

Hiroyoshi OHASHI\*: **Euchrestea, a new tribe of the  
family Leguminosae**

大橋広好\*: マメ科ミヤマトベラ属の分類学的位置

In a monograph of the genus *Euchresta* (Ohashi & Sohma 1970), all of the species then known were revised for the first time based mainly on external and pollen morphology, distribution and ecology. The systematic position of the genus, however, was scarcely discussed in the paper. After the publication, the present author tried to study chromosomes, chemical constituents and several other characters of the genus which may be available for solving the problem. Recently the chromosome number, karyotype and several biochemical data of the genus have become clear. In the present paper, therefore, the problem is treated on the basis of these cytological and biochemical data together with morphological, phytogeographical and ecological characters mentioned in the previous paper.

The genus *Euchresta* consists of five species including four well recognized ones, i. e. *E. japonica* Hook. f. ex Regel (Fig. 1, a), *E. Horsfieldii* (Lesch.) Bennett, *E. tubulosa* Dunn and *E. formosana* (Hayata) Ohwi, and one imperfectly known species, i. e. *E. trifoliata* Merrill (Ohashi & Sohma 1970). The last species is quite similar to *E. japonica* as described in the previous paper. The genus is distributed in southeastern and eastern Asia from Bhutan and Assam in eastern Himalaya southwards through Thailand to Java, Bali and Philippines and eastwards through China, Formosa to southern Japan. Ecologically the species of the genus occur in shady and humid places under the evergreen broad-leaved forests, though they are distributed widely but disjunctively.

The genus was established by Bennett (1838) based on *Euchresta Horsfieldii* (Lesch.) Bennett. This type species was originally described by Leschenault (1810) as *Andira Horsfieldii*. Later, however, de Candolle (1825) expressed doubt about the position of the species in the genus *Andira* trea-

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ting it as "species dubia". He placed *Andira* in the tribe Geoffroeeae (as Geoffreae) in his *Prodromus* 2: 473. In the original description of *Euchresta*, Bennett (1838) discussed relationships between *Euchresta* and other genera of the tribe Geoffroeeae DC., and suggested a close relationship of the genus to the tribe Dalbergieae. Bentham (1860) classified *Euchresta* as a member of the Dalbergieae. This treatment has been the most fundamental work on the systematic position of the genus *Euchresta*. The tribe Dalbergieae is mainly tropical and subtropical trees or woody twiners and less frequently shrubs, and has pinnate leaves, usually diadelphous androecia and indehiscent legumes. In his work on the tribe Dalbergieae three subtribes, viz. Pterocarpinae (as Pterocarpeae), Lonchocarpinae (as Lonchocarpeae) and Geoffroinae (as Geoffroyae), were distinguished, and the last subtribe included the genus *Euchresta*. Taubert (1894) recognized four subtribes in the tribe Dalbergieae, i. e. Pterocarpinae, Lonchocarpinae, Geoffroinae and Anomalaе, though *Euchresta* was treated as a member of the subtribe Geoffroinae. Nakai (1940) established a new subtribe, Euchrestinae, based on the genus *Euchresta*. The monotypic subtribe was distinguished from the subtribe Geoffroinae in the sense of Taubert by the absence of stipules, stipels and woody pod. This treatment is unfortunately not recognized by subsequent taxonomists. Recently Schulze-Menz (1964) adopted Bentham's and Taubert's tribe Dalbergieae but divided it into three subtribes, i. e. Dalbergiinae, Lonchocarpinae and Geoffroinae. Although he did not mention *Euchresta* in his description of the Dalbergieae, the genus must be included in the subtribe Geoffroinae. Hutchinson (1964) recognized four tribes, i. e. Lonchocarpeae, Pterocarpeae, Dalbergieae sensu stricto and Geoffroeeae by splitting the Dalbergieae in the sense of Bentham. The genus *Euchresta* was put in the last tribe and the tribe is equivalent to the subtribe Geoffroinae in the sense of Bentham, Taubert and Schulze-Menz.

In the system of Hutchinson, the tribe Geoffroeeae is characterized generally as follows: Erect trees or shrubs, leaves imparipinnate, flowers in axillary racemes, panicles or subfasciculate, bracts and bracteoles small, often very caducous, ovary few- to 1-ovulate, fruit drupaceous, woody, indehiscent, seeds 2-1, pendulous. The tribe consists of seven genera, namely *Andira*, *Dipteryx*, *Euchresta*, *Fissicalyx*, *Geoffroea*, *Phylloxylon* and *Pterodon*. Morphologically, however, *Euchresta* is an evergreen subshrub or a small

shrub up to 2 m high with fleshy fruit, and its fruit is very characteristic. The fruit is almost equal to the seed and to the embryo in size and shape, because the fruit is one seeded and its pericarp as well as the seed-coat are very thin. This feature of the fruit of *Euchresta* is unique in the tribe Geoffroeeae as well as the tribe Dalbergieae sensu lato or even the family Leguminosae. The pericarp of *Euchresta* and the other genera of the Geoffroeeae consists of three layers, i. e. epicarp, mesocarp and endocarp, though that of the latter genera is definitely thicker than that of *Euchresta*. The mesocarp of *Euchresta* is spongy and less than 0.3 mm thick, while that of the others is woody or fleshy and distinctly thicker. The endocarp of the former is membranaceous and is coherent loosely to the mesocarp, while that of the latter is thick and fleshy and is coherent completely to the mesocarp. In these characters *Euchresta* is diversified from the other genera of the tribe Geoffroeeae, and, accordingly, is unusual even in the tribe Dalbergieae sensu lato.

In distribution, the genus *Euchresta* is confined in southeastern and eastern Asia as mentioned previously, while the other genera of the tribe Geoffroeeae occur mostly in tropical Central and South America and partly in Africa and Mascarene Islands.

The chromosome number of the genus *Euchresta* has hitherto been never reported. In the course of the present study the somatic chromosomes of *E. japonica* were examined by Dr. S. Kurosawa and Dr. K. M. Hasegawa-Emura. Root tips of the plant were prepared by the use of Kurosawa's modification (Kurosawa 1966, Hasegawa 1968, etc.) of Tjio & Levan's oxyquinoline aceto-orcein squash method (1952). The seeds of *E. japonica* were collected by the present author at three localities, i. e. Houraiji in Aichi Prefecture (January 20, 1968), Kiriyaama in Izu, Shizuoka Prefecture (June 14, 1970) and Mt. Takakuma in Kagoshima Prefecture (May 18, 1971), and the seedlings have been growing in the greenhouse of Department of Botany, Faculty of Science, University of Tokyo. Voucher specimens are deposited in the Herbarium, Department of Botany, Faculty of Science, University of Tokyo (TI). As the result of observations eighteen somatic chromosomes of *E. japonica* were counted in all root tip preparations (Fig. 1, b). The somatic chromosome complement was found to consist of the longest two pairs of submedian chromosomes, two pairs of median chromo-

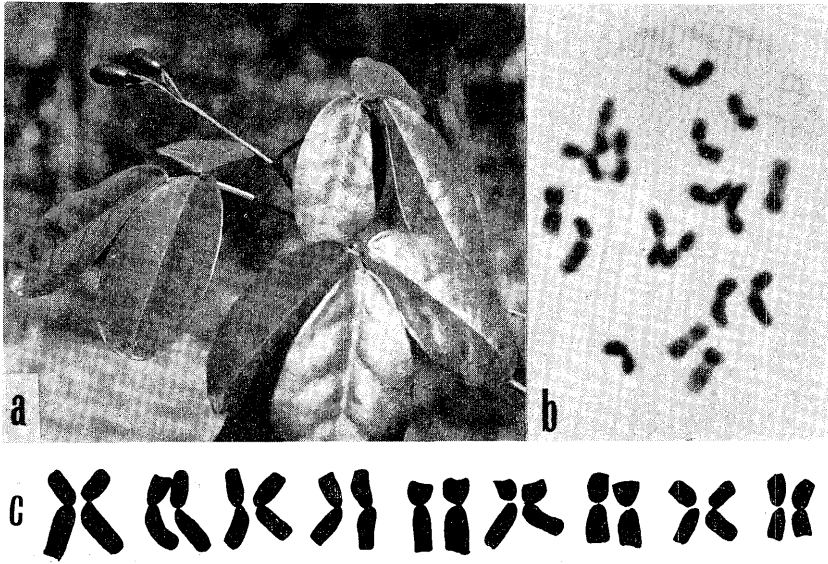


Fig. 1. a: *Euchresta japonica* Hook. f. ex Regel,  $\times 1/3$ . b: Somatic chromosomes of *E. japonica* ( $2n=18$ ),  $\times 2500$ . c: The karyotype of *E. japonica*,  $\times 3500$ .

somes, three pairs of subterminal chromosomes and the shortest two pairs of median chromosomes (Fig. 1, c). Therefore, the karyotype formula may be expressed as follows:

$$K(2n) = 18 = 4A^{sm} + 4B^m + 6C^{st} + 4D^m$$

In the tribe Dalbergieae sensu lato several basic numbers have hitherto been reported as listed below (cf. 4-Darlington & Wylie 1955, 5-Fedorov 1969 and 11-Moore 1972):

$x=10$ : *Andira*<sup>4,5</sup>, *Dalbergia*<sup>4,5,11</sup>, *Derris*<sup>5,11</sup>, *Geoffroea*<sup>4,5</sup>, *Pongamia*<sup>4,5</sup> and *Tipuana*<sup>4,5</sup>.

$x=11$ : *Derris*<sup>4,5</sup>, *Lonchocarpus*<sup>4,5</sup>, *Piscidia*<sup>4,5</sup>, *Pongamia*<sup>4,5</sup> and *Pterocarpus*<sup>4,5</sup>.

$x=12$ : *Derris*<sup>4,5</sup> and *Pterocarpus*<sup>5</sup>.

$x=13$ : *Derris*<sup>4,5</sup>.

$x=16$ : *Dipteryx*<sup>5</sup> and *Platimiscium*<sup>4,5</sup>.

Accordingly, the basic number of *Euchresta*  $x=9$  is new to the tribe Dalbergieae sensu lato.

The genus *Euchresta* contains such quinolizidine alkaloids as lupinine (Mears & Mabry 1971), cytisine (Plugge 1895 fide Mears & Mabry 1971, Turner 1971) and matrine (Fujita 1930 fide Shibata & Nishikawa 1961, Shibata & Nishikawa 1961, Haginiwa unpublished). Shibata and Nishikawa reported the presence of matrine, cytisine and oxymatrine in rootstocks of *E. japonica*. According to Prof. J. Haginiwa, rootstocks of *E. japonica* contain matrine and oxymatrine as principal alkaloids with such secondary alkaloids as anagryrine and methylcytisine (cf. Okuda et al. 1965). The lupinine, cytisine and matrine have been reported only from *Euchresta* within the tribe Dalbergieae sensu lato, and any kind of the quinolizidine alkaloids have hitherto been unknown in all of the other genera of the tribe.

The morphological, ecological, chromosomal and biochemical evidences mentioned above suggest clearly that the genus *Euchresta* is different from all of the other genera of the tribe Geoffroeeae as well as the tribe Dalbergieae sensu lato. On this basis the genus is considered to represent a distinct tribe, i. e. Euchresteae, in the family Leguminosae.

**Euchresteae** Ohashi, trib. nov.

Dalbergieae subtrib. Euchrestinae Nakai in Journ. Jap. Bot. 16: 246 (1940).

Fruticulus vel frutex parvus ad 2 m altus. Caudex lignosus. Folia alterna, petiolata, 3-9-foliolata; foliola subcoriacea; stipulae caducae; stipellae nullae. Inflorescentiae racemosae; bracteae anguste ovatae. Flores 10-22 mm longi; calyx campanulatus vel tubulosus; corolla glabra; stamina diadelpa; ovarium stipitatum, (1-) 2-ovulatum. Legumen longe stipitatum, ellipsoideum, glabrum, indehiscens, carnosum, monospermum.

Type genus: *Euchresta* Bennett

Finally, the relationships of the tribe Euchresteae with other tribes of the subfamily Faboideae in the Leguminosae will be discussed briefly. Bentham (1860) and Ohashi & Sohma (1970) recognized close relationships between *Euchresta* and *Sophora* based on the morphological resemblance. According to Bentham, "in many respects it (= *Euchresta*) comes very near to some *Sophoras*, but the united stamens refer it without doubt to Dalbergieae (page 24)". Ohashi & Sohma reported the similarity between

*Euchresta* and *Sophora*, especially in *Sophora bhutanica* and its allies, in calyx, petals and pollen grains. Based on chromosomal evidence Turner and Fearing (1959) suggested phylogenetic relationships among the tribes within the Leguminosae. According to them, Sophoreae and Podalyrieae are the tribes with the basic chromosome number  $x=9$ , while Dalbergieae and Phaseoleae are those with  $x=10$  and 11. These two groups deviate greatly from each other as illustrated diagrammatically in their paper. Cytologically, therefore, the tribe Euchresteae belongs to the former group with  $x=9$ . This may suggest that the tribe Euchresteae is related to Sophoreae and Podalyrieae. Biochemically, according to Mears & Mabry (1971), the distribution of lupinine in the Leguminosae is restricted to Sophoreae, Genisteae and Euchresteae. Moreover, in the family matrine is reported only from the tribe Sophoreae and Euchresteae. Based on the biochemical data especially the presence of cytosine, furthermore, Turner (1971) states that *Euchresta* is probably a primitive genus whose phyletic roots go back to those ancestral taxa which were intermediate to the tribe Sophoreae, Dalbergieae and Podalyrieae. Biochemical data, however, seem to show close relationships of the tribe Euchresteae with Sophoreae and Genisteae. In summary, the morphological, cytological and biochemical data mentioned above suggest clearly the close relationship between Euchresteae and Sophoreae.

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1970年にミヤマトベラ属のモノグラフを発表した<sup>13)</sup>。この論文ではそれまでに記載されていた全種類について再検討し、次の5種を認めた。すなわち本州・四国・九州のミヤマトベラ *Euchresta japonica* Hook. f. ex Regel (図1, a), 西表島・台湾・フィリピンのタイワンミヤマトベラ (=リュウキユウミヤマトベラ) *E. formosana* (Hayata) Ohwi, 中国(湖北・四川)の *E. tubulosa* Dunn, ブータン・アッサム・タイ・中国(雲南)・ジャワ・バリ島の *E. Horsfieldii* (Lesch.) Bennett および中国(広東)の *E. trifoliata* Merrill である。但し *E. trifoliata* に関してはミヤマトベラに酷似していることを指摘した。またこれと平行してミヤマトベラの分布に関する問題も別に扱った<sup>14)</sup>。しかしこれらの報告ではミヤマトベラ属の種を主として外部形態と花粉形態の比較に基づいて区別したため、属の分類学的位置については殆んど論及しなかった。そこでこの論文ではその問題を扱うこととした。そのため従来の結果に加えて新たに染色体と化学成分のデータをも併せて論議した。

ミヤマトベラ属は普通 Dalbergieae 連の Geoffroinae 亜連<sup>2)16)18)</sup> または Geoffroeeae 連<sup>7)</sup> に分類されている。Hutchinson の Geoffroeeae は内容的には Bentham の Geoffroinae に等しいので、ミヤマトベラ属を Geoffroinae の一員と見做している点に関してはいずれも同じであるといえる。これに反してミヤマトベラ属を Geoffroinae と対等の位置に置き、独立したミヤマトベラ亜連 Euchrestinae を設立する意見もある<sup>12)</sup>。

Dalbergieae 連は主に直立またはつる性の樹木で、単体または二体雄蕊をもち、果実は裂開せず、葉は羽状複葉の群で、主に熱帯と亜熱帯に分布する。約30属を含み、次の3亜連に分類される<sup>16)</sup>。すなわち 1) Dalbergiinae 亜連……果実は乾果でしばしば翼があり、葉は普通互生の羽状複葉、2) Lonchocarpinae 亜連……果実は乾果で多くは無翼、葉は対生の羽状複葉、3) Geoffroinae 亜連……果実は多くは石果状、葉は互生または対生の羽状複葉。

ミヤマトベラ属の形態的な特徴を Geoffroinae 亜連の他の属と比較したうえでまとめてみると次のとうりである。果実は果皮が非常にうすくしかも木質でないこと、また種子1個だけを包み、更に種皮もうすいため果実と種子と胚とが殆んど同じ大き



さであること、葉は3-9小葉からなること、常緑の半かん木あるいは高さ2m位までのかん木であることである。これらの特徴のうち特に種子や胚が果実に比べて非常に大きいことは広義の *Dalbergieae* 連はもとよりマメ科全体からみても全く特異な点であるといえる。

地理的分布の上からはミヤマトベラ属が東南アジアと東アジアに限られているのに対して、他の *Geoffroinae* 亜連の属は大部分がアメリカ大陸の熱帯と南アメリカ、一部がアフリカとマスカリン諸島に分布している。このように外部形態と分布に関してはミヤマトベラ属と *Geoffroinae* 亜連の他の属とは明らかに区別できる。特にミヤマトベラ属において種がそれぞれ著しく隔離分布していること、それにも拘らず各種の生育地の生態条件が一樣であること<sup>13)</sup>、果実の構造が特異であり種子の拡がり方が非常に制限されていること<sup>14)</sup> などから判断すると前述のミヤマトベラ属と *Geoffroinae* 亜連の他属との間の分布上の相違は形態上の相違の大きさを十分に裏付けていると思われる。これらの形態・分布上の違いはミヤマトベラ属と *Dalbergieae* 連との間でも同様に認められる。例えば前述のようにミヤマトベラ属では果実・種子・胚の大きさに殆んど差がなく、半かん木で暖帯に分布する種類を含むことなど非常に特異的である。

ミヤマトベラ属の染色体についてはこれまで全く報告がなかったが、今回鹿児島県高隈山、愛知県鳳来寺山および静岡県桐山産のミヤマトベラで根端を用い、いずれも  $2n = 18$  であることが確認できた(図1, b & c)。この基本数は  $x = 9$  で、これは *Geoffroinae* 亜連は勿論 *Dalbergieae* 連でも初めての数である。*Geoffroinae* 亜連からは  $x = 10, 16$  が知られており、*Dalbergieae* 連からは  $x = 10, 11, 12, 13, 16$  が報告されている<sup>4)5)11)</sup>。

ミヤマトベラ属の化学成分として *quinolizidine* 系アルカロイドが特徴的であり、ルピニン、キティシンおよびマトリンが知られている<sup>10)17)21)</sup> (栽培未発表)。この系列のアルカロイドはマメ科ソラマメ亜科に特有なもので、*Dalbergieae* 連ではミヤマトベラ属のみから例外的に抽出されている。

以上のように染色体についても化学成分についてもミヤマトベラ属と *Dalbergieae* 連の他の属の間にははっきりした違いが認められ、外部形態での両者の違いとも一致することは明らかである。すなわち、ミヤマトベラ属は *Geoffroinae* 亜連はもとより *Dalbergieae* 連とも非常に異なった群であることが認められる。この事実に基づいて本論文では新しくミヤマトベラ連 *Euchrestea* Ohashi を設立した。ミヤマトベラ連は *Dalbergieae* 連には殆んど類縁関係がなく、形態的にも<sup>2)13)</sup>、染色体のうえでも<sup>20)</sup>、更に化学成分においても<sup>10)21)</sup> クララ連に近縁であると考えられる。

最後にミヤマトベラ連と *Dalbergieae* 連の和名について述べておきたい。*Dalbergieae* 連の和名はハネノミカズラ族(例えば本田・向坂: 大綱日本植物分類学

1930), ツルサイカチ族<sup>12)</sup>, ミヤマトベラ族 (本田: 日本種子植物分類大綱 1955) などがある。この連の基準属は *Dalbergia* L. で、これに対する和名もハネノミカズラ属やツルサイカチ属 (牧野・根本: 日本植物総覧 1925) がある。これらは台湾産の *Dalbergia rubiginosa* Roxb. にツルサイカチ, ハネノミマメ, ハネノミカズラの和名がある (牧野・根本) ことに由来する。この植物が日本の出版物に発表されたのはおそらく Matsumura & Hayata, Enum. Pl. Formos. 113 (1906) が最初であり、それには和名がなく、標本として S. Nagasawa in 1904 が引用されている。この標本は 東大資料館にあり、ハネノミマメの名がある。その後台湾総督府民政部殖産局 (川上滝彌): 台湾植物目録 (1910) にはツルサイカチ, ハネノミマメが使われており、松村: 帝国植物名鑑下巻 顕花部後編 (1912) や早田: 台湾植物総目録 (1917) にはハネノミカズラの名が採用されている。したがって *Dalbergieae* の和名としてはハネノミカズラ連またはツルサイカチ連を使用するのがよいと考える。今日それを変更してミヤマトベラ族とする必要もないように思われるので、*Euchrestae* の和名はミヤマトベラ連としておきたい。

### ○マユハケゴケの秩父産を確認する (水島うらら) Urara Mizushima: Chichibu as a verified locality of *Campylopus fragilis*

マユハケゴケはもと群馬県赤城山産の標本に基いて設けられた *Campylopus akagiensis* Broth. et Yas. の和名であった。桜井久一博士は「日本の蘚類」(1954) にその産地として赤城山の他に伊予と武州秩父を挙げておられる。その後高木典雄氏は同種をヨーロッパや北米等に分布する *C. fragilis* の異名とされた。(服部研報 30: 240, 1967)。この時氏は *C. akagiensis* の副基準標本を検討された結果、これは *C. fragilis* であり、その日本における唯一の産地であると書いておられる。氏は桜井博士の報告の基となった伊予産の *C. akagiensis* の標本も調べたが、これは同じシッポゴケ科に属する *Dicranodontium denudatum* と *Brothera leana* の混合したものであったと報告しておられる。東京都立大学牧野標本館には桜井博士によって *C. akagiensis* と同定された標本があり、伊予産のものは高木氏の言われる通りである。秩父産の標本は二点あり、一は永野巖氏採集の大滝村大血川太陽寺産のもの、他は前田禎三氏採集の大滝村大除谷 (オオヨケダニ) 産のものである。前者は葉の横断面で厚膜な細胞は大形薄膜な背腹の細胞間に散在しており *Brothera leana* である。後者では葉脈の部分は暗く、その横断面における厚膜細胞は集って葉背に偏在しており、葉身細胞の形や無性芽の性質も合せ考えると明かに *C. fragilis* である。従って桜井博士が *C. akagiensis* として挙げられた秩父の産地はこの大滝村大除谷として確認されたことになり、*C. fragilis* の本邦における産地は現在のところ群馬県赤城山と埼玉県秩父郡大滝村大除谷の二ヶ所である。

(府中市 [redacted])