

# A Revision of Assam Citrus\*

## (Revisio Aurantiacearum XI)

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### Introduction

Certain accounts of Assam Citrus had been known before the author presented the importance of Citrus assortment of this area as the center of origin of the genus in Eastern Asia<sup>16-23, 27-29</sup>. The remarkable floristic discoveries were noted through the herbarium studies in Europe<sup>15, 18</sup> which proved the presence of two new PAPEDAS, i.e., *Citrus latipes* TANAKA & *C. annamensis* TANAKA (= *C. Combara* RAFIN.), a red-skinned primitive MICROACRUMEN *Citrus indica* TANAKA, besides wild occurrences of *Citrus Aurantium* LINN., *C. sinensis* OSBECK, *C. Limonia* OSBECK, and possibly *C. grandis* OSBECK. Actual survey of the author in Assam area was carried on in 1936 and the following species were recorded<sup>24</sup>.

1. Soh Niamtra, Soh myntra, Shantara=*Citrus reticulata* BLANCO (*C. chrysocarpa* LUSH., same as the Suntara or Santra of western India, Ponkan of Formosa and Japan)
2. Soh tang=*Citrus Aurantium* LINN. (the Sour orange, or Daidai)
3. Soh siem=*Citrus erythrosa* var. *assamica* HORT. ex TANAKA (A simple variety of Kobeni mikan, or Chinese Chü sha chieh)
4. *Citrus grandis* OSBECK (the Shaddock, or Jabon, Zabon)
5. *Citrus indica* TANAKA
6. Soh Kymphor, Soh Comphor=*Citrus latipes* TANAKA
7. Soh Phai=*Citrus limettioides* TANAKA
8. Jamir=*Citrus Limonia* OSBECK (the Canton lemon or Limonia)
9. Soh Jaw [Soh jew]=*Citrus Limonia* var. *Khatta* TANAKA (= *C. Jambhiri* LUSH.) (the Rough lemon of Florida)
10. Soh Kwit, Soh Quid, [Soh Kuid]=*Citrus Combara* RAFIN. (*C. macroptera* MONT. var. *Combara* TANAKA)
11. *Citrus Medica* LINN. (the Citron)
12. Soh Nianglang [Soh Niangriang]=*Citrus sinensis* OSBECK (the Sweet Orange, Amadaidai)

Since the Citron seemed to occur wild throughout the area, no discrimination of three distinct groups (Turunj, Bajoura & Madhukankur) were made on that occasion, but most types of spontaneous occurrence were thought to be small-fruited Bajoura type and this

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was confirmed by KANJIRAL et al.<sup>7)</sup>. He also confirmed the occurrences of *Citrus indica* and *C. latipes*, and presented Assamese name Jora-tenga and Khasi name Soh-manong for the shaddock. The Lime is so popular that the present author did not quote it from Assam, but these authors mention its popularity in that area. The common names of *Citrus indica* were recorded as Humutia-tenga (Assam), Rebo-sinking (Aber) and Generu-ay (Miri).

### Exploration of DUTTA and co-workers

An extensive Citrus survey was conducted by local Horticultural Development Officers, first headed by S. C. BHATTACHARYA and later by S. DUTTA<sup>1,3)</sup>. These reports are most valuable for Citrus taxonomists, treating the subject with accuracy and critical viewpoint worthy of discussing the result more in detail. Many Citrus so far not been reported by the author's former trip were illustrated and described with a few proposed new species. Interpretations may be needed by reading texts and possibly by actual analysis of the characters of the treated materials. The present paper is a preliminary note based upon their observations, which may require further revision by actual visit of Assam area by the author again.

The major paper<sup>1)</sup> admits 17 botanical species, but from the author's Type theory more species need to be added to make their standing clearer, which is discussed here. Description of units goes on according to the following specific status together with all known local cultigens and introduced varieties.

(1) *Citrus Medica*, (2) *C. Limon*, (3) *C. Jambhiri*, (4) *C. Karna*, (5) *C. aurantifolia*, (6) *C. Limetta*, (7) *C. reticulata*, (8) *C. nobilis*, (9) *C. indica*, (10) *C. sinensis*, (11) *C. Aurantium*, (12) *C. grandis*, (13) *C. magaloxycarpa*, (14) *C. ichangensis*, (15) *C. latipes*, (16) *C. macroptera*, (17) *C. assamensis*, n. sp. The author's discussion will follow mainly according to the system of his own<sup>27)</sup>.

### The PAPEDA and OSMOCITRUS

Two true Papedas have been reported by the author as stated before. The first species *Citrus latipes* TANAKA is called Soh-Kymphorshrieh in Assam but undoubtedly several varieties may occur there. The typical latipes has rather large fruit weighing about 70–140 grams, but another type known as Soh-shyrkhoit in Khasi Hills is still larger fruited, weighing 220–340 grams each. Seeds are reported 1.2–1.6×0.9–1×0.5–0.6 cm. in the former, 1.3–1.7×0.8–1×0.5–0.6 cm. in the latter. HOOKER<sup>6)</sup> perhaps did not pay attention to their large, smooth fruits in Khasia where he first discovered this interesting species.

*Citrus Combara* RAFIN. is the Sat-Kara of Assam, corresponding to Soh-Kwit of Khasi Hills. This is not *C. macroptera* MONT. of Malaysia, having conspicuously broad-winged petioles and oval, not acuminate lamina. Seeds are reported to be 1.2–1.7×0.7–0.9×0.3–0.5 cm., almost similar to the former.

It is the remarkable finding that *Citrus ichangensis* SWINGLE was found in Naga Hills in Assam, called Ketsa-Shupfu in Angami language. Seeds are enormous in size measuring 1.2–2×1–1.8×1–1.2 cm. in magnitude. It was reported to have acrid oil thread in the pulp vesicles, never been recorded from any other OSMOCITRUS.

### The Citron and the Lemon

The typical citron, *Citrus Medica* LINN. is known in Assam under the name Bira-jora and Soh-manong, the former being a rather smooth one and not very warty ones as being

found in Western India and Iran. The second one is nothing but a little smaller one and not much different from the third acidless variety called Mitha-jora, all appearing to be of introduced origin. The Bajour Citron, *Citrus limonimeditica* LUSH., classed by the authors<sup>1)</sup> as *Citrus Limon* OSBECK which is wrong, comprising three varieties (1) Pati-lebu (lemon-shaped smooth form), (2) Godha Pati-lebu (subwarty form), and (3) Jora-tenga (rather even and sharply pointed form), all provide typical oblong serrate leaves, bi- or uni-sexual purple flowers, acid fruits with hard caroty-textured rind. These Bajoura citrons are not reported definitely wild in Assam, and the most characteristic indigenous species, called Naya-changney, appears to belong to *Citrus nana* TANAKA, first reported by WESTER from the Philippines in 1915<sup>31)</sup>.

There occur three Lemon allies in Assam area, one being hardly separable from *Citrus Limon*.

(1) Hill lemons = *Citrus pseudolimon* TANAKA, Kata-jamuri, not strongly lemon-scented, size much larger than the typical *C. Limon* with rather oblong leaves, almost wingless petiole and flowers mixing staminate ones. Trees spreading, not much staggering as the Citron group. This seems to be identical with Hill lemon or Galgal of the Western Himalayan hill tracts. The second variety is called Elachi-lebu, having slightly grooved long fruit with distinct Cardamon aroma, and providing a narrow petiole wing on similarly oblong leaf blade.

(2) Acid Sweet-lime reminding the Tahiti lime = (*Citrus latifolia* TANAKA), Soh-syngteng, which has broad leaves with rudimentary wing on the petiole. Flowers are purple outside. Common Tahiti lime seems to be a seedless form of this.

(3) Meyer lemons = *Citrus Meyeri* Y. TANAKA; Soh-long is acid Meyer and Pani-jamir is acidless form of the Meyer lemon, the former being known from the interior China by Frank N. MEYER about 1908. The impossibility of spontaneous occurrence of such an acid citrus of CITROPHORUM in China, seem to have been solved by this finding, as the real acid Meyer seems to occur in Assam.

(4) Assam lemon = *Citrus longelimon* TANAKA\*. Very frequently cultivated even in Western India under the name 'Pat Lemon'<sup>10b)</sup>, being too long for a Lemon. HAYES claims that it is resistant against the Citrus scab<sup>5)</sup>.

#### Rough lemon and Limonia

It is a well know fact that the Rough Lemon (*C. Jambhiri* LUSH.) often makes it very difficult to distinguish from the Canton lemon (*C. Limonia* OSBECK). In Assam there are two forms of the former, Soh-myndong (common rough form) and Kata-jamir (roundish smooth form corresponding to the Mazoe lemon of Africa). An acidless form also seldom occurs in Assam under the name Mitha-tulia. The latter type coming under the category of Limonia, comprises three forms, (1) Soh-jhalia, or Otaheite orange like elliptic form of orange color, (2) Sinduri Nemu-tenga or Rangpur lime, and (3) Nemu-tenga, Yellow fruited Kusai-lime like true Limonia common in Canton area, China.

#### Karna Orange

*Citrus Karna* RAFIN. is infrequently cultivated in the southern slopes of Khasi Hills.

\* *Citrus longelimon* n. sp. *Citrus Limon* similis, foliis longiolibus brevissime petiolatis nudis, fructibus majoribus, viridis, turgescens, terete elliptico-linearibus, extus undulatis laevissimis, apice latior, breve mamillatis, cortice crassior citral-aromaticis, vesiculis elasticis linearibus, acutissimis, pallidis, acidis, ex-succis, oligoseminibus frequenter aeminibus.

### The Lime

Two forms of *Citrus aurantifolia* SWINGLE in cultivation are known in Assam under the name (1) Abhayapuri Kaghzi, a long form, and (2) Karimganj Kaghzi, a small round form.

### The Sweet lime

Although acid form of the Indian sweet lime identical with the Tahiti limes was mentioned before, the true acidless type representing *Citrus limettioides* TANAKA is widely known in Assam by the name Mitha-Kaghzi.

### The Shaddock and allies

Shaddocks are common in 7 forms representing typical *Citrus grandis* OSBECK as follows: (1) Dowadi, pale-pink fleshed turbinate form, (2) Nowgon, light pale-pink fleshed globose form, (3) Gorhat, pink fleshed oblong form, (4) Khanapara, pink fleshed oblate form, (5) Kamrup, rosy fleshed pyriform form, (6) Khasia, red fleshed globose form, and (7) Burni, white fleshed globose form. Two forms belonging to CEPHALOCITRUS-INTERMEDIA-FLAVICARPA are also described, the first being called Zambawak, resembling *Citrus sinograndis* HORT. ex TANAKA, and the latter, Aijal, reminding the grapefruit, *Citrus paradisi* MACF. or rather Uwa Pomelo, *Citrus pseudoparadisi* HORT. ex Y. TANAKA without having bitter taste in the pulp.

### So-called Sour Pummeloos (long forms)

DUTTA lists four "Sour Pummeloos" which have purplish flower, somewhat petiole-winged leaf, and acid pulp. These should be classed other than white flowered CEPHALOCITRUS, and be separated into several categories. The list does not include flat-fruited species like Gajanimma of Madras (Attara of BONAVIDA<sup>23</sup>, erroneously called Amildê in Uttar Pradesh), *Citrus pennivesiculata* TANAKA<sup>24</sup>). DUTTA wonders why the author did not describe any one of *Citrus megaloxycarpa* LUSH. in Assam but it is true that none of them had appeared to the author's attention.

The first Sour pummelo of slightly ellipsoid form with undulate surface and white pulp is called Bor-tenga, common in Assam Valley plains. With the following two, this belongs to CITROPHORUM-DECUMANOIDES of the size and shape of the Ponderosa (*Citrus pyriformis* HASSK.) or less likely Javanese *C. Papaya* HASSK. with larger seeds and comparatively larger central column. It may be also comparable with European *Citrus Lumia* RISSO et PORT.

The second Sour pummelo, Hukma-tenga, is flat form with similar inner characters but having pubescence on the fruit surface, and is nearest to *Citrus Balotina* PORT. et TURP. The third warty form, Holong-tenga, very common in Assam, very much resembling Japanese *Citrus pseudogulgul* HORT. ex SHIRAI, has purplish flower, thick rind, very large central column and comparatively large cuneate seeds, probably most resembling Morocco Citrus "Khouzb el Arsa" or *Citrus aurata* RISSO. It seems most likely represent the true Amildê of BONAVIDA<sup>23</sup>, known by its very acid juice from the time of King BABER. It is thought to typify LUSHINGTON's *Citrus megaloxycarpa*<sup>25</sup>, although there are several discrepancies in the original description<sup>29</sup>. It is said there is an acidless form (Mitha-Holong-tenga) in Nowgong, Assam.

The fourth Sour Pummelo, Jamir-tenga, differs from the foregoing by a little broader obtriangular petiole wing, pubescent branches, finer simply acid greenish pulp vesicles,

and roundish seeds. It is nearest to Philippine "Alemow" *Citrus macrophylla* WESTER<sup>31)</sup> except tuberculate fruit surface, undoubtedly belonging to LIMONELLUS-MEGACARPA, comprising European Bergamot, 4 Javanese species, 3 Philippine species, and Indian *Citrus pennivesiculata*, lately removed from CITROPHORUM-DECUMANOIDES\*.

#### *Citrus assamensis* DUTTA et BHATT.

This is a chance seedling commonly found in gardens in Cachar, North Cachar, Sylhet and Khasi Hills, locally called as Ada-jamir (Soh-sying in Khasia). It differs from three Acid Pummeloos in somewhat roundish fruits, smooth outside and ginger-tasting acid pulp consisting of rather fine soft vesicles, purple flower and well-developed obovate petiole wing. This seems to be nearest to Hukma-tenga mentioned before without pubescent on new growth and young fruit, also differing in size and shape of petiole wing, intensely colored petals and finer vesiculation. Unquestionably it belongs to CITROPHORUM-DECUMANOIDES, although cotyledons are greenish in color. Such cultigen will exist in all possibility as a cultigen and rather more of them can be expected if not being cancelled.

#### Additional Sour pummeloos (short form)

Among seven cultigens listed as hybrids, two are purple-flowered members undoubtedly belonging to the same class as above, Hash-khuli and Sarbati, each one of them being collected only once from Karimganj in Sylhet, Pakistan. The former one is pubescent on new growth, peduncle, and midrib of lamina, providing small obcordate petiolar wing. Flowers bisexual, blooming twice a year. Fruit turbinate, not areolate, rather large sized and yellow, thick-skinned, with spongy albedo and hollow center. Segments 10-12, pulp acid with unpalatable finer vesicles and is seedless. This is supposed to be a hybrid of *C. assamensis* and a shaddock, which is doubtful\*\*. The latter one is also pubescent on peduncle, winged leaves glabrous on the midrib. Flowers both bisexual and staminate, blooming once a year. Fruit globose, lemon yellow, not areolate, smaller than the preceding, rind not thick, carrotty in texture, with rather solid central column. Segments 10-11, pulp acid but sweetish, vesicles being rather coarse. Seeds are rounded with white embryos\*\*\*.

From the author's judgment, these must have been treated separately from Sour Pummeloos above mentioned simply by their short, roundish forms. They must be grouped in the same subsection to which *C. assamensis* belongs.

#### The Sour orange

*Citrus Aurantium* LINN. is widely distributed throughout Assam where it is known under the name Karun-jamir. Very similar round orange with bitter rind is described by the name Gondh-huntra, but it lacks vermillion fruit color and large petiole wing with acid juice of pulp completely devoid of bitterness. Whether this will belong to *C.*

\* LIMONELLUS-MEGACARPA. Widely different from the typical Lime (LIMONELLUS-EULIMONELLUS), especially in fruit size and shape, but leaves are always broad and petiole winged and white flowered. Rind usually thin and tough, pulp acid and greenish, vesicles linear filiform and elastic. It includes *Citrus Bergamia*, *C. javanica*, *C. Papaya*, *C. obata*, *C. obversa*, *C. pseudolimonum*, *C. macrophylla*, *C. longispina*, and Indian *C. pennivesiculata*.

\*\* The author proposes a new name *Citrus Duttiae* for this specific unit.

\*\*\* This unit may deserve to receive a name *Citrus Sarbati* to facilitate for handling it.

*Aurantium* or not, the pubescence on both surfaces of calyx will decide, but this point was overlooked by the describer. If the calyx of the latter is glabrous, this will belong to AURANTIUM-MEDIOGLOBOSA, nearest to Ambul-dodan of Ceylon (*Citrus zeylanica* HORT.).

DUTTA calls attention of two Tangelo- or Tangor-like Citrus, the former being called Soh-khylla No. 1, and the latter No. 3, both belonging to the same section as above, together with Soh-khylla No. 2, which is alluded to the Ât Anni, *Citsus rugulosa* HORT. ex TANAKA, all being white-flowered, globose to short pyriform, and lacking pubescence on new growth. The fruit of the first, i.e. Soh-khylla No. 1, is about 10 cm. in diameter, rather flat and projecting at the base, with spongy albedo and solid central column, and honey yellow, coarse-grained pulp of abundant juice, soursweet in taste of good quality, reminding the Sampson Tangelo. It is grown in home gardens in Khasi Hills and the hybridity with ACRUMEN is unthinkable since it has elongated pulp vesicles. Probably it must be a form very near to *Citrus anonyma* HORT. ex Y. TANAKA<sup>30)</sup>.

The second of Soh-khylla is identified by DUTTA with *Citrus rugulosa* HORT. ex Y. TANAKA, but the sample the author described<sup>24)</sup> did not have orange tinge on rind and pulp and provided fewer number of segments, but undoubtedly it belongs to the same section AURANTIUM-MEDIOGLOBOSA and nothing else.

The third of Soh-khylla is rather small fruited, orange-colored, oblong in outline, somewhat resembling a Sweet-orange but lacking its characteristic orange aroma. Unquestionably it belongs to AURANTIUM-SINENSIODES somewhat resembling one *Citrus Funadoko* HORT. ex Y. TANAKA<sup>30)</sup> which is more analogous to the next deep yellow round orange called Nichols-Roy, a chance seedling from Burnihat, Assam. This last orange is a good substitute for the grapefruit being of good size, yielding a large amount of subacid juice without bitterness. It is comparable with Okinawa *Citrus luteo-turgida* TANAKA in many respects. The leaves of Soh-khylla No. 2, No. 3 and Nichols-Roy resemble more closely to the Sweet orange, while those of Soh-khylla No. 1 and Gondh-huntra are more or less sour orange like but petiole wings never develops to the size of normal sour orange.

#### The Sweet orange

The native home of the Sweet orange, *Citrus sinensis* OSBECK, is sometimes believed outside of India, even as South China Coast but the author admitted its wild existence within India, as historically it was not recorded to be indigenous in China. DUTTA and BHATTACHARYA<sup>1)</sup> discovered its gregarious occurrence at Litsimi, N.-E. border of Naga Hills not far from Burmese frontier. The fruit was recorded as slightly oblong, very deep colored, about 7 cm. in diameter and weighing 170-230 grams. The rind measures 4-7 mm. in thickness and contains 10-13 segments with typical orange flavor though not so good in quality as that of commercial varieties. It is called Soh-niangriang throughout Khasi Hill region.

#### A probable INTERMEDIA

It is rather curious that very few species of CEPHALOCITRUS-INTERMEDIA occurs in Assam under the simultaneous presence of true Shaddock and the Sour orange. A series of them are well preserved in Japan despite the persistent existence of bitter elements in the pulp like in the grapefruit. The only occurrence of such is recorded by Dewa-tenga in Assam. The plant of Denwa-tenga is rather large, nearly thornless, pubescent, bearing fairly large-winged large leaves distinctly Sour-orange scented when crushed. Flowers large, racemose and white; Fruit depressed-obconic, about 13-18 cm.

in diameter, greenish yellow and bitterish rind bearing shaddock aroma. Segments rather uniform, 13-18, whitish pulp is fairly juicy and very acid but not bitter, melting. Seeds many, large-sized and cuneate, containing white embryos. It is hard to compare with Japanese allies but seems to be analogous to *Citrus pseudo-paradisi* HORT. ex Y. TANAKA or *Citrus glaberrima* var. *aurantiaca* HORT. ex TANAKA, but it may prove nearest to the Phillipine *Citrus Panuban* TANAKA<sup>26)</sup> if not too primitive.

#### The King orange

The King orange, *Citrus nobilis* LOUR., first reported from Hue, Annam, by LOUREIRO, was directly introduced into the United States under the name King of Siam. This is a warty from and the author recorded it from Saharanpur<sup>24)</sup>, introduced into India from America. Smooth form common in South China, Okinawa and Japan is not known in any other places. The occurrence of the first form in Assam under the name Jeneru-tenga is a remarkable fact worth crediting to DUTTA and BHATTACHARYA<sup>1)</sup>, which was reported to be fairly common in Upper Assam. Although DUTTA<sup>3)</sup> believes its native home as to be Malay and Cochin-China, but there is a suspicion that it went in opposite way from Shan gardens to Vietnam, as in the case of *Citrus Combara*. The Ahoms who grow the King is said to be the direct descendants of the Shans, and it is difficult to believe that they had known it in coastal Vietnam so early as the 13th century before they settled into Assam area. The King has never been reported from the interior part of Further India even at present.

#### The small-fruited acid MICROACRUMEN

The presence of very widely distributed MICROACRUMEN, *Citrus indica* TANAKA, throughout Assam, is the most significant fact to endorse the value of this area as a native home of METACITRUS, amongst the prevalence of ARCHICITRUS<sup>13,14,15,18,25)</sup>. This has rather slender leaves of Tachibana class and fruits slightly depressed in outline and reddish-orange in color. The segments of fruits vary from 8 to 11, very thin rinded, filled with light-colored acid slimy pulp scanty of juice. The seeds are very large and plump, nearly 1.5 cm. long, containing green monoembryo. DUTTA<sup>3)</sup> records no Indian vernacular name to this species but KANJIRAL and others gave Assamese Humutia-tenga and others as mentioned before.

The Soh-siem, *Citrus erythosa* var. *assamica* HORT. ex TANAKA<sup>24)</sup>, is again claimed here to be identical with the Kobeni, or Chü sha chieh of Yangtze valley almost identical to the type. The small vermilion fruit has "stylar scar depressed in a small apical pit" that was not noticed by the author before besides intense acidity of the pulp. It is said to be sufficiently reddish in color to warrant the approach to the type.

The Kapura-tenga collected from the Lower Assam Valley most exactly represents *Citrus Reshni* HORT. ex TANAKA var. *canaliculata* HORT. described from Kodur, Andhra Pradesh<sup>25)</sup>. It was described to be identical with the former<sup>1)</sup>, in morphological details except its roughness, but still closer comparison will reveal their specific differences.

#### Sweet MICROACRUMEN

The Suntara orange of mandarin group was first reported by the author to be identical with Formosan Ponkan as early as 1912<sup>11)</sup>, which was later confirmed by GANDHI in 1934 after consulting the author's opinion<sup>4)</sup>. It was identified basically to represent *Citrus reticulata* BLANCO or later-named *C. chrysocarpa* LUSH. with some cultivars<sup>24,26)</sup>. A study carried out in New Delhi in 1958 revealed a fact that several other mandarins

occur in Assam-Khasia area, like *Citrus Tangerina*, *C. crenatifolia*, etc.<sup>29)</sup> SINGH and SINGH also described some of them with illustrations<sup>10a)</sup>. DUTTA and BHATTACHARYA<sup>1)</sup> gave three Sweet-Santras, i.e., Soh-niamtra, Soh-umkdait and Naga-santra.

The first is typical Nagpur Suntara well representing *Citrus reticulata* BLANCO, the producing centers of which are well illustrated by NAIK<sup>9)</sup>. They record two local synonyms Soh-thiang and Soh-bang by the Khasis which are locally called Shella orange, Burnihat orange, Jatinga orange, Lushai orange, Karimganj orange, etc., besides common Khasi orange. As varieties of them SINHH & SINGH<sup>10a)</sup> report Coorg orange, Desi variety (with few number of segments) and Butwal. The final ones seems to be a true Suntara, not *Citrus Tangerina* HORT. ex TANAKA, came to the author's attention from Saharanpur<sup>29)</sup>. It is probable, however, the Soh-umkdait of Khasi Hills, represent the tangerine since its rind is thicker, more or less pebbled, having spicy aroma which is lacking in the true Suntara.

The third Assam species, called Naga-Santra, has a small fruit of 3.5-4 × 2.8-4 cm. in size, of orange to deep orange color having 8-10 segments. It was reported to grow in a wild state in far off forests of Mokokchung, Naga Hills, at an altitude of about 1220 M. This has a kind of deep orange-colored skin, and is devoid of basal nipple. Number of segments counts 8-10, with small central column and orange-colored pulp, composed of smaller polygonal pulp vesicles, sweetish but not plenty of juice. In all possibility it may represent the Monkey orange, *Citrus lycopersicaeformis* TANAKA, occasionally growing wild in South-Western India Peninsula<sup>24)</sup>.

#### The Calmondin

The Calmondin, or Szū-kai-kat (Shikikitsu), *Citrus madurensis* LOUR., which was formerly alluded to *C. microcarpa* BUNGE<sup>15,24,26)</sup>, was reported as common in Western India, erroneously called Kumquat or Hazara. It is planted in Karimganj, Sylhet (Pakistan), and is called Naringi, but is known also from Bengal (Pakistan) probably not far from there. This is the first record that ACRUMEN-PSEUDOFORTUNELLA occurs in Assam territory not contradicting to our expectation.

#### Summary and Conclusion

The survey of Assam Horticultural Officers headed by BHATTACHARYA and later by DUTTA presented a very interesting accounts of Citrus of Assam and adjacent area, worth a critical work-out<sup>1,3)</sup>. Including still undescribed units of Citrus fruits, the following summary will be of help to outline a clearer map of native and early introduced Citrus so far known to botanists from this area. It will require, however, still closer analysis for those not sufficiently described and named coming from this area but the presence of the richest Citrus flora in Assam area is very sufficiently illustrated by their reports, giving ever conclusive confirmation to the author's theory of the Center of origin within the hill tracts of Eastern Himalaya, including the state of Assam, Sikkim, Sylhet, Manipur, toward the Burmese frontier. All Citrus subgenera and sections make their presence within this area, even OSMOCITRUS represented by *Citrus ichangensis* makes its approaches in Naga Hills where even the Sweet orange (*Citrus sinensis* OSBECK) grows wild together with *Citrus indica* TANAKA, and *Citrus latipes* TANAKA. Although we have not yet detected the wild primitive form of the Shaddock in the area, it is hopeful to trace its route to Yangtze Valley through Burmese frontier, since we know excellent variety of the Shaddock is grown in Bahmo area in Burma, about 320 km. east of Kohima, Naga Hills.



## A TENTATIVE LIST OF ASSAM CITRUS

\* Only cultivated

## Subgenus I. ARCHICITRUS

- § PAPEDA *Citrus latipes* TANAKA (Soh-kymphorschrieh, Soh-shyrkhoit)  
*Citrus Combara* RAFIN. (Sat-kara)

## § LIMONELLUS

- §§ EULIMONELLUS *Citrus aurantifolia* SWINGLE\* (Khaghzi; Abhayapuri lime & Karimganj lime)

*Citrus limettoides* TANAKA\* (Mitha-kaghzi)

*Citrus latifolia* TANAKA—seedy form\* (Soh-synteng)

- §§ MEGACARPA *Citrus macrophylla* WESTER aff.\* (Jamir-tenga)

## § CITROPHORUM

- §§ CITRIOIDES *Citrus Medica* LINN.\* (Bira-jora & Soh-manong)  
 —acidless form\* (Mitha-jora)

*Citrus limonimedica* LUSH.\* (Pati-lebu, Jora-tenga & Godha Pati-lebu)

*Citrus nana* TANAKA (Naya-changney)

- §§ LIMONIOIDES *Citrus pseudolimon* TANAKA\* (Kata-jamir & Elachi-lebu)

*Citrus longelimon* TANAKA n. sp. (Assam-lemon)

*Citrus Meyeri* Y. TANAKA\* (Soh-long)

—acidless form\* (Pani-jamir)

*Citrus Limonia* OSBECK (Nemu-tenga)

—Rangpur lime\* (Sinduri Nemu-tenga)

var. *otaitensis* TANAKA\* (Soh-jhalia)

*Citrus Jambhiri* LUSH.\* (Soh-myndong)

—smooth form\* or Mazoe lemon (Soh-jew)

—acidless form\* (Mitha-tulia)

- §§ DECUMANOIDES *Citrus megaloxycarpa* LUSH. (Holon-tenga)

*Citrus pyriformis* HASSK. aff.\* (Bor tenga)

*Citrus Balotina* POIT. et TURP. aff.\* (Hukma-tenga)

*Citrus assamensis* DUTTA et BHATT. (Ada-jamir or Soh-sying)

*Citrus* sp.\* (Hash-khuli) Provisionally called *Citrus Duttae*.

*Citrus* sp.\* (Sarbat) Provisionally called *Citrus Sarbati*.

## § CEPHALOCITRUS

- §§ DECUMANA *Citrus grandis* OSBECK\* (Rabab-tenga etc., 7 local varieties)

*Citrus Panuban* TANAKA aff.\* (Dewa-tenga)

- §§ INTERMEDIA *Citrus sinograndis* HORT. ex TANAKA aff.\* (Zambawak)  
 (FLAVICAPRA)

*Citrus pseudoparandisi* HORT. ex TANAKA aff.\* (Aijal)

## § AURANTIUM

- §§ MEDIOGLOBOSA *Citrus anonyma* HORT. ex Y. TANAKA aff.\* (Soh-khylla No. 1)

*Citrus rugulosa* HORT. ex TANAKA\* (Soh-khylla No. 2, Ât Anni)

*Citrus zeylanica* TANAKA aff.\* (Gondh-huntra)

- §§ AURANTIOIDES *Citrus Aurantium* LINN. (Karun-jamir)

- §§ SINENSIODES *Citrus sinensis* OSBECK (Soh-niangriang)

*Citrus Funadoko* HORT. ex Y. TANAKA aff.\* (Soh-khylla No. 3)

- §§ OSMOCITRIOIDES *Citrus luteo-turgida* TANAKA aff.\* (Nichols-Roy)

## Subgenus II. METACITRUS

- § OSMOCITRUS *Citrus ichangensis* SWINGLE (Ketsa-shupfu)

## § ACRUMEN

- §§ EUACRUMEN *Citrus nobilis* LOUR\*. (Jeneru-tenga)

## §§ MICROACRUMEN (CITRIODORA)

# MEGACARPA *Citrus reticulata* BLANCO\* (Soh-niamtra)*Citrus Tangerina* HORT. ex TANAKA\* (Soh-umkdait)# MICROCARPA *Citrus indica* TANAKA (Humutia-tenga)*Citrus erythrosa* HORT. ex TANAKA\* (Soh-siem)*Citrus Reshni* HORT. ex TANAKA var. *canaliculata* HORT. ex TANAKA\* (Kapura-tenga)*Citrus lycopersicaeformis* TANAKA (Naga Santra)§ PSEUDOFORTUNELLA *Citrus madurensis* LOUR.\* (Naringi)

## Lately introduced species

DUTTA<sup>3)</sup> mentions that the following species have been introduced lately into Assam and are planted in the Government gardens at Jorhat, Burnihat and Bakitar, near Haflong, and elsewhere. They represent following species :

*Poncirus trifoliata* RAFIN. (Trifoliate orange)*Citrus Hystrix* DC. (Caffre lime)*Citrus pennivesiculata* TANAKA (Gajanimma)*Citrus Limon* BURM. f. (Lemon Eureka, Villafranca, etc.)*Citrus paradisi* MAFC. (Grapefruit McCarty, Marsh, Foster, etc.)*Citrus maderaspatana* HORT. ex TANAKA (Kitchli)*Citrus sinensis* OSBECK var. *brasiliensis* TANAKA (Washington Navel)*Citrus Temple* HORT. ex Y. TANAKA (Temple orange)*Citrus Clementina* HORT. ex Y. TANAKA (Clémentine)*Citrus Reshni* HORT. ex TANAKA (Cleopatra)*Fortunella margarita* SWINGLE (Nagami Kumquat)*Fortunella crassifolia* SWINGLE (Meiwa Kumquat, wrongly called Marumi)

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