

Three newly recorded plants of South Korea: *Muhlenbergia ramosa* (Hack. ex Matsum.) Makino, *Dichantherium acuminatum* (Sw.) Gould & C.A. Clark and *Rottboellia cochinchinensis* (Lour.) Clayton

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Abstract: Three new Poaceae species are reported in South Korea. *Muhlenbergia ramosa* was found in Boryeong-si, Iksan-si, Jangsu-gun and Gwangju. *Dichantherium acuminatum* and *Rottboellia cochinchinensis* were found in Jeonju-si, Jeollabuk-do and Seogwipo-si, Jeju-do which were thought to be alien species. Genus *Dichantherium* and *Rottboellia* are newly reported in South Korea. *Muhlenbergia ramosa* was thought to be native to Korea.

Keywords: Alien plant, *Dichantherium*, *Muhlenbergia*, Poaceae, *Rottboellia*

Introduction

The three newly reported plants *Muhlenbergia ramosa* (Hack. ex Matsum.) Makino, *Dichantherium acuminatum* (Sw.) Gould & C.A. Clark, and *Rottboellia cochinchinensis* (Lour.) Clayton are all Poaceae plant species. There are over 11,000 taxonomic groups in about 700 genera of Poaceae species spread across the world (Chen et al. 2006). While there are some differing claims among scholars (Chung 1965, Lee 1966, 2007, Korea National Arboretum 2011), it is assumed that there are over 250 taxonomic groups in Korea.

The *Muhlenbergia* Schreb. is generally found in the Western Hemisphere with approximately 150 taxonomic groups (Peterson 2001, 2003, Wu and Peterson 2006). In Korea, there are three taxonomic groups - *M. japonica* Steud., *M. huegelii* Trin., *M. hakonensis* (Hack.) Makino - that have been reported (Chung 1965, Lee 1966, Korea National Arboretum 2011).

Dichantherium (Hitc. & Chase) Gould is an unrecorded Korean genus. There are approximately 70 taxonomic groups distributed worldwide and it has been reported that over 30 taxonomic groups are found in North America (Freckmann and Lelong 2003). However, Aliscioni et al. (2003) conducted molecular testing with groups found in

other areas concluding that it forms a monophyly and thus deemed that it was a native genus of America, while also stating that there are 55 species including Canada, USA, Central America and South America. Initially, it was included as *Panicum* s.l. because of its outward appearance (Hitchcock 1971, Gleason and Cronquist 1991), but through taxonomical research, Gould (1974) elevated it into its own genus. Through recent form and molecular structure research, it has gained further supporter as an independent genus (Brown and Smith 1975, Giussani et al. 2001, Freckmann and Lelong 2003, Zuloaga and Morrone 2003). Compared to *Panicum* s.l., it is a perennial plant and branches out below the mid section of the stem. Furthermore, its flowering season is faster than others from April to June and its second floret fructifies and does not fall off even after maturation. However, because there are still confusions in formative aspect, it appears that comparative research will continue with *Panicum* s.l.

Rottboellia L. f. is another unrecorded genus of Korea and there are about five taxonomic groups found in tropical Africa and Asia in the Old World (Clayton and Renvoize 1986, Wipff 2003, Sun and Phillips 2006). It is very formatively similar to the related taxa genus *Hemarthria* R. Br., but its main difference is that its life type is for one year (Wipff 2003).

The newly discovered *Muhlenbergia ramosa*, *Dichantherium acuminatum* and *Rottboellia cochinchinensis* are all unrecorded plants of Korea. Thus, this study aims at describing its formative characteristics, provide illustrations

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and grant it Korean names, while drafting a classification key for the related taxa to report its domestic distribution and characteristics.

Description of Taxonomic Group

1. *Muhlenbergia ramosa* (Hack. ex Matsum.) Makino, J. Jap. Bot. 1(4): 13. 1917.

M. japonica var. *ramosa* Hack. ex Matsum., Bot. Mag. (Tokyo) 11: 444. 1897.

M. frondosa subsp. *ramosa* (Hack. ex Matsum.) T. Koyama & Kawano, Canad. J. Bot. 42: 868. 1964.

Perennial. Its **rhizome** is covered with scales and reaches out from 4 to 25 cm. Its **culm** typically grows at an angle at a height of 30-120 cm, and has many branches above its mid section. Its **leaf sheath** is opened to the culm and has no fur. Its **leaf blade** is flat and thin, with lengths of 4 to 12 cm and widths of 3 to 4 mm, and the surfaces and edges are rough. The **ligule** has a length of about 0.5 mm and it is truncated. The length of the **panicle** is about 8 to 20 cm and its width is narrow at about 1 to 3cm, while 1 to 2 branches grow at each node. The **spikelet** is in the shape of a narrow needle with a length of about 3mm and it is a greenish gray color with a slight plum color. The **glume** has a length of 1.5 to 2.2 mm and typically the first glume is shorter than the second glume, while having a broad needle shape with a sharp head all having 1-vein. The length of the **lemma** is 2.5 to 3.1 mm and has fur at about 1/4 below the back. The length of the awn is 5 to 10 mm, having a greenish gray or plum color and is rough. The length of the **anther** is about 0.5 mm. The **caryopsis** has a length of about 0.5 mm and is a narrow oval shape. Its blooming and fruiting season is from July to October (Figs. 1, 2).

Korean Name: 가지쥐꼬리새 (Ga-ji-jwi-kko-ri-sae; new Korean name)

Distribution: Outside of Korea, it is distributed in Anhui, Fujian, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Yunnan, and Zhejiang in China, and the western region of Honshu and the Shikoku and Kyushu regions of Japan (Koyama 1987, Osada 1989, Wu and Peterson 2006). They are mostly concentrated in southern regions. There were no records on its distribution in Korea, but recently, it was found at Mudeungsan (Mt.) in Gwangju, and at Geumma-myeon in Iksan-si and Beonam-myeon in Jangsu-gun of Jelloabuk-do. They are mostly found at the edges of forests or next to small roads and typically grow in small groups. It appears to grow wild in both areas with good sunlight or in shades. Due to its long rhizome, it showed high levels of cover degrees and sociability. Taking into account that it grows wild in nearby countries such as

China and Japan, it is judged to be an indigenous species of Korea. It is assumed that other areas where it grows wild below the central area of Korea, similar to that of the distribution in China, can be found, and thus, it is necessary to continuously check areas where it grows naturally.

Observed Specimen: Jeollabuk-do: Iksan-si, Geumma-myeon, Sinyong-ri, Mt. Mireuk-san, 10 Nov. 2011, J.H. Kim and Y.H. Cho 2011-001 (KH); Jangsu-gun, Beonam-myeon, Nodan-ri, 12 Sep. 2012, S.Y. Jung and H.S. Hwang *ParkSH126967* (5 sheet: KH); Iksan-si, Geumma-myeon, Sinyoung-ri, Sajaam, 11 Sep. 2012, S.Y. Jung and H.S. Hwang *ParkSH126970* (8 sheet: KH); **Gwangju:** Mt. Mudeung-san, 12 Sep. 2012, S.Y. Jung and H.S. Hwang *ParkSH126941* (2 sheet: KH).

Classification Key with Related Taxa

1. Has almost no rhizome and does not branch out

----- *M. japonica*

1. The rhizome spreads out longer than the internode of the culm.

2. The glume has a dull end and the length is under 1mm, and it is 1/3 – 1/4 of the length of the lemma

----- *M. Huegelii*

2. The glume is sharp ended and its length is beyond 1.5 mm, and is over 1/2 the length of the lemma.

3. The culm does not branch and the spikelet is over 3.5 mm

----- *M. hakonensis*

3. The culm has many branches above the mid section and its spikelet is under 3 mm ----- *M. ramosa*

Considerations: Of the plants of the same genus in Korea, it is characterized by and differentiated from other taxonomical groups by having many branches. Despite having clearly different characters, *M. japonica* and *M. Huegelii* were misidentified or their characteristics were not properly known. Its Korean name was named ‘Ga-ji-jwi-kko-ri-sae’ taking into account its formative features that it has many branches on the culm.

2. *Dichantherium* (Hitc. & Chase) Gould, Brittonia 26(1): 59. 1974.

Panicum subgen. *Dichantherium* Hitc. & Chase, Contr. U.S. Natl. Herb. 15: 142. 1910.

It is a **perennial** that live in stocks. It has a rhizome, but sometimes for a bulb. In the winter, it sometimes grows a rosette that is clearly different from the cauline leaf. The **culm** is 5 to 150 cm and is empty inside. They mostly grow straight upwards, but sometimes grow in a slant as well. The **ligule** is made up of membranes, fur or both membrane and fur, or may not have any. Also, sometimes, right behind the ligule grows a 1 to 5 mm furry pseudoligule. The **leaf**



Fig. 1. *Muhlenbergia ramosa* (Hack. ex Matsum.) Makino. A. Habit; B. Branch of culm; C. Rhizome.

blade cauline leaf is longer and narrower than the rosette leaf. **Photosynthesis** is C_3 . The panicle grows on the end of the culm and branch. The **first inflorescence** grows on the end of the culm and matures from April to June (July), and sometimes grows until late fall. Usually, only the smallest part undergoes clasmogamy, and has less fruit than in the second inflorescence. The **second inflorescence** grows from the end of the branch and flowers from (May) June to the autumn season and it usually undergoes cleistogamy in full or in part. The **spikelet** is about 0.8 to 5.2 mm long and its backside is compressed, its surface is uneven, and there is no awn. The **first glume** is about 1/5 to 3/4 of the length of the spikelet and it has 1-5-veins, and is truncated or has a sharp or pointy head. The **second glume** is slightly shorter than the spikelet or slightly longer than the second floret, with 5-11-veins and its end is from a round to narrow shape. There are only stamen or sterile for **first floret** and the lemma is similar to that of the second glume. It has a

separate palea and it is thin and shorter than the lemma. The **second floret** is a fertile flower and usually its end is pointy or sometimes have thorns. The lemma shines and usually does not have any fur, and its edge rolls inward. The palea has a groove. It has two **lodicules**. It has three **stamens**. Its **caryopsis** is smooth.

Korean Name: 방석기장속 (Bang-seok-gi-jang-sok; new Korean name)

Dichantherium acuminatum (Sw.) Gould & C.A. Clark, Ann. Missouri Bot. Gard. 65(4): 1121. 1978.

Panicum acuminatum Sw., Prodr. 23. 1788.

P. lanuginosum Elliott, Sketch Bot. S. Carolina. 1(2): 123. 1816.

Dichantherium lanuginosum (Elliott) Gould, Brittonia 26(1): 60. 1974.

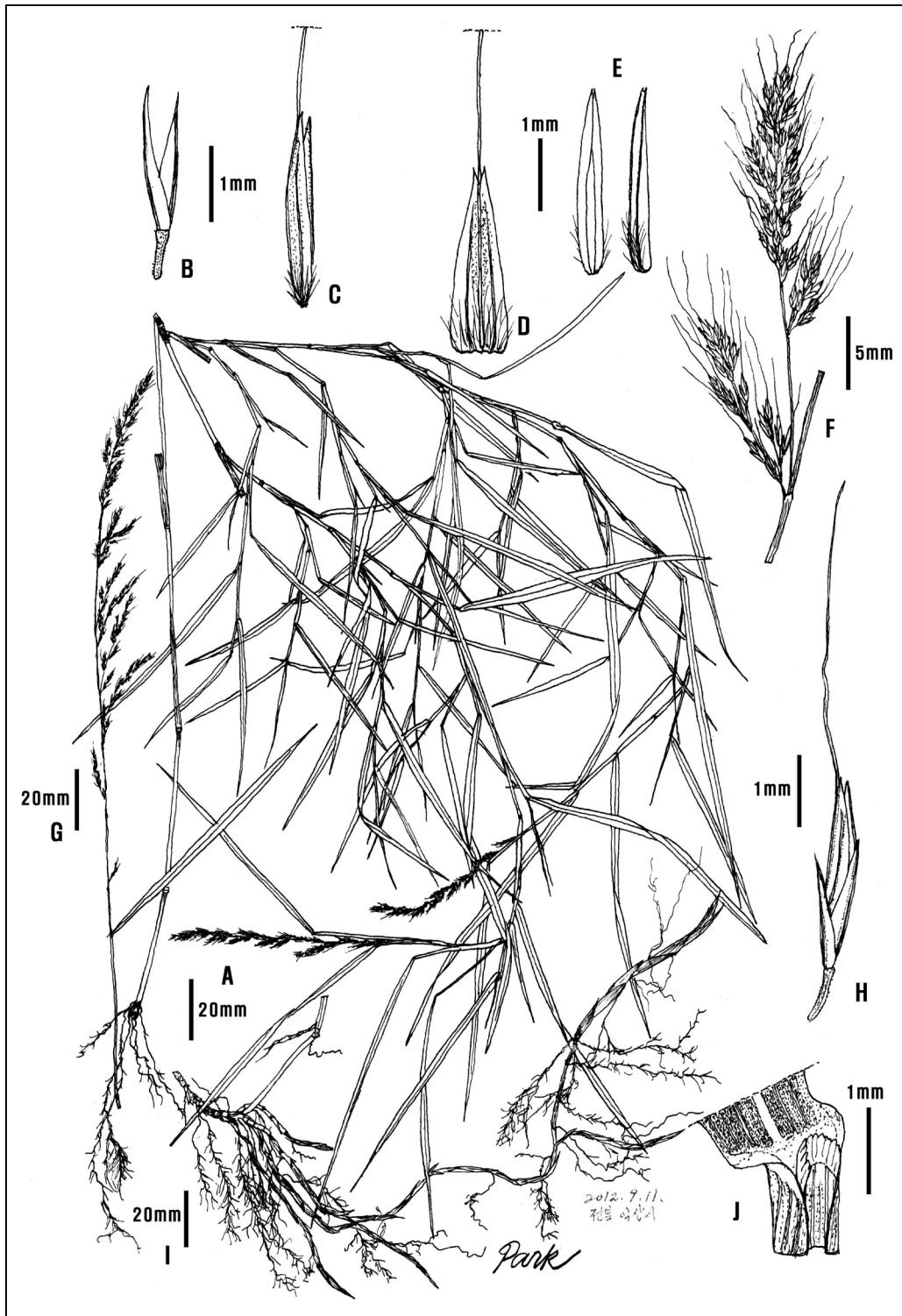


Fig. 2. *Muhlenbergia ramosa* (Hack. ex Matsum.) Makino. A. Habit; B. Glume; C. Floret; D. Lemma; E. Paleas; F. Apart of inflorescence; G. Panicle; H. Spikelet; I. Rhizome; J. Ligule.

Perennial. The height of the **culm** is 15-100 cm and grows at a slant lying down and its culm forms a rosette. The **node** sometimes swells and it has no fur or has soft hairs. The **leaf sheath** is typically shorter than the gap between the nodes and has no fur or sometimes soft hairs. The **ligule** is

made up of furs with lengths of 1 to 5 mm. The **leaf blade** is 2 to 12 cm long and 2-12 mm wide, and it has almost no or a lot of soft hairs all around. For the **inflorescence**, the panicle grows at the edge and branches grow from the culm, while the flower stalk has no fur or is covered with

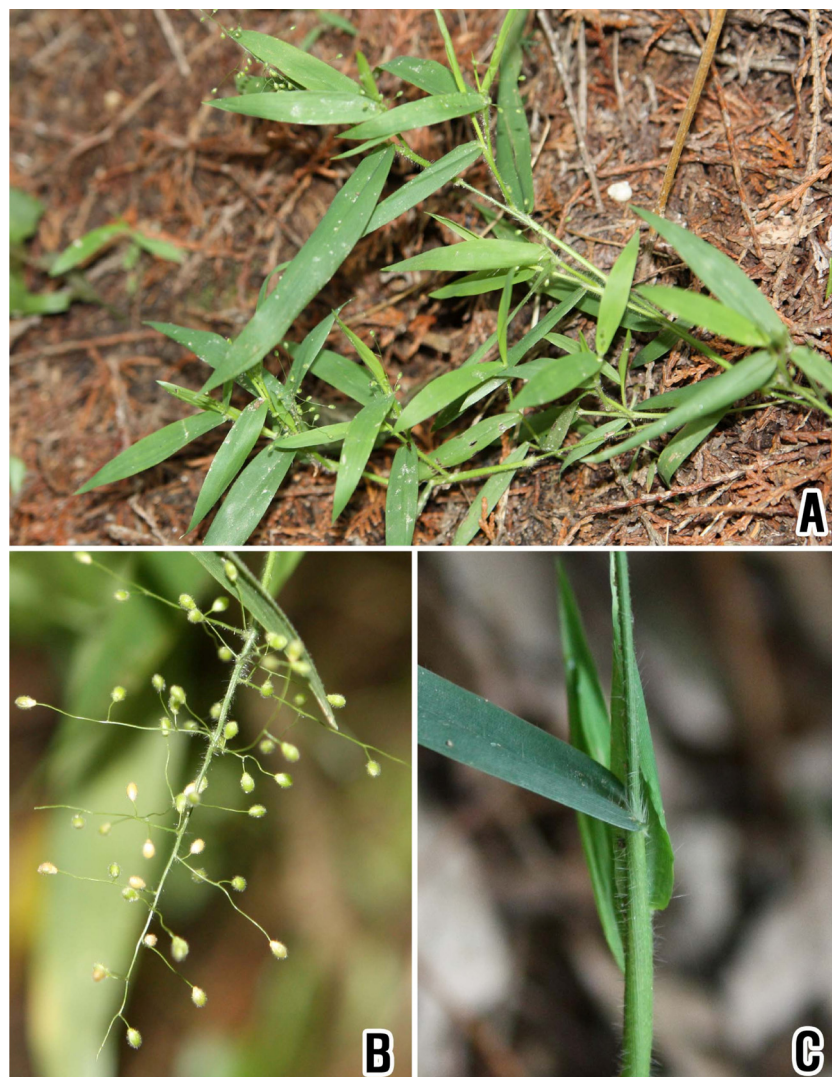


Fig. 3. *Dichantherium acuminatum* (Sw.) Gould & C.A. Clark. A. Habit; B. Panicle; C. Sheath.

soft hairs. The **spikelet** is about 1mm long and is between an obovoid to oval shape. It is covered overall with soft hairs. The **first glume** is about 1/4 to 1/2 the length of the spikelet and it has or does not have fur. The **second glume** has similar size and shapes as that of the lemma and it has almost no or a lot of fur. The **first floret** is sterile and the **second floret** is fertile (Figs. 3, 4).

Korean Name: 방석기장 (Bang-seok-gi-jang; new Korean name)

Distribution: It is indigenous to North America and grows widely from dry to moist areas such as open terrains, sand and clay soil, forests, swamps and halogenic soil. It is widely distributed throughout America (Freckmann and Lelong, 2003). In addition, it has been recorded to be distributed in nearby China and Japan (Osada, 1989; Chen *et al.*, 1990). Taking into account that Aliscioni *et al.* (2003)

recognizes it as a genus that is distributed in America, it is judged to be an alien plant that has been introduced to Korea. It has been found at the Deokjin Citizen's Park in Deokjin-gu, Jeonju-si of Jeollabuk-do. It was first discovered in 2010 and was found to continuously grow naturally. The growing environment studied was nearby flower gardens or walking trails frequented by people, and it was distributed sporadically. Nearby vegetation that grew together were *Ambrosia artemisiifolia* L., *Lonicera japonica* Thunb., *Oplismenus undulatifolius* (Ard.) P.Beauv., *Erigeron annuus* (L.) Pers., and *Cocculus trilobus* (Thunb.) DC. Taking into account that it can be distributed in open terrain as well as inside of forests, it appears not to be sensitive to the amount of light. It is judged that distribution will spread through artificial factors and there is a need for continuous monitoring on the distribution changes.

Observed Specimen: Jeollabuk-do: Jeonju-si, Deokjin-

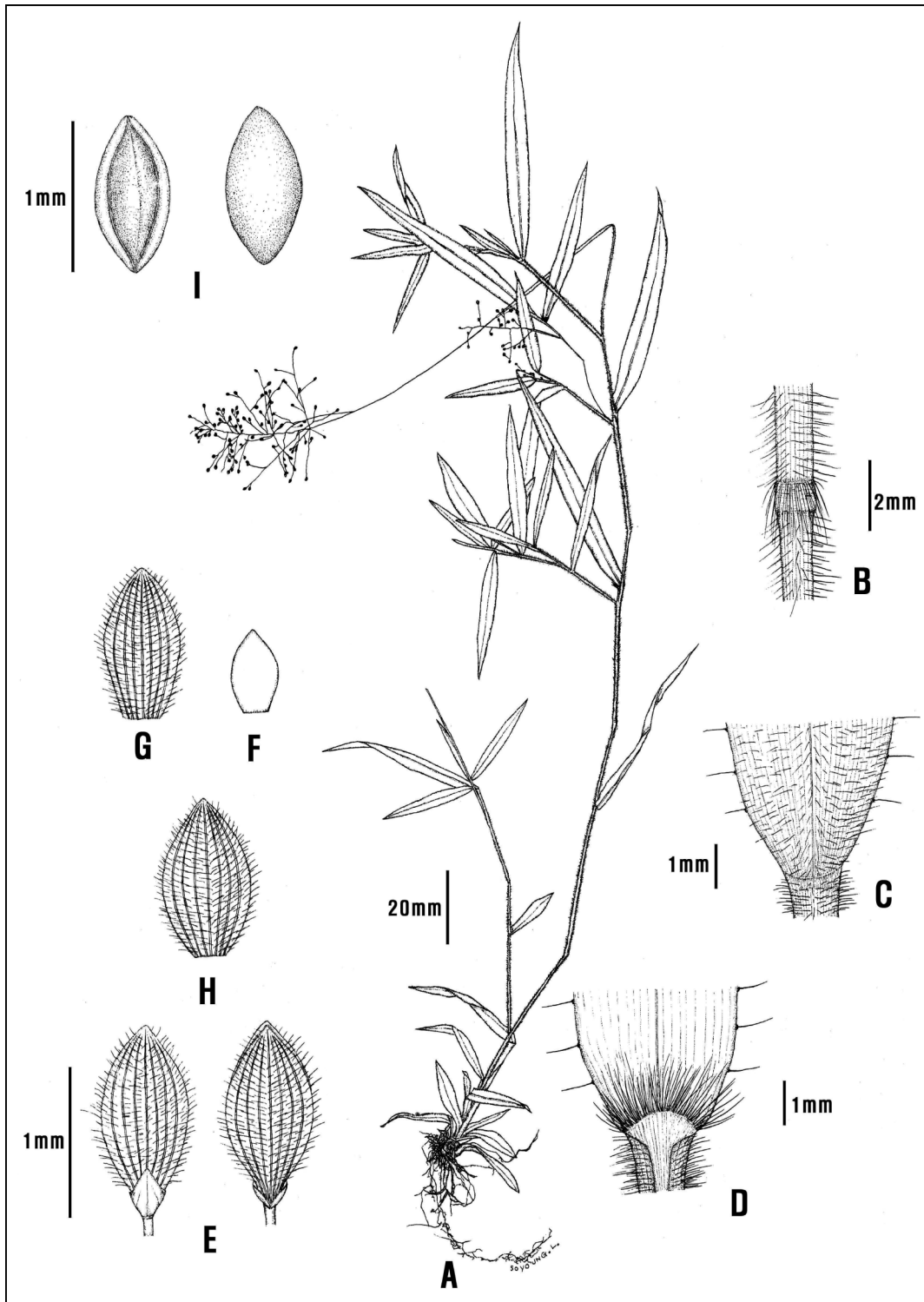


Fig. 4. *Dichantheium acuminatum* (Sw.) Gould & C.A. Clark. A. Habit; B. Culm; C. Abaxial surface of leaf; D. Ligule; E. Spikelets; F. Lower glume; G. Upper glume; H. Lower lemma; I. Upper Lemmas.

gu, Deokjin-dong 1-road, Jogyongdan, 9 Jul. 2010, Y.H. Cho and J.H. Kim *WR-100709-005* (9 sheet: KH); Jeonju-si, Deokjin-gu, Deokjin-dong 1-road, Jogyongdan, 6 Jul. 2011, S.H. Park and S.Y. Jung *P112073* (2 sheet: KH).

Classification Key with Related Taxa

The panicle grows from the end of the culm after midsummer. The branches are not well developed typically, but do branch out rarely. The second floret does not fall or



Fig. 5. *Rottboellia cochinchinensis* (Lour.) Clayton. A. Habit; B. Sheath; C. Prop roots.

swell after maturation ----- *Panicum*

The panicle grows from the end of the culm in the late spring. The branch develops at the node below the mid part of the culm and it branches out again during the autumn season. The second floret does not fall, but swells after maturation ----- *Dichantherium*

Considerations: *D. acuminatum* was categorized as various varieties and subspecies according to whether it has fur on different parts, its shape, length and color of its leaf sheath, and other external characteristics within its species (Gould 1980, Freckmann and Lelong 2003). However, *D. acuminatum* has many parts in its character for the various formative transformations and populations (Hammer 2010). Thus, it is judged that confusion may be caused in setting the limitations of the species. In this research, the various formative characteristics of the species that is difficult to set limitations for the species were all placed in the transformation range and recognized as a single species.

The Korean name given was ‘Bang-seok-gi-jang’ to show the formative characteristics in which it grows by spreading out like a sitting mat, or *bangseok* in Korean.

3. *Rottboellia* L. f., Suppl. Pl. 13. 1781.

Stegosia Lour., Fl. Cochinch. 1: 34. 1790.

Robynsiochloa Jacq.-Fél., J. Agric. Trop. 7: 406. 1960.

Annual plant. The **culm** grows to 30 to 300 cm and it has no fur or rarely has soft hairs below the node, while branching on the upper part of the culm. The **leaf sheath** sometimes has hair on the culm area. The **auricle** is not developed. The **ligule** is a membrane and it has cilium. The **leaf blade** is flat. The **inflorescence** grows on the end and is axillary, while the monogenetic raceme has several spikelets. The **spikelet** is deep within the inflorescence and it disappears after maturation. The spikelet is made with a pair of sessile spikelet and pedicellate spikelet, its back is compressed and has no awn. There are two florets in the **sessile spikelet**. The first glume is coriaceous and it is

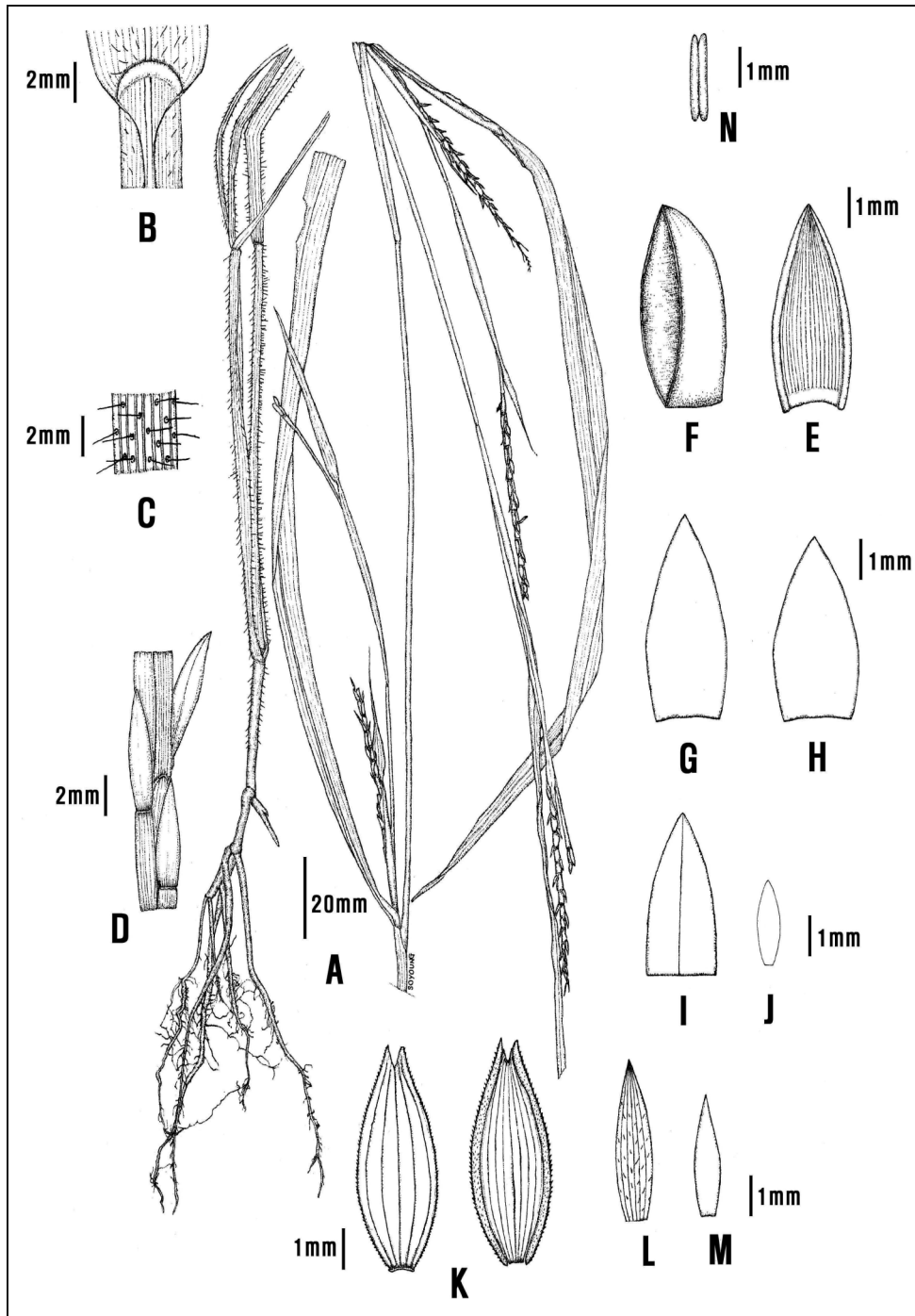


Fig. 6. *Rottboellia cochinchinensis* (Lour.) Clayton. A. Habit; B. Ligule; C. Sheath; D. Spikelets; E. Lower glume of sessile floret; F. Upper glume of sessile floret; G. Lower lemma of sessile floret; H. Lower palea of sessile floret; I. Upper lemma of sessile floret; J. Upper palea of sessile floret; K. Lower glumes of pedicellate floret; L. Upper glume of pedicellate floret; M. Lower lemma of pedicellate floret; N. Anther.

either smooth or rough. It also has two keels and there are small wings on the top. The second glume is coriaceous and has one keel and also has wings. The first floret is either only stamen or a sterile floret. The second floret is fertile. The lemma and palea are glassy. There are three anthers. The ovary does not have any fur. The pedicel of the **pedicellate spikelet** is thick. The pedicellate spikelet is

either sterile or has a stamen. The glume is herbaceous.

Korean Name: 개쇠치기풀속 (Gae-soe-chi-gi-pul-sok; new Korean name)

***Rottboellia cochinchinensis* (Lour.) Clayton**, Kew Bull. 35(4): 817. 1981.

Stegosia cochinchinensis Lour., Fl. Cochinch. 51. 1790.

Annual Plant. The **culm** is hard and grows to around 2 m. Prop roots grow at the lower node to support the culm. The **leaf sheath** has a culm with hard fur that is about 1 to 3 mm. The **ligule** is about 1 to 1.3 mm with membranes and has ciliun at its edges. The **leaf blade** is about 20 to 50 cm long and has a width between 6 to 20 mm. It does not have fur on its flesh side, but may or may not have thick fur on the surface, while the edges are rough. The **inflorescence** has a raceme that grows on the edges or axillary that is monogenetic. Its flowering period is from July to October. The first glume of the **sessile spikelet** has a length of 3.5 to 7 mm and has 11-13 (15)-veins. The second glume is 5 to 6.2 mm and had (13) 15-17-veins and is in the shape of a boat that completely surrounds the floret. It has two florets and the second floret is fertile. The **pedicellate spikelet** has a length of 3 to 8 mm and is sterile. The **caryopsis** has a length of 3 to 4 mm and a width of 2 to 2.2 mm (Figs. 5, 6).

Korean Name: 개쇠치기풀 (Gae-soe-chi-gi-pul; new Korean name)

Distribution: It originated from Southeast Asia and is distributed throughout the tropical regions of the Old World. It is distributed in areas with good sunlight or with some shade and it is found near roads, woody hills, dry farmland and meadows (Wipff 2003, Sun and Phillips 2006). It is distributed in Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan, and Zhejiang of China and it is reported as a naturalized plant in Japan (Shimizu 2003, Sun and Phillips 2006). It was first discovered in Korea in 2009 in the Hahyo-dong area of Jeju-do and it is still showing distribution. Characteristics of its distribution are that it is coastal or nearby regions and some are used as farmland, while most are distributed in abandoned lands. Due to its distribution features, it is regional and taking into account that it grows wild in areas with heavy artificial interference, it is judged to be an alien plant. Nearby plants include *Sida rhombifolia* L., *Phyllanthus urinaria* L., *Paspalum dilatatum* Poir., but it appears that *Rottboellia cochinchinensis* grows in areas where introduction of other plants are suppressed and therefore it is assumed that it is superior when competing with other plants. While it is mostly distributed sporadically, some colony areas have high coverage showing distribution of over 50 in 1 m².

Observed Specimen: Jeju-do: Seogwipo-si, Hahyo-dong, 23 Oct. 2009, G.H. Nam JSYJJ002 (3 sheet: KH); Seogwipo-si, Hahyo-dong, 24 Sep. 2012, S.H. Park and S.Y. Jung JSYJJ001 (5 sheet: KH).

Classification Key with Related Taxa

1. The inflorescence has a raceme that is monogenetic from the lower part and it unfolds along the hand shape or flora axis ----- *Phacelurus*

1. The inflorescence grows as a raceme in the pit area of the upper leaf.

2. The sessile spikelet and pedicellate spikelet have similar shapes and the raceme does not segment easily, and the segmented part of the inflorescence is at an angle

----- *Hemarthria*

2. The sessile spikelet and pedicellate spikelet have different shapes, the raceme segments easily and the segmented part of the inflorescence is flat

----- *Rottboellia*

Considerations: *Rottboellia cochinchinensis* that has displayed continuous distribution since 2009 in the Jeju-do area has very slow spreading speed compared to its growth period. It has seed propagation as an annual plant, but the seed dispersal method is floating type and does not have high mobility to long distances. Furthermore, the surrounding area has many elements that restrict the spread because excluding the farmland, it is mostly housing areas or paved roads. In some mowing areas, when only the upper part is removed, the remaining culm branches out again to flower and fruit, showing very strong survival. Because of this, it is recognized globally as a serious weed (Wipff 2003). When spreading continues to areas outside of the introduced area in the future, it is expected that there will be high risk of ecological disturbance. It has different life forms from the related taxa of *Hemarthria* R. Br. And the thick fur can be checked on the **leaf sheath**. Its Korean name was named ‘Gae-soe-chi-gi-pul’ because it shows similar external appearances with that of the ‘Soe-chi-gi-pul [*Hemarthria sibirica* (Gand.) Ohwi]’.

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References

- Aliscion SS, Giussani LM, Zuloaga FO, Kellogg EA. 2003. A Molecular Phylogeny of *Panicum* (Poaceae: Paniceae): Tests of Monophyly and Phylogenetic Placement within the Panicoideae. *Amer. J. Bot.* 90(5): 796-821.
- Brown W.V., Smith B.N. 1975. The Genus *Dichantherium* (Gramineae). *Bull. Torrey Bot. Club.* 102(1): 10-13.

- Chen SL, Li DZ, Zhu G, Wu ZL, Lu SL, Liu L, Wang ZP, Sun BS, Zhu Z, Xia N, Jia L, Guo Z, Chen W, Chen X, Yang G, Phillips SM, Stapleton C, Soreng RJ, Aiken SG, Tzvelev NN, Peterson PM, Renvoize SA,OLONOVA MV, Ammann KH. 2006. Poaceae. *In* Flora of China, Vol. 22 (Poaceae). Wu Z.Y., Raven P.H., Hong D.Y. (eds.). Science Press and Missouri Botanical Garden Press, Beijing and St. Louis. pp. 1-2.
- Chen SL, Jin YX, Zhuang T, Fang WZ, Sheng GY, Liu L, Wu ZL, Lu SL, Sun BS, Hu ZH, Wang S, Sun XZ, Wang HQ, Yang XL, Wang CP, Li BG, Wen SB. 1990. Flora Reipublicae Popularis Sinicae, Tomus 10(1). Science Press, Beijing. pp. 217-219 (in Chinese).
- Chung IC. 1965. Korean Grasses. Taesutang Press, Seoul. 186 p.
- Clayton WD, Renvoize SA. 1986. Genera Graminum: Grasses of the World. Kew Bull., Addit. Ser. 13: 366.
- Freckmann RW, Lelong MG. 2003. *Dichanthelium* (Hitchc. & Chase) Gould. *In* Flora of North America: North of Mexico Vol. 25. Barkworth ME, Capels KM, Long S, Piep MB. (eds.). Oxford University Press, New York. pp. 406-450.
- Giussani LM, Costa-Sánchez JH, Zuloaga FO, Kellogg EA. 2001. A Molecular Phylogeny of the Grass Subfamily Panicoideae (Poaceae) Shows Multiple Origins of C₄ Photosynthesis. *Amer. J. Bot.* 88(11): 1993-2012.
- Gleason HA., Cronquist A. 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada (2nd ed.). The New York Botanical Garden, New York. pp. 796-806.
- Gould FW. 1974. Nomenclatural Changes in the Poaceae. *Brittonia* 26(1): 59-60.
- Gould FW. 1980. The Mexican Species of *Dichanthelium* (Poaceae). *Brittonia*. 32(3): 353-264.
- Hammer RL. 2010. Systematic and Evolutionary Studies in the *Dichanthelium acuminatum* (Poaceae: Paniceae) Complex. Unpublished Doctor Dissertation. The University of Texas-Permian Basin. 178p.
- Hitchcock AS. 1971. Manual of The Grasses of the United States, Vol. 2. (2nd ed.). Dover Public., Inc., New York. pp. 626-706.
- Korea National Arboretum. 2011. Illustrated Grasses of Korea (Revised and enlarged edition). Korea National Arboretum, Pocheon. 600p. (in Korean).
- Koyama T. 1987. Grasses of Japan and Its Neighboring Regions An Identification Manual. Kodansha, Tokyo. pp. 169-175.
- Lee YN. 1966. Manual of the Korean Grasses. Ewha Womans University Press. Seoul. 300p.
- Lee YN. 2007. Poaceae Barnhart. *In* The Genera of Vascular Plants of Korea. Flora of Korea Editorial Committee (ed.). Academy Publishing Co., Seoul. pp. 1182-1264.
- Osada T. 1989. Illustrated Grasses of Japan. Heibonsha Ltd., Tokyo. pp. 506-519 (in Japanese).
- Peterson PM. 2001. *Muhlenbergia* Schreb. *In* Catalogue of New World Grasses (Poaceae): II. Subfamily Chloridoideae. Peterson PM, Soreng RJ, Davidse G, Filgueiras TS, Zuloaga FO, Judziewicz EJ. (eds.). *Contr. U.S. Natl. Herb.* 41: 143-173.
- Peterson PM. 2003. *Muhlenbergia* Schreb. *In* Flora of North America: North of Mexico Vol. 25. Barkworth ME, Capels KM, Long S, Piep MB. (eds.). Oxford University Press, New York. pp. 145-200.
- Shimizu T. 2003. Naturalized Plants of Japan. Heibonsha Ltd., Tokyo. pp. 290 (in Japanese).
- Sun BS, Phillips SM. 2006. *Rottboellia*. *In* Flora of China, Vol. 22 (Poaceae). Wu ZY, Raven PH, Hong DY. (eds.). Science Press and Missouri Botanical Garden Press, Beijing and St. Louis. pp. 644-645.
- Wipff J.K. 2003. *Rottboellia* L.f. *In* Flora of North America: North of Mexico Vol. 25. Barkworth M.E., Capels KM, Long S, Piep MB. (eds.). Oxford University Press, New York. pp. 691.
- Wu ZL, Peterson PM. 2006. *Muhlenbergia* *In* Flora of China, Vol. 22 (Poaceae). Wu ZY, Raven PH, Hong DY. (eds.). Science Press and Missouri Botanical Garden Press, Beijing and St. Louis. pp. 486-487.
- Zuloaga FO, Morrone O. 2003. *Dichanthelium* (Hitchc. & Chase) Gould. *In* Catalogue of New World Grasses (Poaceae): III. Subfamilies Panicoideae, Aristidoideae, Arundinoideae, and Danthonioideae. Zuloaga FO, Morrone O, Davidse G, Filgueiras TS, Peterson PM, Soreng RJ, Judziewicz EJ. (eds.). *Contr. U.S. Natl. Herb.* 46: 177-192.

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