

# The Genus *Trisetum* (Gramineae) In Malesia And Taiwan

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## Summary

In Malesia and Taiwan there are three taxa of *Trisetum* Pers. (Gramineae): *T. bifidum* (Thunb.) Ohwi in Taiwan and New Guinea, *T. spicatum* (Linné) Richt. ssp. *kinabaluense* Chrtek in Sabah and the ssp. *formosanum* (Honda) Veldk., **comb. nov.**, in Taiwan. *Trisetum flavescens* (Linné) Beauv. must be the conserved type of the generic name. Some subspecific epithets proposed by Hultén (1959) under *T. spicatum* are validated.

## Introduction

The genus *Trisetum* Pers. belongs to the Aveneae and is characterised by the lemma, which is awned in the distal half and has a bifid to bisetose apex. It is very close to *Koeleria* Pers., in which the lemma has a (sub-) apical awn and an entire apex. Some species are intermediary in these characters, as could be expected, but since they are annuals, the life-cycle has been used to place them conveniently in separate satellite genera. Thus we have *Parvotrisetum* Chrtek and *Trisetaria* Forssk. next to *Trisetum* and what is generally called *Lophochloa* Reichenb. next to *Koeleria*. Life form seems a very weak character, especially when it is the only one to base genera on, and it is then not surprising that some authors, e.g. Paunero (1950), Jacques-Félix (1962) have united *Trisetum* with *Trisetaria*, the latter name being the oldest. Jonsell (1978, 1980) has kept them separate, but retained some annuals in *Trisetum*. Unfortunately he has not yet explained the exact reasons for doing so. As we intended to study only the Malesian and Taiwanese taxa, we did not want to get involved in the problems of generic delimitation and have here used the more usual generic name *Trisetum*.

There is yet another problem about the application of the name *Trisetum*, however. The generally accepted lectotype of this is *T. pratense* Pers., a superfluous name for *T. flavescens* (Linné) Beauv. (cf. Hitchcock, 1920; Kerguelen, 1975); the Index Nominum Genericorum erroneously followed Britton & Brown's (1913) arbitrary typification, which must be rejected. They appointed *T. striatum* (Lamk.) Pers., but that is a taxonomic synonym of *Helictotrichon sempervirens* (Vill.) Pilg., the lectotype of *Helictotrichon* Besser! (See Sevenster & Veldkamp, 1983). It has not been realised, however, that as early as 1827, Besser (between July and December) and Link (in October or November) restricted *Trisetum* to the *annual* species, and by retaining *T. parviflorum* (Desf.) Pers. as the only species in it, Link made that the obligatory type! Jonsell has kept that species in *Trisetum* but Holub (1974) has included it in *Rostraria* Trin., which he claimed is the correct name for *Lophochloa*, but which then rightfully would be the 'true' *Trisetum*. What everyone else has called *Trisetum* must then be named *Acrospelion* under which name Besser placed the perennial species including *T. flavescens*. This is of course most undesirable and

therefore Veldkamp (1983) has proposed to make *T. flavescens* the conserved type of both *Trisetum* and *Acrospelion*, whereby the latter name becomes superfluous.

Various attempts have been made to distinguish infra-generic entities in *Trisetum*. For America, Louis-Marie (1928) has proposed a system which was based on morphological characters; for Europe, Chrtek (1965) made another using the anatomy of the leaves and roots. The two systems are incompatible: Louis-Marie's subgenus *Heterolytrum* (= *Trisetum*) includes all of Chrtek's subgenera, while sections of the latter were not recognised by Louis-Marie at all.

The species under study here belong to the subgenus *Trisetum*, with *T. bifidum* in the sect. *Sibirica* Chrtek (1968), reduced to a subsection of sect. *Trisetum* by Probatova (1978), and *T. spicatum* in sect. *Trisetaera* Aschers. & Graebn.

Ridley (1916) described *T. latifolium* from New Guinea and mentioned the presence of *T. spicatum* [as *T. subspicatum* (Linné) Beauv.] there. The type of the first name belongs to *Arundinella furva* Chase, the material of the second to *Anthoxanthum angustum* (Hitcch.) Ohwi.

Some 18th century collections labeled 'Timor' represent *T. antarcticum* (Forst. f.) Trin. This locality is no doubt erroneous, for this species is otherwise only known from New Zealand and some Antarctic islands. If it really occurred in Timor, it could only have been found in the mountains, but the collectors at that time had not yet penetrated so far inland. This species is certainly not the same as *T. spicatum* spp. *australiense* Hultén, although the name is cited in the latter's synonymy by Hultén (1959). It is a 'good' *Trisetum* and certainly not a *Hierochloë* as stated by the International Code of Botanical Nomenclature (1975)! Here its basionym, *Aira antarctica*, is cited as the basionym of *Disarrenum antarcticum* Labill., the type of *Disarrenum* Labill. a name rejected against *Hierochloë*. De Labillardière in fact did mention Forster's name as possibly belonging to what he described and depicted, but his doubts were soon validated when Forster's material turned out to belong to *Trisetum* and his own, to what now is known as *Anthoxanthum redolens* (Vahl) Royen. The reference to Forster must therefore be deleted from his protologue and the Code emended. If it is maintained that *Aira antarctica* must nevertheless be regarded as the basionym, the whole entry of *Disarrenum* must be deleted, as that name then be regarded as a later, heterotypic synonym of *Trisetum*!

### Acknowledgements

This study was initiated by the second author during a course in advanced Angiosperm taxonomy at the Rijksherbarium and finished by the first author. The descriptions are mainly based on material present in L, specimens of the *T. spicatum*-complex seen by Hultén were kindly sent on loan from S by Dr. K. Bremer, making possible the validation of some of Hultén's combinations, while Veldkamp was able to annotate specimens in BO and SING during a visit to these Institutes. The latter also made the drawings, which were carefully inked by Mr. J. van Os, Leiden.

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### Trisetum

*Trisetum* Pers., Syn. 1 (1805) 97; Louis-Marie, Rhodora 30 (1928) 209, 237; C. E. Hubb., Fl. Trop. E. Afr. 10 (1937) 99; Hitchc. & Chase, Man. Grasses U. S., ed. 2 (1951) 287; Bor, Grasses (1960) 447; Ohwi, Fl. Jap. (1965) 148; Chrtek, Bot. Not. 118 (1965) 210; Hsu, Fl. Taiw. 5 (1978) 422; Nicora, Fl. Patag. 3 (1978) 238; Jonsell, Fl. Eur. 5 (1980) 220. — *Acrospelion* Bess. in Schult. & Schult. f., Mant. 3 (1827) 526 ('326'), *nom. superfl.* — *Lectotype: Avena flavescens* Linné = *Trisetum pratense* Pers., *nom. superfl.*, = *Trisetum flavescens* (Linné) Beauv., *typ. cons. prop.* (see introduction).

*Grapphephorum* Desv., Nouv. Bull. Soc. Philom. Paris 2 (1810) 189. — *Lectotype: Grapphephorum melicoideum* (Michx.) Desv. [= *Trisetum melicoides* (Michx.) Scribn.].

*Trichaeta* Beauv., Agrost. (1812) 86, 179, t. 17, f. 8. — *Type: Trichaeta ovata* (Pers) Beauv. [= *Trisetum ovatum* Pers.; the basionym of this is *Bromus ovatus* Cav., 1801, *non* Gaertn., 1770, so Persoon is the validating author].

*Rupestrina* Provancher, Fl. Canad. (1862) 689. — *Type: Rupestrina pubescens* Provancher, *nom. superfl.* [= *Trisetum spicatum* (Linné) Richt.].

Perennials. Innovations folded or involute. Ligule membranous. Panicle lax to densely contracted. Spikelets laterally compressed, (1-) several-flowered, disarticulating above the glumes and between the lemmas (rarely below the glumes in some N. Am. spp.), all florets bisexual except for the variously reduced uppermost one(s). Glumes in situ shorter to longer than the lemmas, of  $\pm$  the same consistency or thinner, unawned, keeled; lower glume usually 1-nerved; upper glume usually 3-nerved, equal to or longer and wider than the lower one. Rachilla prolonged, nodes puberulous to pubescent. Lemmas usually awned above the middle, apex usually bifid and bi-aristate, 3-5-nerved; callus usually shortly hairy. Palea 2-nerved, not enclosed by the lemma in fruit. Lodicules 2, membranous, bilobed, margin puberulous to glabrous. Anthers 3. Ovary apically glabrous or with only a few hairs; styles free at base, protruding laterally. Caryopsis fusiform,  $\pm$  terete, not furrowed; hilum subbasal, punctiform to elliptic, inconspicuous; embryo small; endosperm  $\pm$  liquid.

*Distribution.* Temperate regions, in the tropics in the high mountains. Depending on the classification, 50-75 species, 2 in Malesia and Taiwan.

### Key

1. Peduncle densely pubescent below the contracted panicle. Axis densely pubescent. Lower glume 0.6-1 times as long as the first lemma, Apical teeth of the first lemma 0.4-0.7 mm long ... 2
1. Peduncle and axis glabrous, panicle lax, nodding. Lower glume 0.5-0.6 times as long as the first lemma. Apical teeth of the first lemma 1.5-2 mm long.—Lower glume 2-5 mm long. Upper glume 4.5-6.5 mm long. First lemma 5-7.5 mm long. Anthers 0.9-1.3 mm long. Taiwan, New Guinea ..... 1. *T. bifidum*
2. Lower glume 3.5-5 mm long, 0.6-0.8 times as long as the first lemma. Upper glume 5-7 mm long. First lemma 4.5-6 mm long, apical teeth  $\pm$  0.4 mm long. Taiwan ..... 2a. *T. spicatum* spp. *formosanum*
2. Lower glume 6-7 mm long,  $\pm$  as long as the first lemma. Upper glume  $\pm$  8 mm long. First lemma 6-6.5 mm long, apical teeth  $\pm$  0.7 mm long. Sabah .. 2b. *T. spicatum* spp. *kinabaluense*

### 1. *Trisetum bifidum* (Thunb.) Ohwi

*Trisetum bifidum* (Thunb.) Ohwi, Bot. Mag. Tokyo 45 (1931) 191; Acta Phytotax. & Geobot. 3 (1934) 81; J. Jap. Bot. 17 (1941) 444; Fl. Jap. (1965) 149; Chung, Korean Gr. (1965) 89; Lee, Man. Korean Gr. (1966) 121, f. 90; Hsu, Taiwania 16 (1971) 235; Taiwania 17 (1972) 54, f. 62; Anon., Icon. Corm. Sin. 5 (1974) 91, 845, f. 7012; Hsu, Taiwan Gr. (1975) 285, fig.; Tateoka, Bull. Nat. Sc. Mus. Tokyo B 4 (1978) 1; Hsu, Fl. Taiwan 5 (1978) 422, f. 1384. — *Bromus bifidus* Thunb., Fl. Jap. (1784) 53. — *Trisetum flavescens* (Linné) Beauv. var. *bifidum* Makino, Bot. Mag. Tokyo 26 (1912) 215. — Type: Hb. Thunberg 2576 (UPS, holo, n.v., IDC 1036 seen; L), Japan, Nagasaki, 1774.

*Bromus avenaeformis* Steud., Syn. 1 (1854) 326. — Lectotype: Burger s.n. (L, holo, 908.98-239, here proposed), Japan.

*Trisetum flavescens* (Linné) Beauv. var. *papillosum* Hack., Bull. Hb. Boiss. 7 (1899) 702; Honda, J. Fac. Sc. Univ. Tokyo III, 3 (1930) 126; Chase, J. Arn. Arb. 24 (1943) 83; Henty, Bot. Bull., Lae 1 (1969) 189; Royen, Alp. Fl. N. G. 2 (1980) 1158, f. 375. — *Trisetum sibiricum* Rupr. ssp. *papillosum* Roshev., Bull. Jard. Bot. Russ. 21 (1922) 2. — *Trisetum bifidum* (Thunb.) Ohwi var. *papillosum* Ohwi, J. Jap. Bot. 17 (1941) 445. — Lectotype: Faurie 2359 (G, holo; P, n.v.) (cf. Van Royen, 1980), Japan, Tokyo.

*Trisetum flavescens* (Linné) Beauv. var. *macranthum* Hack., Bull. Hb. Boiss. 7 (1899) 703; Honda, J. Fac. Sc. Imp. Univ. Tokyo III, 3 (1930) 126. — *Trisetum bifidum* (Thunb.) Ohwi var. *macranthum* Ohwi, J. Jap. Bot. 17 (1941) 445. — Type: Faurie 7171 (G, holo, n.v.), Japan, Prov. Ishikari, Sapporo.

*Trisetum taquetii* Hack. in Fedde, Repert. 12 (1913) 386; Honda, J. Fac. Sc. Imp. Univ. Tokyo III, 3 (1930) 128. — Type: Taquet 3403 (W, holo; US, n.v.), Korea, Quelpaert, Hallaisan, July 1909.

*Trisetum biaristatum* Nakai, Bot. Mag. Tokyo 35 (1921) 150; Honda, J. Fac. Sc. Imp. Univ. Tokyo III, 3 (1930) 125. — *Trisetum bifidum* (Thunb.) Ohwi var. *biaristatum* Honda, fide Ohwi, J. Jap. Bot. 17 (1941) 445. — Type: Matsuzaki s.n. (n.v.), Japan, Prov. Izo, Aogashima, 1920.

*Trisetum bifidum* (Thunb.) Ohwi forma *contractum* Ohwi, Bot. Mag. Tokyo 45 (1931) 192. — Types: Faurie 883, 2288 (n.v.), Korea.

*Trisetum bifidum* (Thunb.) Ohwi var. *oshimense* Honda, Bot. Mag. Tokyo 49 (1935) 697. — Type: Jotani s.n. (TI, holo, n.v.), Japan, Prov. Izu, Oshima, Sashikiji, 1933.

*Trisetum bifidum* (Thunb.) Ohwi var. *viride* Honda, Bot. Mag. Tokyo 49 (1935) 697. — Type: Jotani s.n. (TI, holo, n.v.), Japan, Prov. Izu, Oshima, Motomura, 1932.

Tussocky perennial, up to 90 cm high, with a shortly creeping rhizome. Culms densely pubescent at base, becoming glabrous upwards. Ligules collar-shaped, 0.5–2 mm long, margin usually glabrous. Blades flat, up to 20 cm by 5 mm,  $\pm$  appressed pubescent to glabrous above, glabrous beneath. Peduncle glabrous. Panicle  $\pm$  lax, nodding, 10–20 by 2–5 cm across, axis glabrous, lower branches 2 or 3 together, longest one up to 5.5 cm long with 20–25 spikelets, scabrous. Spikelets 5–9 mm long, 2–4 flowered, at least the lower two florets bisexual. Glumes acuminate, scabrid on the nerves; lower glume 2–5 mm long, 0.5–0.6 times as long as the first lemma, 1-nerved; upper glume 4.5–6.5 mm long, 0.6–0.75 times as long as the second lemma, 3–5-nerved. Rachilla nodes 1.5–2 mm long, process 2–2.7 mm long, hairs 0.2–0.5 mm long. First lemma lanceolate, 5–7.5 mm long, scabrid-punctate, somewhat shiny at base, 3-nerved, callus hairs  $\pm$  0.3 mm long, apical teeth 1.5–2 mm long; awn L-shaped, inserted in the apical quarter, usually horizontally patent, column 2–4 mm long, arista 5–7 mm long. First palea 3–5 mm long, keels ciliate, apex bifid, brown-suffused. Lodicules 0.8–1 mm long, oblong, bidentate. Anthers 0.9–1.3 mm long. Caryopsis fusiform,  $\pm$  2.75 mm long.

*Distribution.* China (E. of Szechuan–Kwantung), Korea, Japan, Taiwan, *Malesia*: New Guinea (Snow Mts., Lake Habbema, Brass 9118; W. Sepik, Star Mts., Tel Besin, *Veldkamp* 6248; Central, Iswan Swamp, *Van Royen* 10867).

*Ecology.* Banks of rivulets, well-drained slopes, on limestone, old native camps, 2660–3225 m in New Guinea, at around 2000 m in Taiwan (Hsu, 1978).

*Collectors' notes.* Tussocks to 30 cm across, culms divergent, to 60 cm long. Leaves bright green. Inflorescence pendulous, spikelets green to silvery purple, awns divergent in fruit. Anthers and stigmas white.

*Chromosome numbers.*  $2n = 28$  (Lee, 1966; Hsu, 1971; Tateoka, 1978), 42 (Hsu, 1972).

*Notes.* This species is not as closely related to *Trisetum flavescens* as is sometimes thought. In Probatova's system it belongs to subsection *Sibirica* (Chrtek) Probatova, while the other species, being the generic type, belongs to subsect. *Trisetum*. As the latter is a good forage grass, it has been introduced in many parts of the world, and may perhaps sometime appear in *Malesia* and Taiwan also. It differs from *T. bifidum* by having at most only a slightly scabridulous lemma with an S-shaped awn, white to silvery paleas, and anthers 1.5–3 mm long (for the connoisseurs:  $x = 6$ , not 7).

Thunberg's specimen is filed under *Avena antarctica* in UPS. It is annotated *Bromus bifidus* and *Aira antarctica* and under that latter name there is a collection by Forster f. marked *Bromus bifidus*, but with the 'bifidus' partly crossed out. Schweickerdt (Bothalia 3, 1937, 198) who personally studied these specimens noted that the last one matches another in K, which, we may add, is *Trisetum antarcticum* (Forst. f.) Trin. In L there is a specimen given by Thunberg to D. van Royen, which we assume is an isotype of *Bromus bifidus*.

The Code errs where it cites, under the nomen conservandum 206 *Hierochloë*,

*Aira antarctica* Forst. f. as the basionym of *Disarrenum antarcticum* Labill. De Labillardière only doubtfully included the reference to Forster's plant, which is *Trisetum antarcticum* (Forst. f.) Trin., while his own is *Anthoxanthum redolens* (Vahl) Royen. (See introduction here and R. Brown, Prodr., 1810, 209).

This species has a very curious distribution, 'jumping' from Continental Asia and Taiwan to New Guinea, while it is not found anywhere else in Malesia. Comparable patterns are known for only a few other species: *Carex bilateralis* Hayata, *C. brachyathera* Ohwi, *C. curta* Gooden., *C. duriuscula* C. A. Mey., *C. finitima* Boott (also in Sumatra), *C. michauxiana* Boeck, *Eleocharis attenuata* (Franch. & Sav.) Palla, *Fimbristylis dictyocolea* S. T. Blake (Cyperaceae), *Drosera rotundifolia* Linné ssp. *bracteata* Kern & Steen. (Droseraceae), *Germainia capitata* Balansa & Poitrasson, *Hemarthria pratensis* (Balansa) Clayton (Gramineae), *Myriophyllum propinquum* Cunn. or *M. verticillatum* Linné (Haloragaceae) to which a sterile collection from the Wissel Lakes is thought to belong; *Hypericum gramineum* Forst. (Hypericaceae), *Utricularia minor* (Lentibulariaceae). It is remarkable that, but for the savannah grasses, all these species are montane to subalpine and rare to very rare (*Germainia* ranges from 0–2000 m). The cause of this phenomenon can only be speculated on. Some also occur in Australia.

## 2. *Trisetum spicatum* (Linné) Richt.

*Trisetum spicatum* (Linné) Richt., Fl. Eur. 1 (1890) 59; Hultén, Svensk Bot. Tidskr. 53 (1959) 203; Bor, Grasses (1960) 448, 701; Chrtek & Jirásek, Webbia 17 (1963) 569; Chrtek, Acta Univ. Carol., Biol. 1967 (1968) 95; C. L. Hitchc. *et al.*, Vasc. Pl. Pacif. N. W. (1969) 721; Chrtek, Folia Geobot. & Phytotax. 5 (1970) 447; Tzvel., Nov. Syst. Pl. Vasc. 7 (1970) 59; Kerguélen, Lejeunia n.s. 75 (1975) 277; Jonsell *et al.*, Svensk Bot. Tidskr. 69 (1975) 113; Petrovsky, Nov. Syst. Pl. Vasc. 15 (1979) 22; Jonsell, Fl. Eur. 5 (1980) 222. — *Aira spicata* Linne, Sp. Pl. 1 (1753) 64, non Linné, l.c., p. 63. — *Aira subspicata* Linné, Syst. Nat., ed. 10, 2 (1759) 873, *nom. superfl.* — *Trisetum subspicatum* Beauv., Agrost. (1812) 88, 149, 180, *nom. superfl.* — *Type*: Linné s.n. (LINN, holo, no. 85-7, seen on IDC microfiche; S, iso, n.v., depicted by Hultén, 1959, f. 1), Sweden, Lapland, 1732.

For further synonymy see Hultén (1959) and Kerguélen (1975).

This species has one of the widest natural distributions of flowering plants known (Hultén, 1959): Eurasia, North and South America, New Zealand and Australia. It is no wonder that it is very variable and so Hultén thought he could distinguish at least 14 subspecies in it. Chrtek (1968, 1970) added two more and Petrovsky (1979) another. Unfortunately Hultén gave no key, while his diagnoses are often incompatible and vaguely worded; several of his names are moreover invalid as he did not indicate types. Opinions on the acceptance of these subspecies differ widely. Hitchcock *et al.* (1969) remark that at least for their area 'well marked geographical races are not delimitable ... (and) serve(s) no useful purpose', while Bor (1960) remarked that for the taxa in the Himalaya 'it is by no means possible to make any clear-cut division ... (It) is a polyploid complex which cannot be worked out by the examination of even a large number of dried specimens.' Chrtek (1970), however, 'is inclined to accept' them. Undoubtedly the best guide for identification at present

is provided by the provenance, but at least the plants from Sabah and Taiwan appeared to be really distinct from each other and from material identified by Hultén as *ssp. alaskanum* in S, although that does not seem to be homogenous and can possibly be split up further. Therefore, although a much clearer account of the complex is necessary to clear up the difficulties, we have decided to follow Hultén and Chrtek. The plants from Taiwan must therefore be regarded as a subspecies to avoid the suggestion that they might represent a taxon subjugated to one of Hultén's, e.g. *ssp. alaskanum*.

**2a. *Ssp. formosanum* (Honda) Veldk., comb. & stat. nov. — Fig. 1b.**

*Trisetum formosanum* Honda, Bot. Mag. Tokyo 41 (1927) 636; J. Fac. Sc. Imp. Univ. Tokyo III, 3 (1930) 128. — *Trisetum spicatum* (Linné) Richt. var. *formosanum* Ohwi, J. Jap. Bot. 17 (1941) 443; Chen & Hsu, J. Jap. Bot. 37 (1962) 301; Hsu, Taiwania 17 (1972) 54, f. 63; Taiwan Gr. (1975) 287, f. 38; Fl. Taiwan 5 (1978) 424, f. 1384. — *Type: Matsuda 29* (TI, holo, n.v.), Taiwan, Mt. Nokozan, 1919.

*Trisetum spicatum* auct. non Richt., e.g. Anon., Icon. Corm. Sin. 5 (1976) 92, 845, *pro specim. taiw.*

*Trisetum spicatum* (Linné) Richt. *ssp. alaskanum* auct. non Hultén, e.g. Hultén, Svensk Bot. Tidskr. 53 (1959) 212, *pro specim. taiw.*

*Trisetum subspicatum* auct. non Beauv., e.g. Honda, J. Fac. Sc. Imp. Univ. III, 3 (1930) 129, *pro specim. taiw.*

Tussocky perennial, up to 50 cm high. Culms glabrous at base, becoming pubescent upwards to villous under the panicle. Ligules lingular, 1.5–3 mm long, margin sometimes erose, glabrous. Blades flat, up to 15 cm by 5 mm, glabrous, scabridulous. Peduncle villous. Panicle contracted, erect, 8–15 by 0.5–1.5 cm across, axis villous. Spikelets 5–7 mm long, 3-flowered, the uppermost florets sometimes variously reduced. Glumes acute, scabrid on the nerves, greenish, rarely purple; lower glume 3.5–5 mm long, 0.6–0.9 times as long as the first lemma, 1-nerved; upper glume 5–7 mm long,  $\pm$  0.9–1 (or more) time as long as the second lemma, 3-nerved. Rachilla nodes  $\pm$  1.2 mm long, process  $\pm$  1.5 mm long, hairs 0.8–1.1 mm long. First lemma 4.5–6 mm long, scabridulous, 3–5-nerved, callus hairs 0.2–0.5 mm long, apical teeth  $\pm$  0.4 mm long; awn nearly straight to S-shaped, inserted in the upper  $\frac{3}{10}$ – $\frac{4}{10}$ th, column 1–2 mm long, arista  $\pm$  4 mm long. First palea 3–5 mm long, keels scabridulous, apex bidentate. Lodicules  $\pm$  0.5 mm long, bidentate. Anthers  $\pm$  1.75 mm long. Caryopsis not seen.

*Distribution.* Endemic to Taiwan [*Van Steenis 20698, 20937* (L), *Tamura et al. 20823, 22135* (S)].

*Ecology.* Subalpine grasslands, roadsides in Pinus forest, 3000–3950 m.

*Chromosome number.* N = 14 (Chen & Hsu, 1962).

*Note.* The ecological data have been taken from the numbers cited above as other records are scanty, at most stating 'alpine grass'.

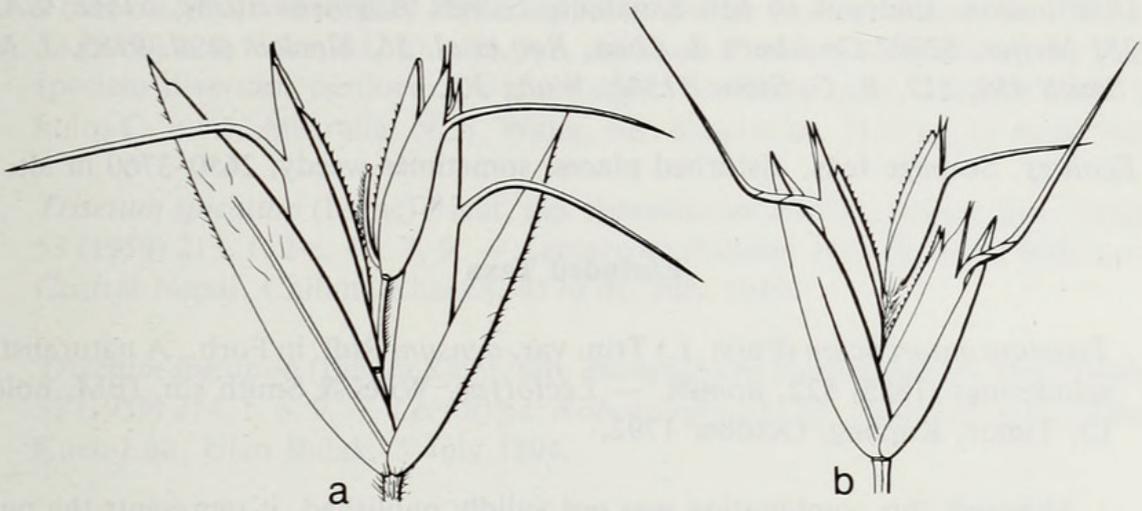


Fig. 1. Spikelets of *Trisetum spicatum* (Linné) Richt. — a. subsp. *kinabaluense* Chrték, *J.M.B. Smith 512*; b. subsp. *formosanum* (Honda) Veldk., *Tamura et al. 20823*; all  $\times 6$ .

**2b. Ssp. kinabaluense** Chrték — Fig. 1a.

*Trisetum spicatum* (Linné) Richt. ssp. *kinabaluense* Chrték, *Folia Geobot. & Phytotax.* 5 (1970) 447. — *Type*: Clemens 51668 (BM, holo, n.v.; L), Sabah, Mt. Kinabalu, Donkey's Ears and Giant Saddle near Low's Peak, over 3960 m, January 1934.

*Deschampsia* sp.: Steen., *Bull. Jard. Bot. Btzg.* III, 13 (1934) 214.

*Trisetum spicatum* auct. non Richt.: J. B. M. Smith, *New Phytol.* 84 (1980) 563, 565, 566.

*Trisetum spicatum* (Linné) Richt. ssp. *alaskanum* auct. non Hultén: Hultén, *Svensk Bot. Tidskr.* 53 (1959) 212, *pro specim. born.*

Tussocky perennial, up to 40 cm high. Culms pubescent at base, becoming villous upwards. Ligules lingular, 2–3 mm long, margin sometimes incised, ciliolate. Blades flat, up to 15 cm by 5 mm, slightly to moderately pubescent. Peduncle villous. Panicle contracted, 8–10 by 1–2.5 cm across, axis villous. Spikelets 6–9 mm long, 3-flowered, the uppermost floret variously reduced. Glumes acute, slightly scabrid, with distinct brown, green and purple areas, sometimes green all over; lower glumes 6–7 mm long, about as long as the first lemma, 1(–3)-nerved; upper glume  $\pm 8$  mm long,  $\pm 0.8$  times as long as the second lemma, 3-nerved. Rachilla nodes 1.5–2 mm long, process  $\pm 1.2$  mm long, hairs  $\pm 0.7$  mm long. First lemma 6–6.5 mm long, scabridulous, 5-nerved, callus hairs 0.1–0.3 mm long, apical teeth  $\pm 0.7$  mm long; awn L-shaped, horizontally patent, inserted in upper  $\frac{3}{10}$ th, column 2–3 mm long, arista  $\pm 4$  mm long. First palea  $\pm 5$  mm long, keels scabridulous, apex bidentate. Lodicules  $\pm 0.3$  mm long, bifid. Anthers  $\pm 1.5$  mm long, yellow. Caryopsis not seen.

*Distribution.* Endemic to Mt. Kinabalu, Sabah. (Clemens 30261, 51668, SAN 29281 Meijer, 82997 Cockburn & Aban, Rao et al. 56, Sinclair et al. 9185, J. M. B. Smith 459, 512, B. C. Stone 11342, Wong 30).

*Ecology.* Seepage fens, disturbed places, sometimes weedy, 2650–3760 m alt.

### Excluded Taxa

1. *Trisetum antarcticum* (Forst. f.) Trin. var. *densum* Ridl. in Forb., A naturalist's wanderings (1885) 522, *nomen*. — *Lectotype*: Wiles & Smith s.n. (BM, holo; L), Timor, Kupang, October 1792.

Although this combination was not validly published, it represents the purported occurrence of the species for Malesia. The plants on which it was based belong to a form of *T. antarcticum*. At BM there are two collections from Timor, one by Nelson, who accompanied Capt. Bligh on the expedition of the *Bounty*, and one by Wiles & Smith, who joined the Captain on his voyage with the *Providence*. *Trisetum antarcticum*, however, occurs only in New Zealand and some Antarctic Islands. It is, moreover, doubtful whether Nelson collected any plants in Timor, as Bligh (*Voyage to the South Sea*, 1792, 240, *vide* Britton, *J. Bot.* 54, 1916, 352) reported that he was too ill to move around. If the species indeed did occur in Timor (it has not been collected since), it could only have grown in the mountains, where none of these collectors could have gone. It is obvious that mislabeling must have taken place.

2. *Trisetum latifolium* Ridl., *Trans. Linn. Soc., London, Bot.* 9, 1 (1916) 250. — *Lectotype*: Kloss s.n. (BM, holo; L), New Guinea, Mt. Carstensz, Camp ix-x, 1710–1950 m, 26 January 1913. = *Arundinella furva* Chase, *non A. latifolia* Fourn. (1886).
3. *Trisetum subspicatum* auct. *non* Beauv.: Ridl., *J. Linn. Soc., London, Bot.* 9, 1 (1916) 250; Steen., *Bull. Jard. Bot. Btzg.* III, 13 (1934) 217. — *Trisetum spicatum* auct. *non* Richt.: Henty, *Bot. Bull. Lae* 1 (1969) 189. — *Anthoxanthum horsfieldii* auct. *non* Mez: Royen, *Alp. Fl. N. G.* 2 (1980) 1188. = *Anthoxanthum angustum* (Hitcch.) Ohwi.

Ridley's original specimens (Kloss s.n., Mt. Carstensz, camps xiii–xiv) were seen at BM. Van Royen equated it with *Anthoxanthum horsfieldii*, but that is an endemic Javanese species. Henty, who had no access to the specimens, merely corrected the name used by Ridley.

### Appendix

(by J. F. Veldkamp)

Hultén did not validly publish all his new taxa because he forgot to indicate their types. Now that we have seen some of his specimens in S which were mentioned by him and sometimes even depicted, these names can be validated:

1. *Trisetum spicatum* (Linné) Richt. ssp. *australiense* Hultén, Svensk Bot. Tidskr. 53 (1959) 220, f. 3-e, 4-i, 10, excl. syn., quae ad *T. antarcticum* (Forst. f.) Trin., speciem diversam pertinent. — *Lectotype*: S. Helms (not 'Helmes') 847 (S, holo; C, n.v.), Australia, N. S. Wales, Mt. Kosciusko, 2135 m, 15 April 1922.
2. *Trisetum spicatum* (Linné) Richt. ssp. *himalaicum* Hultén, Svensk Bot. Tidskr. 53 (1959) 213, f. 2-e, 4-l, 7, 9. — *Lectotype*: Polunin 1175 (S, holo; BM, n.v.), Central Nepal, Chilime Kharka, 4570 m, July 1949.
3. *Trisetum spicatum* (Linné) Richt. ssp. *mongolicum* Hultén, Svensk Bot. Tidskr. 53 (1959) 214, f. 6, 9. — *Lectotype*: Roborovsky s.n. (S, holo; LE, n.v.), Tibet, Kuen-Lun, Ulan Bulak, 5 July 1894.
4. *Trisetum spicatum* (Linné) Richt. ssp. *toluccense* (Kunth) Hultén var. *barbatipaleum* Hultén, Svensk Bot. Tidskr. 53 (1959) 223. — *Lectotype*: Pringle 10032 (S, holo; L; C, n.v.), Mexico, Hidalgo State, Trinidad Iron Works, 1770 m, 21 August 1905.

*Trisetum spicatum* (Linné) Richt. ssp. *ovatipaniculatum* Hultén was validated by Jonsell, Svensk Bot. Tidskr. 69 (1975) 132 with its lectotype represented by Hoppe s.n. (S, holo, n.v.: L), Austria, Karinthia, summit of Mt. Glockner, mistakenly cited by Hultén (f. 2b) 'Tirol, Treffer'. Jonsell suggested that Hultén had indicated types on the sheets, but the ones seen by us were not so designated. Some had remnants of a red label which had been torn up.



Veldkamp, Jan-Frits and Have, J. C. van der. 1983. "The Genus *Trisetum* (Gramineae) in Malesia and Taiwan." *The Gardens' bulletin, Singapore* 36, 125–135.

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