

Alpinia officinalis (*Alpinia officinarum*)
in traditional medicine and modern medico-pharmaceutical practice.

Publication 1: botanical characteristics, synonyms,
features of procurement of raw materials, food use

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Alpinia medicinalis (*Alpinia officinarum*)
in traditional medicine and current medical and pharmacological practice.

Article 1: botanical characteristics, synonymic, specificity of harvesting and use as a food supplement

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SUMMARY

An informational and analytical study of *Alpinia officinarum* Hance was carried out in terms of the botanical characteristics of the plant, problems of synonymy, the peculiarities of the procurement of raw materials, as well as the experience of traditional and modern food use, including in Russia. Revealed massive errors in synonymy, unacceptable for medico-pharmaceutical use of raw materials. It is shown that the results of ethnobotanical studies and thousands of years of world experience of widespread food use of small galangal indirectly indicate the absence of its toxicity. The results obtained allow us to conclude on the need for further information and analytical studies in terms of the chemical composition and biological activity of the rhizomes of *Alpinia officinarum*,

Key words: *alpinia officinalis*, *Alpinia officinarum*, medicinal galangal, small galangal (galangal), *Languas officinarum* (Hance), rhizome of *alpinia officinalis*, *Rhizoma Alpiniae officialinari*, traditional dietetics, adequate synonyms, spices.

RESUME

Current review presents the analytical study of *Alpinia officinarum* Hance, with regards to its botanical characteristics, synonymic problems, specificity of harvesting, as well as the practice of traditional and modern use as a food supplement, including in Russia. It has been discovered that there are significant mistakes in synonymic, which is totally unacceptable for medicinal and pharmacological use. Based on ethno-botanical research and thousands of years of small galangal application, it was shown that it is not toxic. The established results allow for the making of a conclusion about an urgent need of further analytical investigation of chemical composition and biological activity of *Alpinia officinarum* root as well as its application in traditional medicine and current medico-pharmacological practice.

Keywords: *Alpinia officinarum*, galangal, lesser galangal, *Languas officinarum* (Hance), *Rhizoma Alpiniae officialinari*, traditional nutrition, adequate synonyms, spices.

INTRODUCTION

This article continues a series of review publications [22, 26] about unofficial edible and medicinal plants in our country, which have a long tradition of use in Russia and have very relevant pharmacotherapeutic actions today: antiviral, antimicrobial, antifungal and antitumor.

Rhizomes of *Alpinia officinalis* (*Alpinia officinarum* Hance) is one of the most popular medicinal means of traditional Chinese medicine (TCM) [69, 76, 78], which in the XVII-XVIII centuries. in Western Europe, for a number of reasons, it was known as the "Russian root" [39, 40]. Since ancient times, this plant has also been used in Ayurveda [31, 63, 64, 84], Tibetan [29, 56] and Arabic [3, 36, 100] medicine, for more than 1000 years it has been used in Europe [3, 4, 35, 36, 67] and Armenian medicine [2-4], as well as in homeopathy [5, 6, 14, 19, 25, 31, 38, 53, 75, 79]. To date, a sufficient amount of ethnobotanical and ethnopharmacological data has accumulated, which (due to the unique nutritional and medicinal properties *A. officinarum*) are attracting close attention of the modern world scientific community.

In our country, this plant is practically not studied today, despite the long history of food use in Russia [39, 40, 43, 45], a varied chemical composition [57, 63, 85, 97, 101, 103] and a wide range of pharmacotherapeutic action [70, 71]. Information about him in domestic bibliographic sources is fragmentary (not included in all reference, scientific and popular science publications), replete with inaccuracies, and often simply erroneous, since they wander from one publication to another

historically inaccuracies and errors.

This paper opens a series of three review publications on assessing

- experience of traditional medical and food use of *alpinia officinalis* from the standpoint of modern scientific concepts;
- prospects for its use in domestic medical and pharmaceutical practice.

Since the rhizomes *A. officinarum* is a large-tonnage raw material widely used throughout the world with food and medical purposes, it seems to us expedient to assess the prospects of their use as a raw material source for the development of domestic medicines, dietary supplements for food and / or specialized food products of various spectrum of action.

The purpose of this information and analytical study is to objectify information about *alpinia officinalis* in terms of its botanical characteristics, problems of synonymy, peculiarities of raw material procurement, as well as experience of traditional and modern food use, including in Russia.

MATERIALS AND METHODS

The objects of the research were normative documents recommended for use in the prescribed manner, and bibliographic sources of a high degree of reliability, including monographs, scientific periodicals, reference books, dissertations, dissertation abstracts, as well as electronic scientific and official databases. We also took into account Internet resources with links to bibliographic sources of a high degree of reliability.

When performing the work, the following research methods were used: information-analytical, historical, content analysis, systematization.

Conventional medicine terms are quoted either in quotation marks, in italics, or in capital letters, in accordance with the conventional wording in various traditional medical systems. All botanical names are cited in accordance with the International Code of Botanical Nomenclature (Code of St. Louis) [30].

1. Characteristics of the research object

1.1. Taxonomy

Alpinia officinalis - *Alpinia officinarum* Hance belongs to the Ginger family - Zingiberaceae [16], to the genus *Alpinia* - *Alpinia* [16]. The species received its international scientific name in 1871 [61]. In 1887, a drawing of the plant (Fig. 1) was published in the Atlas of Medicinal Plants by Franz Köhler [82]. It is considered that this edition remains the best collection of botanical illustrations of medicinal plants [95].

Total genus *Alpinia* contains 240 species [58], according to other sources - more than 250 species [69]. In 2005, the results of DNA studies were published [83], which showed that the genus is polyphyletic (derived from different ancestors), represented by six clades (a group of organisms containing an ancestor and all descendants), distributed in a tribe (an intermediate taxonomic rank between the family and by birth) *Alpiniae*. Since the findings disproved Smith's (1990) classification [96], botanists assume that the definition of taxa within the genus *Alpinia* requires further research.



Rice. 1. *Alpinia officinalis*; a source: [82]



Rice. 2. *Alpinia officinarum* (Lesser Galangal); source: [60]



A



B

Rice. 3. Fresh rhizomes *Alpinia officinarum*: A - whole rhizome (by Thomaswanhoff; source: <https://commons.wikimedia.org/w/index.php?curid=3450873>); B - cut rhizome (author: I, Luc Viatour, CC BY-SA 3.0; source: <https://commons.wikimedia.org/w/index.php?curid=3450873>)



Rice. 4. *Alpinia officinarum* in Australia; a source: [60]



A - source: [7]



B - source: [69]



B - source: [7]



G - source: [74]

Rice. 5. Dried rhizome a. medicinal: A - whole raw materials, B-D - cut raw materials.

The unique "Dictionary of Plant Names" (Latin-Russian-English-Chinese) [54] contains 6 species of the genus *Alpinia*, relevant for food and medical use in traditional and modern medical and pharmaceutical practice.

1.2. Etymology

Genus *Alpinia* of the Ginger family was named by Carl Linnaeus after Prospero Alpini (Prospero Alpini, 23.11.1553–06.02.1617) [3, 61], also known as Prospero Alpinus or Prospero Alpinio. This Venetian physician and botanist who specialized in exotic plants was later Latinized as Prosper Alpinus. [65]

According to M.R. Fasmeru, the word "kalgan" (one of the names of *A. medicinalis*; for more details see the section "synonymy") comes from Chinese *kó-leung-kéung* via Middle Latin *galanga*, Middle Greek *γαλάγγα* and Arabic *ḫalandžān* "Wild ginger" [50]. The name of the plant "is borrowed from an eastern source, according to Goryaev, who cites a dubious Turkickolyan »[50].

The word "galangal" (*galangal* is one of the names of *a. medicinalis* in English) comes from the Arabic form of the Chinese name for the plant "高良薑" ("go-loen-goen" in Cantonese and "Gao-xiang-jiang" in Mandarin) [77, 94]. In modern Chinese, *alpinia officinalis* is called 高良姜 *gao liang jiang* [7, 8], or in a newer transliteration - *gaoliangjiang* (*gaoliangjiang*) [53, 54], in contrast to the false galangal, or large (*Alpinia galangal* Willd), which in Chinese is called *dagaoliangjiang* (*dagaoliangjiang*) [53, 54].

1.3. Synonymy

Official synonym *Alpinia officinarum* Hance is considered a *Languas officinarum* (Hance) Farw. [53, 54, 70, 99]. However, *a. medicinalis* has a number of folk, historical, everyday and pseudo-scientific synonyms, which introduce terminological confusion in terms of the specific names of food and medicinal plants, both among ordinary people and, unfortunately, in the professional medico-pharmaceutical community. These are three main unfortunate synonyms that cause the main percentage of errors: *galangal*, *galangal*, *galanga*.

Kalgan. One of three often confused false synonyms *a. medicinalis* is "galangal" [16-18,

37]. Correct name *A. officinarum* is a "medicinal galangal" [15, 53, 54].

In domestic folk medicine and even in encyclopedias [16–18], it is customary to call the erect cinquefoil (family Rosaceae) - *Potentilla erecta* L. (Rosaceae). And even somewhat-known and respected specialists [37] with higher medical education and academic degrees use the name "galangal" in their monographs as a synonym for erect cinquefoil. Such a loose use of terminology cannot be considered correct, since back in 1951 the State Publishing House of Agricultural Literature published the "Encyclopedic Dictionary of Medicinal, Essential Oil and Poisonous Plants" [55], in which, under the name "real galangal" (medicinal galangal [15, 53, 54]) rightly means *A. officinarum*, and erect cinquefoil is synonymous with galangalwild "[55].

In modern medico-pharmaceutical practice (in botany and pharmacognosy), the name *Potentilla erecta* L. translated into Russian also has a clarifying definition of "wild" to the noun "kalgan". The name of the wild galangal is considered pharmacognostically correct [9, 49]. This is the name of this plant historically in Russian folk medicine [46].

In international botanical practice, the rhizome of a medicinal. The classic of Russian medical botany prof. A.I. Schreter is the main translation for *Alpinia officinarum* Hance considered "galangalmedicinal" [53, 54].

According to V.V. Pokhlebkin (2010), historically in Russia, the collective name "kalgan" (syn.: Galgan, alpinia, galangal root, pharmacy root) began to be called at once three species of the genus *Alpinia*: 1) *A. officinalis* (the so-called small root), 2) *A. galangal* (large root), 3) *A. sinensis* (Chinese root) [40]. Undoubtedly, this caused confusion not only among writers dealing with spices and herbs [13, 44] and would-be healers [27], but even among pharmacognosts who did not quite bother to understand the taxonomy [45]. And this is happening at a time when even publicly available bibliographic sources, such as the Great Soviet Encyclopedia, interpret the taxonomy and synonymy of the species absolutely correctly: "Kalgan is a perennial plant of the ginger family - *K. real* (*Alpinia officinarum*), also called galgant, or lesser galanga (Unlike *Alpinia galanga* - larger galanga) "[eighteen].

V.V. Pokhlebkin, and after him some other authors, pay special attention to the fact that kalgan is the Russian name for galgant, and "should not be confused with the so-called kalgan-grass, or wild galangal (*Potentilla*, uzik, Dubrovka: *Potentilla erecta* (L.) Raeusch (*Potentilla tormentilla* Schrank, *Rhizoma Tormentillae*) and silver cinquefoil, the roots of which are used as a substitute for a genuine galangal. " "Cinquefoil grows in our forests. Its roots, harvested in early spring or late autumn, have a delicate aroma and may well be used to prepare alcoholic-water infusions or to improve the taste of fruit and berry infusions. In addition, wild galangal is used as an astringent and dye "[39, 40].

I.N. Sokolsky (2011) puts forward an interesting version of the emergence of terminological confusion. Since in the seventeenth and eighteenth centuries. the path of spices and spices lay from the eastern countries to Europe through Russia, "... an expensive foreign root was falsified by Russian cunning merchants by a rhizome remotely similar to it by the rhizome of the *Potentilla* plant, which is very common in Russian forests. Since then, the cinquefoil has received its second name in our country "galangal", sometimes with the addition of "wild" [45].

According to V.V. Pokhlebkin, as well as other domestic plants, popularly "sometimes called kalgan-grass, or cinquefoil, cannot be used as a substitute for spice. This is kamchuga grass, cat's paw, or cuff (*Alchemilla vulgaris*) and cinquefoil (*Potentilla anserina* (L.)). Both of them are devoid of aroma, bitter taste. In medicine, they use not the root, but the leaves "[39, 40].

Galangal. Another adequate synonym for *alpinia officinalis*, which often leads to confusion, is "galangal" because a medicinal is translated from English as "small galangal" (lesser galangal) [11, 54, 61, 71], and experts quite reasonably call another species of the same genus a large galangal - *Alpinia galangal* [11, 12, 18, 54, 61, 70, 71]. Large galangal, in turn, has the following botanical synonyms: *Languas galangal* (L.) Stunth, *Maranta galangal* L., as well as household synonyms used in traditional medical practice: Galangal, Greater Galangal, *Languas*, Siamese Ginger [71].

It adds to the confusion that the well-known Etymological Dictionary of the Russian Language M.R. Vasmera considers as synonyms "plant *Alpinia galanga* "[50] and "kalgan" without adding the necessary adjective "large". Actually *A. galangal* is translated into Russian as large galangal, or *alpinia galanga*, and, according to A.I. Schreter, the main translation synonym *A. galangal* is "false galangal" [53, 54].

If the confusion that has arisen in M.R. Vasmer, can be explained by the fact that the "Etymological Dictionary" [50] came out long before the unique "Dictionary of Plant Names" [54], as well as the works of J. Duke [70, 71], it is not entirely clear what the authors of the editions were based on, which came out of print much later than the classical works of these world famous botanists. For example, N.A. Grischuk (2010) publishes a book with the loud title "The World of Spices and Spices", in which she, without even bothering to understand the morphological groups of raw materials, calls rhizomes - a root, translates the Latin name *Alpinia galanga* as "lesser galangale", but the homeland

this plant is considered by Thailand [13].

Other famous synonyms a. medicinal: galgant [3, 15, 39, 40], lykarsky galangal (Ukrainian) [15], galanga (erroneously! [70]), pharmacy root, alpinia, galangal root [39], Siamese ginger (also used for large galangal) [12], Chinese ginger [71].

In 1931, the following synonyms for galangal were described in English: Galanga (galanga), China Root (Chinese root), India Root (Indian root), East India Catarrh Root (East Indian Qatari root), Lesser Galangal (small galangal), Rhizoma Galangae (rhizome of galanga), Gargaut (gargaut), Colic Root (root for colic), Kaempferia Galanga (Kaempferian galanga) [77], but not all of them can be considered fair today.

Currently, foreign synonyms for *alpinia officinalis* are similar to Russian ones and are just as ambiguous: chinese-ginger, Chinese Ginger - Chinese ginger, lesser galanga - small galanga, lesser galangal - small galangal (English); galangal, galangal officinal - medicinal galangal, petite galangal - small galangal (fr.); galgant - galgant, Galangarhizom (German); galanga, galangal - galangal (Italian); galanga - galanga (Portuguese); galangal - galangal (Spanish) [61, 74].

Such a leading figure in the field of ethnobotany and the modern legislatively justified use of medicinal plants, like Duke JA (2002), considers the taxonomy and synonymy of representatives of the genus *Alpinia* (in particular the great and small galanga) very confusing, especially in terms of describing their medical and food use [70] ...

Galanga. In the world famous reference book "Handbook of Medicinal Herbs" [70] titled Galanga appears *Kaempferia galanga* L.. At the same time, in the article of the specified reference book directly under the heading "Galanga" is marked "very confusing" and the author's footnote: "see. also lesser galangal (*A. officinalis*) and greater galangal (*A. galanga* (L.) Sw.)" [70].

If you look at the official "The Plant List" (a verified list of all known plants on the planet) [99], then in section *Kaempferia* (family Zingiberaceae) [80] one of the types, indeed, is *Kaempferia galanga* L., which has the following synonyms: *Alpinia sessilis* J. Koenig with a trust level (LO) of this synonym 3 out of three, *Kaempferia galanga* var. *Galanga* (UD = 1 out of three), *Kaempferia galanga* var. *Latifolia* (Donn ex Hornem.) Donn (LOI = 1 out of three), as well as the following types (LOI = 3 out of three): *Kaempferia humilis* Salisb., *Kaempferia latifolia* Donn ex Hornem., *Kaempferia marginata* Carey ex Roscoe, *Kaempferia plantaginifolia* Salisb., *Kaempferia procumbens* Noronha and *Kaempferia rotunda* Blanco (marked "illegal") [80].

All these species, not directly related to medicinal alpinum, JA Duke calls Galanga [70]. Unfortunately, specialists much less advanced in medical botany and taxonomy than JA Duke and our other luminaries, confuse the names "galanga" and "galangal", considering them synonyms, and make mistakes that can have a wide variety of consequences in terms of the manufacture of medicines from an incorrectly defined medicinal plant material. There are many such errors in modern Internet encyclopedias, for example, in [12], popular articles on the topic of spices, and even in monographs.

In particular, the pharmacognostic scientist and writer I.N. Sokolsky in his work "The Book of Spices" (2011), basically repeating the already known to us from V.V. Pokhlebkina (2009, 2010) information about galangal (see also the section "Food use"), gives the following names as full synonyms: galanga, a spicy foreign root. At the same time, as an illustration to the article, he generally uses the drawing of the erect *Potentilla*. Unfortunately, references to the literature used, as well as the general list of bibliographic sources, are absent in this work [45]. Other examples were mentioned above.

More pedantic and accurate in his legendary "The book of Spice" ("The Encyclopedia of Spices") John O'Connell (2015) [36], which lists 369 bibliographic sources deserving respect. However, under the name "kalgan", and he also mistakenly combines at once 2 "main", as he writes, of the type -*A. galanga* (large root) and *A. officinalis* (small root). It is possible that such confusion can be attributed to translation errors. At the same time, O'Connell reports that "the third type of galangal is the campfire (*Kaempferia galanga*) - rarely used in cooking, except in Eastern European alcoholic beverages, including bitters and Polish liqueurs (nalewka)" [36]. *Kaempferia* "has a sweeter bouquet (some believe it is sickeningly sweet), and in appearance the rhizome resembles a hand, that is, it has a central core from which thin tubular" fingers "grow" [36]. Actually *Kaempferia* can in no way be attributed to the synonyms of galangal. medicinal, as we have already seen from reliable sources, since it does not even belong to the genus *Alpinia* [70, 99]. According to [80], *kaempferia* belongs to its own genus *Kaempferia*.

The well-known site "Akademik" (<https://dic.academic.ru/> - "Dictionaries and encyclopedias on Akademik"), where in the "Handbook of Homeopathy" a. medicinal is named Galanga (*Galanga*), and as a synonym is given *A. officinalis* (misspelled in Latin name) [10]. This can be explained by the fact that it is under this name that a. medicinal in the German Homeopathic Pharmacopoeia [75, 79]. Apparently, in the homeopathic community, the issue of adequate synonymy was not raised in connection with the use of the name historically accepted in homeopathy.

Thus, summing up an intermediate result in terms of differential diagnostics of alpine species (according to

results of research in the field of synonyms), we consider it necessary to note that in the already mentioned list "The Plant List" [99] as synonyms *A. officinarum* Hance is listed as *Languas officinarum* (Hance) Farw. (UD = 3 out of 3 possible) and *Languas officinarum* (Hance) PH Hô (UD = 2 out of 3) [59] (the difference between them is only in the authorship of the first botanical description of the plant). In other words, for today *Languas officinarum* (Hance) is the only synonym officially accepted for *Alpinia officinarum* Hance [53, 54, 59]. It is from this that all specialists, amateur writers, healers and bloggers who introduce (voluntarily or involuntarily) confusion in the synonymy of medicinal alpinia, should not fully understand it, should proceed from this.

Synonymy and differential diagnosis of alpinia species in medical and pharmaceutical practice is extremely important, since from different species of the genus *Alpinia* stocks various morphological groups of raw materials, which differ in chemical composition and indications for use, also have a specific pharmacotherapeutic effect [32, 53, 70]. It is completely unacceptable to extrapolate data on the pharmacotherapeutic action and indications for the use of raw materials from one type of alpinia to another.

1.4. Botanical description

A. officinarum Hance is a perennial herb up to 1.5 m [53], but in its homeland it can reach a height of 2 m [60, 61]. On one plant, the number of stems can reach 25–40, and some of them are leafy, while others are peduncles [61] (Fig. 2).

Leaves are pointed [53, 68], dark green, sessile, vaginal, narrow lanceolate, alternate, 18–30 cm long, up to 2 cm wide [33, 34, 61]. The flowers are zygomorphic [53], white with dark pink veins, with a short tube and 3 long lobes [33, 34]. Collected in a short (up to 10 cm) apical spike; with three-celled ovary: filiform pistil, stigma almost sessile [53]. The calyx is tubular, the corolla is shortly tubular, three-lobed [33, 34, 61]; the petal-shaped lip is white with red stripes [15, 33, 34].

The fruit is a non-opening [53] oval box with seeds [15, 33, 34, 61], upon reaching ripeness it is brown or reddish, 1–1.5 cm long, about 7 mm in diameter; contains 3–7 seeds [12]. Seeds are spherical [53].

The rhizome is long [53], horizontal, strongly branched, 1–2 cm thick, covered with ringed light leaf scars, reddish brown outside, almost white inside; few roots extend downward [15, 33, 34]. According to other sources, the rhizomes are thick, creeping reddish-brown [68]. They are given in branches one stem at a time, 10–40 stems in total; some of them are flowering, the rest bear only leaves [33, 34] (Fig. 3).

Ding Ping [69] in the chapter "*Alpinia officinarum* Hance 高良姜 (Gaoliangjiang, galangal)" for a monograph on Chinese food plants ("Dietary Chinese Herbs: Chemistry, Pharmacology and Clinical Evidence"), with reference to the Institute of Botany of the Chinese Academy of Sciences, "The flora of China" [72] and the State Pharmacopoeia of the People's Republic of China (2010) [88] report that "the rhizome of *A. officinarum* has a cylindrical shape, often curved and branched, 1–1.5 cm in diameter. The outer surface is brownish-red to dark brown with fine longitudinal wrinkles and grayish sinuous annular nodes" [69].

The taste of the rhizome is sharp, pungent, the aroma is more pronounced than that of ginger [3, 40]. Duke JA et al. (2003) describes the taste of fresh rhizomes of Lesser Galangal as "somewhere between pepper and ginger" [71].

Habitat and ecology. *Alpinia officinalis* grows in Southeast Asia [53]. The plant was found in the wild only on about Hainan in China [15], according to other sources - in Hainan and on about Java (Indonesia) [77].

However, the Javanese galangal (long growing on the island of Java [36]) is another species of the genus *Alpinia* - *A. galanga*, which is called "large root" ("large galangal") [36, 53] and is still practically not used in modern medical practice. "Small galangal", or "small root" (*a. medicinalis*) is a native of southern China, where it grows in coastal areas, in particular throughout Hainan Island and in the Beihai region on the northern coast of the Gulf of Tonkin [36]. It is this species that is historically known as curative and has been used for centuries in traditional Chinese medicine [53, 57, 63, 69, 87–89]. Synonyms have been discussed in detail above.

Settles *a. medicinalis* on damp humus-rich soils, on the edges and glades of subtropical forests [53].

1.5. Cultivation and protection measures

Lesser galangal is cultivated mainly as a spice, used in Europe for over 1000 years. Presumably the plant was introduced by Arab or Greek doctors [71].

Most widely *a. medicinalis* is cultivated in the southern provinces of China, Vietnam and India [53]; according to other sources - in China, Japan, India, the Antilles [15], in Thailand, on about Java (Indonesia [39, 40]). It also occurs as an invasive species in the Mediterranean, Central Asia, Western Asia, the Caucasus, South Africa, South and North America [61].

According to more modern data, as well. *a. medicinalis* is widely grown in Southeast China (Guangdong, Guangxi, Hainan and Yunnan provinces) [63, 84, 85] and Indochina [63, 84], India [63, 84, 85] and the countries of South

East Asia such as Thailand, Indonesia and the Philippines [85], the plains of West Bengal, Assam and the Eastern Himalayas [63, 84].

This species has taken root in most parts of Australia, where it tolerates (under full illumination) a rather cold climate, gives dense balls of beautiful lush bright green foliage (Fig. 4), on which cream flowers appear in summer. Prefers moist, well-drained soils rich in organic matter [60].

In Russia, culture is possible only indoors [53]. The plant is photophilous, prefers bright, but diffused lighting, high humidity, light soil and air access to the roots, which are usually located close to the surface. Grows well at home [48].

1.6. Varietal variety

Currently, at least 2 varieties have been introduced into the culture in the PRC. *A. officinarum* (Zhutou galangal, Fengwo galangal), which are used for food and medical purposes [85, 102]. It is believed that the quality Fengwo galangal is better than Zhutou galangal [85, 102]. Since varieties have different chemical compositions [85], a number of works are devoted to their differential diagnostics.

Morphological comparison of different cultivated varieties *A. officinarum* based on GAP (Good Agricultural Practice) was performed using a scanning electron microscope at the University of Chinese Medicine (Guangzhou, China). The presence of morphological differences in the rhizomes of two varieties, as well as their leaves and pollen, was shown with a similar microstructure of the corresponding organs. It was concluded that it is necessary to practically use the results obtained for the differential diagnosis of varieties of the same species in terms of their reproduction and agricultural production, including for the needs of the medico-pharmaceutical industry [102]. Data on chemical differences between varieties will be presented in our next publication [21].

1.7. Reproduction

Historically, for the purpose of cultivation in tropical and subtropical countries, the small galangal (like the "big root" and ginger) is propagated by dividing the rhizomes [36, 71], but J. Duke (2003) reports that sometimes *a. medicinal* can also be spread by seeds [71].

At home, propagate *a. medicinal* can be done both by seeds and by dividing rhizomes. In the spring, when the plant is transplanted, you can divide the root system so that each part has one or two buds. It is recommended to treat the cut sites with crushed charcoal. As a rule, stems appear quite quickly after planting in the ground and grow quickly as well. The plant reproduces well by seeds. At home, they are sown in January, watered well and maintain a room temperature of + 22 ° C. It is recommended to ensure that there are no drafts and systematically ventilate the room [48].

1.8. Used plant parts and harvesting of raw materials

For food and for medical purposes at *A. medicinal* use dried rhizomes -*Rhizoma Alpiniae officinari* [7, 8, 15, 53, 77] red-brown color, aromatic, spicy hot taste (Fig. 5). The characteristic spicy smell and pungent spicy taste are reminiscent of ginger [15], but more pronounced [3, 40], the taste is "somewhere between pepper and ginger" [71].

Procurement of raw materials. The collected rhizomes are washed from the ground, cut into pieces and dried. Broken pieces reddish-brown, primary bark is much wider than a small central cylinder, aromatic, spicy, pungent taste [33, 34]. Under the microscope, dark secretory cells with essential oil, others with tannins, are visible scattered in the parenchyma. Numerous starch grains, ovoid and pear-shaped, pointed at one end, the center of growth at the blunt end, slightly noticeable transverse lamination. The conducting beams are accompanied by slightly thickened fibers with a wide bore [33, 34]. The famous Russian pharmacognost professor D.A. Muravyova especially notes that "sometimes the rhizome of the so-called large galangal is harvested by mistake -*Rhizoma Galangae majus* from *A. galanga* plant Willd. The pieces of rhizome are similar in shape and are also red-brown on the outside with light circular leaf scars, but they are much thicker in diameter, white on the inside and less aromatic [33, 34].

Procurement of raw materials in traditional Chinese medicine (TCM). Dig up the rhizomes 4–6 year old plants in late summer - early autumn. Removes fibrous roots and dirt. Cut into pieces. Dried in the sun. Used unprocessed [7, 8] (Fig. 5).

Harvesting as a spice. Blank 4–6 year old rhizomes are carried out at the end of the growing season (older rhizomes become fibrous) [71]. The rhizome is cleaned of the outer skin, cut into rectangular pieces 5–8 cm long and dried in this form, after which it becomes hard, woody and acquires a wrinkled surface and a red-brown color. This color is also preserved on the root cut, due to which the galgant can be easily distinguished from ginger [39, 40].

For some species of alpinia, seeds are known to be used [3, 32, 47, 61] for both medicinal and food purposes [36]. In the reference book "Natural Raw Materials of Chinese Medicine" (2004) A.I. Schreter describes 2 species of the genus *Alpinia*. False galangal (*alpinia galanga* - *A. galanga*) raw materials are dried ripefruits (*Fructus Galangae*), in galangal medicinal (*A. officinarum*) - rhizome (*Rhizoma Alpiniae officinari*) [53].

In the reference book by A.B. Mikonenko "Phytotherapy in Traditional Chinese Medicine" [32], which is quite far from pharmacognosy (OD Barnaulov calls it very confusing [3]), 4 species of the genus *Alpinia* are mentioned, but the description of raw materials and preparations is not given. Moreover, in two species, fruits are used (*fructus*), one - seeds (*semen*) and in *Alpinia officinarum* Hance - rhizomes that A.B. Mikonenko calls not *Rhizomata*, and rhizome [32]. The State Pharmacopoeia of the People's Republic of China also includes 4 types of alpinia [20, 24, 87–89], and the morphological groups of raw materials used from each type of alpinia coincide with the reference book by A.B. Mikonenko [34]. State Pharmacopoeias (GF) have the status of a law on the territory of each country and serve to standardize the quality of medicinal plant materials and producing plants. Therefore, the inclusion of a plant in the SP means full recognition by the authorized state bodies of its effectiveness and allows the circulation of drugs from it on the territory of the country. The latest edition of the Chinese Pharmacopoeia (in 4 vols.) In English, published in 2015, contains monographs on hundreds of medicinal plants used in TCM (vol. 1).

Rhizoma Alpiniae officinari is also included in the French Pharmacopoeia (List A - traditionally used medicinal plants) [90–93], Japanese Pharmacopoeia [24, 98], Ayurvedic Pharmacopoeia [81] and Indian *Materia Medica* [86]. In the Ayurvedic Pharmacopoeia [62], the main species of alpinia is the indigenous (so-called "indigenous") species for India *A. galangal*, and the imported species (of Chinese origin) *A. officinarum* is regarded as a substitute for *A. calcarata* Rosc. (*Granthimūla*) which cultivated in the gardens of southern and eastern India, while *A. officinarum* comes from China, cultivated in West Bengal and Assam [81] and has a very wide spectrum of action (for more details see [23]). RN Chopra (1994) includes *A. officinarum* among the species included in the British Pharmacopoeia, which are promising raw materials for the production of Indian medicines [66], since this species is already widely cultivated in India [81].

In the Russian Federation, raw materials are unofficial [19, 20, 24].

Homeopathy uses rhizome [1, 10, 75, 79], according to unverified data, the preparation of raw materials for homeopathic use is carried out from 10-year-old plants [10]. According to the German Homeopathic Pharmacopoeia (GHP) [75], the raw material is "dried rhizomes *Alpinia officinarum* (*Galanga*) containing not less than 4 ml of essential oil in 1 kg of raw materials. " It is important that in accordance with the GHP requirements, raw materials *A. officinarum* there should be no admixture of rhizomes *Kaempferia galanga* L., which differ in size (up to 4 cm thick), light-colored central cylinder [75] and have other indications for use, including in homeopathy.

2. Food use

According to its culinary properties (as a spice), galangal, or galangal, is similar to ginger and turmeric, but in many domestic, American and European publications on this topic, *alpinia officinalis* is absent, although this plant penetrated Europe more than 1000 years ago [3, 40, 71].

V.V. Pokhlebkin believes that galgant (*galangal*) is a spice, only botanically similar to ginger, but not replacing it "and even less so in cooking." "Galgant is much more aromatic than ginger. Ground galgant has a particularly delicate and pleasant aroma (while ginger has a stifling aroma). The taste of galgant is sharply spicy, pungent, bitter "[39, 40]," somewhere between pepper and ginger "[71]. According to O.D. Barnaulov, galgant can serve as a substitute for Chinese cinnamon [3, 4], but he does not specify under what circumstances this is legal and for what purpose.

2.1. Application in Europe

In the Middle Ages in Europe, "kalgan (current English word galangal was often written as galingale or galingale [36]) was a medicine [3, 52] or an expensive but very affordable spice, which was mentioned not only in recipes for delicious dishes, but also in pharmaceutical reference books [36, 52, 73]. As follows from the collection of recipes "Forme of Curi" (1390), galangal was included in the sauce of rusks (crusts of bread), cinnamon, ginger, salt, black pepper and vinegar, which at that time in Europe was called "galantine". The sauce went equally well with red meat, such as venison, and fish. A refined version of galantine was specially prepared "for a goose" [36].

As O'Connell (2015) writes, "The presence of a vibrant galangal in galantine sauce was perfectly appropriate given the connotations of the word galant, which in Old French meant not only "courteous, gallant ", but also "energetic, dashing "[36]. Due to this, galangal, like all other spices, was added to hypokras Is a richly spiced alcoholic drink made from wine [36]. J. Duke (2003) reports

using small galangal to flavor vinegar and a liqueur called "tincture" [71].

Since the 19th century in Western Europe, especially in France, galgant has been used in alcoholic beverages, mainly in the form of gallant oil extracted from rhizomes. From those times to the present day, it is usually used in combination with wormwood, which it softens in a peculiar way [39, 40].

For other purposes, galgant is used very rarely in Europe [39, 40]. In modern Europe, it is rare, you can buy galangal only in the Netherlands [12]. However, according to A.I. Schreter, fresh rhizomes can be purchased in grocery stores in some countries, they are sold as a spice [53].

At the same time, J. Duke (2003) notes that small galangal is a favorite spice in Estonia and Lithuania. [71].

2.2. Eastern cuisine

In oriental cuisine, rhizomes of large and small galangal are widely used as a spice, mainly in the form of a powder (mainly in Indian and Indonesian cuisine) [15, 45, 61], and also as one of the components for making sauces [45].

In Indonesia, "large galangal" (in Indonesian - laos) has long been growing on about. Java. According to the description of the Portuguese physician and naturalist García de Horta (1501-1568), Laos has a large tuberous root, similar to that of ginger, covered with a reddish brown or creamy skin. Local residents do not sow its seeds, but put them in salads and drink the infusion as a medicine [36]. The rhizomes of this type of alpinia have long been used in the cuisines of Southeast Asia: they are included in green curry pastes and play an important role in recipes for soups and shellfish dishes, along with garlic, chili and tamarind. In particular, the large galangal brings to life the tiny but impeccably presented Vietnamese cuisine of Hue. [36]

The galanga alpinum is especially loved in Thailand [12], where it has historically been an integral part of fried rice nasi goreng and roast beef and buffalo rendang. When cooking this roast, the meat is stewed very slowly in coconut milk with a large galangal, turmeric, bay leaf, garlic, chili and ginger. This spice mixture (called pemasak) "not only softens the meat, but also has antiseptic properties, forming a kind of protective coating, so that the finished rendang can be stored for a week, and therefore can be taken with you on the road" [36].

Alpinia galanga (large galangal) is also added to many other traditional Thai dishes, for example, the famous tom-yam soup [12], and the Thai coconut soup tom kha [36]. However, the lesser galangal is considered the preferred species of all other members of the ginger family for Thai cuisine [60]. According to I.N. Sokolsky (2011), most Thai chefs prefer fresh rhizomes cut into thin slices for Thai soups or grated for curries [45].

The "small" galangal (in Indonesian kenchur) has a spicier, camphor flavor than the "large" one. It is used more often as a vegetable rather than as a spice. It is usually peeled, sliced, and added to stews. It is sometimes added to a mixture of five spices [36]. The most famous dish with Mala galanga in Bali is the fried duck "bebek-betulu". A whole duck is rubbed inside and out with a jaikap paste made from onions, ginger, lemongrass, garlic, nuts, chili and grated galangal root. Then the carcass is wrapped in banana leaves, steamed for a while and then baked [12, 36].

Throughout Asia, the rhizome of the lesser galangal is used to make curries [45, 61, 71].

Lesser galangal leaves are also edible. Young leaves, stems and flowers are popular in Eastern cooking, fresh or cooked [71].

2.3. Ayurvedic cooking

Alpinia officinalis has been used as a spice since ancient times [28, 63], but V. Lad and D. Frawley do not include it among the "common herbs" in their famous monograph "The Yoga of Herbs. An Ayurvedic Guide to Herbal Medicine" (1992) [28].

In Ayurveda, not only medicines, but also food products have their own specific traditional characteristics and are selected, among other things, according to the constitutional principle. A. officinarum (Chinese galangal, or because medicinal) has a pungent taste and vipak (effect after digestion) [13, 28, 51]. The pungent taste is most beneficial for Kapha people [28, 51]). According to Ayurvedic ideas, the beneficial effects of a pungent taste are manifested in improving digestion and cleansing the body. Excessspicy taste leads to increased acidity, weight loss, dryness of tissues, irritability. Lack of pungent taste manifests itself in weak digestion, congestion, lethargy, formation and accumulation of amaand mucus [51].

Virya (thermal effect) warming in small galangal; tropism - to the digestive tract [13]; the effect on Doshas is not the same: Vata -, Pita -, Kapha + [13, 28].

2.4. Traditional Chinese Dietetics and Cuisine

Alpinia officinalis has been used in China as a spice since ancient times [63]. Jam from

V. Pokhlebkin cites oranges and galangal as an example, as a dish, in ancient times accessible only to the Chinese nobility and unknown to the people [43].

Currently, galangal belongs in China to the number of everyday food flavorings [43]. In Chinese cuisine, dry rhizomes of small galanga are added to dishes made from vegetables, mushrooms, fish, salads and roast beef [12]. In China, dry and fresh rhizomes, like ginger, are added to sweet and meat dishes, but the norms for laying galgant are half or a quarter less than that of ginger [39].

Arab countries. Alpinia medicinal modern specialists (chemists and biologists) from Saudi Arabia, Egypt and Great Britain are characterized as one of the most commonly used spices of the Ginger family [57].

2.5. Food use in Russia

In the XVI-XVII centuries. It was difficult for Russia to obtain spices through Western European countries. They came to Moscow along the ancient trade route from India and Iran through the Shemakha Khanate and the Caspian Sea (pepper, karjamon, saffron), as well as a new trade route from China through Mongolia and Siberia (star anise, ginger and galgant - galangal root) [40].

In the XVII-XVIII centuries. Galgant was exported from China to Europe through Russia, and therefore in Western Europe at one time it was considered a "Russian root", especially since it was widely used in Russian cuisine of the 17th century [39, 40].

In Russian cooking, the rhizome of galgant was most often used to flavor gingerbread, kvass, sbitney and honey, as well as in home winemaking, for example, vodka was infused [12, 40, 45]. Ancient Russian custard gingerbread, honey and raspberry brews, sbitnyas and kvass, as well as tinctures, the galangal root gave an indescribably peculiar aroma [39].

I.N. Sokolsky gives the composition of the ingredients for the Kalganovaya liqueur, popular in Russia, with a strength of 40%: galangal (galgant), kubeba, ginger, wormwood and violet root, rosemary, cinnamon bark, cardamom, nutmeg, cloves, lavender and rose flowers, tartar, orange and lemon peel [45]. The special vodka "Knyaz Serebryany" with a strength of 40% "was made according to the classical technology of Russian vodkas using galangal root (galanga), rectified alcohol, specially purified water" [45].

In the "Big culinary book" V.V. Pokhlebkin gives an example of a recipe for honey dough with spices - medmo: honey (liquid) 100 g, powdered milk 100 g (in a 1: 1 weight ratio), as well as 0.5 teaspoon of galangal (which can be replaced with an equal amount of nutmeg, turmeric, ginger or 1 teaspoon of ground zest, anise, star anise or cardamom, or take an equal amount of a mixture of all spices) [43].

Not all aromatic plants are classified as spices, but only those with bactericidal properties, which they manifest in varying degrees. Most of them have been known since ancient times and were eaten before salt [41-43]. Galgant, or kalgan, according to V.V. Pokhlebkinu, belongs to the classic (exotic) spices along with different types of pepper, ginger, Ceylon and Chinese cinnamon, vanilla, nutmeg, all types of zest, bay leaves, rosemary, turmeric [41-43].

The Tatars have historically used the small galangal as tea or together with tea [71].

In modern domestic cuisine, the spice is added to goulash and fried beef, which acquire a pleasant taste, as well as to potato soup, vegetable dishes, rice, sauces, mushrooms, salads, fish [15, 61], chicken [45]. However, when using galgant, it is recommended to strictly observe the dosage so as not to disturb the balance of taste [15]. The rate of setting is 0.1-0.15 g of whole or crushed rhizomes per 1 serving [45]. It should be borne in mind that 1 teaspoon of powder replaces about 3 cm of fresh galangal rhizome [12, 45].

I.N. Sokolsky gives very diverse modern recipes with real galangal: pickled tomatoes, meat salad and soup, green curry paste, Chinese tuna, fried chicken, chicken with pineapple, custard gingerbread [45]. B.M. Sakharov recommends removing hard galangal plates from dishes before serving [44]. We did not find such a comment among other authors.

Rhizomes are also used in the modern food industry in the production of bitter gastric liqueurs and vinegars [15].

O.D. Barnaulov considers it necessary to popularize this spice by nutritionists and doctors of other specialties [3].

3. Other uses

Rhizomes are valued not only in cooking for their sweet spicy taste and pronounced aroma, throughout Asia they are also used in perfumery, and were previously widely used for this purpose in Europe [60, 71], they are also used as a substitute for snuff [71] ...

CONCLUSIONS

1. Conducted information and analytical research *Alpinia officinarum* Hance in terms of botanical

characteristics of the plant, problems of synonymy, the peculiarities of the procurement of raw materials, as well as the experience of traditional and modern food use, including in Russia.

2. It was found that rhizomes *A. officinarum* (small galangal) are included in foreign pharmacopoeias, incl. homeopathic, but unofficial in the Russian Federation, where it is historically used as a spice.

3. The results of ethnobotanical research and thousands of years of world experience in the food use of small galangala indirectly indicate the absence of its toxicity.

4. Bibliographic sources of varying degrees of reliability revealed massive errors in synonymy, which is absolutely unacceptable for medico-pharmaceutical use of raw materials.

5. The results of this study allow us to make a conclusion about the need for further information and analytical research in terms of the chemical composition and biological activity of rhizomes *A. officinarum*, as well as the experience of their traditional medical use in order to assess the prospects use in the domestic modern medical and pharmaceutical practice.

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