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Sachiko KUROSAWA\* & Hiroshi HARA\*: **Variations in *Abelia spathulata* Sieb. et Zucc., with special reference to its floral gland**

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寛\*: ツクバネウツギの変異について

In 1953 the junior author noticed that the nectariferous gland inside the base of the corolla of *Abelia spathulata* var. *subtetrasepala* is quite different from that of its mother species, *A. spathulata*. This fact attracted our attention, as the shape of the gland has been in general considered stable in the same species, and we reexamined *A. spathulata* and its allied races in detail.

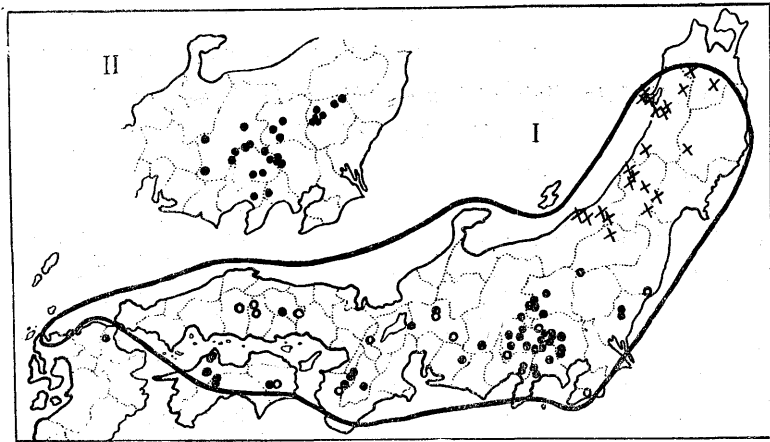
*Abelia spathulata* Sieb. et Zucc. endemic to Japan is a common shrub growing on hills and mountains of Honshu, and is very variable in the shape and the size of leaves, the hairiness of branches, leaves, calyx-tubes and filaments, the shape and the size of calyx-lobes, and the size and the colour of corollae. It varies also by individual and by the condition of the habitat. When growing on barren lands, such as serpentine area, it becomes a very densely branched shrub with small leaves and flowers.

After a careful examination of a large number of living and dried specimens from various districts, however, we came to the conclusion that *A. spathulata* in a wide sense can be divided into several geographical races as explained below. So-called 'mass collections' were made on several mountains where two or three races of the species are growing. Besides the characters which have hitherto been pointed out, we confirmed that the character of the gland at the base of corolla-tube is an important one to separate the races, and it correlates with other morphological characters.

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The typical race, *A. spathulata* var. *spathulata*, has 5 calyx-lobes of almost equal size, usually yellowish white corollae 2-3cm long, and a short clavate gland inside the narrow base of corolla-tube (Fig. 1, A). Its branches, petioles and calyx-tubes are glabrescent or sparsely pilose with short hairs. This race is most widely distributed in Honshû ranging from the Kwantô district west to the Chûgoku district, Shikoku, and northwestern Kyushu (Map. 1). In this race the shape of glands varies by individual to some extent (Fig. 2).



Map 1. Distribution areas of *Abelia spathulata* and its allied races. I. Solid line: total area of *A. spathulata*. Dots: *A. tetrasepala* (Circles: published records). Crosses: *A. spathulata* var. *stenophylla*. II. Dots: *A. spathulata* var. *sanguinea*.

Var. *tetrasepala* Koidzumi (1915) (=var. *subtetrasepala* Makino 1917) is very clearly separated from var. *spathulata* in having a dorsal calyx-lobe always strikingly smaller than the other 4 lobes, often larger corollae 3-4 cm long with a longer slender tube, and a carnosely flat gland totally fused to the inside of the conspicuously gibbose base of corolla-tube (Fig. 1, D). Its corolla is very similar to that of *Weigelastrum* in shape, size, and colour. Its petioles and the basal part and the midrib beneath of its leaves are pilose with patent longer hairs, and its calyx-tubes are more densely appressed pubescent too. Its flowers are generally almost sessile (common peduncles 0.5-2mm long), and its filaments are less hairy. This race blooms about 2 weeks earlier than the other races when growing at the same locality. It prefers mountain districts, and is found from Prov. Iwashiro south-west to a calcareous mountain of north Kyushu (cf. Map 1).

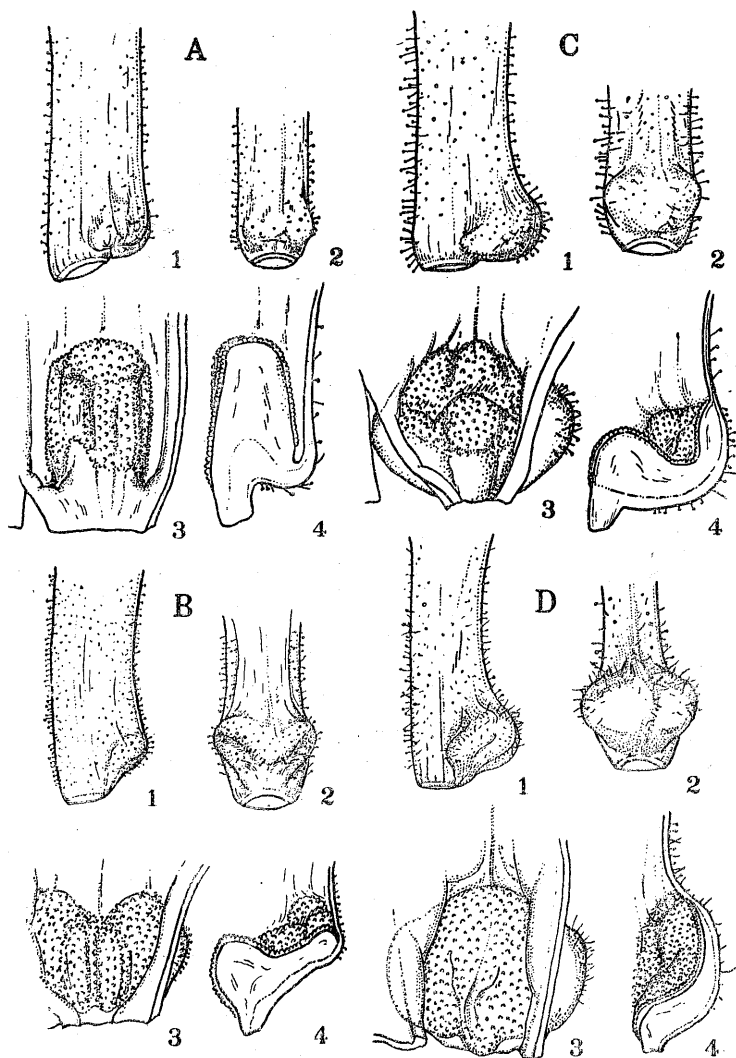


Fig. 1. Floral glands of *Abelia spathulata* and its allied races. A. *Abelia spathulata* var. *spathulata*, B. *A. spathulata* var. *sanguinea*, C. *A. spathulata* var. *stenophylla*, D. *A. tetrasepala*. (1. Base of corolla-tube, side view,  $\times$ ca. 8; 2. Ditto, ventral view,  $\times$ ca. 8; 3. Floral gland, whole view, mag.; 4. Ditto, longitudinal section, mag.).

Besides the typical race above mentioned a few other races which have definite ranges can be recognized in *A. spathulata*. To the north, a remarkable geographical race is differentiated in the Tôhoku-Hokuriku region. Its thick floral gland (Fig. 1. C) is adhered to the inside of the slightly gibbose corolla-tube, showing somewhat intermediate characters between var. *spathulata* and var. *tetra-sepala*. Its calyx-tubes are hairy, and its young branches, its petioles and its mid-

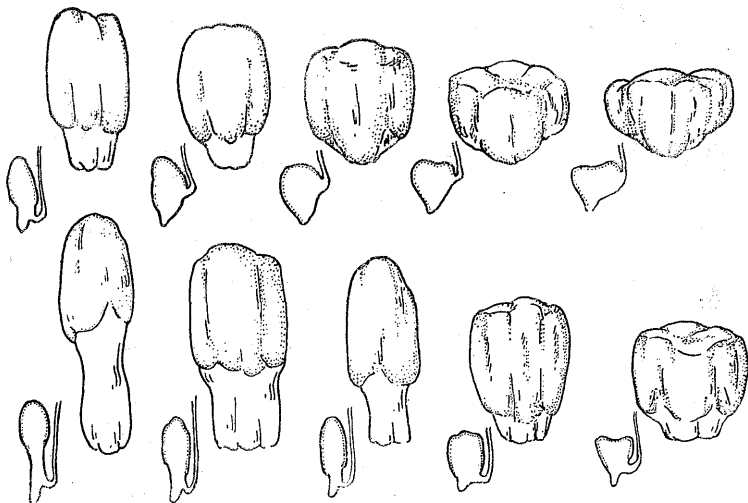


Fig. 2. Variations in floral glands of *Abelia spathulata* var. *spathulata*. Upper row from Jimmuji, Prov. Sagami. Lower row from Mt. Takao, Prov. Musashi.

rib of the underside of leaves are pilose with patent longer hairs. Its leaves are often larger, thicker and lustrous, as is usual in many other plants of that region, but they are especially variable in shape and size. To a large broad leaved form common in this race, var. *macrophylla* Honda (1941) was named, but var. *stenophylla* Honda (1936) based on an extreme form with narrow lanceolate leaves is the earliest name for this race. Some transitional forms are observed in the zone where this race meets with var. *spathulata* (cf. Maps 1 & 2). It is to be noted that the area of this race coincides well with the Tôhoku-Hokuriku floristic region, where many old and young endemics in various plant groups have survived or differentiated having adapted to the climate with heavy snow-fall during winter.

In the western part of the Hokuriku district, and the Kinki district, a form which is called f. *pilosa* Nakai (1921) occurs. It is very near to the typical *A.*

*spathulata*, and differs in having smaller floral glands, patently pilose corolla-tubes, and pilose branches, petioles and nerves as in var. *stenophylla*. The fact that two well differentiated races in eastern Honshu, one in the Kwantô-Chûbu region and the other in the Tôhoku-Hokuriku region, are mixed up or show intermediate forms in the Kinki district, is often observed also in many other plants.

Another race, var. *sanguinea* Makino, is found only in higher altitudes (ca. 1000m to 2000m above the sea-level) on mountains of middle Honshu from Prov. Shimotsuke southwest to Suruga and Shinano (Map 1, II). It has more reddish slender minutely pilose branches, long-caudate leaves with more ascending lateral veins, narrow bracteoles, distinct peduncles (2-5mm long), smaller dark red corollae 2-2.5cm long often with a more curved tube, and a thick obcordate floral gland more or less adhered to the corolla-tube (Fig. 1. B).

On mountains in Prov. Iwaki and Iwashiro, a confusing race showing intermediate characters between var. *spathulata* and var. *sanguinea* is growing. Its corollae are much brighter pink as compared with var. *sanguinea*, its floral glands are almost the same as those of the typical *A. spathulata*, and its leaves are somewhat similar to those of var. *stenophylla*. The colour of corollae varies by individual even at the same locality, and a few individuals have light yellow corollae, but all populations which we have examined on Mt. Ôtakine in Prov. Iwaki seem to belong to this one race (var. *colorata*).

In middle Honshu, three races, var. *spathulata*, var. *tetrasepala*, and var. *sanguinea* which generally occupy different habitats come sometimes into contact on the same mountain, and although var. *sanguinea* usually occurs in higher altitudes than the others, they are growing side by side on some spots. Even in those cases, they are clearly discriminated by the characters above mentioned, and var. *tetrasepala* flowers much earlier than the other two. But where the flowering season of late-flowering individuals of var. *tetrasepala* and that of early-flowering ones of *A. spathulata* overlap, a few individuals which show somewhat intermediate characters between the two races and are supposed to be natural hybrids between them are very rarely met with.

Considering the fact that the character of nectariferous gland is pretty important in entomophilous flowers, and is almost stable in the other genera of Caprifoliaceae such as *Weigela*, *Diervilla*, *Linnaea*, *Leycestria*, *Kolkwitzia*, *Lonicera*, etc., it is very interesting that it varies strikingly in these so closely allied races. As the character of gland is quite stable in var. *tetrasepala* and is well

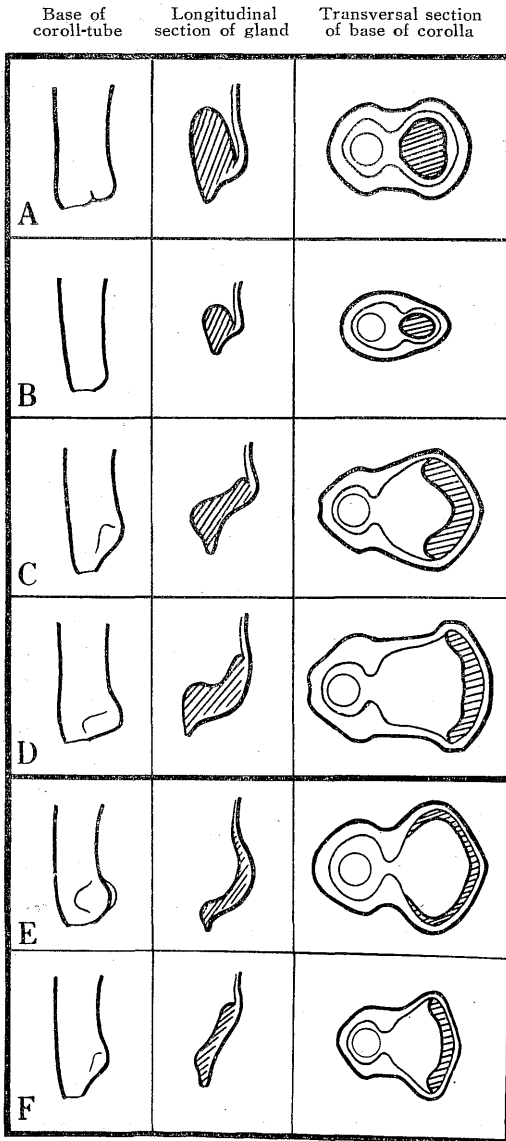


Fig. 3. Floral glands of *Abelia spathulata* and its allied races drawn schematically. A. *Abelia spathulata* var. *spathulata*, B. *A. spathulata* f. *pilosa*, C. *A. spathulata* var. *sanguinea*, D. *A. spathulata* var. *stenophylla*, E. *A. tetrasepala*, F. *A. serrata*. (Gland shaded)

correlated with other morphological characters, this race merits specific recognition as *A. tetrasepala* (Koidz.) Hara et Kurosawa. Its early-flowering habit seems to have been effective to keep this race apart from the others. The other geographical races which show wider ranges of variations, and are more often connected by intermediates should properly be treated as varieties of *A. spathulata*. They seem to be on the way of speciation.

Main differences in floral glands in these races are schematically shown in Fig. 3. Map 2 also shows geographical variations in several characters in *A. spathulata*. The alphabetical characters a to e in a numerator indicate the shape of floral glands, a showing the type figured in Fig. 1. A3, c that in Fig. 1 B3, e that in Fig. 1. C3, and b and d showing intermediate types between a and c, and c and e respectively. The numerical figure in a denominator is

an index showing the variations in seven other morphological characters; i. e. the shape of the base of corolla-tube, the hairiness of the base of corolla-tube, the hairiness of filaments, the hairiness of calyx-tube, the size of corollae, the size of leaves, and the colour of corollae. Each character was divided into five grades scoring 0 to 4. For example the base of corolla-tube figured in Fig. 3 A was scored 0, and that in Fig. 3 D was scored 4. The glabrescent calyx-tube was scored



Map. 2. Map showing indexes of geographical variations in *Abelia spathulata*.  
(Explanations in text).

0, and that with dense long hairs 4; the corolla 1.5-2cm long was scored 0, and that attaining 3.5-4cm long 4; the yellowish white corolla was scored 0, and the dark red one 4. The figures 1 to 3 show various grades of intermediates. By the simple additional step of all these differences, the total figure obtained running from 0 to 28 can be used as an index showing various intermediate forms. Then the index figure of var. *spathulata* becomes 3 to 10, and that of var. *stenophylla* more than 15. Var. *sanguinea* which occurs in higher altitudes of central Honshu overlaps in this map with var. *spathulata*, and its index was surrounded with a circle. These indexes in Map 2 are, of course, not accurate, but are useful to know a tendency of variations in the districts in question.

*Abelia serrata* Sieb. et Zucc. common in western Japan is also closely allied to *A. spathulata*, but has usually only two calyx-lobes. But its calyx-lobes are sometimes cleft into two, and those specimens with such calyx-lobes have often

been misidentified as *A. spathulata*. Its floral gland, however, is fused to the corolla-tube (Fig. 3 F), and is different from that of the typical *A. spathulata*.

Phylogenetical relationships between these races are very interesting, but are difficult to detect. It would be expected that *A. tetrasepala* might be derived from *A. spathulata* by the reduction of one sepal and the fusion of gland to the corolla-tube. But these tendencies seem to originate from old days in the genera *Abelia* and *Zebelia*, as several species also from Himalaya and China have only 2 or 4 sepals, and glands fused to the corolla-tube. *A. spathulata* seems to have had a wide range of tolerance. It is growing on various rocks including serpentine and limestone, and occupies a wide range in Japan differentiated into several races as explained above.

**Abelia spathulata** Siebold et Zuccarini, Fl. Jap. 1: 77 (1838), e typo—Hara, Enum. Sperm. Jap. 2: 36 (1952).

var. **spathulata**. ツクバネウツギ—*A. spathulata*  $\beta$ . *elliptica* Miq., Ann. Mus. Lugd.-Bat. 2: 269 (1866), e typo; *A. spathulata* var. *micrantha* Nakai in Bot. Mag. Tokyo 41: 504 (1927), e typo.

f. **pilosa** Nakai in Journ. Coll. Sci. Tokyo Univ. 42(2): 55 (1921), p.p. ケツクバネウツギ—Lectotypus. Honshu. Prov. Kawachi (Tada, Aug. 1899 in Herb. TI).

var. **colorata** Hara et Kurosawa, var. nov. タキネツクバネウツギ (新称)

A typo corollis intense roseis differt. Glans ut in typo.

Typus. Honshu. Prov. Iwaki: in monte Ōtakine (Hara et Kurosawa, Jun. 18, 1955, fl. in Herb. TI).

var. **sanguinea** Makino in Bot. Mag. Tokyo 18: 106 (1904). ベニバナツクバネウツギ—*A. sanguinea* Makino (1917); *A. curviflora* Nakai (1927), e typo; *A. sanguinea* var. *purpurascens* Honda (1930), e typo.

var. **stenophylla** Honda in Bot. Mag. Tokyo 50: 436 (1936), e typo. ウゴツクバネウツギ—*A. spathulata* var. *macrophylla* Honda, l.c. 55: 202 (1941), e typo; *A. ionostachya* Nakai in Bull. Sci. Mus. Tokyo 33: 23 (1953), e typo.

**Abelia tetrasepala** (Koidz.) Hara et Kurosawa, stat. nov. オオツクバネウツギ (メツクバネウツギ)—*A. spathulata* var. *tetrasepala* Koidzumi in Bot. Mag. Tokyo 29: 311 (1915), e typo; *A. spathulata* var. *subtetrasepala* Makino in Journ. Jap. Bot. 1 (5): 18 (1917).

メツクバネウツギは往々ツクバネウツギの萼片の一つが小さくなつた一形であると考えられてきたが、花筒基部の内側にある蜜腺の形が全く異つている (Fig. 1 参照)。萼



片と蜜腺の特徴の外に、メツクバネウツギの花は通常大形で花筒は細長く基部は著しく膨み、葉柄や葉下面中肋上には長い立毛があり、萼筒にも軟毛が多く、総花梗はきわめて短く、花糸の毛は少く、しかも同一産地では他より約2週間早く開花する。それ故立種として**オオツクバネウツギ** *Abelia tetrasepala* (Koidz.) Hara et Kurosawa と呼ぶ。

**ツクバネウツギ** (*A. spathulata* S. et Z.) にも多くの変異が見られるが、その基準型は関東から九州の東北端にわたり広く分布し、蜜腺は短棒状で通常花冠から離れている。九州中部の山地からもツクバネウツギが報告されているが、私共が標本を見た範囲では全部コツクバネウツギの誤認であつた。**ベニバナツクバネウツギ** はやや高い山地に生じ、下野から信濃・駿河に分布し、枝は赤味が強く、葉の先は尾状にとがり、花冠は小さく暗紅色で往々屈曲し、蜜腺は倒卵形肉質で多少花筒に癒着している。しかし磐城大滝根山のものは花が明るい紅色で他の性質もツクバネウツギに近く**タキネツクバネウツギ**と名付けることにした。

次に東北・北陸にかけて**ウゴツクバネウツギ**が分化している。その蜜腺は花筒内側に半ば癒着していて、若枝・葉柄・葉下面中肋上に長い立毛があり、子房も毛多く、幾分オオツクバネウツギに似た性質をもっている。葉は他の植物の北方型によく見られる様に、大形でやや厚く光沢のあるものが多いが、この型では葉の形と大きさは特に変化が多く、披針形の葉をつけた個体もある。ツクバネウツギとの接触地帯では中間と思われる形も見られる。北陸西部から近畿にはツクバネウツギにごく近いが蜜腺が小形で花筒に長立毛がでて、葉が大形になつたり毛が多くなつたりする点でややウゴツクバネウツギの方向へずれた形がある。**ケツクバネウツギ**は初めこの形とウゴツクバネウツギとの混合であつたが、今後は前者に限定して用いる。

この研究では数箇所産地で多くの個体について生品で数十個の花を調べその変異の幅を観察し、更に各地からの腊葉でこれを補足し、その地方的変異の境界を定める事につとめた。しかしこの点は今後更に精密に調べて発表する心算である。従来虫媒花における花冠内の蜜腺の形は同一の種では安定しているものと一般に考えられ、スイカズラ科でも多くの属や種では一定しているのに、ツクバネウツギでは上述の様に著しい変異を示すことは面白い例である。

次に注目すべき点はツクバネウツギの変異に日本の植物地理学の問題の縮図とも見られる様な地方的変異が認められることである。関東・中部地区ではツクバネウツギ、ベニバナツクバネウツギ、オオツクバネウツギの3型が概ね生育地を異にして「棲み分け」している。オオツクバネウツギでは他より早く開花するという生理的性質が、この型の隔離保存に大きい役割を演じている。

東北・北陸地区には蜜腺の形と毛で異り全体も大きいウゴツクバネウツギが分化しているが、その西部から近畿地方にはこれよりツクバネウツギに近寄つた**ケツクバネウツギ**が産する。これに似た現象はもつと種分化が高度に進んだ植物群においてもしばしば

見られることで、東日本では関東・中部型と東北・北陸型とはつきり分れている場合でも近畿でこれ等が混合し或は中間形を示すことがある。ツクバネウツギ属は明かに所謂 Arcto-Tertiary 要素の一つであり、その分化はかなり古い時代に行われたことが推察される。ツクバネウツギの地域的分化も、その分化の程度は余り高くないが、相当長い時代を通じて行われてきたと考えられる。

この研究に当つては多くの方々から御援助を戴いたが、特に生品の入手について尽力して下さつた久内清孝、佐藤正巳、小川由一、結城嘉美、藤井龍之助の諸氏に対して厚く御礼を申し上げる。

**〇ウスアカカタバミ** (檜山庫三) Kôzô HIYAMA: *Oxalis corniculata* L. f. *atropurpurea* Van Houtte

葉(おおむね莖も)の紫色を呈するカタバミのうち、全体が小形で、葉は赤味ある暗紫色で、花色の黄が濃く、花喉の部分の赤い者をアカカタバミとなし、これに対して、大きさは普通のカタバミと変らないが、葉が暗紫または暗紫褐色をおびて(緑色の部分の多少見られるものも多い)、花色の淡い者をウスアカカタバミと呼んできた。しかし、形の大小、色の濃淡でカタバミを区別することは実際には不可能な場合があつて、上記二品の如きもただ花喉の赤量の有無によつてのみ僅かに識別しうるものが稀でない。また紫葉品には花卉外側の紅味がかつた者がたまたに野外で見られるが、これは草木図説草部巻八カタバミの条下に、花色について、「野州ニ粉紅色ナルアリ」とある者に近いのであろう。

今日アカカタバミと云つている者が草木図説に記されたアカカタバミを指していることは云うまでもない。また牧野富太郎氏が *Oxalis corniculata* var. *atropurpurea* (植雑 11 巻 34 頁, 1897 年) とされたもの、更にまた、*Oxalis corniculata* var. *tropaeoloides* Makino in Bot. Mag. Tokyo 27: 112 (1913) とされたものも、学名は別として、その内容は共に、そこに附記された和名や記文からして、アカカタバミの方であつたか、或はそれにウスアカカタバミをも含めたものであつたであろう(ウスアカカタバミを区別しはじめたのは 1926 年或は 1923 年以後のことである)。尚、このウスアカカタバミの学名としては次のものがよいように思う。

*Oxalis corniculata* L. forma **atropurpurea** Van Houtte ex Hegi, Ill. Fl. Mitt.-Europ. 4-3: 1656 (1924) sub var. *genuina* Rouy et Foucaud.

*O. corniculata* f. *tropaeoloides* (Schlachter ex Planch.) Knuth in Engl., Pfl.-reich IV-130-95: 149 (1930); Hara, Enum. Sperm. Jap. 3: 9 (1954).