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Historical Survey and Present Status of Systematics in the Genus *Petunia* Jussieu (Solanaceae)

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ABSTRACT

Seventy one botanical literature describing or enumerating species of *Petunia* (in a broad sense) have been collected and analyzed to serve for our future studies on the genus *Petunia*.

Sixty four different names of *Petunia* species appeared in the literature were classified into 7 groups according to the latest treatments such as by Fries (1911), Wijsman and de Jong (1985) and Wijsman (1990). Among them, some 40 specific names were considered to be waiting for further examination.

Distribution of *Petunia* species in Brazil, Uruguay, Argentina, Paraguay and Bolivia were demonstrated and possible numbers of species in respective native countries and states were estimated. Existence of type specimens for each species was also checked and general status of the systematics of the *Petunia* was discussed.

INTRODUCTION

Breeding of the garden petunia started in early 19th century by the crossing of *Petunia nyctaginiflora* (=*P. axillaris*) and *P. violacea* (=*P. integrifolia*)[18]. As mentioned by Mabberley (1987), the genus *Petunia* comprises 35 species mostly occurring in tropical and warm South America, but among them only a few species even including their subspecies and varieties were thought to be used for breeding so far[23].

It is reasonable to say that the systematics of the genus has not well been studied because of no complete review was published since Fries' work in 1911. In 1964, Smith and Down noted 8 new species found in Santa Catarina, a small state in Brazil, and later in 1966 they added one more species[20]. Furthermore, a new species was found more recently by Stehmann in 1987 in an adjacent state, Rio Grande do Sul, Brazil.

In this paper, the collected literature referring to *Petunia* species were examined systematically to list up possible true species and serve for our subsequent studies on the genus *Petunia*.

MATERIALS AND METHODS

As shown in Table 1, valuable botanical literature, totaling 71, describing or enumerating *Petunia* species have been collected by one of the authors (Ueda) from The Royal Botanical Gardens, Kew, Wisley, Lindley Library of the Royal Horticultural Society, Tokyo University and Kyoto University. Some literature was donated from Facultad de Agronomia, Universidad de Uruguay.

Wijsman (1990) transferred several species of *Petunia* to *Calibrachoa*. In this study, however, these species were still included in the genus *Petunia* as has been treated.

Hybrids, such as *P.* x *atkinsiana,* were excluded from the survey.

Grouping of the specific names was based upon the latent reference treating given species (Table 2), even if the treatment was considered to be invalid. These invalid treatments were mentioned in the results.

RESULTS

Establishment of the genus Petunia and the type

Table 1　A list of references surveyed in this study

Lamarck, J. B. P. A. M.(1793) Tableau Encyclopedique et Method des Trois Regnes de la Nature, Botanique 2:7.
Lamarck. J. B. P. A. M. (1796) Encycopedie Methodique Botanique 4:480-481+t.
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Roemer, J. J. & J.A. Schultes (1819) Systema Vegetabiliun 4:323-324.
Saint-Hillaire, M. A. (1824) Histoire des Plantes les plus Remarquables du Bresil et du Paraguay 1:220-221+t.
La Llave, C. P. & J. M. Lexarza (1825) Novorum Vegetabilium Descriptiones fasc. 2:3.
Sprengel, C. (1825) Systema Vegetabilium 1:615.
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Ker, H. B.(1830?) Sweet's Flower Garden 2:t.119.
Hooker, W. J. (1831) Curtis's Botanical Magazine 58:t.3113.
Lindley, J. (1833) Botanical Register t. 1626.
Hooker, W. J. (1833) Curtis's Botanical Magazine, New Series 7:3256.
Don, D. (1833) Sweet's Flower Garden 5:t. 193.
Paxton, J. (1834) Paxton' Magazine of Botany 1:7
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Rafinesque-Schmaltz, C. S. (1836) Flora Telluriana 3:76.
Paxton, J. (1836) Paxton's Magazine of Botany 2:173.
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Loudon, J. C. (1839) A Catalogue of All the Plants (Loudon's Hortus Botannicus) p.655.
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Steudel, E. T. (1841) Nomenclator Botanicus p.501.
Paxton, J. (1844) Paxton's Magazine of Botany 11:7-8.
Walpers, G. G. (1844-1845) Repertorium Botanices Systematicae 3:5-7.
Hooker, W. J. (1846) The London Journal Botany 5:162-77, 182-190.
Sendtner, O. (1846) Martii Flora Brasiliensis 10:170-179, 197.
Walpers, G. G. (1846-1847) Repertorium Botanices Sytematicae 6:567-571.
Miers, J. (1850) Illustrations of South American Plants 1:89-114+t.
Planch., J. E. (1850-1851) Flore des Serres et des Jardins de l'Europe 6:39-40, t.550.
Dunal, M. F. (1852) De Candolle Prodromus Systematis Naturalis Regni Vegetabilis 13(1):573-578.
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Macloskie, G. (1905) Reports of the Princeton University Expeditions to Patagonia,1896-1899 8(5): 710-711.
Dusen, P. (1909-1910) Arkiv for Botanik 9(15):14-16.
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Fries, R. E. (1911) Kungl. Svenska Vetenskapsakademiens Handlingar 46(5):1-72+t.
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Fedde, F. & K. Schuster (1917) Just's Botanischer Jahresbericht 39(2):305.
Sandwith, N. Y. (1926) Bulletin of Miscellaneous Information 1926:244-245.
Steere, W. C. (1931) Papers of the Michigan Academy of Science, Arts and Letter 13:123-215.
Morton, C. V. (1944) Contributions from the United States National Herbarium 29:73-74.
Smith, L. B. & R. J. Downs (1964) Phytologia 10(6):439-441, 452-453.

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Cabrera, A. L. & E. M. Zardini (1978) Manual de la Flora de los Alrededores de Buenos Aires pp. 553-554.
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Wijsman, H. J. W., J. H. de Jong & T. M. Pedersen (1983) Acta Bot. Neerl. 32(4): 323-332.
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Wijnands, D. O., J. J. Bos, H. J. W. Wijsman, F. Schneider, C. D. Brickell & K. Zimmer (1986) Taxon 35: 748-749.
Stehmann, J. R. (1987) Napaea Rev. Bot. 2:19-21.
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species, a short history

The first species of the genus *Petunia* to be described was found in Montevideo, Uruguay and was placed in the genus *Nicotiana* (*N. axillaris*) by Lamarck (1793).

The genus *Petunia* was established by Jussieu (1803) and *P. parviflora* and *P. nyctaginiflora* (=*P. axillaris*) were described as the types to the genus (syntype).

Britton and Brown (1913) used their mechanical method of typification by selecting the first mentioned species, *P. parviflora,* as the type (lectotype) without horticultural consideration[22].

Wijsman and de Jong (1985) reported generic separation including differences in the corolla arrangement in the flower bud between species with 2n=14 chromosome like *P. axillaris* and species with 2n=18 chromosome like *P. parviflora* and transferred species of *Petunia* with 2n=14 chromosome to *Stimoryne* established by Rafinesque-Schmaltz (1836) remaining *P. parviflora,* etc. with 2n=18 chromosome in *Petunia.*

The type species of the genus *Stimoryne* was *S. purpurea* (= *P. integrifolia*)[15]. Their treatment caused highly undesirable consequence for horticulturists because all garden petunias should belong to the genus *Stimoryne*[22].

Wijnands *et al* (1986) proposed an alternative choice to conserve the second mentioned species, *P. nyctaginiflora,* by Jussieu (1803) as the lectotype in considering horticulturists.

In reply to the proposal, the I. N. G. Committee was sympathetic to the case favored by horticulturists and the conservation of the genus *Petunia* thus proposed was recommended[3] and so all cultivated garden petunias still belong to *Petunia* at this moment.

Wijsman (1990) transferred the other thus distinguished group of species with hopefully 2n=18 chromosomes to *Calibrachoa* established by Llave and Lexarza (1825). The type species of the genus *Calibrachoa* is *C. parviflora* which was originally described as *C. procumbens* Llave et Lexarza[9].

The latest review of the genus Petunia

The latest review of this genus we could rely on regardless of national boundary should be Fries' (1911) one. As shown in Table 2, he described 27 species including 12 new species. Among them, 2 species (*P. inflata* and *P. occidentalis*) were thereafter treated as subspecies of *P. integrifolia*[23] and *P. violacea* was combined into *P. integrifolia*[16], so that 24 names in his review are considered to be valid today.

Groups of specific names of Petunia appeared in the references

As shown in Table 2, specific names of *Petunia* (including *Calibrachoa*) appeared in the literature collected could be grouped into 7 according to the

Table 2　Present taxonomic status of the genus *Petunia* in a broad sense

Valid names and synonyms (*P: Petunia. C:Calibrachoa*)	Type[1]	Distr.[2]	Sendtner[3] (1846)	Fries[4] (1911)	S. & D.[5] (1964. 1966)
Group A: [*Nicotiana* (1793)→ *Petunia* (1803)→ *Stimoryne* (1985)→ *Petunia* (1989)]					
01: *P. axillaris* (Lamarck) Britton, Sterns et Poggenburg (1888)	L	AB·UV	1), 14)	1	1
01-1: subsp. *parodii* (Steere) Cabrera (1977)	H	A···V			
02: *P. integrifolia* (Hooker) Schinz et Thellung (1915)	n	ABPUV	2), 4)	3)	2
02-1:subsp. *inflata* (Fries) Wijsman (1982)	SS	A·P··		4)	
02-2:subsp. *occidentalis* (Fries) Wijsman (1982)	SS	A···V		5)	
02-3: var. *depauperata* (Fries) Smith et Downs (1966)	SS	·B···		3b)	2b * *
03: *P. littoralis* Smith et Downs (1966)	HU	·B···			4 *
04: *P. reitzii* Smith et Downs (1964)	HU	·B···			3 *
05: *P. saxicola* Smith et Downs (1964)	HU	·B···			5 *
06: *P. scheideana* Smith et Downs (1964)	HU	·B···			6 *
Group B: [*Petunia* (1803)→ *Calibrachoa* (1990)]					
07: *C. caesia* (Sendtner) Wijsman (1990)	hb	·B···	6 *	19	10
08: *C. calycina* (Sendtner) Wijsman (1990)	hb	AB···	5 *, 17)	16	
09: *C. ericaefolia* (Fries) Wijsman (1990)	SS	·B···		24 *	7
10: *C. excellens* (Fries) Wijsman (1990)	H or h	·B···		26 *	
11: *C. hassleriana* (Fries) Wijsman (1990)	SS	A·P··		21 *	
12: *C. heterophylla* (Sendtner) Wijsman (1990)	hb	AB···	12 *	10	11
13: *C. linearis* (Hooker) Wijsman (1990)	n	AB·U·	15)	7	
14: *C. linoides* (Sendtner) Wijsman (1990)	hb	·B···	7 *	20	17
15: *C. macrodactylon* (Smith et Downs) Wijsman (1990)	HU	·B···			16 *
16: *C. paranensis* (Dusen) Wijsman (1990)	SS	·B···		12	
17: *C. parviflora* (Jussieu) Wijsman (1990)	L	/////	3	6	
18: *C. pygmaea* (Fries) Wijsman (1990)	sb	AB·U·		2 *	
19: *C. regnellii* (Fries) Wijsman (1990)	SS	·B···		18 *	
20: *C. rupestris* (Dusen) Wijsman (1990)	HS or SS	·B···		13	
21: *C. sellowiana* (Sendtner) Wijsman (1990)	hb	·B···	11 *	11	12
Group C: Species left for next reviewer by Wijsman (1990)					
22: *P. alpicola* Smith et Downs (1964)	HU	·B···			14 *
23: *P. dusenii* Fries (1911)	H or h	·B···		27 *	
24: *P. helianthemoides* Sendtner (1846)	hb	AB···	8 *	22	
25: *P. humilis* Fries (1911)	hb	···U·		9 *	
26: *P. kleinii* Smith et Downs (1964)	HU	·B···			15 *
27: *P. ledifolia* Sendtner (1846)	sb	·BP··	13 *. 16)	14	
28: *P. micrantha* Fries (1911)	hb	·B···		23 *	
29: *P. pubescens* (Sprengel) Fries (1911)	n	·B·U·	9)	15 * *	
30: *P. sendtneriana* Fries (1911)	sb	·B···		17 *	9
31: P. serrulata Smith et Downs (1964)	HU	·B···			8 *
32: *P. spathulata* Smith et Downs (1964)	HU	·B···			13 *
33: *P. thymifolia* (Sant-Hillaire) Sendtner (1846)	n	AB·U·	10 * *	8	
Group D: Species ignored by Wijsman (1990)					
34: *P. exserta* Stehmann (1987)	H	·B···			
35: *P. felipponei* Sandwith (1926)	H or h	···U·			
36: *P. lignescens* Witasek (1910)	H or h	·B···			
37: *P. longiflora* Rafin (1840)	n	···U·			
38: *P. logifolia* Rojas (1897)	n	·B···			
39: *P. odorata* Rafin (1840)	n	·B···			
40: *P. scabridula* Morton (1944)	HU	···U·			
41: *P. variabilis* Fries (1911)	S or s	·B···		25 *	

Group E: synonyms	Sendtner[3] (1846)	Fries[4] (1911)	Valid name	Treated by
42: *P. dichotoma* Sendtner (1846)	4 *		→ 02	Fries (1911)
43: *P. elegans* Miers (1846)	16		→ 27	Fries (1911)
44: *P. inflata* Fries (1911)		4 *	→ 02-1	Wijsman (1982)
45: *P. intermedia* (Graham) Lindley (1837)	15		→ 13	Fries (1911)
46: *P. nyctaginiflora* Jussieu (1803)	1		→ 01	B.S.P. (1888)
47: *P. occidentalis* Fries (1911)		5 *	→ 02-2	Wijsman (1982)
48: *P. ovalifolia* Miers (1846)	17		→ 08	Fries (1911)
49: *P. parodii* Steere (1931)			→ 01-1	Cabrera (1977)
50: *P. phoenicea* Don ex Loudon (1839)			→ 02	Fries (1911)
51: *P. propinqua* Miers (1846)	14		→ 01	Fries (1911)
52: *P. serpyllifolia* Sendtner (1846)	9 *		→ 29	Fries (1911)
53: *P. violacea* Lindley (1833)	2	3	→ 02	Schinz & Thellung (1915)
53-1: subsp. *depauperata* Fries (1911)		3b *	→ 02-3	Smith & Downs (1966)
54: *P. viscidula* Miers (1846-1850)			→ 17	Fries (1911)
Group F: Species treated as obscure by Fries (1911)				
55: *P. humifusa* Dunal (1852)	→ *Nicotiana*?		Chile	
56: *P. villadiana* Barcena ex Hemsley (1881-1882)	→ Cultivaed *P. violacea*?		Mexico	
Group G: Species excluded by Fries (1911)				
57: *P. acuminata* Graham (1829)	→ *Nicotiana acuminata* (Graham) Hooker			
58: *P. cirrhoides* Miers(1826)	→ *Nicotiana cirrhoides* Miers			
59: *P. cumingiana* Remy (1849)	→ *Nicotiana* sp.			
60: *P. humifusa* Sprengel (1911)	→ *Nicotiana acaulis* Sprengel			
61: *P. mendozinensis* Gill. (1846)	→ *Nierembergia linifolia*			
62: *P. minima* (Phil.) Reiche (1910)	→ *Nicotiana minima*?			
63: *P. viscosa* Colla (1835)	→ *Nicotiana oulophylla* Dunal			
64: *P. viscosa* Miers (1826)	→ *Nicotiana acuminata* (Graham) Hooker			

1) Kinds of types and their existence
H: holotype exist
HS: holotype exist in S (Swedish Museum of Natural History, Stochholm)
HU: holotype exist in US (National Museum of Natural History, Smithsonian Institution, Washington)
h: holotype not exist
hb: holotype in B (Dahlem-Berlin) (destroyed)
S: syntype exist
SS: syntype exist in S
s: syntype not exist
sb: syntype in B (destroyed)
L: lectotype exist
n: any type not exist

2) Distribution: A:Argentina, B: Brazil, P: Paraguay, U:Uruguay, V: Bolivia.* :not occur.
/////:North, Central and South America, and West India

3),4), 5) The numbers in the column indicate the order of description in the article.
*: new species or new subspecies
**: new status
):described in one of the synonyms of the given species, also appeared in group E.
b: subspecies

5): Smith and Downs

treatment by Fries (1911), Wijsman and de Jong (1985) and Wijsman (1990) and more detailed explanation for the group, A-G, are given as follows;

Group A: The existence of this group consisted of 6 species was initially suggested by Smith and Downs (1966) who described *Petunia* species occurring in Santa Catarina, Brazil. Chromosome numbers of the 2 species (*P. axillaris* and *P. integrifolia*) and their subspecies were known as 2n=14[24]. Even though this group is including 4 more species with unknown chromosome numbers occurring in Santa Catarina, Brazil (*P. littoralis, P. reitzii, P. saxicola* and *P. scheideana*) [20], all members were supposed to have 2n=14 chromosomes by Wijsman and de Jong (1985).

According to the lectotype selected by Britton and Brown (1913), Wijsman and de Jong (1985) transfer-

red these 6 species to the genus *Stimoryne* as mentioned earlier.

Following the proposal by Wijnands *et al* (1986) and subsequent Committee's recommendation[3], these species in this group came back to the genus *Petunia*.

Group B: This group with 15 species was transferred to *Calibrachoa* by Wijsman (1990) in response to the recommendation of the Committee mentioned above.

Three species (*P. linoides, P. regnellii* and *P. hassleriana*) were also transferred to *Calibrachoa* without his inspection of specimens because Fries (1911) as well as Smith and Downs (1966) considered them to be closely related to *P. caesia* which had been inspected by him.

Wijsman and de Jong (1985) supposed their chromosome number as 2n=18. Only species in this group whose chromosome numbers were counted by them, however, were as follows; *P. calycina, P. linearis* and *P. parviflora*[24].

Group C: Species belonging to this group were also selected by Wijsman (1990) and tentatively left for the other taxonomists to assign them definitely either *Petunia* or *Calibrachoa*.

Group D: Eight species belonging to our group D were unfortunately ignored by Wijsman (1990) when he transferred selected species to *Calibrachoa* (group B) and left some for next reviewer (group C).

This group included 7 species, that is, 4 species which were also ignored by Fries (1911) (*P. lignescens, P. longiflora, P. longifolia* and *P. odorata*) and 3 species described later than his work (*P. exserta, P. felipponei, P. scabridula*).

Among the species described by Fries (1911), *Petunia variabilis* was also ignored by Wijsman (1990) and belonged to this group.

Group E: Names treated as synonyms by Fries (1911) and researchers after him were listed here.

Group F: Two specific names in this group were treated as obscure by Fries (1911).

Group G: Specific names excluded by Fries (1911) were listed here.

Descriptions of local species

All *Petunia* species are distributed in South America, like southern Brazil, Uruguay, northern Argentina, Paraguay and Bolivia except *P. parviflora,* which is extending northward up to North America[6].

Reported distribution areas of *Petunia* species in these countries were shown in Table 2 and 3.

1: Brazil

In Brazil, the first description of the local species of *Petunia* was done by Sendtner (1846) referring to the Sellow's specimens in B (Dahlem, Berlin) and 17 species including 9 new species were described by him. According to the subsequent reviewer[6], 4 duplications of species name were found. After excluding synonyms, it could be said that he described 13 Brazilian species known in his day (Table 2, 3).

The flora of Santa Catarina has been intensively studied by the staffs of Herbario "Barbosa Rodrigues" in Itajai, Santa Catarina. Their work was published as a large series of "Flora Ilustrada Catarinense". Among them, 17 species of *Petunia* were described by Smith and Downs (1966) including 6 species listed by Sendtner (1846) and 9 species defined by themselves (Table 2, 3).

As shown in Table 2, at least 36 species could be assumed to occur in Brazil and the numbers of the species in respective states according to several Brazilian enumerations are as follows; 4 species in Sao Paulo, 16 in Parana, 16 in Santa Catarina and 16 in Rio Grande do Sul.

Distribution of *Petunia intermedia* was reported in Brazil by Sendtner (1846), which was combined to *P. linearis* by Fries (1911). This species, however, was not found in any subsequent enumerations of Brazilian species (Table 3).

2: Argentina

In Argentina, 5 species were listed by Piccinini (1978), but 2 synonyms of *P. axillaris* (*P. nyctaginiflora* and *P. propinqua*) were included in his list (Table 3).

As shown in Table 3, 2 species were reported to occur in Buenos Aires[5]. In Entre Rios, 7 species were described with figures[4].

Fries (1911) described 3 more species in northeastern Argentina (*P. calycina, P. hassleriana* and *P. helianthemoides*).

Accordingly, at least 10 species are assumed to occur in Argentina.

3: Uruguay

As shown in Table 3, 9 species were enumerated in

Table 3 Supposed distribution of *Petunia* species in respective states in Bazil, Argentina and Uruguay

	Brazil						Argentina			Uruguay	
Species	Sendtner	S. & D.[1]	Angely	Angely	Angely	Stehmann	Piccinini	C. & Z.[2]	Cabrera	Morton	Lombardo
(*P. Petunia. C: Calibrachoa*)	(1846)	(1964,1966)	(1965)	(1970)	(1977)	(1985)	(1978)	(1978)	(1979)	(1944)	(1983)
Group A											
01: *P. axillaris*	B)			SP)		RG	A,A),A)		ER	U	MV
01-1: subsp. *parodii*								BA			
02: *P. integrifolia*	B)	SC	PR)	SP)	PR	RG			ER	U)	
02-1: subsp. *inflata*			PR)				A)				
02-2: subsp. *occidentalis*											
02-3: var. *depauperata*		SCb * *			PRb						
03: *P. littoralis*		SC *									
04: *P. reitzii*		SC *									
05: *P. saxicola*		SC *									
06: *P. scheideana*		SC *			PR						
Group B											
07: *C. caesia*	B *	SC			PR	RG					
08: *C. calycina*	B *		PR		PR	RG					
09: *C. ericaefolia*		SC	PR		PR						
10: *C. excellens*											
11: *C. hassleriana*											
12: *C. heterophylla*	B *	SC			PR	RG			ER		
13: C. linearis	B)								ER		
14: *C. linoides*	B *	SC		SP	PR	RG					
15: *C. macrodactylon*		SC *									
16: *C. paranensis*			PR		PR	RG					
17: *C. parviflora*	B					RG	A	BA	ER	U	MV
18: *C. pygmaea*						RG			ER	U	
19: *C. regnellii*											
20: *C. rupestris*			PR		PR	RG					
21: *C. sellowiana*	B *	SC			PR	RG					
Group C											
22: *P. alpicola*		SC *									
23: *P. dusenii*			PR		PR						
24: *P. helianthemoides*	B *					RG					
25: *P. humilis*										U	
26: *P. kleinii*		SC *	PR		PR						
27: *P. ledifolia*	B *		PR		PR	RG					
28: *P. micrantha*			PR		PR						
29: *P. pubescens*	B)					RG				U	
30: *P. sendtneriana*		SC									
31: *P. serrulata*		SC *									
32: *P. spathulata*		SC *	PR		PR						
33: *P. thymifolia*	B * *		PR		PR	RG			ER	U	
Group D											
34: *P. exserta*											
35: *P. felipponei*										U	
36: *P. lignescens*				SP							
37: *P. longiflora*											
38: *P. longifolia*											
39: *P. odorata*											
40: *P. scabridula*										U *	
41: *P. variabilis*						RG					

1) Smith and Downs,　2) Cabrera and Zardini
B: Brazil,　SC: Santa Catarina,　PR: Parana,　SP: Sao Paulo,　RG: Rio Grande do Sul
A: Argentina,　BA: Buenos Aires,　ER: Entre Rios
U: Uruguay,　MV: Montevideo
*: new species,　**: new status,　b: subspecies or variety,　): described in one of the synonyms of the given species.

Uruguay[13] and among them 2 species were reported to occur in Montevideo[11].

Petunia linearis (Hooker) Paxton was collected by James Baird near the Rio Negro, Uruguay, which was initially described as *Salpiglossis linearis* by Hooker (1831). This species, however, could not be found in these enumerations mentioned above.

Petunia longiflora Rafin was also collected from Montevideo, Uruguay. This name was neither referred by Fries (1911) nor any following reports.

4 : Paraguay and Bolivia

In Paraguay and Bolivia, we could not obtain any papers describing local species of *Petunia.* In Paraguay, however, 3 species (*P. integrifolia* subsp. *inflata, P. hassleriana* and *P. ledifolia*) were reported in given literature[6]. In Bolivia, only 2 species (*P. axillaris* subsp. *parodii* and *P. integrifolia* subsp. *occidentalis*) were recorded as shown in Table 2[6].

Available type specimens of Petunia species

Eleven important Sellow's holotype and syntype specimens in B (Dahlem, Berlin) which are indicated as "hb" or "sb" in Table 2 were destroyed during The Second World War[23].

Any type specimen did not exist for one of the most important species from the horticultural point of view, that is *P. integrifolia* and the figure illustrated by Hooker (1831) should serve as the type[23]. In addition, some species described in the earlier time also lack type specimens, like of *P. linearis, P. pubescens* and *P. thymifolia* (Table 2).

At this moment, Swedish Museum of Natural History, Stockholm (S) whose specimens are indicated as "HS" or "SS" in Table 2 (8 species) and National Museum of Natural History, Smithsonian Institution, Washington D.C. (US) whose specimens are indicated as HU or SU (9 specimens) could play the most important roles in identification of *Petunia* species.

Invalid treatments

Petunia violacea subsp. *depauperata* Fries was combined into *Petunia integrifolia* var. *depauperata* (group A) by Smith and Downs (1966), but their combination was regarded as invalid because of no description.

Petunia longifolia Rojas (group D) from Corrientes, Argentina was described in Spanish and so invalid.

Calibrachoa sellowiana (Sendtn.) Wijsman was considered as invalid because the original name was *Petunia selloviana* Sendtner, even though Fries (1911) described it as *Petunia sellowiana* Sendtn..

Estimation of total number of Petunia and Calibrachoa species

Even though in 1966 Smith and Downs and in 1977 Angely combined *P. excellens* Fries and *P. regnellii* Fries into *P. linoides* Sendtner, Wijsman (1990) regarded them as separate species in a different genus, namely *Calibrachoa.* In this way, further consideration should be obviously required before estimation of specific number in *Petunia* and *Calibrachoa.* If the former treatments are accepted, number of species in group B will be reduced to 13.

DISCUSSION

In considering the present state of *Petunia* systematics, live materials will be necessary for further studies because separation of *Calibrachoa* species from the genus *Petunia* will require investigations on the chromosome and arrangement of corolla.

Even for the investigation using specimens in herbarium, one may encounter with many problems to identify the given species because the important type specimens in Dahlem, Berlin were destroyed (Table 2). Establishment of neotypes for these lost specimens and for several species described in earlier period will be required for the genus *Petunia.*

In this paper, we could estimate some 40 species in the genus *Petunia* in a broad sense, that is including

Calibrachoa. This estimation of species number means that about 15 ambiguous species of *Petunia* or *Calibrachoa* are waiting for the further inspection because the latest reviewer, Fries (1911) described only 25 valid species (Table 2) and the remainders were added after his day in each country independently without precise, reciprocal examinations of specimens.

Careful inspection of specimens beyond the national boundary will often reduce the number of valid species. In the genus *Petunia*, however, the possibility of increasing the number of species in the future could not be denied because some areas are still remaining without extensive study on the natural resources except Santa Catarina, Brazil from where 9 new species of *Petunia* were found quite recently[19, 20].

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Petunia Jussieu 属（ナス科）に於ける系統学の歴史的背景及び現状

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摘要

Petunia 属の今後の研究に資する為，*Calibrachoa* 属を含めた広義の *Petunia* 属を記載した文献，71編を集め，最新の記載に従って配列し解析した．

文献には，64種類の種名が認められ，それらは Fries (1911)，Wijsman and de Jong (1985) および Wijsman (1990) に従って7グループに類別できた．そのうち，およそ40種類の種名は，採用可能なものであったが，いずれも今後の検討を必要とした．いくつかの種名に対しては，手続き上の誤りが認められた．

ブラジル，ウルグアイ，アルゼンチン，パラグアイ及びボリビアに於ける *Petunia* の分布がまとめられ，各国，各州に分布する種数が推定された．

それぞれの種に対して，タイプ標本の種類とその存否が検討された．