saadreo ghomebis khalkhuri sakhelts'odebaa k'unts'uraula, matrakha - tetri ghomi. Moderately late harvest foxtail millet cultivars were: matrakha ts'iteli, matrakha, tetri khit'ira tetri, nazhgli tetri, tetri ghomi, chakura, khira tetri, baramula, bojga ghomi or bojga, gvelik'uda, k'vrikhina, ts'iteli ghomi, khuch'iela, joriela, q'viteli ghomi, grdzelbets'va, iisperi, matrakha, ortita, tavts'vrila. Late harvest foxtail millet cultivars were: k'irchkheula, khot'ora, usakhelo ts'itela, usakhelo tetri, borjga, anu bozhga tetri, bandula ghomi, k'orchkheula, ach'arula (lomouri, 1950; chenk'eli, 1960). Early harvest cultivars: shvidk'viria and motsorozi, which took almost two months to ripen, allowed the farmer, after harvesting grain in the summer, to grow wheat on the same plot and, thus, receive two harvests from the estate. The ghomi varieties widespread in Lechkhumi were distinguished by the shortest growing season (Tsinamadrishvili, 1919; Mushkudiani, 2001; Sadunishvili *et al.* 2021).

According to Sahokia (1950), six varieties of foxtail millet were known in Guria: tetri, baramula, dzirdabali, shvidk'vira, khuch'ila, joriela. Dekaprelevich and Kasparyan (1928) mention the following vernacular names of foxtail millet: nazhgvli tetri, usakhelo tetri, usakhelo ts'iteli, bojga tetri, chakura, khit'iri tetri. Menabde and Eritsyan (1948) mention: matrakha, khot'ora, barambula and borjgha. According to Meunargia (1939), early and late foxtail millet were sown in Samegrelo: "...Motsorosi is early, and the second ghomi is late." (Sadunishvili *et al.* 2021).

According to ethnographic essays by M. Alavidze (1951), varieties of foxtail millet were widespread in Lechkhumi: bozhga or beghela ghomi harvested at the end of September. Kuda ghomi ripens at the end of September. Kozua is a yellow, dense spike variety. Motsorozi is an early cultivar, which ripening in two months (Sadunishvili *et al.* 2021).

Rukhadze (1976) lists the following cultivars of foxtail millet in Samegrelo: ts'iteli (ch'ita), tetri (che), saadreo (tskhedi), sagviano (tsitsva), k'ik'aloba (early harvest ghomi), usakhelo (whitish ghomi with small spikes), k'ukhure, kochobe, k'ap'edi, gudure, khgk'ire (late harvest ghomi), kheture (hardly threshed blackish ghomi with big spikes), gurule (late harvest fine grain ghomi), the same as :didi ghomi rusuli (big grained ghomi), motsorozi//motorozi, gujure, bojga//boch'k'a (which as some

household keepers say is peaked and known as k'uda ghomits), jonjura//jojura, zodela, gogua, tsets ghomi, joghore or nangere (Sadunishvili *et al.* 2021).

In ethnographic materials collected by the same author in Guria the following cultivars of foxtail millet are mentioned: boboq'vauri, nazhghvli tetri, q'viteli usakhelo, urushuli// uroshauli, matrakha, dzirdabali, tetri ghomi, khazarala (big spike ghomi), bojga//jonjore ghomi, jashuri or burchkha ghomi, early harvest shvidk'vira, khit'iria, kheture, ormosavala ghomi, baramula, joriela, bambula (red big spike furry ghomi) and chakura (fine grain ghomi). In Adjara six cultivars of ghomi were revealed: k'irchkhelura, burchkha, bats'arai, bojgai, khuturai and jashuri Sadunishvili *et al.* 2021).

In the 1950's new Georgian cultivars were created via artificial selection: ajametis N1; ajametis N2, grdzelbets'va, iisperi, k'udala, matrakha, ortita, chakura, tavts'vrila, ajametis okromartsvala, ajametis q'viteltsvala, q'viteli ghomi, ajametis mok'lebets'viani, ach'arula, khot'ora, imeruli, tetri ghomi (Gordadze, Chkhenkeli, 1950; Sadunishvili *et al.* 2021).

None of these diverse varieties has survived in modern agriculture. As Sarjveladze and Chachava (2007) emphasize, "grdzelbetsva" was cultivated in a village Shuamta of the Vani district. In the collection by Iakobashvili, they found ghomi variety "grdzelbetsva", which had been taken from the Ajameti experimental station and gave the authors a small amount in 1997 for planting at the Sartichala experimental station. This cultivar is sown neither East Georgia, nor in West Georgia at present. (Sadunishvili *et al.* 2021).

Foxtail millet cultivation techniques used in Georgia

Foxtail millet, despite the labor-intensive agricultural technology, has been the breadwinner of the culture of our ancestors since ancient times. Traditions of ghomi cultivation in various regions of Georgia are described in rich ethnographic literature (Abakelia et al., 1991, Ajindzhal, 1969, Alavidze, 1949, Bakhia-Okruashvili, 2010, Baramidze, 1983, Barjadze, 2004, Berdzenishvili et al., 1983, Bregadze, 1969, Chanturishvili, 1973, Didmanidze, Gogitidze, 2006, Eichwald, 1837, Gabisonia, 1973, Jalabadze, 1978, 1990, Kakhiani, 1964, Lomjaria, 2012, Maisaia et al., 2005, Malakmadze, 2008, Miminoshvili, 1998, Murie, 2018, Mushkudiani, 2001, Rukhadze, 1960, 1973, 1976, 1982, Sharashidze et al., 1938, Vanilishi, Thandilava, 1964; Sadunishvili *et al.* 2021).

Ghomi is a spring crop. Georgian varieties of the foxtail millet compose a unique ecological group, noticeably different from East Asian (China, Manchuria, Korea, India) groups, with tall and thick stems, long and wide leaves, large spikes, long growing period, small seeds and their high protein and vitamin content (Maisaia, 1979). Ghomi has the longest growing season among millet group plants in Georgia, which prevents its spread into agricultural areas of higher elevations. The crop is distributed mainly in the lowlands with the upper limit not exceeding 500-600 m a.s.l. Ghomi produces a good harvest on chernozem, sandy and alluvial soils (Sadunishvili *et al.* 2021).

Depending on the length of the growing season, the following ghomi groups are conventionally distinguished:
1. Very early, begins fruit bearing within 50-60 days after germination. These are: motsorozi, shvidkvira, *etc*.
2. Early, fruit bearing 70-80 days after germination.
3. Medium, fruit bearing 80-90 days after germination.
4. Late, fruit bearing 100-120 days after germination;
5. Very late, fruit bearing more than 120 days after germination.

In Georgia, ghomi is sown from the second half of April. According to the farmers' experience, they did not sow foxtail millet and millet in early spring, since the early shoots of the crops, in addition to being easily suppressed by weeds, were also damaged by birds. Ghomi has a fairly high need for warmth. When carrying out agrotechnical measures, it should be considered that in the first period of development, ghomi is characterized by weak growth and is easily affected by weeds. Therefore, in crop rotation hoed crops such as corn, potatoes, *etc*. are good predecessors for ghomi. Under optimal conditions, foxtail millet produces 2-7 tons of grain per hectare. The depth of sowing seeds should not exceed 1-2 cm. Gomi is sown in rows (the distance between rows is 15-30 cm). To obtain green mass, sowing is carried out using the complete sowing method with 10-12 kg of seeds per hectare. When the ghomi sprout produces the first 2-3 leaves, it should be weeded. At this time, its first hoeing should also take place. Weeding is carried out by leaving a distance of 10-12 cm between plants. Approximately 15-20 days after the first hoeing, the second one, lighter than the first, begins. Sometimes the third hoeing follows as well. Harvest begins in September, including the first half of October. Before harvesting, the best heads are selected, tied into bundles and stored for seeds (Gotsadze, Maisaia, 2015; Maisaia et al., 2018; Sadunishvili *et al.* 2021).

Foxtail millet since corn introduction

Corn, in particular in West Georgia, starting from the 18th century, quickly replaced various grain crops that had been widespread here since ancient times: ghomi, chadi, even wheat, etc. (Gugushvili, 1954; Sadunishvili *et al.* 2021).

In 1850, wheat fields were already smaller compared to the cornfields. Nevertheless, in the 1850s, foxtail millet was widely consumed and used by noble and poor (Sadunishvili *et al.* 2021).

In the 1890s, ghomi was already a rare meal, served only to honored guests or during celebrations (Sadunishvili *et al.* 2021).

Since the 1900s and especially since the 1920s, large deposits of ghomi in Guria-Samegrelo have become very rare, in some areas it has already completely disappeared, and the new generations knew about it only from the memories of elder people. In the 1920s, foxtail millet was sown in the markets of Zugdidi, Senaki and Ozurgeti of the Kutaisi province (Dekaprelevich, Kasparyan, 1928; Sadunishvili *et al.* 2021).

According to the data of the 1940-1950s, ghomi was sown in small amount in West Georgia: Imereti, Guria, Adjara, Samegrelo and Apkhazeti (Menabde, Eritsyan, 1948; Gordadze, Chkhenkeli, 1950; Sadunishvili *et al.* 2021).

According to data from the 1960s, Gomi were still sown in West Georgia at that time (Bregadze, 1968; Sadunishvili *et al.* 2021).

In the 1970s of cereal crops foxtail millet was grown in relatively large quantities in Imereti (Jalabadze, 1978; Sadunishvili *et al.* 2021).

According to data from the 1980s, wheat was sown in the village of Doberazeni, Martvili district. In the 1980s, ghomi crops were traced in Imereti (Beridze et al., 1983, 1984; Sadunishvili *et al.* 2021).

According to data from 1970-1990, the Gomi culture was preserved in the form of household plots in Guria, Imereti and Samegrelo (Maisaia, 1987; Sadunishvili *et al.* 2021).

Formerly widely grown as food grain (Rozhevits et al. 1934; Bussmann et al. 2018, 2020a,b, 2021a,b).

When young the species provides good fodder for livestock, especially for sheep. The seeds provide feed for poultry and are used for distillation of alcohol (Rozhevits et al. 1934; Bussmann et al. 2018, 2020a,b, 2021a,b)

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Literature cited

Abakelia N, Alaverdashvili S, Gambashidze N. 1991. Calendar of Georgian folk days. Krialosani, Tbilisi, Georgia. (in Georgian)

Abakelia N. 1999. Archaic cults and rituals in Samegrelo – Samegrelo-Kolkheti-Odisha. Essays on Archaeology, Linguistics, History, Architecture and Ethnology, Tbilisi, Georgia. (in Georgian)

Adzhinjal IA. 1969. From the ethnography of Abkhazia. Alashara, Sokhumi, Georgia. (in Russian)

Alavidze M. 1949. Materials for ethnography of Lechkhumi. Works of A. Tsulukidze Kutaisi State Pedagogical Institute, vol. IX. Kutaisi, Georgia. (in Georgian)

Alavidze M. 1951. Lechkhumian word of mouth. Soviet Writer, Tbilisi, Georgia. (in Georgian)

Chkhenkeli N. 1959. Foxtail millet in Georgia. Proceedings of the Agricultural Institute of Georgia 51/52:19-42. (in Georgian)

De Beauvois PAMFG. 1812. Essai d'une nouvelle agrostographie. Inprimerie de Fain, Paris, France.

De Candolle A. 1885. Location of cultivated plants. K. Rikker, St. Petersburg, Russia. (in Russian)

De Castelli C. 1976. Reports and album about Georgia. Text translation from Italian, research, comments by Giorgadze B. Metsniereba, Tbilisi, Georgia. (in Georgian)

de Milano, GG. 1964. Letters about Georgia in the 18th century. Text translation from Italian, research, comments by Giorgadze B. Sabchota Sakartvelo, Tbilisi, Georgia. (in Georgian)

Decaprelevich L. 1938. The main crops of the field of Shota Rustaveli's era. Shroma and Teqnologia, Tbilisi, Georgia.

Dekaprelevich LL, Kasparyan AS. 1928. On the study of Italian millet (*Setaria italica* P.B. *maxima* Alf.) cultivated in Georgia. Works on applied botany, genetics and selection, 19(2). (in Russian)

Didmanidze O, Gogitidze S. 2006. The village Maradidi and its inhabitants. Shota Rustaveli State University of Batumi, Batumi, Georgia. (in Georgian)

DuBois de Montpérreux, F. 1839. Voyage autour du Caucase, chez les Tscherkesses et les Abkhases, en Colchide, en Georgie, en Armenie et en Crimée. Vol. 2. A Pihan de la Forest, Paris, France.

Eichwald E. 1837. Reise aus dem Caspischen Meere und in den Kaukasus unternommen in den Jahren 1825-26, Band I, Stuttgart, Deutschland.

Eliava G. 1978. With ethnographer's eye. Sabchota Sakartvelo, Tbilisi, Georgia. (in Georgian)

Gabisonia K. 1973. A village in Abkhazia at the end of the 19th century and at the beginning of the 20th century (1880-1905). Alashara, Sokhumi, Georgia. (in Georgian)

Gordadze V, Chkhenkeli T. 1950. Foxtail millets of Western Georgia. Proceedings of the Ajameti Agricultural Experimental Station. Vol. IV, Academy of Sciences of the Georgian SSR, Tbilisi, Georgia. (in Georgian)

Gorgidze AD, Rusishvili NSh. 1984. Botanical composition of the most ancient wheats of Georgia. Collection "Man and his environment". Metsniereba, Tbilisi, Georgia. (in Russian)

Gorgidze AD. 1979. Living relict of cultivated wheat. Bulletin of the Academy of Sciences of the Georgian SSR, 96(2):425-428. (in Russian)

Gotsadze N, Maisaia I. 2015. Let us restore the forgotten agricultural crops. Universali, Tbilisi, Georgia. (in Georgian)

Gugushvili P. 1954. Grain farming in Georgia and Transcaucasia 1801-1920. Academy of Sciences of the Georgian SSR, Tbilisi, Georgia. (in Georgian)

Güldenstädt JA. 1815. Dr. JA Güldenstädts Reisen nach Georgien und Imerethi. Maurerschen Buchhandlung, Berlin, Deutschland.

Gvritishvili D. 1965. Essays from the history of Georgia (XV-XVII centuries). Sabchota Sakartvelo, Tbilisi, Georgia. (in Georgian)

Jalabadze G. 1978. Farming in Imereti. Materials for ethnographic study of Imereti. Metsniereba, Tbilisi, Georgia. (in Georgian)

Jalabadze G. 1990. Pastoral culture in Western Georgia. Metsniereba, Tbilisi, Georgia. (in Georgian)

Javakhishvili I. (ed.) 1987. Materials for the history of Georgian household and handicrafts, Vol. IV, Part II, Fields of agriculture. Metsniereba, Tbilisi, Georgia. (in Georgian)

Javakhishvili I. 1930. Economic history of Georgia. Book I. Kartuli Tsigni, Tbilisi, Georgia. (in Georgian)

Jolokhava T. 2004. Megrelian customs. Holidays, shrines. Metsniereba, Tbilisi, Georgia. (in Georgian)

Kakhiani K. 1964. Peasant household in Imereti (according to ethnographic materials). Metsniereba, Tbilisi, Georgia. (in Georgian)

Kalandia T. 2005. Two thousand Lazian words. Dictionary material. Artanuji, Tbilisi, Georgia. (in Georgian)

Ketskhoveli N. 1957. Cultivated plant zones in Georgia. Academy of Sciences of the Georgian SSR, Tbilisi, Georgia. (in Georgian)

Koch K. 1843. Reise durch Russland nach dem Kaukasischen Jathmus in den Jahren 1836, 1837 und 1838. J.G. Cotta Stuttgart-Tübingen, Deutschland.

Komarov VL. 1938. Origin of cultivated plants. Selkhozgiz, Moscow-Leningrad, Russia. (in Russian)

Kovalevsky GV. 1929. Agricultural India. Trudy po prikladnoy botanike, genetike i selektsii, 21. (in Russian)

Lamberti A. 2011. Description of Samegrelo. Translated by from Italian by Chkonia A. Mtatsminda, Tbilisi, Georgia. (in Georgian)

Linnaeus C. 1753. Species Plantarum. Vol. 1. The Ray Society, London, U.K.

Lisitsina GN, Prischepenko LV. 1977. Paleoethnobotanical finds in the Caucasus and the Middle East. Nauka, Moscow, Russia. (in Russian)

Lomjaria S. 2012. O, my village. Meridiani, Tbilisi, Georgia. (in Georgian)

Lomouri N. 1962. Greek colonization of the coast of Colchis. Tbilisi State University, Tbilisi, Georgia. (in Georgian)

Lortkipanidze R. 1997. Soils and agriculture of Imereti. Metsniereba, Tbilisi, Georgia. (in Georgian)

Machavariani N. 2006. Vocabulary of plants in Abkhazian. Kartuli Ena, Tbilisi, Georgia. (in Georgian)

Maisaia I, Mchedlishvili K, Jinjikhadze T, Eradze N. 2018. Use of foxtail millet in folk medicine. Bulletin of the Academy of Agrarian Sciences of Georgia 40(2): 127-137. (in Georgian)

Maisaia I, Shanshiashvili T, Rusishvili N. 2005. Agrarian culture of Colchis. Metsniereba, Tbilisi, Georgia. (in Georgian)

Maisaia I. 1979. Botanical composition of foxtail millet of Western Georgia. Bulletin of the Academy of Sciences of the Georgian SSR 95(1):161-164. (in Georgian)

Maisaia I. 1987. Foxtail millet culture in Georgia. Tbilisi, Georgia. (in Georgian)

Maisuryan NA. 1929. Millet of Georgia. Trudy po prikladnoy botanike, genetike i selektsii 22(2). (in Russian)

Makalatia S. 1927. New Year in Georgia. Sakhelgami, Tbilisi, Georgia. (in Georgian)

Makalatia S. 1941. History and ethnography of Samegrelo. Society of Ethnographic Studies of Georgia, Tbilisi, Georgia. (in Georgian)

Malakmadze R. 2008. Ligani valley. Artanuji, Tbilisi, Georgia. (in Georgian)

Menabde V, Eritsyan A. 1948. Foxtail millet of Georgia. Botanical-systematic essay. Proceedings of Tbilisi Institute of Botany, 12. (in Georgian)

Meunargia I. 1939. The last period of the Samegrelo principality and Davit Dadiani. Teqnika da Shroma, Tbilisi, Georgia. (in Georgian)

Miminoshvili O. 1998. Ethnographic trip in Georgia. Tbilisi State University, Tbilisi, Georgia. (in Georgian)

Mourier J. 2018. Samegrelo (Old Kolkheti). Translated from French by Antelava V. Artanuji, Tbilisi, Georgia. (in Georgian)

Mushkudiani K. 2001. From the history of Lechkhumi. Motsameta, Kutaisi, Georgia. (in Georgian)

Nanobashvili B. 1988. Family life in Eastern Georgia (Marriage according to the ethnographic materials of Kiziki), Metsniereba, Tbilisi, Georgia. (in Georgian)

Pkhakadze G. 1955. About foxtail millet culture in Georgia. Works of the Agricultural Institute of Georgia, 42-43:86-88. (in Georgian)

Polievktov MA. 1926. Embassadorship of steward Tolochanov and clerk Ievlev to Imereti, 1650-1652. Tiflis University, Tiflis, Georgia. (in Russian)

Pruidze L, Maisaia I, Sikharulidze Sh, Tavartkiladze M. 2016. The bread of our being. Palitra L, Tbilisi, Georgia. (in Georgian)

Rozhevits RY, Shishkin BK, Komarov VL 1934 (English 1973). Flora of the USSR, Volume 2: Glumiflorae; Akademia Nauk, Leningrad, 622 pages, 50 b/w plates, 2 maps.

Rukhadze J. 1960. Foxtail millet culture in Western Georgia. Materials for ethnography of Georgia, XI. Metsniereba, Tbilisi, Georgia. (in Georgian)

Rukhadze J. 1968. Some agrarian customs in 19th century Western Georgia. Issues of Georgian Ethnography. Metsniereba, Tbilisi. (in Georgian)

Rukhadze J. 1973. Ethnographic expedition in Samtredia region. Matsne – History, Archaeology, Ethnography and Art History Series 3:224-227. (in Georgian)

Rukhadze J. 1975. For the issue of the remains of the plant cult in Western Georgia. Materials for ethnography of Georgia, XVIII. Metsniereba, Tbilisi, Georgia. (in Georgian)

Rukhadze J. 1976. Cult significance of grain storehouses in Georgia. Matsne – History, Archaeology, Ethnography and Art History Series 2:156-162. (in Georgian)

Rukhadze J. 1982. Pages from Vani diary. Sabchota Sakartvelo, Tbilisi, Georgia. (in Georgian)

Sadunishvili T, Maisaia I, Batsatsashvili K, Sikharulidze S, Darchidze T. 2021. Georgia's Agrarian Culture. Georgian National Academy of Sciences, Tbilisi, Georgia. (In Georgian)

Sakhokia T. 1950. Trips (Guria, Adjara, Samurzakhano, Abkhazia). Sakhelgami, Tbilisi, Georgia. (in Georgian)

Sakhokia T. 1956. Ethnographic writings. Scientific-Methodological Office, Tbilisi, Georgia. (in Georgian)

Sarjveladze A, Chachava L. 2007. Let's restore the Georgian foxtail millet. I. Lomouri Institute of Agriculture, Collection of scientific works, 35. (in Georgian)

Sharashidze G, Tsereteli B, Alavidze M. 1938. Vocabulary of Kartvelian languages, I. The Georgian branch of the Academy of Sciences of the USSR, Tbilisi, Georgia. (in Georgian)

Sheibe AM. 1958. Plant cultivation. Publishing House of Foreign Literature, Moscow, Russia. (in Russian)

Soselia O. 1955. Rural obligations in Western Georgia in the 17th century. Materials for the history of Georgia and the Caucasus, 32. Academy of Sciences of the Georgian SSR, Tbilisi, Georgia. (in Georgian)

Tsinamdzghvrishvili I. 1919. Talking about farming in general and the action in particular. Tbilisi, Georgia. (in Georgian)

Tumanyan MG. 1944. Cultivated plants of the Urartian period in Armenia. Izvestia AN ASSR, Social sciences 1-2:73-82 (in Russian)

Vanilishi M, Thandilava A. 1964. Lazeti. Sabchota Sakartvelo, Tbilisi, Georgia. (in Georgian)

Wu Z, Raven, PH, Hong D. eds. 1994–2013. Flora of China. Science Press, Beijing & Missouri Botanical Garden Press, St. Louis

Zhukovsky PM. 1933. Agricultural Turkey (Asian part - Anatolia). Moscow-Leningrad, Russia. (in Russian)