

THE GENUS *MANISURIS* L. (POACEAE) IN INDIA

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ABSTRACT

The genus *Manisuris* L. belongs to the subtribe Rottboellinae, tribe Andropogoneae of the subfamily Panicoideae. The genus *Manisuris* L. is represented in India by nine species and three varieties. The description of the genus *Manisuris* L. and a key to all the twelve taxa is given.

The structure formed by the fusion of the internode of the rhachis (*i.e.* joint) and the pedicel of pedicelled spikelet is a very useful character and a key to the Indian species based only on this character has been provided. Critical notes on nomenclature and identity are given.

A detailed description of *M. forficulata* Fischer emend. Jain has been given. Two new combinations have been made, *viz.* *M. acuminata* (Hack.) O. Kuntze var. *stocksii* (Hook. f.) Jain and *M. divergens* (Hack.) O. Kuntze var. *hirsuta* (Fischer) Jain.

All the taxa of the genus found in India are endemic to India. It has been suggested that the genus *Manisuris* L. might have originated in peninsular India.

Diagnostic characters such as the lower glume of the sessile spikelet and the joints and pedicels of all the twelve taxa are illustrated by line drawings.

INTRODUCTION

There has been some confusion regarding the limits of the genus *Manisuris* L. and its related genera of subtribe Rottboellinae (tribe Andropogoneae, subfamily Panicoideae) in Indian floras. Much of the confusion has resulted from frequent transfers of species from one genus to another. For example, it will be seen that almost all the species now included by Bor (1960) under *Elyonurus* Humb. et Bonpl. ex Willd., *Coelorhachis* Brongn., *Hemarthria* R. Br., *Heteropholis* Hubb., *Mnesithea* Kunth and *Manisuris* L. were at one time or the other, assigned to the genera *Rottboellia* L. f. and/or *Peltophorus* Desv. Species now treated under *Hackelochloa* O. Kuntze have, till recent, been treated by most authors under the genera *Manisuris* L. f. (Nov. Gram. Gen. 21, 1779) and *Manisuris* P. Beauv. (Essai Agrost. 119, 1812) which are later homonyms of *Manisuris* L. (Mant. Pl. Alt. 164, 1771).

***Manisuris* L.** Mant. Pl. Alt. 164, 1771.

Annual or perennial slender grasses. Culms usually much-branched. Leaves linear. Inflorescence of spike-like, spathe-supported, compressed racemes, which terminate the culms and their branches. Spikelets in pairs, different in sex and shape; the internodes of the rhachis (here referred as joints) fused with the adjacent pedicels to form rather stout internodes, convex on the back, hollowed out on the inner face for the reception of the sessile spikelet. Owing to this fusion of a joint and

pedicel, the spikelets seemingly in opposite pairs on each node; a pair formed of one sessile spikelet of that node and one pedicelled spikelet of next lower node. Rhachis more or less fragile, disarticulation at right angles to the rhachis, tips of internodes truncate or oblique, with concavities corresponding to the next upper sessile and adjacent pedicelled spikelet. Sessile spikelets dorsally compressed. Florets 2, lower male or neuter, palea present or not; upper hermaphrodite, awnless. Glumes equal, or the upper shorter; lower coriaceous, transversely rugose or muricate; conspicuously winged from the keels, upper membranous, immersed in the cavity formed by the joint and pedicel, usually 3-nerved, keeled (often obscurely). Lemmas hyaline, nerveless or 2-nerved. Lodicules 2, cuneate. Stamens 3; stigmas linear. Grains oblong, embryo equalling the grain. Pedicelled spikelets male or neuter. Lower glume coriaceous, smooth, asymmetrically or unilaterally winged, upper variously winged from keel. Florets as in sessile, but male or barren.

Etymology: *Manisuris* is derived from MANIS, a scaly lizard and OURA a tail, in allusion to the appearance of the racemes.

Type species: *Manisuris myuros* L.

Type locality: India.

Chase and Niles (1962) have listed 28 species and 5 varieties; several of these taxa are now treated under other genera. Recently 3 more species of the genus *Manisuris* have been added from India. One variety is being reinstated here. The genus is re-

presented in several parts of the world ; it is more common in tropics.

Critical note : The genus is distinguished from its related genera by the lower glume of the sessile spikelet being winged and usually variously sculptured or foveolate, and internodes of the rhachis (joints) and pedicels of the adjacent pedicelled spikelets being fused to form a variously shaped, usually stout structure.

The shape, size, ornamentation and awns of the lower glume of sessile spikelet have generally been used to distinguish the Indian taxa of the genus. Whereas these are usually reliable and helpful characters, variations are sometimes seen. For example, the ridges on the back of the glume in *M. forficulata* Fischer and *M. talbotii* (Hook. f.) Bor are very variable ; spikelets with fewer ridges, incomplete ridges or completely devoid of any ridges on back are sometimes seen along with ridged ones in the racemes of both these grasses. Particularly, the lowest one or few spikelets in a raceme are often without ridges on lower glumes. The character of direction of the ridges, i.e. whether they point and overlap upwards (towards the tip of the glume) or downwards, has been used by some authors. This again is often a variable character. The ridges in *M. acuminata* (Hack.) O. Kuntze are ordinarily horizontal or pointing and overlapping downwards, but one or two upper ridges pointing upwards can be seen in many specimens. In *M. goensis* Rolla Rao et Hemadri the tips of the otherwise-downward-pointing ridges sometimes bend and point upwards.

One group of species in the genus is characterised by only one awn in the lower glume of sessile spikelet ; spikelets with this single awn becoming bifid are sometimes seen mixed with normal spikelets. The size of awn also sometimes varies.

A combination of the different characters (size, ornamentation, awn) of the lower glumes of sessile spikelets, however, makes separation of all the taxa of the genus quite easy.

The structure formed by the fusion of joint with the pedicel has been found to be a very useful character in distinguishing the Indian species of this genus, so much so that it has been possible to draw a dichotomous key to the Indian species only on the basis of the shape and size of this structure.

As mentioned earlier, fusion of the joint with the pedicel is a character so far found to be constant within the genus. But, in *M. clarkei* (Hack.)

Bor, the pedicel is not fused with the joint ; and in this respect the transfer of the species from *Coelorhachis* to *Manisuris* is rather anomalous. This matter is, however, not taken up in further detail here. It would be necessary to make an examination of more material and to have a better understanding of *Coelorhachis* and its allied genera, before disturbing the present position.

SPECIES IN INDIA

Hooker (1896) treated the species of this genus under *Rottboellia* L. f. ; and the five species, numbers 6 to 11, given by Hooker, are all retained by Bor (1960). The variety *Rottboellia acuminata* Hack. var. *stocksii* Hooker described by Hooker (l.c. p. 155) has not been retained by Bor. But, another variety, namely var. *woodrowii* Bor has been added by him. In the latter part of the book, Bor has included another less known and rare species, namely *M. divergens* (Hack.) O. Kuntze. Fischer (1933) had described a new variety of *M. forficulata* Fischer, namely var. *hirsuta* Fischer. Bor has retained this variety ; and thus, Bor has reported six species and two varieties of the genus *Manisuris* L. in India.

Recently, three more species of the genus have been described from peninsular India (Jain and Deshpande 1968, Jain and Hemadri 1968, Rolla Rao and Hemadri 1968).

The material of the genus from all the major herbaria of India has been examined. The type material of most of the Indian species and varieties of the genus is available in Calcutta herbarium, and has been examined.

This scrutiny has led to :

1. a better understanding of the distinguishing characters of the various taxa ;
2. fuller appreciation of taxonomic value of the joint of the rhachis and its adjacent pedicel ;
3. emendment of the description of *M. forficulata* Fischer ;
4. reinstatement of the variety *Rottboellia acuminata* var. *stocksii* Hooker and the resulting new combination *Manisuris acuminata* var. *stocksii* (Hooker) Jain ;
5. transference of the variety *M. forficulata* Fischer var. *hirsuta* Fischer to *M. divergens*, and the resulting new combination *M. divergens* var. *hirsuta* (Fischer) Jain ; and
6. proper understanding of the range and appreciation of endemism of various taxa in India.

The genus is now believed to comprise nine species and three varieties in India. Two dichotomous keys to the Indian species of the genus are provided, one is based primarily on the lower glume of the sessile spikelet; the other only on the character of joint and pedicel.

Thereafter, the species and the varieties are dealt one by one; they are arranged in alphabetical order. Detailed descriptions of the taxa have been excluded, except in case of *M. forficulata* Fischer emend. Jain. Critical notes on nomenclature or identity are added.

The specimens examined during this study are listed. The herbaria, where this material is deposited are indicated; for this, the abbreviations approved by the International Association of Plant Taxonomists have been employed.

KEY TO THE INDIAN SPECIES AND VARIETIES OF *MANISURIS* L.

Note: This key is based mainly on the characters of lower glume of sessile spikelet; and the word glume here, unless otherwise specified, refers to the lower glume of sessile spikelet; its sizes exclude the awn, but include the wings.

- A. Lower glume of sessile spikelet not awned, devoid of tubercles or hooks; transversely grooved or not:
 - B. Glume umbonate, ovate, winged on both sides but mainly above the middle only, joints and pedicels free ... 2. *M. clarkei*
 - BB. Glume oblong, with a deep transverse groove, winged on both sides above as well as below the groove, joint and pedicel fused ... 7. *M. myuros*
 - AA. Lower glume with 1 or 2 awns; if awn reduced, the glume with tubercles or ridges:
 - C. Glume flat on back, devoid of tubercles or depressions, densely ciliate; joints and pedicels densely ciliate, fused to form a high-heeled-boot like structure ... 8. *M. santapau*
 - CC. Glume foveolate or marked with tubercles or hooks on margins and back (sometimes devoid of tubercles in *M. talbotii*, but then with characteristic turbinate joint), joints and pedicels glabrous or pubescent:
 - D. Glume with 2 divergent awns:
 - E. Glume (excluding the awn, but including the wings and tubercles) almost orbicular; joint and pedicels unequal, without tuft of hairs ... 6. *M. mysorensis*
 - EE. Glume oblong or obovate, oblanceolate, longer than broad, joints and pedicels equal, having tufts of hairs at the tips:

F. Glume 5-8 mm long, awns also 5-8 mm long; marginal tubercles conspicuous, back of the glume with tubercles or ridges, rarely smooth 4. *M. forficulata*

FF. Glume 5 mm long or less, awns about 3 mm long or less, marginal tubercles not conspicuous, back of the glume pitted or faintly ridged:

G. Glume about 2.5 mm long, glabrous or puberulous, joints and pedicels 1.5 mm long 3.1. *M. divergens*

GG. Glume 4-4.5 mm long (sometimes longer), densely white hirsute, joints and pedicels 2.5 mm long, hirsute ... 3.2. *M. divergens* var. *hirsuta*

DD. Glume with one well-developed awn (rarely bifid at tip) or the awn reduced to a mucro; back of the glume with transverse ridges or tubercles and hooks, rarely devoid of them:

H. Glume with several vertical furrows, and 3-4 transverse ridges, ridges pointing downwards or upwards. Joints and pedicels fused to form a clavate structure, 2-3.5 mm long, slightly tumid at both ends:

I. Pedicelled spikelet 4.5-5 mm long, its lower glume long awned ... 1.2. *M. acuminata* var. *stocksii*

II. Pedicelled spikelet 3-4 mm long blunt or shortly aristate:

J. Sessile spikelet including the awn upto about 8-10 mm long; its lower glume long awned ... 1.1. *M. acuminata* var. *acuminata*

JJ. Sessile spikelet including the awn about 5 mm long, its lower glume short awned or awnless ... 1.3. *M. acuminata* var. *woodrowii*

HH. Glume without vertical furrows; ridges usually only 2, stout and complete from one margin to another, sometimes incomplete or absent:

K. Ridges of the glume pointing and overlapping upwards, joints stout turbinate, about 2 mm long

- and broad or broader ... 9. *M. talbotii*
 KK. Ridges pointing and overlapping downward, joint and pedicels about 4 mm long, fused to form a rather dumb-bell-shaped structure, tumid below ... 5. *M. goaensis*

KEY TO THE INDIAN SPECIES OF *MANISURIS* L.
 BASED ON THE CHARACTERS OF JOINT AND PEDICEL

- A. Joint and pedicel free; joint shorter than pedicel; joint only about 1 mm long, pedicel 1.5-1.75 mm long ... 2. *M. clarkei*
 AA. Joint and pedicel fused; joint equal to or longer than pedicel:
 B. Joint and pedicel 4-4.5 mm long, tumid below ... 5. *M. goaensis*
 BB. Joint and pedicel less than 3.5 mm long:
 C. Joint and pedicel about 1.5-2 mm long:
 D. Joint turbinate, even broader than long ... 9. *M. talbotii*
 DD. Joint clavate, longer than broad ... 3. *M. divergens* var. *divergens*
 CC. Joint and pedicel 2 to 3.5 mm long:
 E. Joint and pedicel glabrous:
 F. Joint and pedicel unequal, joint 2.5 mm, pedicel 1.5 mm long ... 6. *M. mysorensis*
 FF. Joint and pedicel almost equal:
 G. Joint broadest at tip or middle, narrowed to base 7. *M. myuros*
 GG. Joint dumb-bell-shaped, narrowed in middle, slightly tumid at top and base ... 1. *M. acuminata*
 EE. Joint and pedicel hairy or hirsute or with a tuft of cilia:
 H. Joints and pedicels densely hirsute or ciliate:
 I. Joints and pedicels forming a long high-heeled-boot like structure, long ciliate ... 8. *M. santapaui*
 II. Joint and pedicels white hirsute ... 3.2. *M. divergens* var. *hirsuta*
 HH. Joints and pedicels with a tuft of hairs on tip, slightly tumid above ... 4. *M. forficulata*

1. *Manisuris acuminata* (Hack.) O. Kuntze, Rev. Gen. Pl. 2: 779, 1891; Fischer in Fl. Madras 1761, 1934; Bor, Grass. Bur. Cey. Ind. & Pak. 191, 1960. *Rottboellia acuminata* Hack. in DC. Monogr. Phan. 6: 291, 1889; Hook. Fl. Brit. Ind. 7: 155, 1896; Lisboa, Bomb. Grass. 56, 1896; Cooke, Fl. Bomb. 953, 1908.

Peltophorus acuminatus (Hack.) A. Camus, Blatter & McCann, Bomb. Grass. 34, 1935.

Etymology: The specific name refers to the acuminate, awned tip of lower glume of sessile spikelet.

Description: Annual. Culms 7-30 cm high. Leaves flaccid, up to 20 cm long, usually shorter. Racemes 2-5 cm long. Sessile spikelet about 8-10 mm long, including the awn, lower glume ovate acuminate, coriaceous below, with several vertical furrows and 3 to 6 conspicuous transverse ridges (like pleats) which are more or less horizontal or pointing upwards or downwards, rarely devoid of these, glume winged in upper half, long awned, awn 1, rarely bifid. Pedicelled spikelet: lower glume flat, not tubercled, winged on one margin, unawned; upper glume boat-shaped, keel narrowly winged in upper half.

1.1. *Manisuris acuminata* var. *acuminata*

Specimens examined: MYSORE: North Kanara, Karwar, 29 Aug. 1885—Talbot 1291 (CAL, DD); Karwar, 10 Nov. 1894—Talbot 3171 (BLAT, CAL, DD); Hattikeri, Oct. 1919—Sedgwick and Bell 6556 (CAL); Mysore and Carnatic—Thomson s.n. type (CAL); Castle Rock, 28 Oct. 1957—A. Mehta 428 (DD). GOA: near Chimbali, 9 Nov. 1963—Rolla Rao 92890 (BSI).

Distribution: So far endemic to Western Ghats and western coast of peninsular India.

Illustration: Fig. 8, based on Thomson's type collection.

1.2. *Manisuris acuminata* (Hack.) O. Kuntze var. *stocksii* (Hooker f.) Jain comb. nov. Basionym: *Rottboellia acuminata* Hack. var. *stocksii* Hook. f. Fl. Brit. Ind. 7: 155, 1896.

Etymology: Named in honour of John Ellerton Stocks, a doctor-botanist who made collections in Sind and Baluchistan in nineteenth century.

Description: Hooker (1896) gave the following description of this variety: "Diffusely branched from the root, glume I of pedicelled spikelet 1/5 in., subulate-lanceolate erect or recurved, narrowed into a slender scaberulous awn, not or obscurely winged—Malwar, Stocks—The long glumes of the pedicelled spikelets give this variety a very different appearance, but intermediates occur, and the specimens are mixed with those of *R. acuminata* proper".

Bor (1960) did not recognise this variety, but due to the larger size of pedicelled spikelets and their

spreading or recurved awned lower glumes, the grass looks very distinct from var. *acuminata*. It is, therefore retained as a distinct taxon.

Specimens examined: Mysore and Carnatic—Thomson s.n. (CAL).

Distribution: So far endemic in peninsular India.

Illustration: Fig. 12, based on Thomson's specimen.

1.3. *Manisuris acuminata* (Hack.) O. Kuntze var. *woodrowii* Bor, Grass. Bur. Ceyl. Ind. & Pak. 191, 1960.

Etymology: The grass is named in honour of George Marshall Woodrow, who made collections in Western India and was Director of Botanical Survey at Poona in end of nineteenth century.

Critical note: The lower glume of sessile spikelets is unawned or shortly awned. Though different intermediate stages of length of the arista or awn are seen, yet the total length of the sessile spikelet, including the arista helps in distinguishing it from var. *acuminata*. The sessile spikelets, including the arista, are about 5 mm long in var. *woodrowii*. They are much longer (8-10 mm) in var. *acuminata*.

Specimens examined: MYSORE: Castle Rock, alt. 600 m, Oct. 1908—Meebold 10595 (CAL), Castle Rock, 20 Oct. 1909—Bhide s.n. (BLAT, BSI). GOA: Marmagao coast, 15 Oct. 1891—Talbot 2559 (BSI, CAL); Marmagao, Sept. 1919—Hallberg & McCann A 77 (BLAT); Marmagao No. 27—s.l. (CAL); Vascodegama, Sept. 1909—Bhide s.n. (BSI); Vascodegama, Sept. 1909—s.l. 9483 (BLAT).

Distribution: So far endemic on West Coast of peninsular India.

Illustration: Fig. 4, based on Bhide's specimen.

2. *Manisuris clarkei* (Hack.) Bor apud Santapau, Fl. Khandala. Rec. bot. Surv. India 16(1): 357, 1953; Bor, 191, 1960.

Rottboellia clarkei Hack. in Ost. Bot. Z. 41: 8. 1891; Hook. f. Fl. Brit. Ind. 7: 156, 1896; Lisboa, Grass. Bomb. 58, 1896; Prain, Beng. Pl. 1192, 1903; Cooke, Fl. Bomb. 954, 1908.

Coelorhachis clarkei (Hack.) Blatter & McCann in J. Bomb. nat. Hist. Soc. 32, 33, 1927; Blatter & McCann, Bomb. Grass. 41, 1935; Mooney, Suppl. Bot. Bih. & Ori. 193, 1950.

Etymology: The specific name is given in honour of Charles Baron Clarke, a mathematician-botanist

of late nineteenth century who made collections in several parts of India and was also for some time, Superintendent of the Botanical Garden at Calcutta.

Description: Annual. Culms 15-60 cm (even up to 1 m) long, much-branched. Leaves up to 25 cm long and 1.5 cm broad, linear. Racemes 1.5-5 cm long. Sessile spikelets 2.5-3 mm long, unawned, lower glume slightly gibbous below, winged mainly in the upper half, or a narrow wing passing to the base of the margins. Pedicels not fused with joints of rhachis. Pedicelled spikelet similar to sessile, but smaller and less gibbous, often much reduced.

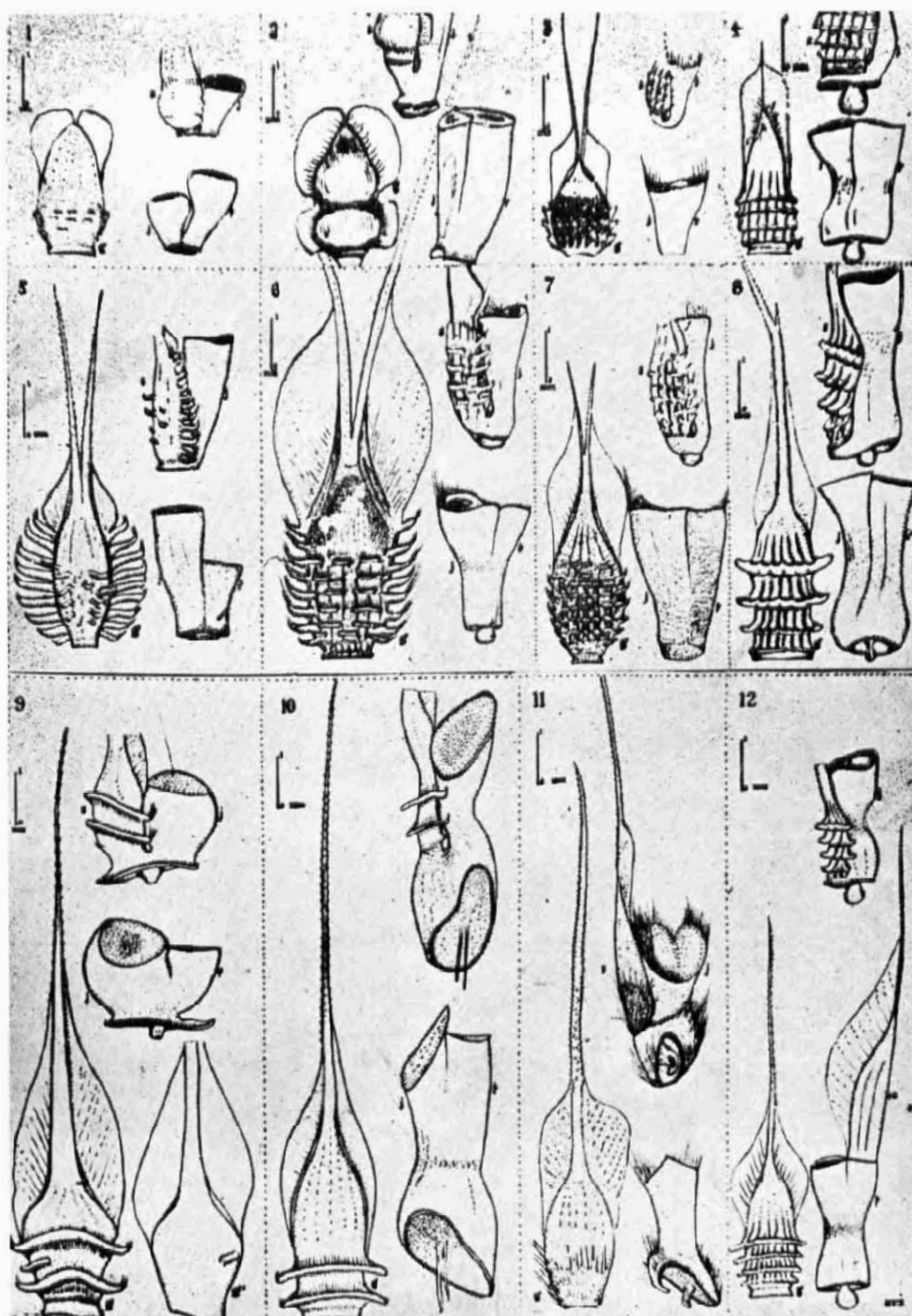
Critical note: The taxonomic position of this species is rather uncertain. The anomaly in its inclusion in the genus *Manisuris* L. has been indicated above. The range of the grass is also different from most other taxa of the genus in India.

Specimens examined: GUJERAT: Dangs, Waghai, 22 Oct. 1955—Santapau 19969 (BLAT); Waghai, 16 Nov. 1955—R. Fernandez 2240 (BLAT); Bhavandgarh, 22 Nov. 1959—Wadhwa 60622 (BSI). MAHARASHTRA: Bombay, Kalsubai hills, 13 Oct. 1907—E. B. 1117 (BSI); Khandala, Oct. 1918—McCann 9410 (BLAT); Bombay, Mumbra, 8 Oct. 1954—Shenoy 4634 (BLAT). MADHYA PRADESH: Bastar, Keskul, alt. 667 m, 16 Nov. 1958—Subramanyam 7101 (MH); Kabirchabutra 1000 m, 27 Oct. 1960—Maheshwari, 4241 (CAL). ORISSA: Jashpur, Kardhana alt. 900 m, Sept. 1941—Mooney 1825 (DD). BIHAR: Parasnath, alt. 600 m, 1 Oct. 1873—Clarke 21075 C type (CAL); Ramgarh, Hazaribagh, 600 m, 27 Nov. 1874—Clarke 24995 B (CAL). MYSORE: North Kanara, 20 Nov. 1889—Talbot 2072 (BLAT); North Kanara, 28 Dec. 1955—Bole 1498 (BLAT); North Kanara, 20 Nov. 1892—Talbot 2820 (BLAT, BSI); North Kanara, Sept. 1939—Kaikini s.n. (DD 82379); North Kanara, Borchy, 26 Nov. 1892—Talbot 2072 (CAL); Halyal, 10 Nov. 1889—Talbot 2072 (CAL); Castle Rock, 25 Oct. 1902—Gammie 15669 (BLAT, BSI); Jugglebet, 15 Nov. 1883—Talbot 1566 (BSI).

Distribution: Peninsular India, extending northwards only up to Gujarat, Madhya Pradesh and Bihar.

Illustration: Fig. 1, based on Clarke's type material.

3. *Manisuris divergens* (Hack.) O. Kuntze, Rev. Gen. Pl. 2: 779, 1891; Bor, Grass. Bur. Ceyl. Ind. & Pak. 701, 1960; Jain, Bull. bot. Surv. India 9: 293, 1967.



Figs. 1-12: 1. *Manisuris clarkii* (Hook. f.) Bor. 2. *M. myuros* L. 3. *M. divergens* (Hack.) Kuntze. 4. *M. acuminata* (Hack.) Kuntze var. *woodrowii* Bor. 5. *M. mysorensis* Jain et Hemadri. 6. *M. forficulata* Fischer emend. Jain. 7. *M. divergens* (Hack.) O. Kuntze var. *hirsuta* (Fischer) Jain. 8. *M. acuminata* (Hack.) Kuntze var. *acuminata*. 9. *M. talbotii* (Hook. f.) Bor. 10. *M. goensis* Rolla Rao et Hemadri. 11. *M. santapau* Jain et Deshpande. 12. *M. acuminata* (Hack.) Kuntze var. *stocksii* (Hook. f.) Jain.

g, g': Lower glume of sessile spikelet, dorsal view; j: joint i.e. internode of the rachis of raceme; p: pedicel of the pedicelled spikelet (the joint and pedicel are mostly fused, so these letters indicate the portion of the fused structure representing joint or pedicel); ps: pedicelled spikelet seen in profile; s: sessile spikelet seen in profile.

Rottboellia divergens Hack. in DC. Monog. Phan. 6: 292, 1889, non auct. plur.

Etymology: The specific name refers to divergent awns of the lower glume of sessile spikelet.

Critical note: The grass described under the name *Rottboellia divergens* by Hooker (1896), Lisboa (1896) and Cooke (1908) and under *Peltophorus divergens* by Blatter & McCann (1935) is not *R. divergens* Hack. at all. Fischer (1933) detected this error and gave a new name *Manisuris forficulata* Fischer to the grass referred by Hooker, Cooke etc. Fischer, however, made a new error; he included two distinct grasses under his *M. forficulata*. This matter is discussed in detail under *M. forficulata* Fischer emend. Jain.

Uptil few years ago, the only known material of this grass (i.e. true *R. divergens* Hack.) was its type specimen collected by Huegel and deposited in the Vienna herbarium. It appears that the grass had never been collected since then. The original description of Hackel was based on Huegel's specimen, which is rather poor. Only recently, the grass has been collected from Mercara in Mysore State, in peninsular India.* A detailed description and illustration have therefore been separately provided by Jain (1967).

3.1. *Manisuris divergens* (Hack.) O. Kuntze var. *divergens*

Specimens examined: MYSORE: Mercara, on way to Abbi Falls, 20 Oct. 1963—A. S. Rao 94909 (BSI, CAL).

Distribution: So far endemic in peninsular India.

Illustration: Fig. 3, based on A. S. Rao's specimen.

3.2. *Manisuris divergens* (Hack.) O. Kuntze var. *hirsuta* (Fischer) Jain comb. nov.

Basionym: *Manisuris forficulata* Fischer var. *hirsuta* Fischer, Kew Bull. 1933, 357, 1933.

Etymology: The name of the taxon refers to the hirsute nature of lower glumes of sessile spikelet and of joints of rhachis.

Description: Fischer gave the following description for the variety:

"A typo nodis, pedicellis glumisque inferioribus generaliter dense hirsutis, spicularum sessilium

glumarum inferiorum spinulis minoribus plus minusve indumento celatis, aristis curtioribus interdum glumis minoribus, spicularum pedicellatarum glumis superioribus, cuspidatis, haud aristatis, ala cuspidis apicem superante differt."

The lower glume of this variety is illustrated by Fischer in drawing No. 6, Fig. No. 6 (loc. cit.).

The type of this variety, namely Meebold 10559, has been examined. The size of the grass, size of spikelets, the ornamentation on the lower glume of sessile spikelet distinctly show that it is more close to *M. divergens* (Hack.) O. Kuntze.

The distribution of the variety also corresponds more with *M. divergens*.

Specimens examined: MYSORE: Bababudan hills at Kalhatti, 1800 m. Oct. 1908—Meebold 10559, type (CAL).

Distribution: So far endemic in Mysore in peninsular India.

Illustration: Fig. 7, based on Meebold's type specimen.

4. *Manisuris forficulata* Fischer in Kew Bull. 1933, 353, 1933. emend. Jain. Fischer in Fl. Mad. 1761, 1934 proparte; Bor, Grass. Bur. Ceyl. Ind. & Pak. 192, 1960 proparte.

Rottboellia divergens auct. plur. non Hack., Hook. f. Fl. Brit. Ind. 7: 155, 1896, proparte; Lisboa, Bomb. Grass. 57, 1896, proparte; Cooke, Fl. Bomb. 953, 1908, proparte.

Peltophorus divergens of Blatter & McCann, Bomb. Grass. 34, 1935 proparte.

Etymology: Forfex: A pair of shears or scissors. The name refers to the structure of lower glume of sessile spikelet which looks like a pair of shears.

Critical note: Fischer (1933) discovered that the grass referred in Indian floras as *Rottboellia divergens* Hack. or *Peltophorus divergens* (Hack.) Camus had throughout been wrongly identified; it was not that species, but a different grass, and needed a new name. He named it *Manisuris forficulata* Fischer. Whereas one error was rectified, unfortunately another crept in. Fischer's description of *Manisuris forficulata* was based on a mixture of two distinct grasses. This is evident also from the illustration (2-5, Fig. 6) provided with the description of the species, where only drawing No. 5 illustrates actual *M. forficulata*; nos. 2, 3 and 4 illustrate another taxon (described elsewhere as

*Dr. K. Hemadri found a specimen of this grass mixed with *Arthraxon villosus* Fischer, collected from Bababudan hills, also in Mysore.

M. mysorensis sp. nov.)*. Much of the type material cited by Fischer is available here (CAL) and has been examined. Dr. C. E. Hubbard has kindly examined for me the holotype† and some paratypes deposited in Kew Herbarium and supplied necessary information.

Whereas the material mounted on the holotype belongs only to one taxon, namely, true *M. forficulata* Fischer, the paratypes are a mixture of two grasses. The diagnostic characters mentioned by Fischer in the original description of *M. forficulata* agree with the holotype, but the full description given by him does not satisfactorily agree with that grass; it has been based on the mixture of material of both the taxa; the measurements of the various glumes, etc. distinctly show this. The characters distinguishing *M. forficulata* from the other grass in this mixture are tabulated later in this paper.

Bor (1960) has cited two specimens, Meebold 12221 (misprint 13331) and Meebold 10558 for *M. forficulata* Fischer. Whereas the former specimen does belong to this species, the latter does not. However the illustration (drawing no. 6, in Fig. 10 on p. 193) provided by Bor is correct for *M. forficulata* Fischer.

It is considered necessary to provide an emended description of *M. forficulata* Fischer.

Manisuris forficulata Fischer emend. Jain

Annual tufted grass, up to about 20 cm high (usually 10-15 cm, rarely up to 30 cm). *Culms* erect or ascending, villous or glabrescent, slender, sparingly branched, terminating in solitary racemes, nodes 2-3, glabrous, slightly constricted. *Leaf sheaths* compressed, striate, upper spathaceous, densely villous, hairs often tubercle-based. *Ligule* membranous, about 2 mm long, entire or dentate. *Blades* linear acute or acuminate, flat or conduplicate, 4-14 × 0.2-0.5 cm, hairy, upper leaves shorter. *Peduncles* villous. *Racemes* terminal, erect, solitary, spiciform, 2-6 × 0.3-0.5 cm, pale glabrous rather scarious and shining. Joints of the rhachis subclavate, compressed, about 2.5 mm long, with a tuft of long hairs on their tips at the outer angle, pedicels flat, equal to and fused with joints. *Spikelets* paired, one sessile and hermaphrodite, the other pedicelled and male or neuter, dissimilar in shape.

Sessile spikelet (excluding the awns) 5-8 mm long, with a short glabrous callus. *Lower glume* (excluding the awns) including the wings 6-8 mm long, oblanceolate or oblong ovate, excluding the wings oblong ovate; thinly coriaceous, 5-6-nerved, glabrous or puberulous, 4-6 grooved, margins of the glume and often the lower convex portion of its back with tubercles or hooks, the latter sometimes ciliate at tips; apex of glume cleft, bearing two 3.5-5 mm long wings, inner margins of the wings produced into two 5-8 mm long slender divergent antrorsely barbellate awns. *Upper glume* elliptic lanceolate, acute, 3-4 mm long, margins narrowly inflexed, thinly membranous, faintly 3-nerved. *Lower floret* neuter; *lemma* oblong lanceolate, obtuse, about 3 mm long, hyaline; *palea* hyaline, small or o. *Upper floret* hermaphrodite; *lemma* elliptic ovate, acute, 2-2.5 mm long, hyaline *palea* oblong ovate, subacute, 2 mm long, hyaline; *lodicules* 2, .4-.5 mm, hyaline. *Stamens* 3, anthers about .5 mm long; *styles* 2, *stigmas* plumose. *Grain* elliptic oblong, slightly-compressed. *Pedicelled spikelet* (excluding the awn) 5.5-8 mm. *Lower glume* (excluding the awn) including the wing oblong lanceolate, 5.5-8 mm long; excluding the wing oblique, ovate lanceolate, 3.5-4 mm long; flat on the back, 5-7-nerved, margins narrowly inflexed, one margin with a thinly membranous, hyaline wing from base of glume to about the middle of the awn, the other margin produced into a slender antrorsely barbellate, 8-12 mm long awn. *Upper glume* excluding the wing ovate, acute, 3-4 mm long; including the wing 4-7 mm long, 3-nerved, strongly keeled, boat-shaped, apex prolonged into a slender, antrorsely barbellate, 3-6 mm long awn; keel winged from about its middle to much beyond the apex of the glume. *Lower floret* empty; *lemma* oblong lanceolate, obtuse, 2-3 mm long, hyaline, *palea* hyaline, small or o. *Upper floret* male or neuter; *lemma* hyaline, subacute, about 2.5 mm long; *palea* similar but smaller. *Stamens* not seen.

Fischer (loc. cit.) had quoted the following specimens in the original description of *Manisuris forficulata* Fischer:

1. Bombay Presidency, Mahabaleshwar, Sept. Dr. J. C. Lisboa, without number (type);
2. Belgaum, Dr. Ritchie, 808;
3. Belgaum, Dr. Ritchie, 827;
4. Khandala, Sept. A. Meebold 8850;
5. N. Kanara at Castle Rock, Oct. A. Meebold, 10558;

*Jain & Hemadri, *Bull. bot. Surv. India* 10: 280-282, 1968.

†was later examined by author at kew.

6. Belgaum District, Amboli ghat, Oct. W. A. Talbot 4305;

7. Cochin State at Kavalay, 3000-4000 ft. Nov. A. Meebold 13331.

Of these, numbers 1, 4 and 7 are actually *Manisuris forficulata* Fischer emend. Jain (Replicates of collection No. 7 are present at Kew as well as at Calcutta; the collection number is 12221 and not 13331, the latter seems to be a typographic error).

Collection No. 2, 3 and 5 belong to the new species *Manisuris mysorensis* Jain et Hemadri.

Collection No. 6 (Talbot 4305) is a mixture of *M. forficulata* and *M. mysorensis*. Five replicates of this collection are present at Calcutta (CAL) and Poona (BSI). For convenience of reference, these are now labelled as A-E. Two out of the five sheets (namely A and B) have *M. forficulata* only; three sheets (C-E) have both taxa mounted on them. As far as practicable individual plants on these sheets have now been provided with proper labels. Talbot 4305B is from Poonda not from Amboli Ghat.

Specimens examined: MAHARASHTRA: Borivli, National Park, 19 Sept. 1953—R. Fernandez 1576, and 21 Aug. 1954—R. Fernandez 1890 (BLAT); Gibson, s.n. (CAL); Trombay Sept. 1919—McCann A-71 (BLAT); Poona, Mulshi, 12 Oct. 1956—Jain 7614 (BSI); Matheran, Oct. 1921—s.l. A258 (BLAT); Matheran Garbut Pt. 3 Oct. 1960—Irani 5499 (BLAT); Tungar hill, 29 Sept. 1941—Santapau 21127 (BLAT); Khandala, alt. 600 m, Sept. 1907—Meebold 8850 paratype (CAL); Khandala, Sept. 1918—s.l. 5050 (9) (BLAT); Khandala, Saddle, Oct.

1918—s.l. 9616 (BLAT); Khandala, Oct. 1918—McCann A 70 (BLAT); Khandala Hotel, 3 Sept. 1949—Santapau 10283 (BLAT); Lonavla, 14 Oct. 1909—Bhide A 69(2) (BLAT, BSI); Panchgani, behind the table-land, Oct. 1908—Blatter 3805 (BLAT); Panchgani, Oct. 1920—Blatter & Hallberg B 1286 (BLAT); Mahabaleshwar, 18 Oct. 1905—Talbot 4509 (BSI); Mahabaleshwar, 16 Oct. 1905—Talbot 4539 (BSI); Mahabaleshwar, alt. 1400 m, Nov. 1918—Sedgwick & Bell 4509 (CAL); Mahabaleshwar, Lodwig Pt. 19 Oct. 1951—Bole 314 and Wilson Pt. 21 Oct. 1951—Bole 401 (BLAT); Mahabaleshwar, Dhobi Falls, 15 Oct. 1957—Mahajan 24758 (BSI); Mahabaleshwar, 28 Oct. 1957—A. Mehta 459 (DD); Machutar Forest, Satara Road, Mahabaleshwar 10 Oct. 1960—Ansari 67541 (BSI); Mahabaleshwar—Lisboa s.n. 26.9.1891 type (BLAT, CAL, K). MADHYA PRADESH: Pachmarhi, 300 m, 8 Oct. 1960—Joseph 11336 (MH); Bailadilla 1000 m, 6 Oct. 1940—Mooney 1461 (DD). MYSORE: Belgaum, Amboli ghat, 6 Oct. 1900—Talbot 4305 A Paratype (CAL, BSI), Poonda—Talbot 4305 B (BSI). KERALA: Travancore, Peermade, 3 Dec. 1941—Jacob 20244 (MH); Kavalay Cochin, alt. 900 m. Nov. 1910—Meebold 12221 paratype (CAL).

Distribution: The grass occurs in peninsular India, and Central India.

Illustration: Fig. 6 based on Lisboa's collection.

Manisuris forficulata var. *hirsuta* Fischer has been transferred to *M. divergens* (Hack.) O. Kuntze; the transfer and the new combination are discussed under *M. divergens*.

TABLE

The chief distinguishing characters between *Manisuris forficulata* Fischer emend. Jain and *M. mysorensis* Jain et Hemadri.

<i>M. forficulata</i> Fischer emend. Jain (Fig. 6)	<i>M. mysorensis</i> Jain et Hemadri (Fig. 5)
Joints (internodes of the rhachis) and pedicels equal, 2.5 mm long; joints with a tuft of hairs at top.	Joints 2.5 mm long, devoid of tuft of hairs, pedicels about 1.5 mm long.
Lower glume of sessile spikelet excluding the awns, including the wings, 6-8 mm long, oblanceolate or oblong obovate; excluding the wings oblong ovate; wings 3.5-5 mm long.	Lower glume including the wings 3-4.5 mm long, broadly ovate; excluding the wings almost orbicular, wings 1-2 mm long.
Hooks on the margins of the lower glume of sessile spikelet about .5 mm long or less.	Hooks on the glume almost equal to the width of the body of glume, spreading out .75 mm on each side.
Lower glume of pedicelled spikelet excluding the awns, including the wings, oblong lanceolate, 5.5-8 mm long; excluding the wings oblique, ovate, lanceolate, 3.5-4 mm long, 5-7 nerved.	Lower glume of pedicelled spikelet excluding the awns, including the wings elliptic ovate, 3-4.5 mm long, excluding the wings ovate, 2.5 mm long, 3-5 nerved.

5. *Manisuris goaensis* Rolla Rao et Hemadri, Bull. bot. Surv. India 10: 106-109, 1968.

Etymology: The species has been named after its type locality Goa in peninsular India,

Description: Annual. Culms 20-35 cm tall. Racemes 3.5-7 cm long. Sessile spikelets 9-14 mm long (including awns); lower glume coriaceous, ovate lanceolate, 9-14 mm long, glabrous or puberulous, strongly 2-ridged near base, tips of the ridges hairy, awned, awn 5-8 mm long, rarely bifid; upper glume about 3 mm long, narrowly winged above. Pedicelled spikelet 8-13 mm long, lower glume 8-13 mm including awn, winged on one margin, awn 4-6 mm long; upper glume including wing 3-4 mm long, boat-shaped, winged on back, awned, awn upto 3 mm long or much shorter.

Specimens examined: GOA: Verna village on Cortalim-Madgoa road, 8 Nov. 1962—Rolla Rao 84474 A, holotype (CAL); Goa, Porvorum, 8 Nov. 1963—Rolla Rao 92850 A, paratype, (CAL).

Distribution: So far endemic to peninsular India.

Illustration: Fig. 10 based on holotype.

6. *Manisuris mysorensis* Jain et Hemadri. Bull. bot. Surv. India 10: 280-282, 1968.

M. forficulata Fischer, Kew Bull. 1933, 355, 1933 pro parte; Fischer, Fl. Mad. 1761, 1934 pro parte; Bor, Grass. Burm. Ceyl. Ind. & Pak. 192, 1960 pro parte.

Rottboellia divergens of Hook. f. Fl. Brit. Ind. 7: 155, 1896 pro parte.

Peltophorum divergens of Blatter & McCann, Bomb. Grass. 34, 1935 pro parte.

Etymology: The specific name has been given after the type locality, Mysore State in peninsular India.

Critical note: The reasons for creating this species and characters distinguishing it from *M. forficulata* Fischer emend. Jain are discussed under *M. forficulata*.

Description: The detailed description is given elsewhere in this journal (10: 280-282, 1968).

Specimens examined: MYSORE: Castle Rock, 25 Oct. 1902—Gammie 15643 A holotype (CAL), B and C isotypes (CAL), D isotype (BSI), E isotype (BLAT); Belgaum dist., Amboli Ghat, 6 Oct. 1960—Talbot 4305 pro parte, paratypes C (BSI), D-E (CAL).

Distribution: So far endemic in Mysore State in peninsular India.

Illustration: Fig. 5, based on type.

7. *Manisuris myuros* L. Mant. 2, 300, 1771; Fischer, Fl. Mad. 1760, 1934; Bor, Grass. Burm. Ceyl. Ind. & Pak. 192, 1960.

Rottboellia myurus (L.) Benth. Hook. f. Fl. Brit.

Ind. 7, 154, 1896; Achariyar & Mudaliyar, S. Ind. Grass. 174, 1921.

Etymology: The name *myuros* is based on Greek word *Myouros* meaning: mousetail.

Description: Perennial. Culms 15-70 cm high; leaves 5-15 cm long, rarely more, linear. Racemes 2-7 cm long, solitary, terminal and axillary, shortly exserted. Sessile spikelets 2.5-3 mm long, brown, unawned; lower glume with a deep transverse groove, both margins winged above as well as below the groove. Pedicelled spikelets about 4 mm long; lower glume winged on one margin, upper glume boat-shaped, keel winged at tip.

Specimens examined: ANDHRA PRADESH: Nellore, Dugarazpatam, July 1883—Gamble 12785 (CAL); Nellore—Thomson s.n. (CAL, MH. 88470); MADRAS: Coimbatore, Pollachi, 4 Oct. 1906—Barber 3503 (MH), Elliots Beach, 29 Aug. 1899—Bourne 3114 (CAL); Madura, Bodinaikanur, Dec. 1910—Meebold 13681 (CAL); Kambam, May 1917—s.l. 688 (BLAT); Madurai, 27 Oct. 1956—B. D. Patil 706 (CAL); Murugumalai, 16 June 1961—Sebastine 12618 (MH); Ramnad, Srivilliputtur, 14 Nov. 1953—Sakharamrao 22095 (MH); Melakadu Forest, 17 Dec. 1964—Ramamurthy 22739 (MH); South Arcot, Pelakuppam, Vemmundy Kolla, 20 Aug. 1930—Narayanswamy 4075 (MH); Annamalai, 22 Oct. 1939—Jacob 6382 (MH); Tinnevely, 25 July 1892—(Illegible) 1584 (MH); Tirukarangudi, 16 Sept. 1916—S. India Flora, No. 13113 (MH); Manimuthar dam, alt. 300 m, 28 June 1957—Sebastine 3704 (MH); Tiger Falls, 4 Mar. 1958—Sebastine 5514 (MH); Sciahadri, 29 Nov. 1961—Sebastine 13712 (MH); Sivanaperi, 7 Nov. 1962—Joseph 15154 (MH); Kodaikanal ghat, Pulneys, 1 Jan. 1899—Bourne 1940 (CAL); Palamcottah, Mar. 1835, Herb. Wight 3287 (CAL, DD); Herb. Wight 3071/Bis (CAL); Chingleput, Avadi, 19 Sept. 1917; S. India Flora 14867 (MH); Avadi 13 Jan. 1918, S. India Flora 15461 (a) (MH); Sithampur, 28 Oct. 1914, S. India Flora 11207 (MH); Adyar, July 1886—Gamble 17572 (CAL); Tranquebar—Rottler s.n. (CAL); Wallich 8880 C (CAL).

Distribution: So far endemic in Madras and Andhra Pradesh in Peninsular India.

Illustration: Fig. 2 based on Wight's collection.

8. *Manisuris santapau* Jain et Deshpande. Bull. bot. Surv. India 10: 277-279, 1968.

Etymology: The species has been named in

honour of Dr. H. Santapau, S.J., F.N.I., then Director, Botanical Survey of India.

Description: The detailed description and illustrations are given elsewhere in this journal (10: 277-279, 1968).

Specimens examined: MAHARASHTRA: Ratnagiri, in exposed pools on laterite hill top, 15 Sept. 1961—C. Saldanha CS 7130 A holotype and C-D isotypes (CAL), B isotype (BSI); Ratnagiri, in exposed pools on laterite hill top, 15 Sept. 1961—C. Saldanha CS 7132 A paratype (BLAT), B. paratype (CAL).

Distribution: So far endemic in Maharashtra State in peninsular India.

Illustration: Fig. 11 based on holotype.

9. *Manisuris talbotii* (Hook. f.) Bor, Grass. Burm. Ceyl. Ind. & Pak. 192, 1960.

Rottboellia talbotii Hook. f. Fl. Brit. Ind. 7: 155, 1896; Lisboa, Bomb. Grass. 57, 1896; Cooke, Fl. Bomb. 954, 1908.

Peltophorus talbotii (Hook. f.) Camus, Blatter & McCann, Bomb. Grass. 35, 1935.

Etymology: The grass has been named in honour of William Alexander Talbot a forester-botanist of Bombay who collected the type of the species.

Description: Annual. Culms 15-30 cm high. Leaves 3-8 cm long, linear. Racemes 2-7 cm long, rather stout; joints of the rachis very tumid almost saccate. Sessile spikelets closely imbricate, lower glume with 2-3 transverse ridges (Fig. 9 g); ridges sometimes more than three, or incomplete, i.e. not running from one margin to other (Fig. 9 g'), or entirely absent; glume broadly winged on both margins in the upper part and prolonged into a 4-8 mm long awn, length of awn variable. Pedicelled spikelet equal to the sessile, lower glume winged on one margin, long-awned; upper glume keeled, keel winged above.

Specimens examined: GOA: Vascodagama, Sept. 1909—Bhide, s.n. (BLAT, BSI); Marmagao, 15 Oct. 1891—Talbot 2572 isotype (BLAT, BSI, CAL); near Chimbél, 9 Nov. 1963—Rolla Rao 92892 (BSI).

Distribution: So far endemic in Goa on west coast of peninsular India.

Illustration: Fig. 9 based on type specimen.

ENDEMISM AND ORIGIN OF THE GENUS

Turrill (1964) has stated that generally peninsular regions are a close second to islands in having

favourable conditions for endemism. The case of the genus *Manisuris* L. in India amply supports this. All the twelve taxa of the genus found in India are endemic to India; ten are confined to southern parts of the peninsular regions of India. *M. forficulata* extends northwards upto Central India, occurring there only in mountain regions; *M. clarkei* extends further northeastwards to Orissa and Bihar.

Ten taxa viz. *Manisuris acuminata*, *M. acuminata* var. *stocksii*, *M. acuminata* var. *woodrowii*, *M. divergens*, *M. divergens* var. *hirsuta*, *M. goaensis*, *M. myuros*, *M. mysorensis*, *M. santapau* and *M. talbotii* are so far endemic to the small region of Mysore, Goa and the adjacent southern parts of Maharashtra State.

Some of these taxa have been discovered only recently (e.g. *M. goaensis* and *M. santapau*) and whether they will remain endemic, or their range will extend can be judged only after few decades; but in case of others such as *M. myuros* (type species of the genus), *M. divergens* and *M. talbotii*, it can certainly be said that they have remained endemic for long periods, ranging from 75 to 200 years, or even more. This rich endemism can be attributed greatly to the range of these taxa lying in the peninsular region of India.

Hartley (1958) has shown that peninsular India is one of the two main centres of high concentration of grasses of the tribe Andropogoneae. The type species of the genus *Manisuris* L. was described from India as early as 1771; new taxa have been added to the genus from the same region at almost regular intervals (1832, 1856, 1873, 1891, 1900, 1902, 1907, 1908, 1910, 1918, 1961, 1963*), and it is quite likely that the genus *Manisuris* originated in peninsular India.

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*These are some of the dates of collection of the type material of Indian taxa.

for supplying material of the genus *Manisuris* L. for study. Dr. Rolla Seshagiri Rao had kindly supplied the type material of *M. goaensis* Rolla et Hemadri and an advance copy of the manuscript of his paper on that new species. Father Kraemer has kindly helped with translation of some passages from Latin to English. Thanks are also due to the Directors of Komarov Botanical Institute, Leningrad (U.S.S.R.) and Royal Botanic Gardens, Kew (U.K.) for permission to work in their herbaria.

REFERENCES

- BLATTER, E. J. AND C. McCANN. *The Bombay Grasses*. New Delhi, 1935.
- BOR, N. L. *The Grasses of Burma, Ceylon, India and Pakistan*. London, 1960.
- CHASE, A. AND C. D. NILES. *Index to Grass Species*. Boston, 1962.
- FISCHER, C. E. C. New or little known plants from South India-II. *Kew. Bull.* 339-357, 1933.
- HARTLEY, W. Studies on the origin, evolution and distribution of the Gramineae-I. The Tribe Andropogoneae. *Austr. J. Bot.* 6 : 116-128, 1958.
- HOOKE, J. D. *Flora of British India*. London, 1896.
- JAIN, S. K. Notes on Indian Grasses-VIII. *Manisuris divergens* (Hack.) Kuntze collected after thirteen decades. *Bull. bot. Surv. India* 9 : 293, 1967.
- AND U. R. DESHPANDE. *Manisuris santapau* Jain et Deshpande, a new grass from India. *Ibid.* 10 : 277, 1968.
- AND K. HEMADRI. *Manisuris mysorensis* Jain et Hemadri, a new grass from India. *Ibid.* 10 : 280, 1968.
- LISBOA, J. C. *List of Bombay Grasses and their Uses*. Bombay, 1896.
- RAO, ROLLA S. AND K. HEMADRI. A new species of *Manisuris* L. (Poaceae) from Goa. *Bull. bot. Surv. India* 10 : 106, 1968.
- TURRILL, W. B. *Plant Taxonomy, Phytogeography and Plant Ecology. Vistas in Botany*, 4. London, 1964.