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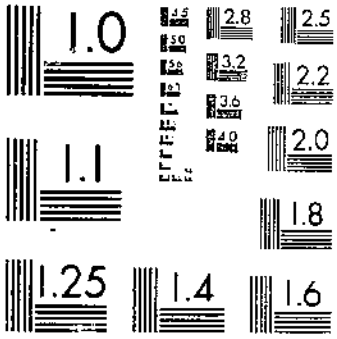

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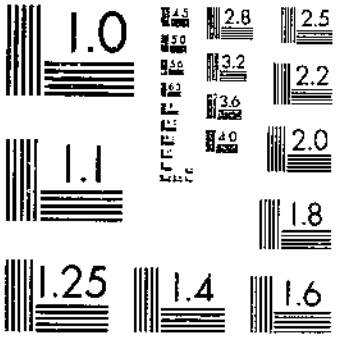

MICROCOPY RESOLUTION TEST CHART
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A Taxonomic Revision of the Genus Lolium

By Edward E. Terrell

Crops Research Division

Technical Bulletin No. 1392

Agricultural Research Service

UNITED STATES DEPARTMENT OF AGRICULTURE

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A Taxonomic Revision of the Genus Lolium

By EDWARD E. TERRELL, *research botanist*
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INTRODUCTION

Lolium, a genus of the grass family, includes eight species, according to the present treatment. The species are indigenous to Europe, the North Atlantic Islands, temperate Asia, and north Africa, but they have been widely distributed to other parts of the world. Two members of the genus are important economic grasses in cool temperate climates throughout the world. In Europe *L. perenne* (perennial ryegrass) and *L. multiflorum* (annual ryegrass, Italian ryegrass) are especially important as forage grasses. In the United States perennial ryegrass is sometimes grown in permanent pastures, especially in the Pacific Coast and Southern States. It is a common but minor component of lawn grass mixtures. In the Southern United States annual ryegrass is sown in the fall to furnish a good temporary lawn in winter and spring. It may be used also as excellent temporary pasture or cut as hay.

There are no modern taxonomic revisions of the genus. Rouville (1853)[1] in a doctoral thesis recognized three broad species. Essad (1954) studied five species by means of discriminant functions. He concluded that the allogamous group, including *L. perenne*, *L. multiflorum*, and *L. rigidum*, can be clearly separated from the autogamous group, *L. temulentum* and *L. remotum*. *Lolium multiflorum* and *L. rigidum* are like *L. temulentum* and *L. remotum* in being separable from each other only with difficulty. *Lolium perenne* differs more from *L. rigidum* than it does from *L. multiflorum*.

The chaotic state of the nomenclature of *Lolium* considerably hampered efforts to devise a better classification; some order had to be made of the approximately 480 published names. Many names additional to those listed in "Index Kewensis" and the Smithsonian "Index to Grass Species" were found during this study; undoubtedly there are others undiscovered, because *Lolium* has been treated in many European floras in the past 200 years. All of the known published names are given in an appendix, organized in the usual chronological sequences together with some nomenclatural and morphological annotations. A large proportion of the published names refer to unimportant local variants, environmental modifications, abnormal forms, or are later homonyms.

The present study represents an "alpha taxonomy" stage in the accrual of knowledge concerning

[1] See Literature Cited, p. 44.

the genus. Man's cultivation, along with the weedy nature of the genus, has resulted in complex evolutionary patterns. Information has been obtained by cytological and genetical studies on the genus in cultivation, but very little data exist about natural populations in the Mediterranean and southwestern Asian regions —the centers of variation. Field collections obtained and analyzed by modern methods are needed to reveal variation patterns. Until more evidence is available concerning natural hybridization and other phenomena, a more useful classification is achieved by recognizing the extremes as species and at the same time calling attention to intergradations between them.

Although I collected some specimens in the Eastern United States and in Portugal and Spain and grew small numbers of plants in the greenhouse, herbarium specimens provided most of the data for this investigation. About 4,780 specimens were received on loans.

In addition, I visited certain European and American herbaria to examine types and entire collections.

In the following list (abbreviations by Lanjouw and Stafleu, 1964) herbaria from which loans were received are designated with "(L)" and those visited are designated "(V)":

BAG	National Herbarium of Iraq, Baghdad (L)
BC	Instituto Botánico de Barcelona, Barcelona (V)
BM	British Museum (Natural History), London (L, V)
CAL	Central National Herbarium, Calcutta (L)
COI	Botanical Institute of University of Coimbra, Portugal (L)
DAO	Department of Agriculture, Ottawa, Ontario (L)
E	Royal Botanic Garden, Edinburgh (L)
FI	Istituto Botanico, Florence (L, V)
G	Conservatoire et Jardin Botaniques, Geneva (L, V)
GH	Gray Herbarium, Cambridge (V)
HUJ	Hebrew University, Jerusalem (L)
K	Royal Botanic Gardens, Kew (L, V)
LAU	Musée Botanique Cantonal, Lausanne (L)
LE	Komarov Botanical Institute, Leningrad (L)
LINN	Linnean Society, London (V)
LISC	Centro de Botánica da Junta de Investigações do Ultramar, Lisbon (L, V)
LISE	Estação Agronómica Nacional, Oeiras, Portugal (V)
LISI	Instituto Superior de Agronómia, Lisbon (V)
LISU	University of Lisbon, Lisbon (V)
MA	Instituto "Antonio José Cavanilles", Madrid (V)
MADM	Museu Municipal do Funchal, Madeira (L)
MADS	Museu de História Natural do Seminário do Funchal, Madeira (L)
NA	U.S. National Arboretum, Washington (L, V)
NY	New York Botanical Garden, New York (L, V)
ORT	Jardin de Aclimatación de la Orotava, Tenerife, Canary Islands (L)

P	Muséum d'Histoire Naturelle, Paris	(V)
PR	National Museum, Prague	(L)
RAW	Gordon College, Rawalpindi, Pakistan	(L)
US	U.S. National Herbarium, Washington	(L, V)
W	Naturhistorisches Museum, Vienna	(L)

CYTOLOGY AND GENETICS

Artificial crosses made by geneticists provide some information about the biosystematics of *Lolium*. The general facts from this source were reviewed (Terrell 1966) and may be briefly summarized as follows: (1) All taxa for which chromosome numbers have been counted are diploid with $2n=14$; (2) *L. perenne, L. multiflorum,* and perhaps *L. rigidum* are self-incompatible and cross-pollinated; (3) *L. temulentum, L. remotum,* and perhaps *L. rigidum* var. *rottbollioides* (*L. loliaceum*) are self-compatible and self-pollinated; (4) all taxa of *Lolium* are more or less interfertile; (5) most of the species of *Lolium* are known to cross with *Festuca* section Bovinae, including *F. pratensis* Huds. (*F. elatior* L.), *F. arundinacea* Schreb., and *F. gigantea* (L.) Vill.; (6) certain species of *Lolium* cross with considerable difficulty with *Festuca* section Festuca, including *F. ovina* L., *F. rubra* L., and their close relatives; (7) *Lolium* has never been crossed successfully with any other genus besides *Festuca;* (8) *Lolium* and *Festuca* constitute a comparium because they can exchange genes; and (9) in contrast to *Lolium*, *Festuca* includes polyploid taxa.

Natural hybrids of various *Lolium* species and intergeneric hybrids with *Festuca* have been found, chiefly in Europe (briefly listed by Terrell 1966). Natural hybrids of *L. perenne* × *F. pratensis* are particularly frequent in Europe.

According to geneticists, *L. rigidum* var. *rigidum* is self-incompatible whereas *L. rigidum* var. *rottbollioides* is self-compatible. This inconsistency may be more apparent than real because of insufficient samples studied as well as uncertainties regarding taxonomic identities.

The ability of certain *Lolium* species to cross with *Festuca* section Bovinae suggests to certain authors that the genera should be united (Terrell 1966). Their morphological differences (spicate vs. paniculate; one glume vs. two glumes) may be less significant than heretofore believed. However, the species of *Lolium* are more closely related to each other than to *Festuca*. I favor, at least in the present state of knowledge, the retention of *Lolium* and *Festuca* as two distinct genera. That they do cross in nature as well as artificially does not necessarily mean they are congeneric. Similar situations are known in other grass genera. Each case must be decided on its own merits. More facts are needed about hybridization and morphology to arrive at general principles regarding generic limits in grasses. Classification should also provide a stable and usable nomenclature. Name changes should be made only when the evidence is clearly in their favor.

TAXONOMIC AND EVOLUTIONARY RELATIONSHIPS

According to geneticists there are two compatibility groups in *Lolium*: *L. temulentum* and *L. remotum*, which are self-pollinated and self-compatible, and *L. perenne* and *L. multiflorum*, which are cross-pollinated and self-incompatible. The situation in *L. rigidum* is in doubt. Compatibility data for the remaining taxa are unknown.

The groupings of species on a morphological basis are not clear-cut nor are the species very distinct from each other; consequently, I have not divided the genus into sections or series (as did certain past authors). Nevertheless, I recognize *L. temulentum*, *L. remotum*, and *L. persicum* as one group. It seems likely that *L. remotum* and the widespread *L. temulentum* originated from the same or similar basic stock in southwest Asia or central Europe. They are known only as weeds of cultivated crops and probably evolved in close association with primitive agriculture. *L. persicum*, restricted to southwest Asia, could be a derivative of the same basic stock or part of a prototype stock from which the other two taxa were derived.

Lolium perenne and *L. multiflorum* form another group. The area where *L. multiflorum* is indigenous is not known; possibly it originated in southern Europe. *L. perenne* is indigenous in meadows in certain areas of southern and central Europe and perhaps also in north Africa, the Middle East (where now rather rare), and southwest Asia.

Lolium rigidum, a polymorphic complex as presently constituted, consists of several elements. The *strictum-rottbollioides* element probably has received genes from *L. perenne* and *L. multiflorum*, which led to formation of the weedy segment of *L. rigidum* by introgression. *L. rigidum* is composed of other elements (*paraboliceae, siculum, gaudinii*, for example) about which not much is known. There may be one or more "swamped" taxa in the complex. *L. subulatum* may be an offshoot of the *strictum-rottbollioides* element. Environmental modification superimposed on hybridization and introgression are believed to be partial causes of the great variation in the *L. rigidum* complex.

Lolium canariense, perhaps most similar to the *L. perenne* group, appears to be the result of isolation after chance dispersal of variants of *L. perenne, L. multiflorum, L. subulatum*, or the *L. rigidum* group to the North Atlantic Islands. *L. canariense* may not be very old, geologically speaking. Lems (1960) stated that the flora of the Canary Islands includes a Mediterranean element and a Littoral element from the sea coasts of Europe and Africa.

Local populations of *Lolium* taxa often have distinctive characteristics; when, however, many populations are studied these distinctions are bridged by apparently continuous variations.

One of the major sources of taxonomic difficulties in the genus is the intergradation among *L. multiflorum, L. perenne*, and the polymorphic *L. rigidum*. It appears that repeated hybridizations and introgression occurred during their evolution, especially during the past several thousand years of man's disturbance of habitats in the Mediterranean and southwest Asia.

SYSTEMATIC TREATMENT

Lolium L., Species Plantarum 83. 1753; Genera Plantarum ed. 5. 36. 1754. (Name first mentioned in Virgil's Georgics.)

Craepalia Schrank, Baier. Fl. 1: 382. 1789.

Crypturus Link, Linnaea 17: 387. 1843.

Arthrochortus Lowe, Jour. Bot. Kew Misc. 8: 301. 1856.

Annuals or tufted perennials, with one to many erect to subprostrate culms. Blades flat or sometimes more or less folded, either rolled or folded in young shoots. Ligules membranous, short. Auricles present or absent. Inflorescence a spike, bearing few to many solitary, sessile, 2- to 22-flowered spikelets in two ranks alternating on opposite sides of the slender to thickened and cylindrical rachis. Flowering determinate in spike. Spikelets placed edgewise to concavities of rachis, in certain species more or less sunken in the concavities and covered by the glumes. Flowering indeterminate within a spikelet. Lower, or first, glume present only in the terminal spikelet; the remaining spikelets with a single, outer glume (upper, or second, glume). Rachillas disarticulating above the glumes and between the florets, leaving a short segment attached to bases of florets. Lemmas more or less ovate or oblong, with or without subterminal awns. Awns present or absent, more or less straight, slender, to 2.5 cm. long. Paleas similar to lemmas in size and shape, narrowly keeled, usually ciliolate. Lodicules 2, more or less lanceolate or narrowly deltoid. Stamens 3. Styles 2. Caryopses closely and rather tightly invested by lemma and palea or sometimes partly free, oblong to narrow-elliptic, rounded to subacute at base, rounded and with whitish apical area at distal end; embryo orbicular or oval, about one-third to one-fifth the length of the caryopsis; hilum linear; hilar side of caryopsis with longitudinal trough, embryo side convex.

Eight species native to Europe and North Atlantic Islands, temperate Asia, and north Africa. Type of the genus is *L. perenne*.

Although subdivisions of genera are not recognized here, the following have been published: subgenus Lobeter, Doell, Fl. Grossh. Baden 1: 111. 1857; subgenus, Dasychloa, Doell, op. cit. 113; sect. Ctenium, Dumort., Obs. Gram. Fl. Belg. 97. 1823; sect. Dolathera, Dumort., ibid.; sect. Craepalia, (Schrank) Dumort., ibid.; sect. Craepalia, (Schrank) Godr., in Gren. & Godr., Fl. France 3: 614. 1855; sect. Eulolium, Godr., op. cit. 612; sect. Crypturus, (Link) Asch. & Graebn., Syn. Fl. 2: 760. 1902. The following series published by Nevski, in Komarov (ed.), Fl. USSR 2: 434–438. 1934: Temulentae, Remotae, Persicae, Rigidae, Multiflorae, Perennes. Also, in Nevski, Act. Inst. Bot. Acad. Sci. USSR, ser. 1, fasc. 2: 40. 1936, is series Loliacea.

Key to Mature and Complete Plants

A. Plants either perennial with spikelets 2- to 10-flowered or annual (or biennial) with spikelets 11- to 22-flowered; glumes less than 15 mm. long.

B. Perennial; spikelets 2- to 10-flowered; glumes one-third to equaling or slightly exceeding spikelet, but usually about one-half to three-fourths as long; rachis glabrous or scaberulous only on angles; lemmas awnless (or awns to 8 mm. long at least in hybrids with *L. multiflorum*); leaf blades 1–6 (usually 2–4) mm. wide; immature leaves folded in young shoots ..... *L. perenne*

BB. Annual or biennial (or perennial at least in hybrids with *L. perenne*); spikelets 11- to 22-flowered; glumes typically one-fourth to one-half as long as spikelets; rachis scaberulous; lemmas usually with awns to 15 mm. long (or sometimes awnless at least in hybrids with *L. perenne*); leaf blades 2–8 (usually 4–7) mm. wide; immature leaves rolled in young shoots ..... *L. multiflorum*

AA. Plants annual; spikelets 2- to 11-flowered; glumes of various lengths.

C. Mature caryopses plump and thick, only 2–3 times longer than wide; lemma apices usually rounded or blunt, if awned then awns attached 0.5–2.0 mm. below apices; typically weeds of grain crops or flax.

D. Lower florets in a spikelet 5.2–8.5 mm. long, 1.5–3.0 mm. wide; mature caryopses usually 4.2–7.0 mm. long, 1.6–3.0 mm. wide; glumes 7–30 mm. long; spikes 5–40 cm. long; leaf blades usually 3–10 mm. wide; awns present or absent; rachis 0.5–3.5 mm. thick ..... *L. temulentum*

DD. Lower florets in a spikelet 3.5–5.4 mm. long, 1.2–1.8 mm. wide; mature caryopses usually 3.2–4.5 mm. long, 1.2–1.8 mm. wide; glumes 5–16 mm. long; spikes 2–23 cm. long; leaf blades usually 1–6 mm. wide; usually awnless (or rarely awns to 10 mm. long); rachis slender, 0.5–1.5 mm. thick ..... *L. remotum*

CC. Mature caryopses more than 3 times longer than wide; lemma apices various, if awned then awns attached 0.2–1.0 mm. below apices; habitats various.

E. Lemmas awnless or awns less than 3 mm. long (rarely longer in *L. rigidum* from southwest Asia); rachis 0.5–3.0 mm. thick.

F. Florets large, 6.3–12.0 mm. long, 1.0–2.4 mm. wide; spikelets only 2- to 4-flowered, with long (2.2–6.3 mm.) rachilla segments; glumes usually acute or acuminate, 14–25 mm. long ..... *L. subulatum*

FF. Florets smaller, 3.2–8.5 (rarely to 9.8) mm. long, 0.9–2.0 mm. wide; spikelets 2- to 11-flowered, with short (1.0–3.5 mm.) rachilla segments; glumes obtuse to acute, 4–20 mm. long (to 30 mm. in Madeira Islands) ..... *L. rigidum* (two varieties)

EE. Lemmas with awns more than 3 mm. long; rachis slender, 0.5–1.5 mm. thick.

G. Lower florets in a spikelet 8–12 mm. long, 1.5–2.7 mm. wide (5–6.5 times longer than wide); paleas often 0.5–1.8 mm. longer than their lemmas or equal to them; spikelets 1.5–7.0 mm. wide; restricted to southwest Asia and Middle East ..... *L. persicum*

GG. Lower florets in a spikelet 3–10 mm. long, 0.7–1.5 mm. wide (4–10 times longer than wide); paleas equal to lemmas in length or to 0.5 mm. longer; spikelets 1–4 mm. wide; restricted to Canary, Cape Verde, and Madeira Islands ..... *L. canariense*

1. Lolium perenne L.

[Fig. 1]

Lolium perenne L., Sp. Pl. 83. 1753. ("Europa ad agrorum versuras solo fertili," type, LINN!,[2] photo, DAO!; although not typical, specimen 99.1 (see Savage 1945) labeled in Linnaeus' handwriting seems the best choice as lectotype.)

Synonymy: See Appendix.

Perennial, (3–) 8–90 cm. high. Culms erect, spreading, decumbent, or rarely prostrate (sometimes rooting at lowest nodes), slender, usually with 2–4 nodes below spike, glabrous or scaberulous above. Basal leaf sheaths green, reddish, purplish, or in age straw-colored, sometimes papery in texture, glabrous; upper sheaths commonly green, glabrous. Leaf blades folded in young shoots. Mature blades acute, attenuate, or somewhat rounded at apices, usually less than 14 (–30) cm. long, 1–6 mm. wide, many-nerved (usually about 20), glabrous and shiny below, glabrous above, with margins glabrous to scaberulous. Ligules rounded to truncate or erose, to 2.5 mm. long. Auricles present or absent, to 3 mm. long. Spikes straight or slightly curved, 3–31 cm. long, usually one-fourth to one-half the height of the plants, bearing 5–37 spikelets. Rachis slender, often flexuous, about 0.6–2.5 mm. thick at nodes; internodes in cross section concavo-convex or concavo-angular, glabrous or scaberulous on angles. Spikelets lying against concavities of rachis, 5–22 mm. long, 1–7 mm. wide, containing (2–) 5–9 (–10) fertile and 0 or 1 rudimentary florets. Rachilla segments somewhat flattened, usually 0.7–2.0 mm. long. Glumes lanceolate or narrow-oblong, rounded on backs, thin or somewhat thickened, acute or obtuse, 3- to 9-nerved, 3.5–15.0 mm. long, 0.7–1.5 mm. wide, glabrous, one-third as long as to equaling or rarely slightly exceeding spikelet, somewhat longer to somewhat shorter than lowest floret. Lemmas (of lower and middle florets of spikelet) oblong or ovate, rounded on backs, obtuse, acute, slightly bifid, or erose at hyaline apices, 3- to 5-nerved, 3.5–9.0 mm. long, 0.8–2.0 mm. wide (about 4 to 8 times longer than wide), glabrous or glabrate. Awns usually absent or to 8 mm. long, subterminal. Paleas similar to lemmas in size and shape, to 1 mm. shorter than to slightly surpassing lemmas, acute or obtuse; keels with minute teeth. Anthers linear, 2.0–4.2 mm. long, 0.3–0.7 mm. wide, yellow, whitish, or purplish. Lodicules (dried; only a few examined) about 0.7 mm. long, 0.3 mm. wide. Mature caryopses 2.9–5.5 mm. long, 0.7–1.5 mm. wide.

Chromosome number: $2n=14$.

HABITATS AND DISTRIBUTION: Fields, meadows, waste places, roadsides, sometimes a weed. Cultivated extensively in temperate regions as a lawn, forage, or soil-binding grass. First cultivated in England about 1677 (Arber 1934, Beddows 1953). Distributed throughout Europe to northern Scandinavia (Hultén 1950), temperate Asia west to India and north to western Siberia (Nevski 1934), north Africa. Indigenous in parts of Europe, Asia, and presumably north Africa. Introduced elsewhere throughout the world on all continents and many islands.

[2] Exclamation marks indicate specimens seen by author.

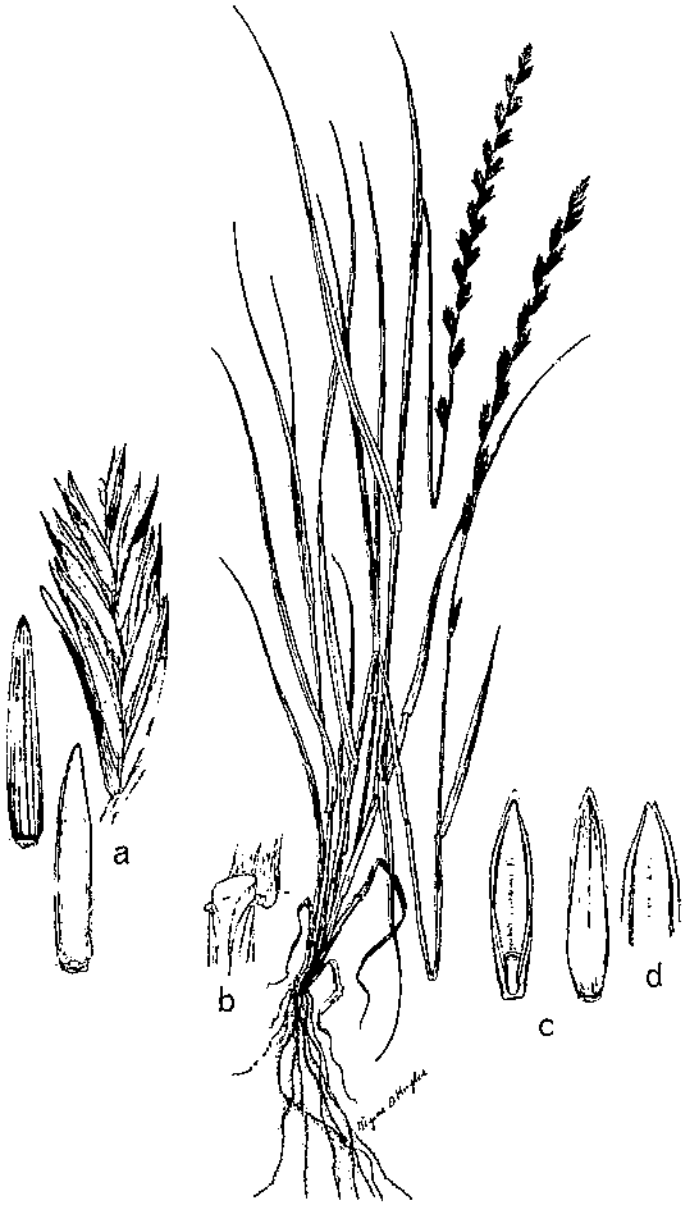

FIGURE 1.—*Lolium perenne*: Plant, × $\frac{2}{3}$; *a*, complete spikelet and glume, dorsal and ventral views, × 4; *b*, ligule, × $2\frac{1}{2}$; *c*, floret, ventral and dorsal views, × 4; *d*, palea tip, × 8. Plant *DAO 12071*; *a,b,c,d PI 220528*.

COMMON NAMES IN GENERAL USE: English—Perennial ryegrass; also English ryegrass, raygrass, eavers (Great Britain), other British names in Beddows (1953); sometimes "rye-grass" or "rye grass." French—Raygrass anglais, ray-grass, Ivraie, Ivraie vivace. German—Englisches raygrass, lolch, Deutsches Weidelgras.

Hybrids between *L. perenne* and *L. multiflorum* include (1) short-rotation ryegrass and (2) Oldenburg ryegrass (German—Oldenburger Weidelgras).

DISCUSSION: Aberrant or abnormal forms are not uncommon in *L. perenne*. There are a whole series of these forms, all of which have been given names (see Appendix). Causes for abnormalities were mentioned by Fournier (1858), Arber (1934), Sinskaya and Sharapova (1960), Jacques-Félix (1961), and others. Some of the branched forms arise as a result of hybridization with species of *Festuca*.

Lolium perenne is typically awnless. If a name is needed for the occasional awned plants, the following may be used: *L. perenne* forma *aristulatum* (Schur) Terrell (comb. nov., based on *L. perenne* var. *aristulatum* Schur, Enum. Pl. Transsilv. 812. 1866). Var. *spicata* Schumach. (1801) is a misnomer; according to Art. 60 it may be avoided. *L. perenne* var. *aristata* Willd. (1797) not only refers to *L. multiflorum* but also was never validly published. *L. brasilianum* forma *aristatum* Rothm. (1944) is considered as not strictly taxonomically equivalent because of the questionable application of the species name.

The close relationship between *L. perenne* and *L. multiflorum* is discussed in detail under the latter species.

Lolium brasilianum was originally described by Nees as perennial. Its described characteristics fit *L. perenne*, and a fragment of the type (US) resembles *L. perenne* more closely than it does any other taxon. Therefore, I have placed it in synonymy under this species. Rothmaler (1944, 1946), however, used the name to refer to certain flax weeds in Portugal that he believed to have been derived from *L. multiflorum* in the course of flax culture in historical times. Hjelmqvist (1950) also commented on *L. brasilianum*. The very few Portuguese specimens I have seen appeared to resemble *L. multiflorum* or *L. rigidum*, but I did not see enough specimens to pass judgment about the taxonomic relationships of the Portuguese flax weeds. This subject would be worth investigating by someone who can study the plants in Portugal. At any rate, it appears that the original description of *L. brasilianum* Nees for plants from South America referred to plants different from those studied by Rothmaler.

In the Negev region of Israel there are populations that superficially resemble *L. perenne* in having short glumes, small spikelets, and slender rachises. However, they intergrade with *L. rigidum* as it occurs in Israel, and perhaps they are better considered part of the *L. rigidum* complex. Tentatively they have been included in that complex, although it is possible that they merit taxonomic recognition. I am indebted to Naomi Feinbrun, Hebrew University, for first calling my attention to them.

Decumbent or subprostrate plants with much thickened rachises occur in Greece, the Aegean Islands, and sporadically elsewhere around the Mediterranean

region. Heldreich and Orphanides during the 19th century collected such plants (cf. Boissier, Flora Orientalis), now distributed to certain herbaria as *L. compressum*, *L. strictum* var. *compressum*, *L. rigidum* var. *compressum*, and *L. perenne* var. *compressum*. Many of these collections grade imperceptibly into ordinary *L. perenne*. They appear to have been somewhat modified by the maritime environments. Such plants are often difficult to distinguish from *L. rigidum* var. *rottbollioides* from similar habitats. Rechinger (1943) remarked on the problem of their identities and separation. My tentative conclusions are that both *L. perenne* and *L. rigidum* include "maritime ecotypes" that superficially resemble each other and possibly hybridize.

REPRESENTATIVE SPECIMENS: EUROPE.—**England**: Hereford, Almeley Nieuport House on roadside, vice-county 36, *Melderis 672* (BM); Norfolk, Appleton, common in old pasture, *Hubbard*, 12 July 1935 (G, US). **Netherlands**: meadow near Utrecht, *Van Zeist*, 3 July 1949 (W). **Portugal**: Caminha, na margem esquerda do rio Coura, *Garcia 693* (COI). TRAS-OS MONTES: Vimioso, arredores de Argoselo, *Teles 44* (LISE, MA). BEIRA ALTA: Figueira c. Rodrigo entre Nave Redonda e Almofala, *Teles & Rainha 335* (LISE). **Spain**: MADRID: in agris, Rivas de Jarana, *Vicioso*, 9 June 1918 (MA); sembrados de Madrid, *Aterido*, May 1924 (MA). **Italy**: TUSCANY: Monte Morello, *Fanfani*, 1 June 1890 (FI). CALABRIA: La Sila, Bassa Valle Cecita, *Sarfatti & Corradi*, 28 June 1950 (FI). **Greece**: MACEDONIA (N.W.): meadow, 4,000 ft., Pisoderion, *Alston & Sandwith 474* (K). CRETE: dist. Hierapetra, Montes Aphendi Kavusi, inter vineas ad Thriphti, substr. schist., about 800 m., *Rechinger 13258* (G); dist. Chania, in saxosis schist. inter Skines at Nea Rumata, about 300 m., *Rechinger 13396* (W). **Sweden**: Södermanland, Paroecia Torö, Mossen, in palude exsiccata, *Asplund*, 13 Aug. 1929 (BM, DAO). **Finland**: Alandia, par. Lemland, Granboda, in graminosis, *Magnusson*, 24 July 1911 (G).

ASIA.—**Israel**: Jerusalem, Mt. Scopus, on Senonian soil, *Amdursky*, 4 May 1933 (some sheets with specimens tending toward *L. rigidum*) (BC, BM, E, FI, G, HUJ, MA, P, US, W); Jerusalem, 800 m., *Dinsmore 1064* (E); Upper Galilee, Ein Zeitim, *Eig, M. Zohary & Feinbrun*, 11 May 1927, Fl. Pal. L75 (HUJ). **Turkey**: Ankara, Hacikadun Valley nr. Kecioren, by stream, *Davis & Dodds 18751* (E); Adana, dist. Feke, Sencan dere nr. Gurumze, 1,300 m., *Davis, Dodds & Cetik 19662* (K). **USSR**: KIEW: prope urb. Uman, *Czernouss*, June 1903 (G). **India**: Dalhousie, about 7,000 ft., *Stewart 2194* (US). **West Pakistan**: Punjab, Murree, roadside, 7,000 ft., *Stewart 15358* (US); Upper Toxa, Murree Hills, open places, 7,000 ft., *Stewart 27551* (G, W); Nakial, Kotli dist., Mirpur, 5,000 ft., *Mahd*, Apr. 1955 (W).

NORTH AMERICA.—**Canada**: ONTARIO: Near Cumberland, Russell County, *Dore et al 16397* (DAO).

2. **Lolium multiflorum** Lam.

[Fig. 2]

Lolium multiflorum Lam., Fl. France 3: 621. 1778. ("les environs de Peronne," France, lectotype, P!; fig. 3.)

Synonymy: See Appendix.

Annual or short-lived perennial, to 127 cm. high. Culms erect, spreading, or decumbent, usually with 4 or 5 nodes below spike, glabrous or scaberulous above. Basal leaf sheaths green, reddish, purplish, or in age straw-colored, glabrous; upper sheaths commonly green, glabrous or scabrous. Leaf blades rolled in young shoots. Mature blades attenuate to somewhat rounded at apices, 11–22 cm. long, 2–8 (–11) mm. wide, many-nerved (usually about 20), glabrous and shiny below, scaberulous to glabrous above, with margins scaberulous to glabrate. Ligules rounded, truncate, or

FIGURE 2.—*Lolium multiflorum*: Plant, × $\frac{2}{3}$; *a*, complete spikelet, × 3; *b*, ligule, × 2; *c*, palea tip, × 10; *d*, glume, dorsal view, × 4; *e*, floret, ventral and dorsal views, × 4. All drawings of *Terrell 5537*, Maryland, USA.

erose, to 4 mm. long. Auricles usually present, 1–4 mm. long. Spikes straight or slightly curved, 17–31 (–44) cm. long, usually about one-third the height of the plants, bearing 6–38 spikelets. Rachis rather slender, straight, about 0.8–2.0 mm. thick at nodes; internodes in cross section concavo-convex or concavo-angular, usually more or less retrorse-scabrous. Spikelets lying against concavities of rachis, 8–31 mm. long (excluding awns), 2–10 mm. wide, containing 11–22 fertile and 0 or 1 rudimentary florets. Rachilla segments somewhat flattened, usually 0.8–1.7 mm. long. Glumes lanceolate or narrow-oblong, rounded on backs, thin or somewhat thickened, obtuse, acute, or slightly erose, 3- to 7-nerved, 5–14 (–18) mm. long, 0.9–2.0 mm. wide, glabrous, one-fourth to one-half as long as spikelet, slightly shorter to slightly longer than lowest floret. Lemmas (of lower and middle florets of spikelet) lanceolate to lance-ovate, rounded on backs, obtuse, acute, slightly bifid, or erose at hyaline apices, 3- to faintly 5-nerved, 4.0–8.2 mm. long, 1–2 mm. wide (length-width ratio about 5–8:1), 0.7–1.5 mm. thick, glabrous or glabrate. Awns typically present, rarely absent, more or less straight, slender, minutely scaberulous, attached 0.2–0.7 mm. below apex, to 15 mm. long, usually longest in upper florets of a spikelet. Paleas similar to lemmas in size and shape, slightly shorter to slightly longer than lemmas, acute to obtuse; keels with minute teeth. Anthers more or less linear, (2.5–) 3.0–4.5 (–5.0) mm. long, 0.4–0.8 mm. wide, yellow, purplish, or reddish-brown. Lodicules (only a few examined) 0.9–1.1 mm. long, 0.35–0.40 mm. wide in fresh condition, triangular-lanceolate or lanceolate, swollen-bulbous at base. Mature caryopses 2.6–3.8 mm. long, 0.7–1.5 mm. wide.

Chromosome number: $2n=14$.

HABITATS AND DISTRIBUTION: Fields, meadows, roadsides, waste places, sometimes a weed. Cultivated in temperate regions as a forage, lawn, or soil-binding grass. Native to Europe. No information available about where indigenous; it may have originated in Italy where it was being grown in the 13th and 14th centuries in winter-irrigated meadows in Lombardy (Beddows 1953, Suvorova 1960). Now distributed throughout Europe to northern Scandinavia (Hultén 1950), north Africa, and west temperate Asia. Introduced elsewhere throughout the world.

COMMON NAMES IN GENERAL USE: English.—Italian ryegrass, annual ryegrass. French.—Raygrass d'Italie, Ivraie multiflore. German.—Italienisches raygrass, Welsches Weidelgras. A cultivar of *L. multiflorum* is Westerwold ryegrass (Westerwolths ryegrass; German.—Westerwoldisches Weidelgras).

DISCUSSION: *L. multiflorum* was the subject of a special study by Suvorova (1960), who included information about morphology, distribution, cultivation, and genetics. In addition, Manner (1960) provided an extensive literature review as well as information about interspecific hybrids with *L. perenne*.

Aberrant plants were mentioned by Grunder (1948), Nyquist and Schulke (1961), and others.

Lamarck described *L. multiflorum* as awned and many-flowered[3] (photograph of his type

[3] In this study many- or few-flowered refer to the number of florets per spikelet.

specimen in fig. 3). He did not state whether it was annual, biennial, or perennial. However, enough is now known about such plants as Lamarck described to indicate that they are usually either annual or biennial.

The close relationship between *L. multiflorum* and *L. perenne* has been much studied. Each is self-incompatible. When crossed they are often highly interfertile (see Manner 1960 and Terrell 1966). In examining specimens in European and American herbaria I found many putative hybrids with intermediate degrees of awn development and number of florets per spikelet, two of the principal distinguishing characteristics. There appears to have been much introgression in all characteristics; hence, their separation becomes arbitrary. Certain authors (e.g., Vasek and Ferguson 1963) have expressed doubt that they are distinct species.

Many characteristics have been used to separate *L. multiflorum* and *L. perenne*. For example, Lakon (1919) and Hellbo (1926) claimed differences in the marginal teeth of the lemma and palea. Beddows (1937) pointed out small differences in their prophylls. However, these and a number of other differences mentioned in floras strongly overlap. The following tabular comparison is based on my studies of typical plants and emphasizes the main distinguishing characteristics (in italics) as well as those which overlap the least.

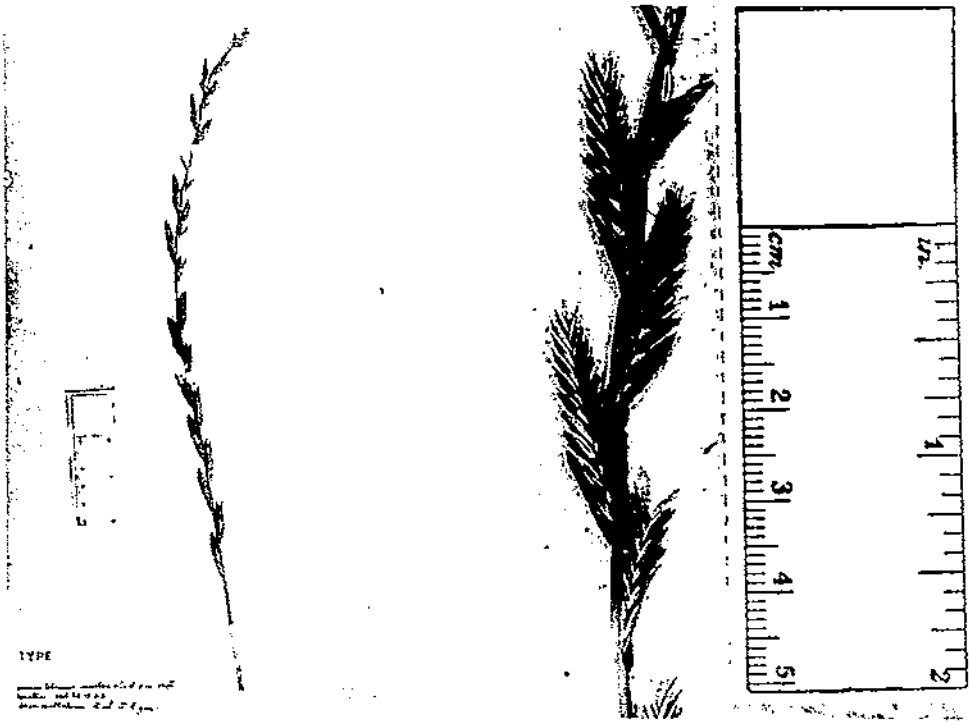

FIGURE 3.—Type of *L. multiflorum* Lam. (P): entire sheet and part of spike.

	L. multiflorum	*L. perenne*
Plant height	Taller and more robust, to 127 cm. high	Shorter, to 90 cm.
Duration	Annual or biennial (or short-lived perennial, at least in hybrids)	Perennial
Leaf vernation	Rolled	Folded
Blade width	Usually 3 to 8 mm.	Usually 2 to 4 mm.
Blade indument	Usually scaberulous above	Usually glabrous
Rachis indument	Scabrous	Glabrous or scaberulous only on rachis angles
Spike length	Usually longer, 17 to 44 cm.	Usually shorter, 3 to 31 cm.
Spikelets	With 11 to 22 florets	With 2 to 10 florets
Glume length	Typically one-fourth to one-half as long as spikelets	Typically one-half to three-fourths as long as spikelets
Awns	Typically present, to 15 mm. long (or absent, at least in hybrids)	Typically absent (but to ca. 8 mm. long, at least in hybrids)
Anther length	Usually 3.0 to 4.5 mm.	Usually 2.0 to 4.0 mm.

There are also chemical, physiological, and agronomic differences: seedlings of *L. multiflorum* fluoresce under ultraviolet light; *L. multiflorum* is said to be less winterhardy and to commence growth earlier in the spring.

In separating the two taxa in question many authors have attributed considerable importance to the presence, absence, and degree of development of awns. However, I believe that the number of florets per spikelet is determined by a more complex genetic mechanism; hence, may be a more reliable character for separation. According to C. E. Hubbard (in correspondence) the single most reliable characteristic is the folding (versus rolling) of the immature leaf in bud.

Typical specimens are distinct in the field and herbarium. In the present treatment I am provisionally considering *L. multiflorum* and *L. perenne* as separate species, despite the intergradation between them. Those who prefer to consider *L. multiflorum* as either a subspecies or variety may use one of the following names (see Appendix): *L. perenne* subsp. *multiflorum* (Lam.) Husnot; *L. perenne* var. *multiflorum* Thuill. ex Bast.

Lolium italicum was described by Braun as a few-flowered, awned, short-lasting perennial. As far as nomenclature is concerned, Hubbard (1956) showed that *L. italicum* must be abandoned because it was published essentially as a synonym of the older *L. multiflorum*. In certain European floras Braun's name has been maintained as referring to a species distinct from *L. multiflorum*. However, I can find no basis for this—there seems to be a continuous series from *L. multiflorum* through *L. italicum*. It is apparent, also, that plants fitting Braun's original description could be hybrids between *L. multiflorum* (awned and many-flowered) and *L. perenne* (awnless and few-flowered).

Another name published as a synonym, hence not valid, is *L. gaudinii*. In practice it has been used to refer to miscellaneous *L.*

rigidum—*L. multiflorum*—*L. perenne* variants.

Lolium siculum Parl. was originally described as having 11 to 13 florets per spikelet, consequently, it is placed in synonymy under *L. multiflorum*. A type specimen, if one exists, has not been located. *L. siculum* is a problematical taxon and is discussed further under the systematic treatment of *L. rigidum*.

Westerwold or Westerwolths ryegrass originated in the Westerwolde area, Province of Groningen, Netherlands. Wittmack (1922) stated that compared to *L. italicum* it has larger fruits and seeds, awns as long or longer, and lowest florets awnless but uppermost awned. He, also, included measurements of lengths of palea teeth and rachillas. According to him, Westerwold ryegrass is annual or rarely biennial and is "difficult to distinguish with certainty from *L. italicum*." Breakwell (1923) commented that there is no botanical distinction between it and commercial varieties of *L. italicum* (*L. multiflorum*). Haan (1955) suspected that this possibly shortest lived form of all ryegrasses originated from unintentional selection of annual, early-maturity plants from fields of Italian ryegrass. In the writings of these and other authors there is no indication that Westerwold ryegrass differs from *L. multiflorum* sens. lat. in other than minor ways; therefore, it is concluded that, although this grass has received varietal rank in the past (see Appendix), it should instead be considered a cultivar of *L. multiflorum*.

REPRESENTATIVE SPECIMENS: **England:** railroad embankment, Rugby, *Jackson*, 19 June 1897 (BM); rubbish tip, Mitcham Common, Surrey, *Lousley*, 30 Sept. 1956 (BM). **Netherlands:** Gulpen (prov. Limburg), *Kramer & Mennega*, 4 June 1952 (W). **Spain:** Cadiz, *Gran*, 5 Apr. 1952 (MA). **Switzerland:** BERNE: prés fertiles à Mengistorf entre Könitz & Scherle, *Romieux*, 16 June 1889 (G). **Madeira Islands:** MADEIRA: Caniço, *Costa*, May 1938 (MADM). **Israel:** Upper Jordan Valley, env. of Afigim [prob. cult.], *Baum*, 12 May 1956 (HUJ). **Republic of South Africa:** CAPE: Alexandria Dist., Miller's Farm, Kaba, *Archibald 5417* (BM). **Canada:** MANITOBA: Fort Garry, Winnipeg Dist., *Boivin & Laishley 13299* (DAO).

3. **Lolium rigidum** Gaud.

Lolium rigidum Gaud., Agrost. Helv. 1: 334–335. 1811. (Switzerland, holotype, LAU!)

Annual, (6–) 18–43 (–70) cm. high. Culms erect to wide spreading, or decumbent, or subprostrate, usually with 2–4 nodes below spike, glabrous or scabrous above. Leaf sheaths green or purplish, or in age straw-colored, glabrous, becoming loose in age, glabrous to scaberulous. Leaf blades acute or attenuate at apices, to 17 cm. long (usually less than 10 cm.), 0.5–5.0 (–8.0) mm. wide, many-nerved, glabrous below, glabrous to scaberulous above, with margins glabrous to scaberulous. Ligules rounded to truncate, to 1.5 mm. long. Auricles present or absent, to 3.5 mm. long. Spikes straight or curved, 3–30 cm. long, one-fourth to five-sixth the height of the plants, bearing 2–19 spikelets. Rachis slender to rather thick, cylindrical to somewhat angular, about (0.5–) 1.0–2.5 (–3.5) mm. thick at nodes; internodes in cross section concavo-convex or concavo-angular, glabrous to scabrous. Spikelets lying against concavities of rachis or more or less sunken in rachis and

partly to mostly concealed by glumes, 5–18 mm. long, 1–3 (–7) mm. wide, usually narrow and tightly appressed against rachis especially after anthesis, containing 2–8 (–11) fertile and 0 or 1 rudimentary florets. Rachilla segments 0.9–2.8 (–3.5) mm. long, one-fourth to one-half as long as florets they subtend. Glumes lanceolate to oblong, rounded on back, rather thick, obtuse or rounded to acute, 3- to 7- (–9-) nerved, 4–20 mm. long (to 30 mm. in Madeira plants), 1–2.5 mm. wide, glabrous to scaberulous, (one-third–) three-fourths as long as to slightly longer than spikelet. Lemmas (of lower and middle florets of spikelet) more or less lanceolate, rounded on backs, obtuse, acute, or erose at often hyaline apices, 3- to 5-nerved, 3.2–8.5 (–10.5) mm. long, 0.9–2.0 mm. wide, glabrous to scaberulous. Awns usually absent or rarely to 10 mm. long, straight, slender, subterminal. Paleas similar to lemmas in size and shape, slightly shorter to slightly longer than lemmas, acute to obtuse; keels with minute teeth. Anthers 1.2–3.1 mm. long. Lodicules (dried; only a few examined) about 0.8–1.0 mm. long, narrow-lanceolate, attenuate. Mature caryopses 2.7–5.5 mm. long, 1.0–1.4 mm. wide, light-brown to blackish.

COMMON NAMES: English.—none in general use; Wimmera ryegrass has been used to refer to *L. rigidum* var. *rigidum* or var. *rottbollioides* (as *L. loliaceum*) or to *L. multiflorum* × *L. rigidum* (see Manner 1960, p. 51). French.—Ivraie raide. German.—Steifer lolch.

DISCUSSION: The type specimen (fig. 4) of *L. rigidum* appears to represent one of the weedy sorts of variants common in southern Europe and the Mediterranean region.

Lolium rigidum varies among other ways in the degree of appression of its glumes. This character varies considerably on different culms of the same plant. It is also dependent on age: flowering spikelets are spread widely, but in fruiting the spikelets and covering glumes become rather tightly appressed against the rachis. Some of the variation in spikes of *L. rigidum* var. *rigidum* is shown in figure 5.

After much study of the Mediterranean specimens in European and American herbaria, I concluded that *L. rigidum*, *L. strictum*, and *L. loliaceum* intergrade with each other so closely that they should be considered the same species. *L. rigidum* intergrades also with *L. perenne* and *L. multiflorum*.

Although some entities included under *L. rigidum* have certain unusual characters, they are not recognized as distinct taxa because of apparently complete intergradation with the main body of *L. rigidum*. *L. rigidum* sens. lat. as treated here is a polymorphic species. Discussion of questionable entities follows.

Lolium rigidum var. *duthiei* Hack. ex Hook. f. superficially appears to be an awned form of *L. rigidum*. It is discussed further under *L. temulentum*.

Lolium siculum is mentioned under *L. multiflorum* because of its many-flowered spikelets, but it must also be considered in relation to the polymorphic *L. rigidum*. Certain specimens seen from Sicily, Yugoslavian islands, and other scattered localities in the Mediterranean were labeled *L.*

FIGURE 4.—Type of *L. rigidum* Gaud. var. *rigidum* (LAU): entire sheet and part of spike.

FIGURE 5.—Spikes of *L. rigidum* var. *rigidum*, showing variation; two spikes on left are similar to *L. perenne*.

siculum by their collectors. Some of these appear to fit Parlatore's description, but they grade into *L. rigidum* and *L. multiflorum*. At least three collections from the islands off Yugoslavia are peculiar in having very large florets (about 10 mm. long), congested, overlapping spikelets, glumes about one-half to three-fourths as long as their spikelets, lemmas with awns to 6 mm. long, and blades as wide as 8 mm. The collections are as follows:

Yugoslavia: Scoglien westl. v. Lagosta: Bielac, *Ginzberger & Teyber*, 29 and 30 May 1911 (W 6083); Scoglio Bacile near Lesina, *Petter* (W 2491); Insel Lukovci (Bacili), *Marcevic*(?), 2 May 1913 (W 5189).

Arthrochortus loliaceus Lowe is known only from several collections taken in the 1850's from the Desertas group of the Madeira Islands. Besides the specimens cited in the Appendix under the synonymy of *L. rigidum* var. *rottbollioides* there are five other sheets collected by N. H. Mason and located in the herbaria of Vienna, Edinburgh, and the British Museum. *Arthrochortus loliaceus* (alias *Lolium lowei* Menezes) is distinctive and remarkable in having very long (20–30 mm.) and very indurate glumes and swollen nodes of the rachis. There are superficial resemblances to both *L. rigidum* and *L. subulatum*. Sizes and shapes of the florets are much like those in *L. rigidum*. Swollen nodes also occur in *L. canariense*, an atypical kind of which occurs in the Madeiras on the island of Porto Santo. It is concluded that the basic affinity of *Arthrochortus* lies with *L. rigidum*, with the possibility of having some genes from *L. canariense*. Because *Arthrochortus* has been insufficiently collected and is doubtfully distinct from *L. rigidum* it is provisionally placed in synonymy.

L. parabolicae Sennen ex Sampaio refers to a series of variants that grow along the shores of the Atlantic and Mediterranean mainly in Portugal and Spain. Sennen's original collection in 1917 came from Mataro, north of Barcelona, Spain. Sampaio formally described the species in 1922, noting its relationship to *L. rigidum* and its occurrence at Vila do Conde on the west coast of Portugal (specimens cited below). Collections from this last locality are among the most typical ones.

Pinto da Silva (1948) concluded that it was best to retain the original spelling, rather than follow Coutinho in spelling it "parabolicum." The meaning of the epithet is unknown.

L. rigidum var. *maritimum* (Godr.) Merino, based on *L. strictum* var. *maritimum* Godr., may or may not refer to the same taxon. I have not seen a type specimen, and the original description is insufficient to establish its identity.

Plants referrable to *L. parabolicae* have been collected at seven locations in Portugal (part of these were cited by Pinto da Silva and Fontes (1951) and by Rozeira and Malato-Beliz (1958)), two localities in Spain, two localities in Morocco, and on the islands of Fuerteventura and Hierro, Canary Islands. In 1965 I had the opportunity to collect at Mataro, Spain, along the beach in the vicinity of the railroad station, the type locality for *L. parabolicae*. Certain plants resembled *L. parabolicae;* others graded into *L. rigidum* or *L. multiflorum–L. perenne*.

When the total range of variation in *L. rigidum* is considered,

the plants referred to *L. parabolicae* are simply a local, maritime extreme. They are connected with *L. rigidum* sens. lat. by intergrading specimens from north Africa and elsewhere around the Mediterranean. It would be desirable to have population samples from the localities at which *L. parabolicae* has been collected.

The following collections are typical specimens referrable to *L. parabolicae*:

Portugal: DOURO LITORAL: Vila do Conde: areas maritimos, *Sampaio*, Apr. 1901, Fl. Lusit. Exs. 1832 as *L. rigidum β maritimum* (COI, FI, MA, P, W); Vila do Conde in arenosis maritimus, *Rothmaler & Silva 15499* (COI, G, LISE); entre Leixoes e Boa Nova, *Malato-Beliz et al 2155* (COI, LISE). ALGARVE: Lagos, *Welwitsch*, in 1848 (COI, W). **Canary Islands**: FUERTEVENTURA: in arenosis in La Punta de Handia, *Burchard 393* (K, W).

Key to Varieties of **Lolium rigidum**

A. Rachis somewhat cylindrical or angular in cross section, slender to somewhat indurated, (0.5–) 1.0–1.5 (–2.0) mm. in diameter at lowest nodes of rachis; lemmas or florets usually 4.5–8.5 mm. long; spikes 9–30 cm. long; culms erect to decumbent or rarely subprostrate ..... var. *rigidum*

AA. Rachis cylindrical, indurated, 1.5–3.5 mm. in diameter at lowest nodes of rachis; lemmas or florets usually 3.2–7.0 mm. long; spikes 3–11 (–20) cm. long; culms usually less than 30 cm. long, more or less erect-spreading to decumbent to subprostrate; most frequent in maritime habitats of the eastern and central Mediterranean region ..... var. *rottbollioides*

3a. **Lolium rigidum** Gaud. var. **rigidum**

[Fig 6]

Synonymy: See Appendix.

Culms erect, decumbent, or rarely subprostrate. Spikes straight or somewhat curved, usually 9–30 cm. long. Rachis slender to somewhat thickened and cylindrical, (0.5–) 1.0–1.5 (–2.0) mm. thick at lowest nodes of rachis. Spikelets 1–3 (–7) mm. wide, partly or mostly concealed by glumes but less sunken in rachis than in var. *rottbollioides*. Lemmas usually 4.5–8.5 mm. long.

Chromosome number: $2n=14$.

HABITATS AND DISTRIBUTION: Fields, roadsides, waste places, rocky hillsides, sandy areas, often weedy and able to colonize pioneer habitats. Southern Europe (adventive northward), north Africa, throughout Mediterranean region and Middle East to southwest Asia in Crimea, Caucasus (Georgia and Azerbaijan), Uzbekistan SSR, Iran, Afghanistan, India (Kashmir) (fig. 7). Introduced in many parts of the world, including southern Africa, Canary and Madeira Islands, Australia, and sparingly in North and South America.

REPRESENTATIVE SPECIMENS: **Portugal**: arredores de Nira, *Ferreira*, June 1914 (COI). **Italy**: TUSCANY: in promontorio Argentario, Calo Galera, *Sommier*, 24 June 1901 (FI). **Yugoslavia**: Sebenico, *Korb*, 13 June 1927 (W). **Greek Islands**: EUBOEA: Hagia Anna, ad versuras, *Rechinger 16841* (G, W); Achmet Aga (Prokopion) ad versuras, *Rechinger 17170* (W). CEA: solo schistoso, *De Heldreich*, 21–24 May 1898 (W - Halac. Graec.). SCYRO: *Tunta 721* (W - Halac. Graec.). CRETE: dist. Sitia in vineis arenosis ad Limin Sitias, *Rechinger 12484* (G, W). **Turkey**: 13 km. from Urfa, *Davis & Hedge 028143* (DAO, US); pentes schisteuses du Guzel-Déré, au NO. de Mersina (Cilicie), *Balansa 755* (some specimens tending toward var. *rottbollioides*), (E, FI,

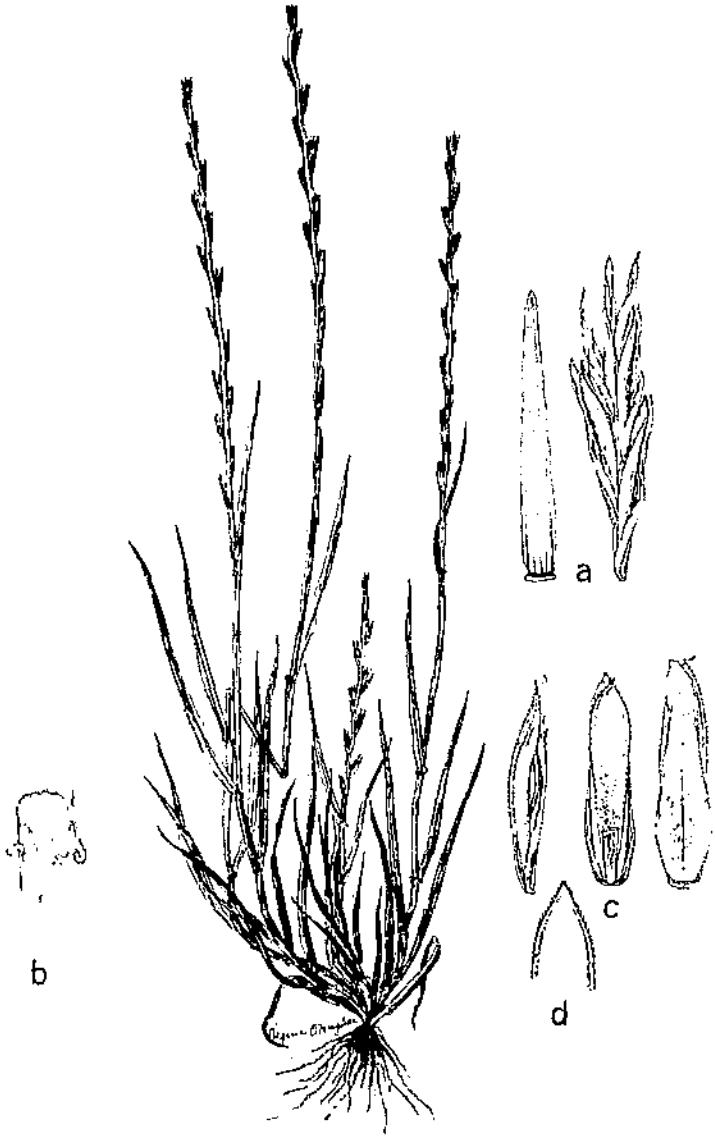

FIGURE 6.—*Lolium rigidum* var. *rigidum*: Plant, × 2/3; *a*, glume and spikelet less glume, × 3; *b*, ligule, × 3; *c*, florets in three views, × 4; *d*, palea tip, × 8. All drawings of *L 363*, Israel (HUJ).

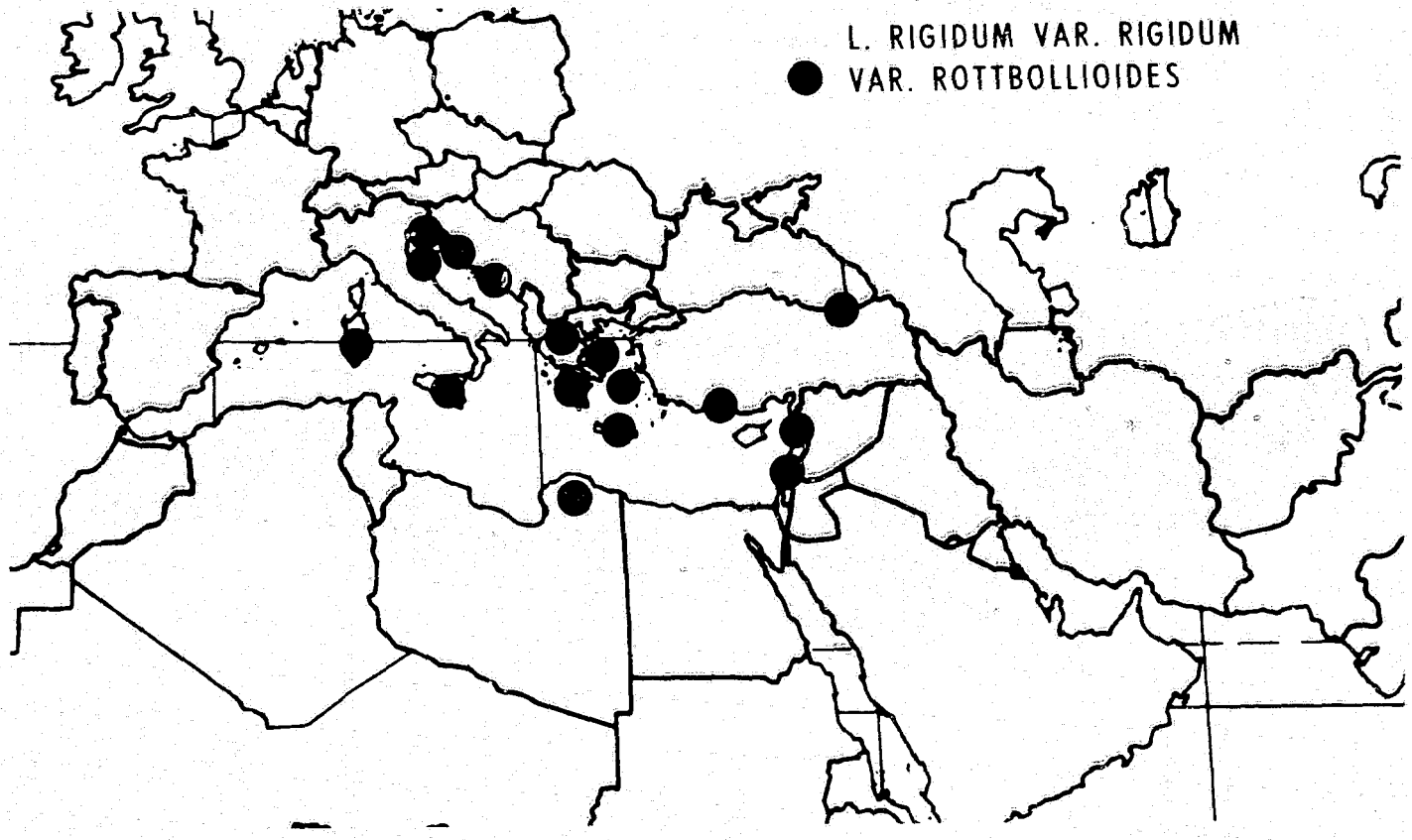

FIGURE 7.—Distribution (indigenous range) of varieties of *L. rigidum* (Canary and Madeira Islands not shown).

G, P, US, W). **Israel:** Sharon Plain, Raanana to Even-Yehuda, sandy loam, *Zohary & Amdursky*, 18 Apr. 1951 (BM, DAO, G, HUJ, US, W); Philistaean Plain, Gedera, *Eig, M. Zohary, & Feinbrun*, 11 Apr. 1927, Fl. Pal. L363 (HUJ). **Iraq:** prope urbem Baghdad, Scheriat el Beda, in deserto, *Handel-Mazzetti 948* (W). **Iran:** Ahwaz, Khuzistan, fields, *Koelz 14932* (US); Chesmashirin, Bakhtiari, *Koelz 15420* (US).

3b. **Lolium rigidum** var. **rottbollioides** Heldr. ex Boiss.

[Fig. 8]

Lolium rigidum var. [β] *rottbollioides* Heldr. ex Boiss., Fl. Orient. 5: 680. 1884. *Rottboellia loliacea* Bory & Chaub. cited as syn.

Lolium loliaceum auct., pro parte (non *L. subulatum* Vis.)

Synonymy: See Appendix.

Culms usually less than 30 cm. long, erect to decumbent to subprostrate, especially in plants from maritime habitats (these variants described as *L. crassiculme* Rech. f.). Spikes often short and somewhat curved, 3–11 (–20) cm. long. Rachis thick, cylindrical, 1.5–3.5 mm. thick at lowest nodes of rachis. Spikelets 1–3 (–5) mm. wide, partly sunken in rachis. Glumes more indurate than in var. *rigidum*. Lemmas usually 3.2–7.0 mm. long.

Chromosome number: $2n = 14$.

HABITATS AND DISTRIBUTION: Roadsides, waste places, sandy areas, often in maritime habitats. Mediterranean region in southern Europe, north Africa, and Middle East (fig. 7); Madeira Islands (as *Arthrochortus*). Usually coastal, and most frequent in Greece, Yugoslavian coast, and islands of the Aegean Sea. Introduced sparingly elsewhere, including Republic of South Africa, North America, South America, and Australia.

DISCUSSION: *Lolium loliaceum* commonly includes Mediterranean populations with thick, cylindrical rachises and indurated glumes. After studying their relationship to *L. rigidum* sens. lat. (including *L. strictum*), I concluded that these taxa belong in one species. *L. loliaceum* and *L. rigidum* intergrade so strongly that, in the last analysis, there is some question whether they are even varietally distinct. Considered as a variety *L. loliaceum* can only be separated arbitrarily from *L. rigidum*. Under Art. 60 of the International Code of Botanical Nomenclature it becomes *L. rigidum* var. *rottbollioides* Heldr. ex Boiss.

The taxon, *L. crassiculme*, described by Rechinger, is a rather well-marked extreme; however, it falls within the total range of variation possessed by *L. rigidum* var. *rottbollioides* and is included in synonymy.

Typification of *L. rigidum* var. *rottbollioides* rests on *Rottboellia loliacea*, which was cited as its synonym. Bory and Chaubard's description is not definitive. Their illustration appears to be a composite of the two specimens on the lectotype sheet (fig. 9). On this sheet the plant on the left is approximately typical of the entity here called *L. rigidum* var. *rottbollioides*. The plant on the right has longer glumes and slightly larger florets: it is closest to *L. rigidum* var. *rottbollioides* but tends toward *L. subulatum*.

Lolium subulatum Vis. has usually been considered synonymous with *L. loliaceum*. It is, however, based on a different type, and it is treated here as a distinct species. As my circumscription of *L.*

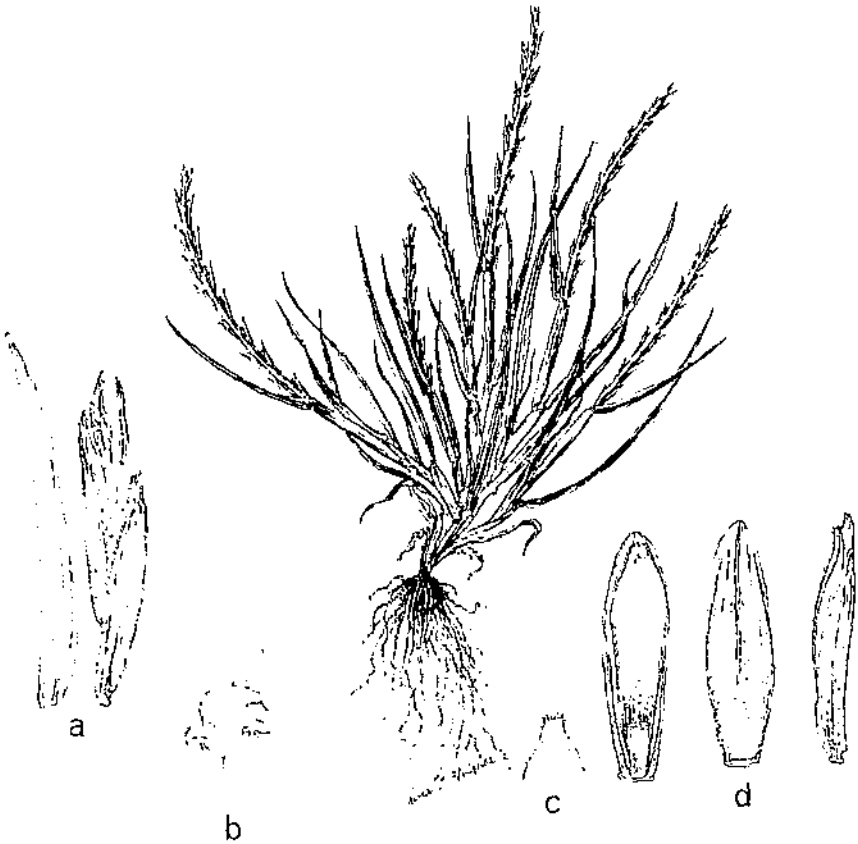

FIGURE 8.—*Lolium rigidum* var. *rottbollioides*: Plant, × ½; *a*, glume in side view and spikelet less glume, × 6; *b*, ligule, × 2½; *c*, palea tip, × 7; *d*, floret in three views, × 6. All drawings of *W 12621*, Greece.

subulatum is a new one as far as previous usage is concerned, it is necessary to compare the nomenclatural evidence to establish the correctness of application of the names *L. subulatum* and *L. rigidum* var. *rottbollioides* (*L. loliaceum*). This subject is discussed further under *L. subulatum*. Taxonomic differences are given in the key to species of *Lolium*.

REPRESENTATIVE SPECIMENS: **Italy:** MARCHES: Fano, *Cocconi*, July 1898 (FI); in arenosis maritimis alla Hag. I. Ancona, coll. unknown, May 1890 (FI). **Yugoslavia:** in literalibus prope pagum Martinscica, *Smoquina*, Gram. Hung. 291, 7 June 1903 (DAO, K, US, W); in arenosis maritimis ad pagum Fasana, *Freyn*, 3 June 1877 (FI, K, W). **Greek Islands:** LEROS: in Pharmacusarum, *Heldreich*, 6 May 1877 (W). RHODOS: in arenosis maritimis a promont., *K. H. & F. Rechinger 8390* (G, US, W). SAMOS: in Monte Kierki in lapidosis reg. infer. ad Marathokampos, *Rechinger 1690C* (W). CRETE: dist. Hierapetra, in litore lapidoso-argilloso a porto Hierapetra orientem versus, *Rechinger 13040* (US). **Israel:** Judaean Mts., Agua Bella, *D. Zohary*, 3 May 1951, Fl. Pal. 11954 (HUJ); Mt. Carmel, Shumarigh, *Naftolsky*, 15 May 1929, Fl. Pal. 11953 (HUJ). **Republic of South Africa:** CAPE: sand dunes at Strand, *Parker 5595* (K).

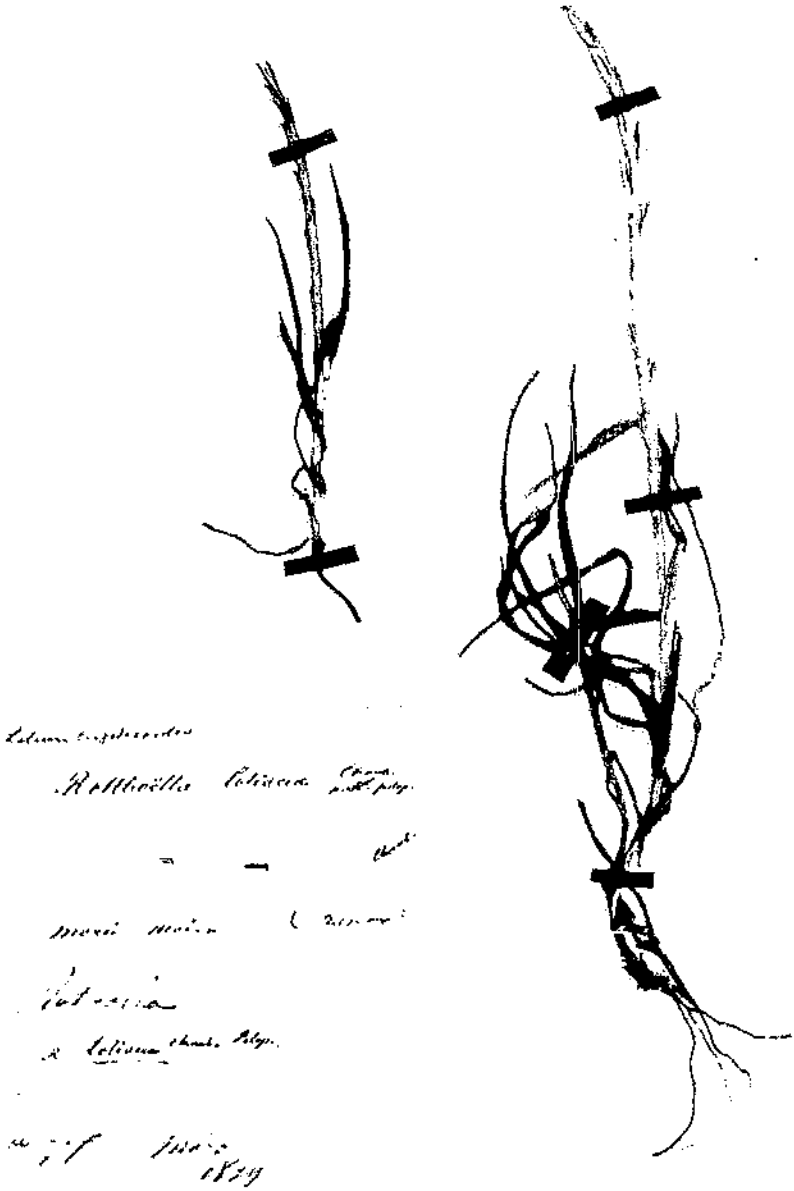

FIGURE 9.—Type of *Rottboellia lolinacea* Bory and Chaubard (G).

4. Lolium subulatum Vis.

[Fig. 10]

Lolium subulatum Visiani, Fl. Dalm. 1: 90. pl. 3. 1842. ("In satis circa Bergato prope Ragusa. D. Neumayer," holotype, Univ. of Padua; isotype (?), W!—"in agro Ragusino.")

Lolium loliaceum auct., pro parte.

Synonymy: See Appendix.

Annual, to 65 cm. high. Culms erect to spreading or decumbent, usually with 1 or 2 nodes below spike, glabrous. Leaf sheaths green, becoming straw-colored, loose, and scarious in age, sometimes with a hyaline marginal border near top of sheath, upper ones glabrous or scaberulous. Leaf blades attenuate, to 17.5 cm. long, (1.7–) 2.0–4.5 (–6.7) mm. wide, many-nerved, retrorsely scaberulous above, glabrous below. Ligules truncate or rounded-truncate, 1–2 mm. long, 3–4 mm. wide. Auricles present or absent, to 2 mm. long. Spikes straight or somewhat curved, 16–25.5 cm. long, usually three-fourths to five-sixths the height of the plants, base often included in sheaths, bearing 9–18 spikelets. Rachis cylindrical, indurated, 2–3 mm. thick at nodes; internodes in cross section concavo-convex, glabrous. Spikelets partly sunken in excavated rachis and entirely covered by glumes, 11–18 mm. long, containing 2–4 flattened, loosely arranged fertile florets and 0 or 1 rudimentary florets. Rachilla segments flattened and becoming slightly wider distally, those subtending lower florets 2.2–6.3 mm. long, 0.3–1.0 mm. wide, and about one-half as long as florets, those subtending upper florets 1.8–3.6 mm. long. Glumes lanceolate, rounded on backs, thick and indurated especially at bases, acute or attenuate, several-nerved, (10–) 14–25 mm. long, 2.0–2.8 mm. wide, glabrous, usually longer than or equaling spikelet. Lemmas (of lower and middle florets of spikelet) lanceolate, ovate-lanceolate, or oblong, rounded on backs, more or less acute, faintly 1- to 3-nerved, 6.3–12.0 mm. long, 1.0–2.4 mm. wide, glabrous or minutely scaberulous. Awns usually absent on lower florets, to 3 mm. long in uppermost one or two florets, straight, filiform, subterminal, glabrous. Paleas similar to lemmas in size and shape; keels with minute teeth. Anthers 1.8–3.4 mm. long, 0.3–0.6 mm. wide. Lodicules (dried; only a few examined) 1.6–2.0 mm. long, 0.3–0.5 mm. wide, ovate-lanceolate or attenuate. Mature caryopses 4.7–7.7 mm. long, 1.3–2.0 mm. wide, 3½ to 4½ times longer than wide, dark- or light-brown.

Chromosome number not known.

HABITATS AND DISTRIBUTION: Fields and waste places. Known only from Cyprus, Israel, Lebanon, Syria, and Yugoslavia (Pula; Dubrovnik).

DISCUSSION: Centered in Israel are populations of a taxon somewhat different from *L. rigidum* var. *rottbollioides*. These populations are recognized here as a species, the earliest name for which is *L. subulatum* Vis. (*L. suffultum* Sieber ex Huter is a later synonym that also clearly refers to this taxon.) This circumscription of *L. subulatum* changes the existing usage; this name is usually considered a synonym of *L. lolia-*

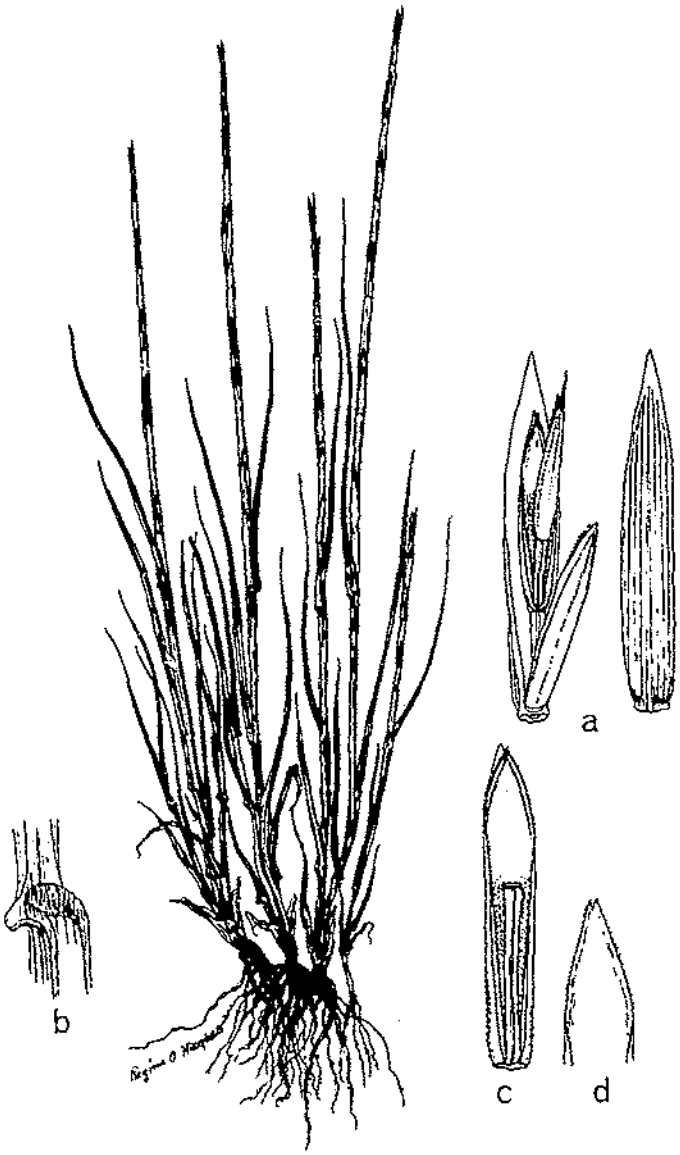

FIGURE 10.—*Lolium subulatum*: Plant, × ½; *a*, complete spikelet and glume, × 2½; *b*, ligule, × 2½; *c*, floret, × 4; *d*, palea tip, × 10. All drawings of *L50*, Israel (HUJ).

ceum (*L. rigidum* var. *rottbollioides*.)

Morphological differences between *L. subulatum* and *L. rigidum* var. *rottbollioides* are emphasized in the key to species and partly shown in fig. 11. There is no conclusive evidence that the

FIGURE 11.—Spikes of *L. rigidum* var. *rottbollioides* (Meyers, 16 April 1912, Israel, HUJ), left, and *L. subulatum* (*Eig et al. L52*, Israel, HUJ), right.

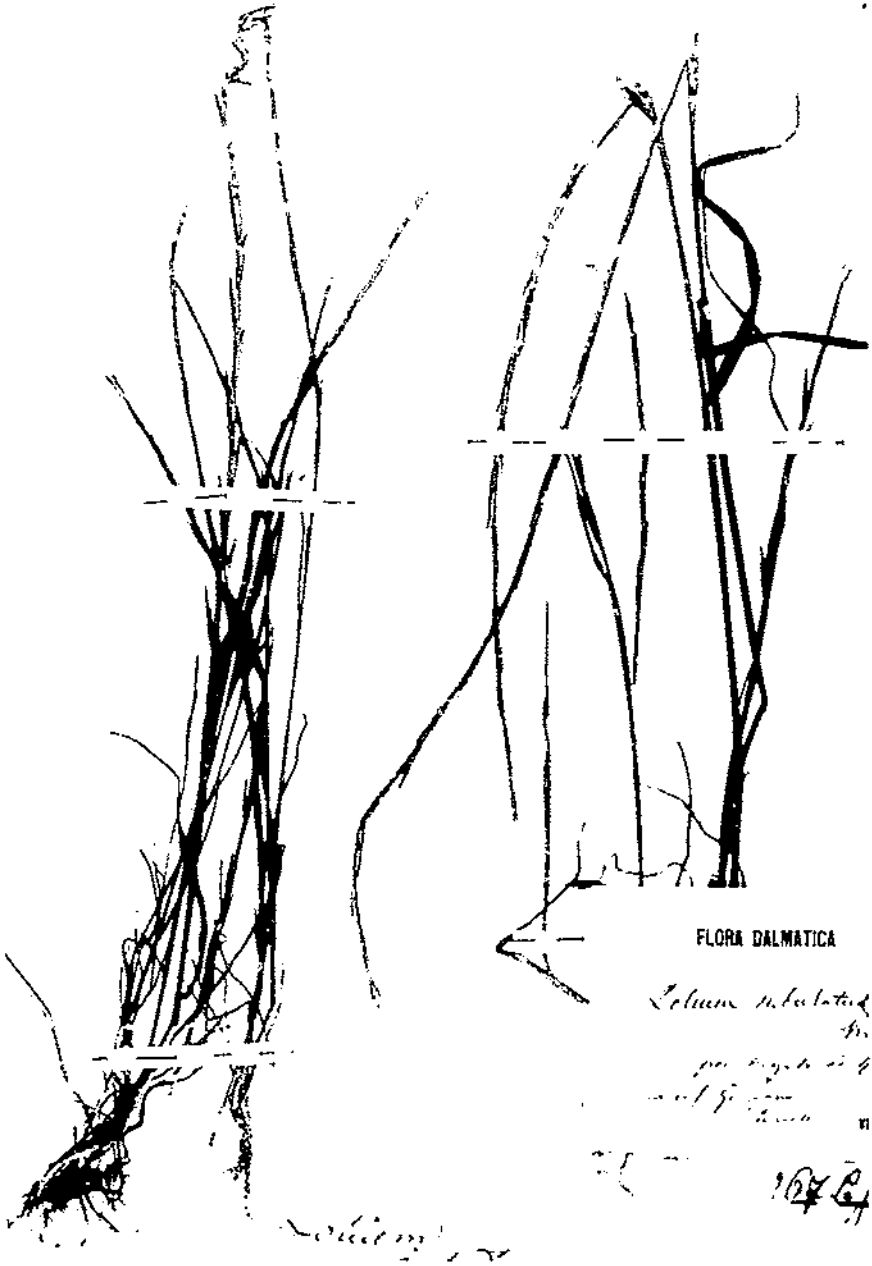

FIGURE 12.—Type of *L. subulatum* Visiani (Padua herbarium). (Portions of two labels not visible.)

two taxa intergrade, although they are not greatly different in morphology. *L. subulatum* has a discrete geographic range of its own. Treatment of *L. subulatum* (in this new sense) as a species is consistent with the rest of my present treatment of *Lolium*, as the distinctions between it and *L. rigidum* var. *rottbollioides* are as great as or perhaps greater than that between such taxa as *L. temulentum* and *L. remotum* or between *L. perenne* and *L. multiflorum*.

Visiani described and illustrated *L. subulatum* rather completely. Any remaining doubts about application of the name are cleared up by the type specimen (fig. 12). The plants have large glumes, large florets, and long rachilla segments. As previously mentioned, the type specimen of *L. rigidum* var. *rottbollioides* includes two plants. The one on the left side (fig. 9) is more or less typical; whereas, the one on the right tends in the direction of *L. subulatum*, at least it has larger glumes and florets and longer rachilla segments. This, however, is the only specimen I have seen that in any way suggests intergradation of the two taxa. The typification of *L. rigidum* var. *rottbollioides* is less clear-cut than that of *L. subulatum;* however, the preponderance of evidence favors the present interpretation.

The type specimen of *L. subulatum* Vis., from the vicinity of Ragusa, now Dubrovnik, Yugoslavia, was collected by Neumayer and then passed to Visiani. There is another collection of *L. subulatum* from Yugoslavia: *Freyn,* (?) June 1877, near Pola and Fasana on dunes, W–12630. This sheet has three plants of *L. rigidum* var. *rottbollioides* and one of *L. subulatum*. Thus, it appears that at Pola (also spelled Pula) both taxa grow at the same locality. That they occur together or nearby at another locality in Yugoslavia, also, is suggested by another sheet in the Vienna herbarium (W–12631). This specimen was collected by Neumayer at or near the type locality for *L. subulatum;* however, it is *L. rigidum* var. *rottbollioides*. Habitat information on the label states "in vineis rarissime."

REPRESENTATIVE SPECIMENS: **Israel:** Jerusalem, *M. Zohary,* 3 Mar. 1924 (HUJ); Ammon, env. of Ein Suella, *Eig, Zohary, & Feinbrun,* 8 May 1927 (HUJ); Cile'ad, Wadi Warran, *Eig, Zohary, & Feinbrun,* 10 May 1927 (HUJ). **Lebanon:** in arenosis prope fluv. Beyrouth, *Peyron,* 17 May 1884 (G). **Syria:** Aleppo, (as "Lebanon: Alep"), *Peyron,* 17 July 1888 (G). Other specimens cited in this section are also representative.

5. **Lolium canariense** Steud.

[Fig. 13]

Lolium canariense Steud., Syn. Pl. Glum. 1: 340. 1854. (Canary Islands; lectotype, University of Caen!)

Lolium gracile Parl., in Webb & Berth., Hist. Nat. Iles Canar. 3, part 2: 423–424. 1846–1850. ("In Paso del Pino, Barranco dell' Acqua Grainar,' Canary Islands, lectotype, FI!) Non Dumortier, 1823, nec Hegetschw. & Heer, 1840.

Lolium infelix Rouy., Monogr. Lolium 39, pl. 3. 1853. Pro parte.

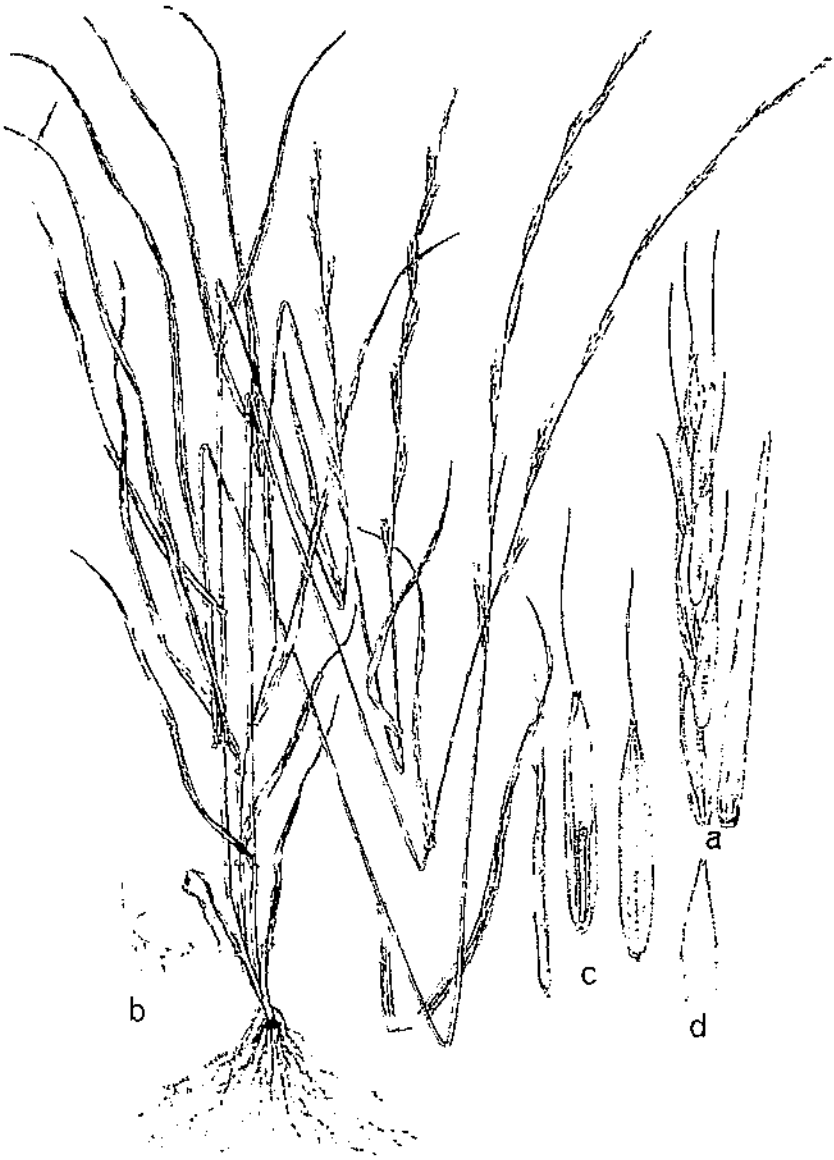

FIGURE 13.—*Lolium canariense*: Plant, × 3/4; *a*, spikelet less glume and glume, × 2; *b*, ligule, × 2; *c*, floret in three views, × 3; *d*, palea tip, × 4. All drawings of *W 251270*, Canary Islands.

Annual, to 67 cm. high. Culms erect or spreading, slender, usually with 3 or 4 nodes below spike, glabrous above. Leaf sheaths green, purplish, or in age straw-colored, with scarious margin at top of sheath, becoming loose in age, glabrous. Leaf blades rolled in young shoots. Mature blades attenuate, 5–21 cm. long, 1.5–5.0 mm. wide, many-nerved, glabrous below, glabrous or scaberulous above. Ligules truncate or rounded-truncate, to 2 mm. long. Auricles usually present, rarely absent, 0.5–2.5 (–4.5) mm. long. Spikes straight, to 20 cm. long, usually one-fourth to one-half the height of the plants, bearing 7–15 spikelets. Rachis slender, about 0.8–1.1 mm. thick at internodes, often swollen at nodes; internodes in cross section thin and flattish to concavo-convex, glabrous or scaberulous. Spikelets lying against concavities of rachis, 6–24 (–34) mm. long (excluding awns), 1–4 mm. wide, containing (4–) 5–9 (–10) fertile and 0 or 1 rudimentary florets. Rachilla segments terete or slightly flattened, 0.8–4.0 (–4.7) mm. long, (one-fifth–) one-fourth to one-third (–one-half) as long as florets they subtend. Glumes lanceolate or narrow-lanceolate, rounded on back, somewhat indurated and sometimes swollen at base, obtuse, truncate, acute, or attenuate, sometimes erose, several-nerved, 3–28 (–31) mm. long (length quite variable even on same plant), 0.8–2.0 mm. wide, glabrous or scaberulous, (one-half as long as–) usually equaling or slightly exceeding spikelet (to twice as long in extreme plants). Lemmas of lower and middle florets of spikelet narrow- to ovate-lanceolate, rounded on backs, obtuse, erose, or bifid, sometimes hyaline and purplish at apices, faintly 1- to 5-nerved or scarcely nerved at all, (2.4–) 3.0–10.0 mm. long, 0.7–1.5 mm. wide, 4 to 10 times longer than wide, densely puberulent or scabrous-puberulent to glabrous. Awns filiform, flexuous, upwardly scaberulous, often purplish, subterminally attached, short or absent on lemmas of basal florets of a spikelet, 2.5–15 (–17) mm. long in middle florets, progressively shorter in upper florets, 1 to 2 times longer than their lemmas. Paleas similar to lemmas in size and shape, equaling them in length or to 0.5 mm. longer, acute to sometimes bifid with awnlike teeth; keels with minute teeth. Anthers 1.3–2.9 mm. long, 0.3–0.7 mm. wide. Lodicules (dried; only a few examined) ca. 0.8–1.1 mm. long, narrow-lanceolate, long-attenuate. Mature caryopses (immature in most collections) narrow-elliptic or narrow-oblong, 3.3–4.5 mm. long (to 6.5 mm. long in one collection from Palma, Canary Islands), 0.8–1.2 mm. wide.

Chromosome number: $2n=14$. (Hovin and Hill 1966.)

HABITATS AND DISTRIBUTION: Dry and moist open places, exposed mountain slopes, shady valleys; sea level to about 2,700 m. Canary Islands: islands of Tenerife (several locations), Grand Canary, Gomera, Hierro, and Palma; Cape Verde Islands: islands of Santo Antão and São Nicolau; Madeira Islands: island of Porto Santo.

DISCUSSION: *Lolium gracile* has been the name used in the past for this species, but it must be abandoned under Art. 64 of the 1961 International Code. There were two earlier uses of this name, but these were taxonomic equivalents of *L. temulentum* or *L. remotum* (see Appendix).

Although the herbaria at Paris and Leiden have many other Steudel collections, they do not have the type of *L. canariense*. A specimen in the herbarium of the University of Caen, France, is satisfactory as a lectotype. It was collected by J. M. Despreaux in 1840 on Grand Canary Island and was determined by Steudel in 1847. It very much resembles other specimens of *L. canariense* examined during this study.

Lolium canariense (alias *L. gracile*) is a poorly known species with a Macaronesian distribution (see Lems 1960, concerning other such endemics, although he included *L. gracile* under *L. temulentum*). There are a number of collections from the Canary Islands, especially the island of Tenerife. These collections are quite variable, especially in size of florets. The Bourgeau, Perraudiere (fig. 14), and Sprague and Hutchinson collections have long, narrow florets, while certain other collections from the Canary and Cape Verde Islands have short, ovate florets. Transitions exist between these extremes, and other morphological features of the inflorescences and spikelets appear to be common to all. Thus, these varied collections are here included under one species. It is possible that future collections from these island groups may necessitate taxonomic realinements. The occurrence of introduced species of *Lolium* on these islands suggests the possibility, also, of hybridization of these with *L. canariense*.

The three collections from the island of Porto Santo, Madeiras, are not typical of *L. canariense*, tending in the direction of *L. rigidum* var. *rottbollioides*. There are other Madeiran collections from Ilheu Chao of the Ilhas Dezertas group that were in the past named *Arthrochortus loliaceus* R. T. Lowe. The morphology of these is much closer to *Lolium rigidum* var. *rottbollioides;* hence, they are discussed under that taxon.

Affinities of *L. canariense* are uncertain until additional collections are available. Only a few collections had mature caryopses, which makes conclusions more tenuous. Plants with small florets resemble *L. multiflorum* in the morphology of single florets as well as in the presence of long, flexuous awns. Plants with long, narrow florets are not very much like any other species of *Lolium*, or at least they are distinct enough to be indicative of species rank. Generally, *L. canariense* has its closest affinities to the *L. perenne* group, particularly *L. multiflorum*.

Distinctive characters include: Long, narrow glumes that in the lower part of the spike typically equal or exceed the spikelets in length; long, filiform, flexuous awns that attain a length 1 to 2 times longer than the lemmas bearing them; long, flexuous spikes with flattish, thin rachises that are occasionally nodose-enlarged at the nodes and glume bases; spikelets with 4 to 10 florets; long, narrow florets in some collections; very loose sheaths from which the branches pull away as they mature. This is a unique combination of characters in *Lolium*.

REPRESENTATIVE SPECIMENS: Canary Islands: TENERIFE: in udis convallium opacarum, Guimar, *Bourgeau*, 24 Apr. 1855 (COI, FI-Webb, G, K, MA, P, US, W); same loc., *Perraudiere*, 4 Apr. 1855 (COI, G, GH, K, P, US); dry slopes of Sombrerito, *Murray*, 14 June 1899 (K); others by *Murray* (BM, K); near Puerto Orotava, *Murray*, 26 Apr. 1902 (BM). GRAND CANARY: Valle de los Nueve, 150 m., *Sventenius*, 15 Mar.

1947 (ORT). PALMA: caldera between Tenerra and Taburiente, *Sprague & Hutchinson 445* (K). Cape Verde Islands: SANTO ANTÃO: *Bolle* in 1852 (W); Monte Jelho, *Cardoso*, May 1890 (LISC, LISU); Faja da Janela de Cima, *Barbosa 7064* (LISC). SÃO NICOLAU: Cachaca, *Lowe*, 22 Feb. 1864 (BM, K). Madeira Islands: PORTO SANTO: Pico da Gandaia, *Costa*, Mar. 1939 (MADS); Pico da Juliana, 400 m., *Costa*, Apr. 1939 (MADM). (Both collections atypical.)

FIGURE 14.—Spikes and upper leaves of *L. canariense* (*Perraudiere*, 4 April 1855, Canary Islands, COI).

6. **Lolium temulentum** L.

[Fig. 15]

Lolium temulentum L., Sp. Pl. 83. 1753. ("In Europae agris inter Hordeum, Linum," lectotype LINN—99.10!, photo DAO!)

Synonymy: See Appendix.

Annual, 20–122 cm. high. Culms erect, spreading, decumbent, or subprostrate (sometimes rooting at lowest nodes), with 3–5 nodes below spike, scabrous or glabrous above. Leaf sheaths green but becoming straw-colored, glabrous or upper ones scaberulous. Leaf blades rolled in young shoots. Mature blades more or less attenuate at apex, to 27 cm. long, (1.5–) 3–10 (–12) mm. wide, many-nerved, glabrous and glossy to scaberulous below, more or less scaberulous above especially toward apex, with margins scaberulous to glabrate. Ligules truncate or rounded, 0.5–2.7 mm. long. Auricles present or absent, to 4 mm. long. Spike straight, 5–40 cm. long, one-sixth to one-half the height of the plants, bearing 5–26 spikelets. Rachis usually stiff, thickened, about 0.2–2.7 (–3.5) mm. thick at nodes; internodes in cross section concavo-convex or concavo-angular, retrorse-scaberulous or glabrous. Spikelets lying against concavities of rachis, 8–28 mm. long (excluding awns), 3–8 mm. wide, containing 2–10 fertile and 0–4 rudimentary florets. Rachilla segments slightly or somewhat flattened, 0.8–4.1 mm. long, one-fourth to one-half as long as florets they subtend. Glumes of lower and middle spikelets lanceolate, rounded on backs, somewhat thickened or indurate, obtuse or subacute, 3- to 11-nerved, (5.5–) 7–30 mm. long, 1.8–3.0 mm. wide, glabrous, ¾ as long as to 1½ times longer than spikelet. Lemmas (of lower and middle florets of spikelet) ovate or oblong, rounded on backs, obtuse to acute, or erose, or slightly bidentate at more or less hyaline apices, 5- to 7-nerved, (4.7–) 5.2–8.5 mm. long, 1.5–3.0 mm. wide, usually about 2.8 to 3.5 times longer than wide, glabrous or scaberulous. Awns present or absent, usually less than 17 mm. long (to 23 mm. long), more or less straight, slender, slightly flattened, minutely scaberulous, attached about 0.5–2.0 mm. below apex. Paleas similar to lemmas in size and shape, 0.8 mm. longer to 1.2 mm. shorter than lemmas, acute, short acuminate, or erose, hyaline at apex; keels with minute teeth. Anthers (1.8–) 2.0–3.2 (–4.0) mm. long, about 0.3–0.8 mm. wide, yellow. Lodicules in dried condition 0.7–1.3 mm. long, in fresh condition 1.4–1.6 mm. long, varying considerably in size and shape, often with 1 or 2 short lateral teeth. Mature caryopses oblong, often partly exposed, (3.8–) 4.2–7.0 mm. long, (1.1–) 1.6–3.0 mm. wide, 1.4–2.2 mm. thick, about 2 to 3 times longer than wide, light- to dark-brown; palea covering mature caryopses often with median transverse wrinkles.

Chromosome number: $2n=14$.

HABITATS AND DISTRIBUTION: Known only as a weed, mainly of wheat and other cereals, occasionally in waste places. Zohary (1962) considered it an obligatory weed and used the term "anecophyte" to refer to such species, whose original habitats are unknown. Zohary (1950) stated that

FIGURE 15.—*Lolium temulentum*: Plant, × $\frac{2}{5}$; *a*, glume in ventral view and spikelet less glume, × 2; *b*, ligule, × 2; *c*, palea tip, × 10; *d*, floret in three views, × $2\frac{1}{2}$; *e*, part of spike of long-awned form, × $\frac{2}{5}$. Plant and *a,b,c,d* of *US 2302189*, Greece; *e* of *US 2041786*, cult. in Canada.

Rikli employed the term "archeophyte" apparently in a similar way. Throughout Europe, except northern Scandinavia (Hultén, 1950), and east in temperate Asia to southern USSR, India, Nepal, and China. In temperate parts of Africa but more common in east Africa and northward in Ethiopia and north Africa. Introduced on all other continents and many islands. Darnel is said to be the "tares" of the Bible (Moldenke and Moldenke 1952).

COMMON NAMES IN GENERAL USE: English.—Darnel; also Bearded Darnel, Bearded Ryegrass. French.—Ivraie, Ivraie enivrante. German.—Taumellolch.

POISONOUS PROPERTIES: There are many references in the botanical literature to the poisonous properties of *L. temulentum* grains. Nevski (1934) stated: "Only those seeds are toxic which contain hyphae of a fungus between the seed coat and the aleurone layer. The fungus is apparently responsible for the formation of a toxic alkaloid, temulin—$C_7H_{12}N_2O$." Seeds 4,000 years old in archeological material from ancient Egypt contained the fungus (Täckholm and Täckholm 1941; Lauer, Täckholm, and Åberg 1950). In primitive agriculture it is difficult to separate the seeds of wheat from those of *L. temulentum*, which grows in the same fields (Zohary 1962). Poisonous wheat flour may result.

DISCUSSION: Type specimens of the southwest Asian *L. rigidum* var. *duthiei* Hack. ex Hook. f. and *L. temulentum* var. *gracile* Regel were seen; they are the same taxon. Until additional collections are available from southern Russia and adjacent countries it is uncertain whether the taxon belongs in *L. rigidum* or *L. temulentum*. The plants have the slender, rigid, strict appearance of *L. rigidum* but have long awns as does *L. temulentum*. In other characters they seem intermediate between *L. rigidum* and *L. temulentum*, or perhaps they represent prototype populations from which these taxa evolved.

Although *L. temulentum* var. *semiglabrum*, described from Turkmen SSR (type LE! isotype G!), is similar in some characters to *L. temulentum* var. *gracile* it is generally more like *L. temulentum*. It is worthy of further investigation as being somewhat transitional to var. *gracile*.

Lolium cuneatum Nevski is considered here as a synonym of *L. temulentum*. It is basically similar to *L. temulentum*, but it has narrower, more appressed spikelets. This decision is based on the holotype lent to me from Leningrad. Certain other collections in the herbarium at Leningrad from elsewhere in Russia had been annotated as *L. cuneatum* by Nevski but are different from the type specimen. Therefore, I do not consider these as being the same taxon as the type.

The following are atypical variants of *L. temulentum*: **West Pakistan:** Mirkhani, SW of Drosh, Chitral, *Stainton 2285* (BM); Chitral village, *Stainton 2150* (BM); Parachinar, NW Frontier, *Stewart 28239* (RAW).

The following appear intergradient between *L. perenne* and *L. temulentum*: **West Pakistan:** Murree, Punjab, 7,000 feet, *Stewart & Stewart 1598* (RAW, US); Murree, Punjab, 6,000 feet, *Stewart & Stewart 1531* (US).

The degree of development of or the absence of awns is a minor character in *L. temulentum*, and it is apparently uncorrelated with other characters. There are all degrees of awning, from muticous

to long-awned. Sometimes, plants that appear to be awnless actually have very short, weak, inconspicuous awns. In addition, awn development varies among florets within one spikelet, as well as in spikelets from different parts of one spike.

Although in the past many authors used the rank variety regarding awns, the rank forma is much more suitable. Article 60, 1961 International Code of Botanical Nomenclature states that the earliest name in a rank must be used; therefore, the following names (see Appendix) are available for use:

Lolium temulentum forma *temulentum* (synonym: forma *macrochaeton* (A. Braun) Junge) refers to awned plants.

Lolium temulentum forma *arvense* (With.) Junge refers to plants which are awnless or have very short awns.

REPRESENTATIVE SPECIMENS: EUROPE.—**England:** Ham, Surrey, on rubbish-tip near sandpits, *Hubbard 1654* (K); Teddington gravel pits, *Turrill*, 19 June 1926 (K); in field of rye, Edmondsham, Dorset, *Linton*, July 1903 (BM, DAO). **Portugal:** Vila Vicosa, Herdade da Vigaria, *Fernandes & Sousa 1971* (COI); BEIRA BAIXA: Castelo Branco pr. Maxiais, *P. & M. Silva 5374a* (LISE); ESTREMADURA: Sintra, *Rainha 2009* (LISE). **Spain:** HUESCA: Prepirineos Aragoneses, between Sabinangio and Fiscal, *Sandwith 4672* (K). **Balearic Islands:** MALLORCA: Frigales, Lluch, *Ferrer*, 14 June 1954 (MA). **Corsica:** Otta, les moissons, *Reverchon*, 14 June 1885 (E). **Hungary:** Comit. Esztergom, inter segetes prope pagum Kesztölcz, *de Degen & de Flatt*, Gram. Hung. 285, 29 June 1900 (DAO, US, W). **Czechoslovakia:** Nové Město, inter Avenam sativam ad pagum Horni Bobrová, *G. & V. Sirjaev & Sykora*, 29 July 1926 (G, K). **Greek Islands:** EUBOEA: Hagia Anna, *Rechinger 16826* (G, US). CRETE: dist. Chania, inter segetes inter Chania et Alikianu, *Rechinger 13411* (G, K, US, W). **Madeira Islands:** MADEIRA: Santa, Porto do Moniz, *Costa*, July 1928 (MADM).

ASIA.—**Lebanon:** ad Berytum (Beirut) in arvis ad Ras Beirut, *J. & F. Bornmuller 13018* (CAL). **Israel:** Judacan Mts., Qiryat-Anavim, *Amdursky*, 21 May 1930 (HUJ); Jerusalem, grainfields, *Dinsmore 2784* (E). **Iraq:** in cornfield, Mandali, *Ali Rawi*, 30 Mar. 1950 (BAG); Chamchemal, *Rogers 0234* (BM). **Turkey:** MARAS: Maras-Goksun road 24 km. from Maras, fallow field, *Stainton & Henderson 5559* (E). **West Pakistan:** Lower Swat, common weed, 3,000 ft., *Steward 27475* (BM). **India:** Dehra, 2,000 ft., Dehra Dun Dist., N.W.P., *Gamble 24459* (CAL). **Nepal:** weed of cornfields, Lawamjula, 3,000 ft., *Polunin et al. 683* (K).

AFRICA.—**Kenya:** weed at farm, North Kinangop, *Lundin AB 5098* (K).

7. **Lolium remotum** Schrank

[Fig. 16]

Lolium remotum Schrank, Baiersche Flora 1: 382. 1789. ("um Burghausen," Bavaria, Germany; type not known.)

Synonymy: See Appendix.

Annual, 23–104 cm. high. Culms erect, slender, usually with 3 or 4 nodes below spike, glabrous or scaberulous just below spike. Leaf sheaths green, glabrous. Leaf blades rolled in young shoots. Mature blades attenuate at apex, to 26 cm. long, 1.0–6.5 mm. wide, many-nerved, glabrous or scaberulous above, glabrous below or scaberulous along margin near apex. Ligules truncate, to 2.5 mm. long. Auricles present or absent, to 2 mm. long. Spikes straight, 2–23 cm. long, less than one-sixth to one-third the height of the plants, bearing 3–20 spikelets. Rachis slender, 0.5–1.4 mm. thick at nodes; internodes in cross section concavo-convex or concavo-angular, glabrous or sometimes scaberulous on angles.

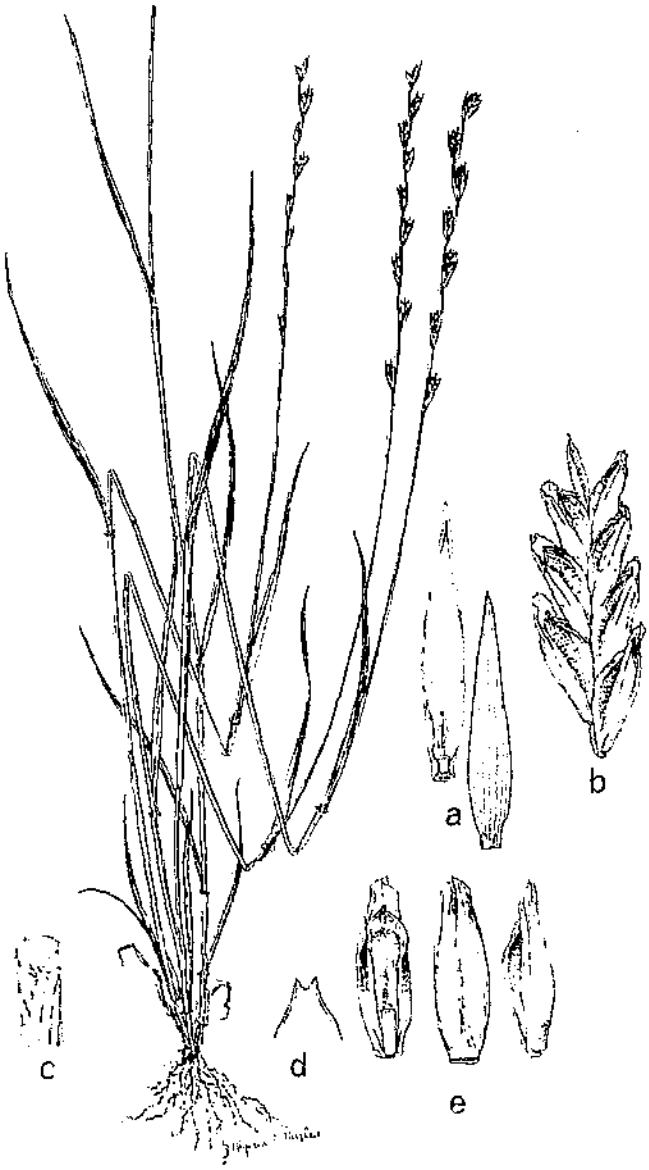

FIGURE 16.—*Lolium remotum*: Plant, × 1; *a*, glume in ventral and dorsal views, × 3; *b*, spikelet less glume, × 3; *c*, ligule, × 2; *d*, palea tip, × 8; *e*, floret in three views, × 4. All drawings of *US 1052517*, Sweden.

Spikelets lying against concavities of rachis, 5–16 mm. long (excluding awns), 1–5 mm. wide, containing 2–10 fertile and 0–2 rudimentary florets. Rachilla segments slightly flattened, 0.8–2.0 mm. long, about one-third to one-fourth as long as florets they subtend. Glumes of lower and middle spikelets lanceolate, rounded on backs, rather thin, obtuse or acute, 3- to 7-nerved, 5–16 mm. long, 1–2 mm. wide, glabrous, (one-half–) two-third as long as to somewhat longer than spikelets. Lemmas (of lower and middle florets of spikelet) ovate, rounded on backs, usually rounded and erose or sometimes acute at hyaline apices, 3- to 7-nerved, 3.5–5.4 mm. long, 1.2–1.8 mm. wide in fruit, usually about 2.3–3.3 times longer than wide, glabrous. Awns absent or rarely to 10 mm. long, attached 0.2–1.0 mm. below apex. Paleas similar to lemmas in size and shape, about equaling them in length or to 0.8 mm. shorter, acute, obtuse or erose at hyaline apices; keels glabrous below, with minute teeth distally, or glabrate. Anthers 1.6–2.2 mm. long, 0.5–0.8 mm. wide. Mature caryopses sometimes partly exposed, 3.2–4.5 mm. long, 1.2–1.8 mm. wide, 0.7–1.4 mm. thick, about 2 to 3 times longer than wide, brown; palea covering mature caryopses sometimes with median transverse wrinkles.

Chromosome number: $2n=14$.

HABITATS AND DISTRIBUTION: Known only as a weed, primarily in flaxfields, rarely in other cultivated crops (e.g., *Ornithopus sativus*, Scholz 1965), and in waste places. Believed by some authors to have evolved by nonpurposeful selection in the course of flax cultivation (Morosov 1929, Rothmaler 1944, 1946, Hjelmqvist 1950, Scholz 1965). Europe north to northern Scandinavia, but absent or rare in the Mediterranean region; in Spain mainly in north and west; scarce in Portugal, Crete, and Sicily. Canary Islands (Tenerife); north Africa only from Morocco. Asia in western (north to Archangel) USSR; two collections from India; apparently rare or absent in southwest Asia. Introduced rarely on other continents. See Hjelmqvist's 1950 map of distribution.

COMMON NAMES IN GENERAL USE: English.—none in general use. German.—Leinlolch, Acker lolch.

REPRESENTATIVE SPECIMENS: **Ireland:** County Donegal, Letterkenny, in flaxfield, *Wedgewood*, 4 Aug. 1929 (K). **Belgium:** champs de lin, Ciply, *Martinis 194* (G). **France:** Meuse, Milly, Murvaux, Clery-Petit, dans les champs de lin, *Bullemont*, 29 June–1 July 1889 (W). **Hungary:** Comit. Heves, inter segetes, lini praedii Puszta Varsány prope Hatvan, *de Degen 287* (DAO, US, W). **Czechoslovakia:** Koldstyn (Goldenstein), inter *Linum* ad Ostruzna (Spornhau), about 400–450 m.s.m., *Laus*, 13 Aug. 1928 (K, P, US, W); Nové Město, inter *Linum* prope pagum Horní Bobrová, *V. & G. Sirjaev*, 9 Aug. 1926 (FI, G, K, US, W). **Sicily:** inter segetes, Messina, *Borzi*, May 1907(?) (FI). **Italy:** ABRUZZI: Pescara, *Kuntze*, in 1866 (FI). **Finland:** Isthmus Karelicus, par. Sakkola, in agro lino consito, *Lindberg*, 1 Aug. 1897 (W). **Estonia:** near Tartu, Raadi, weed in flax, *Leppik*, 27 Aug. 1924 (K, US). **USSR:** unter Lein beim Dorfe Ribaky im Kreise Moskau, *Petunnikov & Ssyreistschikov*. 12 June 1905 (G, US, W); prov. Twer, dist. Staritza, in agris inter *Linum* pr. Wysch-Gorodiscze, *Titz 1545b* (G, LE); dist. Archangelsk, Kotlas area, *Ashennikov*, 2 Aug. 1936 (LE); dist. Leningrad, Pskov area, Seredkinsk, flaxfield, *Ganeshin & Mathiesen*, 30 July 1929 (LE). **India:** field weed, Jhelum Punjab, *Stewart 6190* (US).

8. **Lolium persicum** Boiss. & Hohen. ex Boiss.

[Fig. 17]

Lolium persicum Boiss. & Hohen. ex Boiss., Diagn. Pl. Orient. Nov., ser. I, 2 (fasc. 13) : 66. 1853. (Iran, "in uliginosis montis *Elbrus* prope *Derbend*," *Kotschy 278*, 9 June 1843, holotype and 3 isotypes G! photo, holotype DAO!; isotypes BM! K! LE! P! W!; specimens immature.)

Annual, 14–59 cm. high. Culms erect or spreading, usually with 3 or 4 nodes below spike, glabrous or scabrous above. Leaf sheaths green, glabrous or upper ones scaberulous. Leaf blades attenuate, 3.5–20 cm. long, 1.5–7.0 mm. wide, many-nerved, glabrous and shiny or slightly scaberulous below, more or less scaberulous above especially toward apex, scabrous to glabrate along margins. Ligules truncate, to 2 mm. long. Auricles present or absent, to 2 mm. long. Spikes straight, (3–) 5–12 (–21) cm. long, (one-half–) one-fourth–one-fifth the height of the plants, bearing 3–12 spikelets. Rachis slender to rather stiff and somewhat thickened, about 0.5–1.6 mm. thick at nodes; internodes in cross section concavo-convex, retrorse-scaberulous. Spikelets lying against concavities of rachis, (9–) 12–22 (–27) mm. long (excluding awns), 1.5–7.0 mm. wide, containing 4–9 fertile and 0–2 rudimentary florets. Rachilla segments slightly flattened, 1.7–2.9 mm. long, one-third to one-fifth as long as florets they subtend. Glumes of lower and middle spikelets lanceolate, rounded on backs, more or less thickened, obtuse or acute, 5- to 7-nerved, (4.7–) 7.5–23.0 mm. long, 1.6–2.3 mm. wide, glabrous, two-thirds as long as to equaling spikelet (usually three-fourths to four-fifths as long). Lemmas (of middle and lower florets of spikelets) lanceolate, rounded on backs, usually acute or attenuate, sometimes obtuse, erose, or slightly bidentate at hyaline apices, 3- to 5-nerved, (5.2–) 8.2–11.7 mm. long (excluding awns), 1.5–2.7 mm. wide in fruit, usually about 5 to 6.5 times longer than wide, glabrous. Awns always present, more or less straight, slender, slightly flattened, retrorse-scaberulous, (1.5–) 5–15 (–18) mm. long, attached about 0.2–1.0 mm. below apex. Paleas similar to lemmas in size and shape, usually 0.5–1.8 mm. longer than lemmas or about equal, acute or acuminate at apex; keels with minute teeth. Anthers 1.5–3.1 mm. long, 0.3–0.7 mm. wide, usually yellow. Lodicules (dried; only a few examined) about 0.7–1.4 mm. long, 0.3–0.8 mm. wide, lanceolate or deltoid, rounded below, sometimes with one lateral tooth. Mature caryopses (4.8–) 5.5–7.0 mm. long, 1.2–1.9 mm. wide, 0.7–1.2 mm. thick, about 3.7 to 5 times longer than wide, light- to dark-brown.

Chromosome number: $2n=14$.

HABITATS AND DISTRIBUTION: Fields, waste places, and around cultivated land; moist places, riverbanks, and stony slopes. Altitude to 2,200 meters. Specimens seen from Georgian and Turkmen SSR, Turkey, Iraq, Iran, and Afghanistan (fig. 18). Boissier (Flora Orientalis) reported it from Armenian SSR and Baluchistan (West Pakistan). Nevski (1934) indicated it occurs east to Kirghiz SSR.

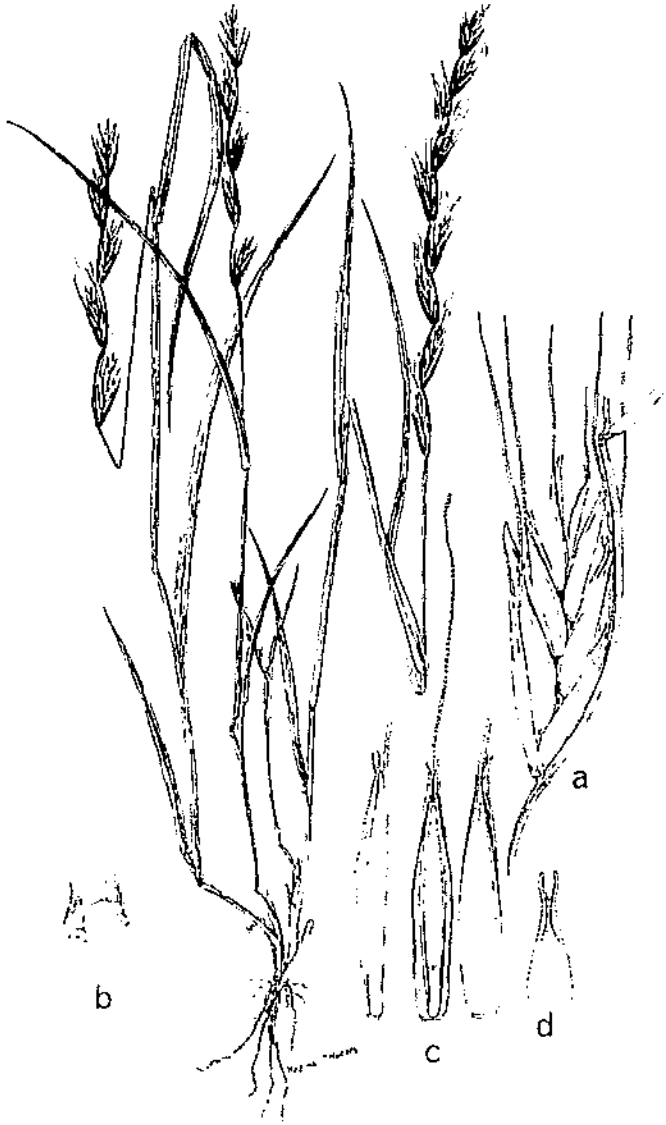

FIGURE 17.—*Lolium persicum*: Plant, × ⅔; *a*, complete spikelet and rachis, × 2; *b*, ligule, × 2; *c*, floret in three views, × 3; *d*, palea tip, × 8. All drawings of *DAO 12282*, introduced in Canada.

The single record from northwest China is believed to be an introduction. Its occurrence has been reported in interior central Lebanon and northern Syria (Thiebaut 1953, Rechinger 1959). Introduced accidentally into North America in wheat grown in south-

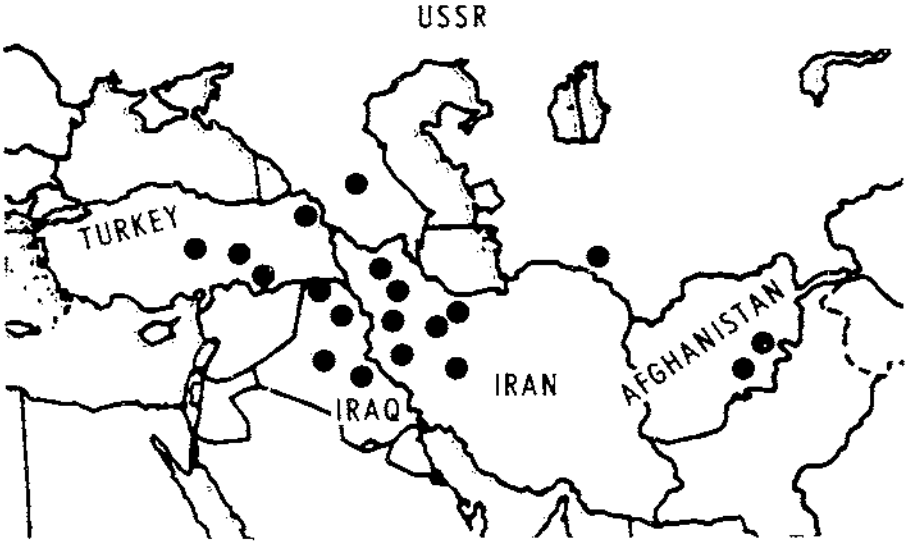

FIGURE 18.—Distribution of *Lolium persicum*.

ern Canada and now spread locally in Alberta, Saskatchewan, Manitoba, also sparingly in British Columbia and Ontario (Dore 1950); from there it spread into the United States—in North Dakota (Cavalier, Renville, Slope, and Ward Counties), Montana (Daniels County), and Wyoming (Weston County). Also reported from New York (Smith 1965). Introduced locally in England in wheat (Hubbard 1954 and specimen cited from Gloucester.).

COMMON NAMES: English.—Persian Darnel (suggested by Dore 1950).

REPRESENTATIVE SPECIMENS: **Turkey:** KAYSERI: sand at margin of field, 30 km. from Pinarbasi, 2,000 m., *McNeill 425* (K). MARAS: cornfield weed, 1,700 m., Hobek Dag, dist. Goksun, *Davis et al. 20197* (K). KARS: near Olor, dist. Olty, *Sosnowsky*, 7 July 1912 (W). **Iraq:** in montis Kuh-Sefin reg. infer. supra pagum Schaklava, ditionis Erbil, Kurdistania, *Bornmüller 1911* (FI, G, K, P, W); fields near cotton farm, Karradah at Baghdad, *Graham*, 17 Mar. 1920 (K); mountain slope by roadside, 30 km. NE of Zakho, 1,400 m., *Ali Rawi 23512* (K). **Iran:** M. Elburs, in valle Lar ad pagum Getschesär, 2,200 m., *J. & A. Bornmüller 8498* (BM, CAL, FI, G, K, P, US, W); Khamseh, *Furse & Synge 684* (E, K); along stream, 5,500 ft., Durud, Luristan, *Koelz 15544* (US); weed in garden near Tabriz, *Smith 2190* (K). **Afghanistan:** feuchte Weizenfelder zw. Duab und Bulola, *Volk 2097* (US). **China:** TSINGHAI: shady roadside under trees, Sining, *Keng & Keng 5125* (K). **USSR:** fields and waste places, Aschab., *Betner*, 22 July 1911 (US). **England:** Sharpness Docks, Gloucester, *Townsend*, 8 May 1953 (K). **United States:** NORTH DAKOTA: Langdon, Cavalier County, *Stevens 490* (DAO); by grain elevators, Mohill, Renville County, *Dore & Boivin 13330* (DAO); abandoned field, Amidon, Slope County, *Stevens*, 19 July 1945 (US). **Canada:** ALBERTA: field and roadside, Spirit River, *Dore 564* (DAO). SASKATCHEWAN: Carlyle, dist. d'Assiniboia, *Boivin 8386* (DAO); grain elevators, Kisbey, *Dore & Breitung 11508* (DAO).

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APPENDIX

Synonyms

In the following lists of names the original spellings, genders, and other designations usually have been retained, even if incorrect according to the 1961 International Code of Botanical Nomenclature. If an author did not clearly indicate the rank of a taxon but merely used letters or numbers, usually the combination is repeated as he published it. Many later homonyms have been omitted as unnecessary. The many nomina nuda in Gandoger, Flora Europae, were also omitted. Quotation marks indicate publications not seen. Exclamation marks denote herbarium specimens examined by me. Taxonomic practice varies concerning italicizing or not italicizing Latin designations such as "ex" and "nom. nud."; here these are not italicized.

1. **Lolium perenne** L., Sp. Pl. 83. 1753.

L. tenue L., Sp. Pl., ed. 2, 122. 1762. (Holotype, LINN—99.6!) This name refers to depauperate *L. perenne*.

L. perenne β *tenue* (L.) Huds., Fl. Angl., ed. 2, 1: 55. 1778.

L. rubrum Huds., Fl. Angl., ed. 2, 1: 55. 1778. As syn. Name of pre-Linnaean origin.

L. perenne var. *compressum* Sibth., Fl. Oxon. 50. 1794. Description suggests aberrant "*cristatum*" form.

L. perenne var. *aristata* Willd., Sp. Pl. 1: 462. 1797. Refers to *L. multiflorum*, which see. Name not valid.

L. perenne α *spicata* Schumach., Enum. Pl. Saell. 1: 36. 1801. Spikelets aristate.

L. perenne β *ramosa* Schumach., Enum. Pl. Saell. 1: 36. 1801. Spikes branched; spikelets ovate, awnless.

L. halleri K. Gmel., Fl. Badens. 1: 271. 1805.

L. perenne β *cristatum* Pers., Syn. Pl. 1: 110. 1805. Spikelets aggregated into a head.

L. perenne γ *compositum* Schrad., Fl. Germ. 397. 1806. Nom. nud.

L. perenne α *vulgare* (Host) Schrad., Fl. Germ. 397. 1806. Based on *L. vulgare* Host, a nom. ined.

L. perenne Σ *viviparum* Schrad., Fl. Germ. 398. 1806. Nom. nud.

L. ramosum (Leers ex Pers.) Beauv., Ess. Agrost. 166. 1812. Based on *L. perenne* var. *ramosum* Leers ex Pers. (Pers. 1805, Schumach. 1801).

L. aristatum (Willd.) Lag., Gen. & Sp. Nov. 5. 1816. Based on *L. perenne* var. *aristatum* Willd., which see.

L. perenne var. *compositum* Sincl., Hort. Gram. Woburn. 104. 1816. Main characteristic is short, broad, crowded spike.

L. agreste Hort. ex Roem. & Schult., Syst. Veg. 2: 748. 1817. As syn.

L. perenne γ *paniculatum* S. F. Gray, Nat. Arr. Brit. Pl. 2: 93. 1821. Spike branched at base.

L. perenne Σ *viviparum* S. F. Gray, Nat. Arr. Brit. Pl. 2: 93. 1821. Viviparous.

L. perenne γ *purpurascens* S. F. Gray, Nat. Arr. Brit. Pl. 2: 93. 1821. Spikelets purplish-green.

L. latum Roth ex Steud., Nom. Bot., ed. 1, 492. 1821. As syn.

L. perenne var. *russellianum* Sincl., Hort. Gram. Woburn. 211. 1824.

L. perenne var. *whitworthiensis* Sincl., Hort. Gram. Woburn. 211. 1824.

L. perenne var. *stickneiensis* Sincl., Hort. Gram. Woburn. 211. 1824. Nom. nud.

L. perenne var. *monstrosum* Sincl., Hort. Gram. Woburn. 211–212. 1824.

L. perenne γ *confertum* Spenner, Fl. Friburg. 1: 157. 1825. Spikelets congested.

L. perenne γ *festucaeforme* Winm. & Grab., Fl. Siles. 1: 101. 1827.

L. perenne Σ *humile* Gaud., Fl. Helv. 1: 352. 1828.

L. brasilianum Nees, Agrost. Bras. 2: 443–444. 1829. See discussion in text.

L. bouchéanum Kunth, Rev. Gram. 2: 665, pl. 220. 1834. Refers to either *L. perenne* with awns or to *L. perenne* × *L. multiflorum*.

L. perenne var. *commune* Kirschl., Prodr. Fl. Alsace 195. 1836. Nom. nud.

L. stoloniferum Lawson, Agric. Man. 104. 1836.

L. grossum Lawson, Agric. Man. 105. 1836.

L. perenne var. *secundum* Tin., Fl. Luxemb. 41. 1836.

L. perenne β *aristatum* Desp., Fl. Sarthe & Mayenne 330. 1838. Spikelets aristate.

L. perenne β *aristatum* Schrad., Linnaea 12: 463. 1838. No description; cited *L. boucheanum* Kunth as synonym.

L. perenne var. *racemosum* Parn., Grasses Scotl. 1: 142, pl. 65. 1842. (Near Edinburgh, holotype, K!) Spikelets with short peduncles — "cristatum form" of *L. perenne*.

L. perenne var. *angustifolium* Parn., Grasses Scotl. 1: 142. 1842. (Near Edinburgh, holotype, K!). Tall, slender, with long, narrow leaves.

L. perenne α *genuinum* Godr., Fl. Lorr. 3: 189. 1844.

L. perenne subvar. *cristatum* Coss. & Germ., Fl. Env. Paris 2: 656. 1845. Spike crested "cristatum form" (not based on Pers. pro var.).

L. perenne d. *glomeratum* Bosch, Prodr. Fl. Bat., ed. 1, 1: 329. 1850. Spikelets in groups of 2 to 4.

L. perenne e. *subsecundum* Bosch, Prodr. Fl. Bat., ed. 1, 1: 329. 1850. Spikelets secund.

L. perenne α *vulgare* Schrad. a. *laeve* Opiz, Seznam Rostl. Kvet. Ceske 60. 1852. Nom. nud.

L. perenne α *vulgare* Schrad. b. *asperum* Opiz, Seznam Rostl. Kvet. Ceske 60. 1852. Nom. nud.

L. montevidense Rouy., Monogr. Lolium 18, 33. 1853. As syn. of *L. brasilianum* Nees.

L. felix Rouy., Monogr. Lolium 25, pl. 1, figs. 1–7. 1853. Included both *L. perenne* and *L. multiflorum*.

L. canadense Bernh. ex Rouy., Monogr. Lolium 27. 1853. As syn. Non *L. canadense* Michx. ex Roem. & Schult., 1817.

L. rosettanum Fig. & Del. ex Rouy., Monogr. Lolium 31. 1853. As syn.

L. pectinatum Fig. & Del. ex Rouy., Monogr. Lolium 34, pl. 2, figs. 2, 3. 1953. As syn. of *L. felix*.

L. perenne δ *furcatum* Billot ex Godr., in Gren. & Godr., Fl. Fr. 3: 612. 1856. (Description also cited Rouy., Monogr. Lolium, pl. 1, fig. 4, 1853; lectotype, P! also specimen (a type?), K!) Aberrant form with curved spikelets.

L. marschallii Steven, Bul. Soc. Nat. Mosc. 30: 103. 1857.

L. perenne b. *orgiale* Doell, Fl. Grossh. Baden 116. 1857. Abnormal variant; spikelets 12-flowered.

L. perenne d. *paleaceum* Doell, Fl. Grossh. Baden 116. 1857. Sterile, aberrant form.

L. strictum var. *compressa* Boiss. & Heldr. ex Boiss., Diagn. Pl. Orient. Nov. ser. II. 3(4): 144. 1859. See discussion in text.

L. compressum Boiss. & Orph. ex Boiss., Diagn. Pl. Orient. Nov. ser. II. 3(4): 144. 1859. As syn. of *L. strictum* Presl var. *compressa* Boiss. & Heldr. ex. Boiss.

L. perenne var. *geminatum* Masters, Jour. Bot. Brit. & For. 1: 8. 1863. Spikelets paired.

L. perenne var. *speirostachyum* Fourn. ex Masters, Jour. Bot. Brit. & For. 1: 8. 1863. Aberrant, with spikelets arranged spirally around rachis.

L. perenne var. *sphaerostachyum* Masters, Jour. Bot. Brit. & For. 1: 8. 1863. Aberrant, with florets in whorls on spikelets, hence spikelets almost spherical instead of flattened. Stamens and pistils may be aborted.

L. perenne a. *condensatum* Schur, Enum. Pl. Transsilv. 812. 1866. Spike wide, dense, secund, recurved.

L. perenne c. *aristulatum* Schur, Enum. Pl. Transsilv. 812. 1866. All or lower florets awned; awn half as long as lemma.

L. pseudo-italicum Schur, Enum. Pl. Transsilv. 812. 1866. As syn. of *L. perenne* c. *aristulatum* Schur.

L. perenne commune Alefeld, Landw. Fl. 357. 1866.

L. perenne var. *marschallii* (Stev.) Trautv., Act. Hort. Petrop. 1: 24. 1871. Steven pro sp.

L. perenne auriculatum Hack., Oest. Bot. Zeitschr. 27: 124. 1877. Auricles long and overlapping. (Spain; type, W 10339!)

L. multiflorum forma *microstachya* Uechtritz, "Jahresber. Schles. Ges. Vaterl. Cult. 1879: 334. 1880." Description not seen. (specimen pro var., type?, K! — *L. perenne* with awns or *L. perenne* × *L. multiflorum*.)

L. perenne d. *obtusiflorum* Grantzow, Fl. Uckerm. 351. 1880. Spikelets abnormal.

L. perenne f. *longiglume* Grantzow, Fl. Uckerm. 351. 1880.

L. cristatum L. ex Nyman, Consp. Fl. Eur. 845. 1882. As syn.

L. perenne var. *pacyi* Sturtev., N.Y. Expt. Sta. Rpt. 1882: 77. 1883. Nom. nud.

L. rigidum γ *compressum* (Boiss. & Heldr.) Boiss., Fl. Orient. 5: 680. 1884. Based on *L. strictum* Presl var. *compressa* Boiss. & Heldr. ex Boiss.

Hordeum compressum Boiss. & Orph. ex Boiss., Fl. Orient. 5: 681. 1884. As syn. of *L. rigidum* var. *compressum* (Boiss. & Heldr.) Boiss. Non Griseb., 1874.

Lolium perenne var. *perenne* subvar. *compressum* (Boiss. & Orph.) Perez-Lara, Anal. Soc. Españ. Hist. Nat. 15: 427. 1886. Based on *L. compressum*

Boiss. & Orph. ex Boiss. and *L. strictum* var. *compressa* Boiss. & Heldr. ex Boiss.

L. perenne var. *perenne* subvar. *ramosum* (Leers) Perez-Lara, Anal. Soc. Españ. Hist. Nat. 15: 427. 1886. Citation of Leers was incorrect.

L. perenne var. *perenne* subvar. *tenue* (Coss. & Germ.) Perez-Lara, Anal. Soc. Españ. Hist. Nat. 15: 427. 1886. Based on *L. perenne* var. *tenue* Coss. & Germ., 1845.

L. perenne α *typicum* Beck, Fl. Nied.-Oest. 1: 112. 1890.

L. perenne Σ *compactum* Beck, Fl. Nied.-Oest. 1: 112. 1890. Spikes shortened, only 2.5–3.5 cm. long.

L. multiflorum β *boucheanum* (Kunth) Beck, Fl. Nied-Oest. 1: 112. 1890. Kunth pro sp.

L. cristatum Pers. ex Jackson, Index Kew. 2: 108. 1894. As syn. Erroneously attributed to Persoon, who published only *L. perenne* var. *cristatum*.

L. perenne var. *brasilianum* (Nees) Kuntze, Rev. Gen. Pl. 3: 355. 1898. Nees pro sp.

L. perenne var. *compressum* (Boiss. & Heldr. ex Boiss.) Hausskn., Mitt. Thur. Bot. Ver., N. F., XIII & XIV. 71. 1899. Based on *L. strictum* var. *compressa* Boiss. & Heldr. ex Boiss. Non *L. perenne* var. *compressum* Sibth.

L. vulgare Host ex Asch. & Graebn., Syn. Fl. 2: 754. 1902. As syn. Name not found in Host, Icon. Gram. Austr. 1: pl. 25. 1801.

L. perenne [var.] D. *pauciflorum* Asch. & Graebn., Syn. Fl. 2: 754. 1902. Spikelets 3- or 4-flowered.

L. perenne monstr. *compositum* (Thuill.) Asch. & Graebn., Syn. Fl. 2: 754. 1902. Thuill. pro sp.

L. perenne monstr. *ramosum* (Smith) Asch. & Graebn., Syn. Fl. 2: 755. 1902. Ref. to Smith not validated.

L. perenne monstr. *furcatum* (Billot ex Godr.) Asch. & Graebn., Syn. Fl. 2: 755. 1902. Godr. pro var.

L. perenne monstr. *palaceum* (Doell) Asch. & Graebn., Syn. Fl. 2: 755. 1902. Doell pro var.

L. perenne monstr. *sphaerostachyum* (Masters) Asch. & Graebn., Syn. Fl. 2: 755. 1902. Masters pro var.

L. perenne monstr. *viviparum* (Koch) Asch. & Graebn., Syn. Fl. 2: 755. 1902.

L. trabuti Hochr., Ann. Cons. Jard. Bot. Geneve 7/8: 123–124. 1904. (Algeria: "Oran, Duveyrier, dans les fentes de rochers, au sommet du Ras ed Dib," 950 m., *Hochreutiner 621*, 4 June 1901, holotype G!; rather anomalous but apparently nearest *L. perenne* or *L. rigidum*.)

L. rigidum γ var. *corsicum* Hack. ex Briq., Prodr. Fl. Corse 1: 180. 1910. (Type, W 12679! is apparently an awned form of *L. perenne*.)

L. perenne forma *anomala* Hack. ex Stuckert, Anal. Mus. Nac. Buenos Aires, ser. 3, 14: 174. 1911. Has an undulate or subundulate rachis.

L. perenne var. *replans* Jansen & Wachter, Ned. Kruidk. Arch. 1912: 92. 1912.

L. perenne monstr. *cephalatum* Jansen & Wachter, Ned. Kruidk. Arch. 1912: 92. 1912. Spikes abnormal.

L. perenne subvar. *aristatum* (Coss. & Germ.) Rouy, Fl. Fr. 14: 306. 1913.

L. perenne subvar. *polyanthum* (Beck) Rouy, Fl. Fr. 14: 307. 1913. Beck pro var.

L. perenne subsp. *boucheanum* (Kunth) Rouy, Fl. Fr. 14: 307. 1913. Kunth pro sp.

L. perenne forma *typicum* (Beck) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 316. 1913.

L. perenne forma *cristatum* (Doell) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 316. 1913.

L. perenne forma *longiglume* (Grantzow) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 316. 1913.

L. perenne forma *pauciflorum* Asch. & Graebn.) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 316. 1913.

L. perenne forma *orgyiale* (Doell) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 316. 1913.

L. perenne monstr. *ramiflorum* Junge, Jahrb. Hamb. Wiss. Anst. Beih. 3, 30: 317. 1913. Aberrant, with branching culms.

L. perenne var. *tenuis* Schult. ex Fedtsch., Bul. Jard. Bot. Pierre Grand 14 (Suppl. 2): 92. 1915. Nom. nud.

L. perenne 5. *laxiusculum* Podpera, Kvetena Moravy 6: 123. 1926.

L. perenne forma *compactum* (Beck) Holmb., Skand. Fl. 1: 243. 1926.

L. perenne forma *ramosum* (Schum.) Holmb., Skand. Fl. 1: 244. 1926.

L. perenne forma *palaceum* (Doell) Holmb., Skand. Fl. 1: 244. 1926.

L. perenne forma *viviparum* (Gray) Holmb., Skand. Fl. 1: 244. 1926.

L. perenne monstr. *catabrosoides* Murr, Veröff. Mus. Ferd. Innsbruck 10: 48. 1931. Aberrant: inflorescence paniculate, with aborted florets.

L. perenne subsp. *atlaticum* Senn. & Maur., Cat. Fl. Rif Or. 135. 1933. (error for *atlanticum*). Nom. nud.

L. perenne forma *compositum* (Thuill.) Bouly de Lesd., Publ. Soc. Dunk. 1934: 89. 1934. Thuill. pro sp.

L. rigidum var. *perenne* Grossh., Trudy Bot. Inst. Azerbaidzh. Fil. Akad. Nauk SSSR 8: 319. 1939.

L. perenne var. *scabriculme* Maire, Bul. Soc. Hist. Nat. Afr. Nord 33: 98. 1942. Culms scabrous below spikes.

L. brasilianum forma *aristatum* Rothm., Agron. Lusit. 6: 264. 1944. Awned form. (Identity dubious.)

L. brasilianum forma *muticum* Rothm., Agron. Lusit. 6: 264. 1944. Muticous form. (Identity dubious.)

L. perenne var. *vulgare* (Host) Schrad. forma *prostratum* Pichi-Sermolli, Webbia 6: 73. 1948. (Italy: P. delle Calbane, on serpentine; type, FI!) Prostrate, with rather rigid, short culms.

L. perenne monstr. *subsecundum* (Bosch) Jansen, Fl. Neerl. 1: 107–108. 1951.

L. perenne monstr. *glomeratum* (Bosch) Jansen, Fl. Neerl. 1: 108. 1951.

2. **Lolium multiflorum** Lam., Fl. Fr. 3: 621. 1778.

L. perenne var. *aristata* Willd., Sp. Pl. 1: 462. 1797. (Hubbard, 1956, pointed out that this is based on a figure by Vaillant that Lamarck cited in his description of *L. multiflorum*.) This name is not validly published (see Rec. 32A, 1961 International Code of Botanical Nomenclature).

L. compositum Thuill., Fl. Env. Paris, n. ed. 62. 1799. Inflorescence branched.

L. perenne var. *multiflorum* Thuill. ex Bast., Fl. Maine & Loire 47. 1809. Described simply as many-flowered in comparison to *L. perenne*, which is said to have 6–12 florets per spikelet. Apparently, Thuillier did not publish this combination.

L. multiflorum [var.] β *muticum* DC., Fl. Fr., ed. 3, enl., 5: 286. 1815. Muticous.

L. aristatum (Willd.) Lag., Gen. & Sp. Nov. 5. 1816. Based on *L. perenne* var. *aristata* Willd.

L. multiflorum β *aristatum* Gaud., Fl. Helv. 1: 354. 1828. With awns.

L. italicum A. Braun, Flora 17: 259. 1834. (Hubbard, 1956, noted that this was published as a synonym of *L. multiflorum*.) See discussion in text.

L. perenne var. *italicum* Kirschl., Prodr. Fl. Alsace 196. 1836. Nom. nud. No basionym cited.

L. multiflorum 2. *subaristatum* Mutel, Fl. Fr. 4: 139. 1837. Only upper florets of each spikelet have short awns.

L. multiflorum [var.] b. *diminutum* Mutel, Fl. Fr. 4: 139. 1837. Spikelets with part (5–10) of the florets awned.

L. multiflorum [var.] b. *submuticum* Mutel, Fl. Fr. 4: 139. 1837. Almost muticous.

L. multiflorum [var.] c. *complanatum* Mutel, Fl. Fr. 4: 139. 1837.

L. multiflorum [var.] d. *compositum* (Thuill.) Mutel, Fl. Fr. 4: 140, pl. 91, fig. 638. 1837. Thuill. pro sp.

L. multiflorum B. *ramosum* Desportes, Fl. Sarthe & Mayenne 329. 1838. Inflorescence branched, spikelets muticous.

L. multiflorum β *subaristatum* Schrad., Linnaea 12: 463. 1838. Nom. nud.

L. perenne var. *italicum* Parn., Grasses Scotl. 1: 142, pl. 65. 1842. No basionym cited.

L. multiflorum γ *excelsum* Griseb., Spic. Fl. Rum. 2: 430. 1844.

L. perenne var. *submuticum* Parn., Grasses Brit. 300, pl. 139. 1845. (Near Edinburgh, holotype, K!; actually=*L. multiflorum*.)

L. perenne var. *multiflorum* Parn., Grasses Brit. 302, pl. 140. 1845. (Holotype, K!) Although Parnell did not cite a basionym, this name presumably based on *L. multiflorum* Lam.

L. siculum Parl., Fl. Palerm. 1: 252. 1845. See discussions in text under *L. multiflorum* and *L. rigidum*.

L. italicum [var.] b. *muticum* Parl., Fl. Ital. 1: 531. 1848. Muticous.

L. gaudini Parl., Fl. Ital. 1: 532. 1848. As syn. of *L. multiflorum* Lam. sens. Gaud. Although used by certain authors of floras, this name is not valid.

L. multiflorum var. *decompositum* Breb., Fl. Norm., ed. 2, 322. 1849. Inflorescence branched.

L. felix Rouv., Monogr. Lolium 25, pl. 1, figs. 1–7. 1853. *L. perenne* and *L. multiflorum* both included.

L. osiridis Fig. & Del. ex Rouv., Monogr. Lolium 34. 1853. As syn. of *L. italicum*.

L. pectinatum Fig. & Del. ex Rouv., Monogr. Lolium 34, pl. 2, figs. 2, 3. 1853. As syn. of *L. felix*.

L. elongatum Hort. ex Rouv., Monogr. Lolium 35. 1853. As syn.

L. rieffelianum De Moor, Traite Gram. Belg. 98. 1854.

L. perenne var. *italicum* (A. Braun) Coss. & Dur., Expl. Sci. Alger. 2: 193. 1855. Braun pro sp.

L. perenne var. *multiflorum* (Lam.) Coss. & Dur., Expl. Sci. Alger. 2: 194. 1855.

L. perenne δ *geniculatum* Hallier, Bot. Zeit. 21, App. 1: 8. 1863. With geniculate culms and 12–20 flowers per spikelet, therefore *L. multiflorum*.

L. italicum aristatum Alefeld, Landw. Fl. 358. 1866. With awns.

L. italicum submuticum Gennari, Spec. e var. rimarch. e nouve Fl. Sard. 26. 1866.

L. multiflorum forma *microstachya* Uechtritz, "Jahresber. Schles. Ges. Vaterl. Cult. 1879: 334. 1880" See under *L. perenne*.

L. multiflorum β *pumilum* Boiss., Fl. Orient. 5: 679–680. 1884. ("In arenosis Syriae littoralis ad Sidonem (Gaill. No. 829!), ad Nahr el Kasimieh (Barbey!)"=syntypes, G-Boissier!)= Awnless and immature variants of *L. multiflorum* Lam.

L. multiflorum forma *cristata* C. T. Timm, Ber. Deutsch. Bot. Ges. 4. 1886. CLXIX. 1887. Nom. nud.

L. perenne γ *polyanthum* Beck, Fl. Nied.-Oest. 1: 112. 1890. Spikelets 12- to 22-flowered; therefore=*L. multiflorum*.

L. temulentum var. *multiflorum* (Lam.) Kuntze, Rev. Gen. Pl. 2: 779. 1891.

L. temulentum var. *multiflorum* forma *glaberrimum* Kuntze, Rev. Gen. Pl. 2: 779. 1891. Culm glabrous below spike.

L. italicum forma *pedunculatum* Stebl. & Schröt. ex Jaccard, Cat. Fl. Valais 403. 1895. Spikelets pedicellate.

L. perenne δ *gaudini* (Parl.) Fiori, Fl. Anal. Ital. 1: 104. 1896. Parl. pro sp.

L. perenne Σ *siculum* (Parl.) Fiori, Fl. Anal. Ital. 1: 104. 1896. Parl. pro sp.

L. italicum var. *composita* Murr, Deutsche Bot. Monatsschr. 15: 48. 1897. Nom. nud.

L. italicum var. *cristata* Murr, Deutsche Bot. Monatsschr. 15: 48. 1897. Nom. nud.

L. italicum var. *brachypodiata* Stebler & Volkart, in Schröter, Ber. Schweiz. Bot. Gesell. VIII: 119. 1898. (Stebler & Volkart 240, cited by Asch. & Graebn., Syn. Fl. 2: 758. 1902, is in herb. BC.) Aberrant: spikelets with both glumes and short-pedicellate (to 1 cm. long).

L. italicum [var.] γ *microstachyum* Hack. ex Goiran, Bul. Soc. Bot. Ital. 1899: 287. 1899. Nom. nud.

L. italicum [var.] δ *ramosum* Goiran, Bul. Soc. Bot. Ital. 1899: 288. 1899. Nom. nud.

L. italicum [var.] Σ *cristatum* Goiran, Bul. Soc. Bot. Ital. 1899: 288. 1899. Nom. nud.

L. perenne subsp. *italicum* (A. Braun) Husnot, Gram. France 85. 1899.

L. perenne subsp. *multiflorum* (Lam.) Husnot, Gram. France 85. 1899.

L. italicum α *laxum* Sickenb., Mém. Inst. Égypt 4: 314. 1901. Nom. nud.

L. italicum β *tenue* Sickenb., Mém. Inst. Égypt 4: 314. 1901. Nom. nud.

L. italicum γ *strictum* Sickenb., Mém. Inst. Égypt 4: 314. 1901. Nom. nud.

L. multiflorum α *robustum* Sickenb., Mém. Inst. Égypt 4: 314. 1901. Nom. nud.

L. multiflorum β *tenue* Sickenb., Mém. Inst. Égypt 4: 314. 1901. Nom. nud.

L. multiflorum [var.] A. *perennans* Asch. & Graebn., Syn. Fl. 2: 757. 1902. Plants robust, living for 2 or 3 years.

L. multiflorum [var.] B. *gaudini* (Parl.) Asch. & Graebn., Syn. Fl. 2: 758. 1902. Parl. pro sp.

L. multiflorum [var.] I. *longiaristatum* Asch. & Graebn., Syn. Fl. 2: 758. 1902. Upper florets with long awns.

L. multiflorum monstr. *ramosum* (Guss.) Asch. & Graebn., Syn. Fl. 2: 758. 1902. Guss. pro var., 1842.

L. multiflorum monstr. *brachypodiatum* (Stebl. & Volkart) Asch. & Graebn., Syn. Fl. 2: 758. 1902. Based on *L. italicum* var. *brachypodiata* Stebler & Volkart.

L. multiflorum α *italicum* (A. Braun) Beck, Wiss. Mitt. Bosn. Herzeg. 9: 459. 1904.

L. multiflorum subsp. *italicum* (A. Braun) Schinz & Keller, Fl. Schweiz, ed. 2, 1: 65. 1905.

L. multiflorum subsp. *gaudini* (Parl.) Schinz & Keller, Fl. Schweiz, ed. 2, 1: 65. 1905. Parl. pro sp.

L. multiflorum typicum Stuckert, Anal. Mus. Nac. Buenos Aires, ser. 3, 6: 528. 1906.

L. siculum var. *cristatum* Lojac., Fl. Sicul. 3: 381. 1908. Crested form (aberrant).

L. siculum var. *aristatum* Lojac., Fl. Sicul. 3: 381. 1908. Nom. nud.

L. siculum var. *ramosum* Lojac., Fl. Sicul. 3: 381. 1908. Inflorescence branched.

L. gaudini var. *longearistatum* (Asch. & Graebn.) Lojac., Fl. Sicul. 3: 381–382. 1908. Misspelling based on *L. multiflorum* var. *longiaristatum* Asch. & Graebn.

L. bromaceum Lojac., Fl. Sicul. 3: 382. 1908. As syn. of *L. gaudini* var. *longiaristatum* Asch. & Graebn.

L. gaudini var. *breviaristatum* Lojac., Fl. Sicul. 3: 382. 1908. Awns very short. (Asch. & Graebn. erroneously cited as authors of var. epithet.)

L. gaudini var. *muticum* Lojac., Fl. Sicul. 3: 382. 1908. Besides muticous lemmas, this variety has other characters of ordinary *L. multiflorum*.

L. multiflorum var. *longearistatum* Merino, Fl. Descr. Ilustr. Gal. 3: 396. 1909. Later homonym.

L. multiflorum forma *distachyum* Merino, Fl. Descr. Ilustr. Gal. 3: 397. 1909. One culm bearing two spikes.

L. annuum var. *westerwoldicum* Mansholt, Mitt. Deutsch. Landwirtsch. Ges. 25: 111. 1910. Nom. nud. See *L. multiflorum* var. *westerwoldicum*.

L. multiflorum subvar. *gaudini* Briq., Prodr. Fl. Corse 1: 182. 1910.

L. multiflorum A. *perennans* Asch. & Graebn. a. *typicum* Jansen & Wachter, Ned. Kruidk. Arch. 1912: 92. 1912. Spikelets 5- to 15-flowered.

L. multiflorum A. *perennans* Asch. & Graebn. a. *typicum* Jansen & Wachter 1. *longiaristatum* (Asch. & Graebn.) Jansen & Wachter, Ned. Kruidk. Arch. 1912: 92. 1912. Asch. & Graebn. pro var.

L. multiflorum A. *perennans* Asch. & Graebn. a. *typicum* Jansen & Wachter 2. *submuticum* (Mutel) Jansen & Wachter, Ned. Kruidk. Arch. 1912: 92. 1912. Mutel pro var.

L. multiflorum A. *perennans* Asch. & Graebn. a. *typicum* Jansen & Wachter 3. *muticum* (DC.) Jansen & Wachter, Ned. Kruidk. Arch. 1912: 92. 1912. DC. pro var.

L. multiflorum A. *perennans* Asch. & Graebn. b. *macrostachyum* Jansen & Wachter, Ned. Kruidk. Arch. 1912: 93. 1912. Spikelets rigid, 20- to 30-flowered.

L. multiflorum A. *perennans* Asch. & Graebn. c. *microstachyum* (Uechtritz) Jansen & Wachter, Ned. Kruidk. Arch. 1912: 93. 1912. Based on *L. multiflorum* forma *microstachya* Uechtritz.

L. multiflorum A. *perennans* Asch. & Graebn. d. *cristatum* (Timm) Jansen & Wachter, Ned. Kruidk. Arch. 1912: 93. 1912. Based on *L. multiflorum* forma *cristatum* Timm.

L. multiflorum B. *gaudini* (Parl.) Asch. & Graebn. monstr. *ramosum* (Guss.) Jansen & Wachter, Ned. Kruidk. Arch. 1912: 93. 1912.

L. multiflorum B. *gaudini* (Parl.) Asch. & Graebn. monstr. *cephalatum* Jansen & Wachter, Ned. Kruidk. Arch. 1912: 93. 1912.

L. multiflorum subvar. *muticum* (DC.) Rouy, Fl. Fr. 14: 308. 1913. DC. pro var.

L. multiflorum α *typicum* Rouy, Fl. Fr. 14: 308. 1913.

L. multiflorum forma *longiaristatum* (Asch. & Graebn.) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 318. 1913.

L. multiflorum forma *cristatum* (C. Timm) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 318. 1913.

L. multiflorum forma *microstachyum* (Uechtr.) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 318. 1913.

L. multiflorum forma *submuticum* (Mutel) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 318. 1913.

L. multiflorum forma *muticum* (DC.) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 318. 1913.

L. multiflorum var. *macrostachyum* "Jansen & Wachter, Prodr. Fl. Bat., ed. 2, 2443. 1916."

L. perenne var. *rigidum* Gaud. forma *siculum* Knoche, Fl. Bal. 332. 1921. Based on *L. siculum* "Willk., Barc., Rod., Parl.?" Basionym unclear, therefore, nom. nud.

L. multiflorum var. *westerwoldicum* Mansholt ex Wittmack, Landwirtsch. Samenkunde, ed. 2, 244–246. 1922. Wittmack cited *L. annuum* var. *westerwoldicum* Mansholt, a nom. nud. See discussion in text under *L. multiflorum*.

L. westerwoldicum Breakwell, Grass & Fodder Pl. N. S. W. 171. 1923. As syn. of *L. italicum*. See *L. multiflorum* var. *westerwoldicum*.

L. multiflorum forma *compositum* (Thuill.) Holmb., Skand. Fl. 1: 245. 1926.

L. lesdaini Sennen, Mem. Acad. Cienc. Barc. III. 20(14): 10. 1928. Nom. nud. *Sennen 5049*, from Castelldefels, Spain, labeled with this name in herb. BC!, BM!, G!, is closest to *L. multiflorum*, awnless variant.)

L. multiflorum B. *gaudini* (Parl.) Asch. & Graebn. forma *rubescens* Dalla Torre, Veröff. Mus. Ferd. Innsbruck 7: 21. 1928. Leaf sheaths and spikelets reddish.

L. multiflorum subsp. *multiflorum* (Husnot) Becherer, Ber. Schweiz. Bot. Gesell. 38: 156. 1929. Based on *L. perenne* subsp. *multiflorum* Husnot. Authority for combination unnecessary, according to 1961 International Code of Botanical Nomenclature.

L. gaudini [var.] b. *pumilum* (Boiss.) Dinsm., in Post & Dinsm., Fl. Syria, Palest., & Sinai, ed. 2, 2: 790. 1933. Based on *L. multiflorum* β *pumilum* Boiss.

L. gaudini [var.] c. *aristatum* (Post) Dinsm., in Post & Dinsm., Fl. Syria, Palest., & Sinai, ed. 2, 2: 790. 1933. Based on *L. multiflorum* var. *aristatum* Post, 1896, a later homonym.

L. multiflorum var. *scabrum* Bouly de Lesd., Publ. Soc. Dunk. 1934: 90.

1934. (Dunkerque, France, type, K!; culm scabrous below spike.)

L. multiflorum forma *ramosum* (Guss.) Bouly de Lesd., Publ. Soc. Dunk. 1934: 91. 1934. Guss. pro var., 1842.

L. multiflorum forma *paleaceum* Bouly de Lesd., Publ. Soc. Dunk. 1934: 91. 1934. Spike abnormal: spikelets twisted to one side.

L. multiflorum var. *siculum* (Parl.) Maire, in Emberger & Maire, Cat. Pl. Maroc IV: 945. 1941. Parl. pro sp.

L. multiflorum subsp. *italicum* (A. Braun) Schinz & Keller var. *latifolium* Maire, Bul. Soc. Hist. Nat. Afr. Nord 33: 99. 1942. Blades 4–11 mm. wide; culms 1 m. high; glumes and lemmas obtuse, even emarginate; spikelets muticous.

L. multiflorum subsp. *gaudini* (Parl.) Schinz & Keller var. *laeviculme* Maire, Bul. Soc. Hist. Nat. Afr. Nord 33: 99. 1942. Culms entirely glabrous, not scabrous below spike as in other varieties of this subspecies.

L. multiflorum var. *crassispicum* Jansen & Wachter, Ned. Kruidk. Arch. 52: 213. 1942. Rachis thickened.

L. siculum forma *aristatum* Jansen & Wachter, in Jansen, Fl. Neerl. 1 (2): 106. 1951. With awns.

L. multiflorum monstr. *compositum* Jansen & Wachter, in Jansen, Fl. Neerl. 1 (2): 110. 1951. Inflorescences branched.

L. multiflorum monstr. *cristatum* Jansen & Wachter, in Jansen, Fl. Neerl. 1 (2): 110. 1951. Spike crested.

L. multiflorum monstr. *viviparum* Jansen & Wachter, in Jansen, Fl. Neerl. 1 (2): 110. 1951. Viviparous.

L. multiflorum monstr. *cephalatum* Jansen & Wachter, in Jansen, Fl. Neerl. 1 (2): 110. 1951. Spike abnormal.

L. multiflorum subsp. *italicum* (A. Braun) Schinz & Keller var. *aristatum* (Willd.) Maire & Weiller, Fl. Afr. Nord 3: 290. 1955. Based on *L. perenne* var. *aristatum* Willd.

L. multiflorum subsp. *italicum* (A. Braun) Schinz & Keller var. *aristatum* (Willd.) Maire & Weiller forma *longiaristatum* (Asch. & Graebn.) Maire & Weiller, in Maire, Fl. Afr. Nord 3: 290. 1955. Based on *L. multiflorum* I. [var.] *longiaristatum* Asch. & Graebn.

L. multiflorum subsp. *italicum* (A. Braun) Schinz & Keller var. *aristatum* (Willd.) Maire & Weiller forma *submuticum* (Mutel) Maire & Weiller, in Maire, Fl. Afr. Nord 3: 290. 1955. Based on *L. multiflorum* [var.] c. *submuticum* Mutel.

L. multiflorum subsp. *italicum* (A. Braun) Schinz & Keller var. *aristatum* (Willd.) Maire & Weiller forma *muticum* (DC.) Maire & Weiller, in Maire, Fl. Afr. Nord 3: 290. 1955. Based on *L. multiflorum* [var.] β *muticum* DC.

L. multiflorum subsp. *gaudini* (Parl.) Schinz & Keller var. *gaudini* (Parl.) Asch. & Graebn. forma *macratherum* Maire & Weiller, in Maire, Fl. Afr. Nord 3: 291. 1955. (As a new name for *L. multiflorum* "var. *gaudini* f. *longiaristatum* Pamp."; lemmas awned, upper with long awns.)

L. multiflorum subsp. *gaudini* (Parl.) Schinz & Keller var. *gaudini* (Parl.) Asch. & Graebn. forma *brachyatherum* Maire & Weiller, in Maire, Fl. Afr. Nord 3: 291. 1955. (As a new name for *L. multiflorum* "var. *gaudini* f. *submuticum* Pamp."; some lemmas awnless, others with short awns.)

L. multiflorum subsp. *gaudini* (Parl.) Schinz & Keller var. *gaudini* (Parl.) Asch. & Graebn. forma *anatherum* Maire & Weiller, in Maire, Fl. Afr. Nord 3: 291. 1955. (As a new name for *L. multiflorum* "forma *muticum* A. & G." in part; all lemmas awnless.)

L. multiflorum subsp. *westerwoldicum* (Mansholt) Suvorova, Bul. Appl. Bot., Gen., & Pl. Breed. 33: 9. 1960.

3a. Lolium rigidum Gaud. var. **rigidum**

L. rigidum Gaud., Agrost. Helv. 1: 334. 1811.

L. strictum Presl, Cyp. Gram. Sicul. 49. 1820. Type not located.

L. strictum Decker ex Steud., Nom. Bot., ed. 2, 2: 65. 1841. As syn.

L. phoenice Rouv., Monogr. Lolium 36, pl. 1, figs. 8, 9. 1853. = *L. rigidum* pro parte, *L. loliaceum*.

L. arenarium Rouv., Monogr. Lolium 38, pl. 2, figs. 9, 10. 1853.

L. perenne var. *littorale* Fig. & Del. ex Rouv., Monogr. Lolium 38. 1853. As syn. of *L. arenarium* Rouv.

L. infelix Rouv., Monogr. Lolium 39, pl. 3. 1853. = *L. temulentum*, *L. remotum*, *L. rigidum* pro parte, and *L. canariense*.

L. perenne var. *rigidum* (Gaud.) Coss. & Dur., Expl. Sci. Alger. 2: 194. 1855.

L. strictum α *genuinum* Godr., in Gren. & Godr., Fl. Fr. 3: 613. 1856.

L. strictum β *maritimum* Godr., in Gren. & Godr., Fl. Fr. 3: 613. 1856. Spike subulate; plant robust.

L. strictum γ *tenue* Godr., in Gren. & Godr., Fl. Fr. 3: 613. 1856. Spike subulate, very slender; spikelets with 3–5 flowers; culms slender.

L. rigidum var. *subacaulis* Vis., Mem. Real. Ist. Venet. Sci. Lett. Art. XVI: 54. 1871. With a shortened culm.

L. flagellare Sprun. ex Boiss., Fl. Orient. 5: 680. 1884. As syn. (original specimens from "Attica"-G! BM!, from "Lycabetto"-G! K! W!; all are *L. rigidum*, sens. lat.)

L. perenne var. *rigidum* subvar. *aristatum* Perez-Lara, Anal. Soc. Españ. Hist. Nat. 15: 428. 1886. Nom. nud.

L. perenne var. *rigidum* subvar. *maritimum* (Godr.) Perez-Lara, Anal. Soc. Españ. Hist. Nat. 15: 428. 1886. Based on *L. strictum* β *maritimum* Godr.

L. perenne var. *rigidum* subvar. *tenue* (Godr.) Perez-Lara, Anal. Soc. Españ. Hist. Nat. 15: 428. 1886. Based on *L. strictum* γ *tenue* Godr.

L. rigidum var. *tenue* (Godr.) Dur. & Schinz, Consp. Fl. Afr. 5: 933. 1894. Based on *L. strictum* γ *tenue* Godr.

L. rigidum var. *duthiei* Hack. ex Hook. f., Fl. Brit. Ind. 7: 364. 1896. (Kashmir, near Sirinagur, alt. 5,000-6,000 ft., *Duthie 10846*, holotype K! isotypes US! W!; photo, DAO=*L. temulentum* var. *gracile* Regel, 1881; see discussions in text under *L. rigidum* and *L. temulentum*.)

L. strictum β *rigidum* (Gaud.) Posp., Fl. Oest. Küstenl. 1: 150. 1897.

L. rigidum β *aristatum* Goiran, Bul. Soc. Bot. Ital. 1899: 288. 1899. Nom. nud.

L. rigidum α *muticum* Sickenb., Mém. Inst. Égypt 4: 314. 1901. Nom. nud.

L. rigidum β *aristatum* Sickenb., Mém. Inst. Égypt. 4: 314. 1901. Nom. nud.

L. rigidum β *strictum* (Presl) Halac., Consp. Fl. Graec. 3: 445. 1904. Presl pro sp.

L. rigidum var. *aristatum* Hack. ex Stuck., Anal. Mus. Nac. Buenos Aires, ser. 3, 6: 530. 1906. This name valid; two earlier homonyms were nom. nud.

L. gaudini var. *pseudo-rigidum* Lojac., Fl. Sicul. 3: 382. 1908. Presumably=*L. rigidum* Gaud., sens. lat.

L. rigidum var. *subulicolum* Lojac., Fl. Sicul. 3: 382. 1908. A variant distinguished only by vegetative characters.

L. rigidum var. *maritimum* (Godr.) Merino, Fl. Descr. Ilustr. Gal. 3: 394. 1909. Based on *L. strictum* β *maritimum* Godr.

L. rigidum var. *genuinum* (Godr.) Briq., Prodr. Fl. Corse 1: 180. 1910. Based on *L. strictum* var. *genuinum* Godr.

L. rigidum γ var. *corsicum* Hack. ex Briq., Prodr. Fl. Corse 1: 180. 1910. Included here as to name only; see under *L. perenne*.

L. humile Rouy, Fl. Fr. 14: 309. 1913. As "race" of *L. strictum* Presl.

L. rigidum monstr. *compositum* Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 317. 1913. Spike branched.

L. perenne var. *rigidum* forma *strictum* (Presl) Knoche, Fl. Bal. 332. 1921. Presl pro sp.

L. rigidum forma *angustifolium* Ginzb., Oest. Bot. Zeitschr. 70: 248. 1921.

L. rigidum forma *latifolium* Ginzb., Oest. Bot. Zeitschr. 70: 248. 1921.

L. parabolicae Sennen ex Sampaio, Bol. Soc. Brot., ser. 2, 1: 125. 1922. Sennen, Bul. Soc. Bot. Fr. 68: 408. 1921, name only. (Spain: Catalogne, Mataro, "sables maritimes de la voie ferrée," *Sennen 3238*, types, BC! COI! G! MA! W!; see discussion under *L. rigidum*.)

L. husnoti rigidum Sennen, Bul. Soc. Bot. Fr. 73: 678. 1926. Nom. nud.

L. husnoti Sennen, Bul. Soc. Bot. Fr. 74: 408. 1927. Nom. nud. (*Sennen 3239*, from Spain, is "type," BC! BM! COI! MA!=*L. rigidum* or *L. rigidum* × *L. multiflorum*.)

L. rigidum b. *ramosum* Druce, Brit. Pl. List, ed. 2, 134. 1928. Nom. nud.

L. strictum α *latifolium* (Ginzb.) Hayek, Repert. Sp. Nov. Fedde Beih. 30(3): 298. 1932. Based on *L. rigidum* var. *latifolium* Ginzb.

L. strictum β *angustifolium* (Ginzb.) Hayek, Repert. Sp. Nov. Fedde Beih. 30(3): 298. 1932. Based on *L. rigidum* var. *angustifolium* Ginzb.

L. strictum b. *subacaule* (Vis.) Hayek, Repert. Sp. Nov. Fedde Beih. 30(3): 298. 1932. Based on *L. rigidum* var. *subacaulis* Vis.

L. rigidum forma *ramosum* Bouly de Lesd., Publ. Soc. Dunk. 1934: 91. 1934. Spike branched.

L. rigidum subsp. *maroccanum* Senn. & Mauric., Cat. Fl. Rif Or. 135. 1934. Nom. nud. (as "*rigidum*").

L. rigidum var. *transiens* Burollet, Bul. Soc. Sci. Nat. Maroc 16: 127. 1936. With short glumes.

L. rigidum var. *transiens* Burollet forma *latiglumis* Burollet, Bul. Soc. Sci. Nat. Maroc 16: 127. 1936. A form with glumes one-third as wide as long, very obtuse, sometimes nearly truncate and very slightly recurved at the tip.

L. rigidum var. *glabrum* Grossh., Trudy Bot. Inst. Azerbaidzh. Fil. Akad. Nauk. SSSR 8: 319. 1939. Culms glabrous.

L. strictum forma *aristatum* Maire, Bul. Soc. Hist. Nat. Afr. Nord 30: 369. 1939.

L. rigidum var. *subteres* Maire & Weiller, in Maire, Bul. Soc. Hist. Nat. Afr. Nord 32: 223. 1941. As new name for *L. lepturoides* f. *maritima* (Gatt., Maire. & Weiller, op. cit. 31: 208. 1941, nom. nud.) Differs from *L. rigidum* var. *maritimum* by having retuse instead of acutish glumes.

L. rigidum var. *atherophorum* Maire, Bul. Soc. Hist. Nat. Afr. Nord 33: 99. 1942.

L. rigidum var. *decipiens* Samp., Fl. Port. 88. 1946. Nom. nud.

L. rigidum var. *tenue* (Godr.) Dur. & Schinz forma *maritimum* (Godr.) Maire & Weiller, in Maire, Fl. Afr. Nord 3: 294. 1955. Based on *L. strictum* β *maritimum* Godr.

L. rigidum var. *tenue* (Godr.) Dur. & Schinz forma *transiens* (Burollet) Maire & Weiller, in Maire, Fl. Afr. Nord 3: 294. 1955. Based on *L. rigidum* var. *transiens* Burollet.

L. rigidum var. *oliganthum* (Godr.) Maire & Weiller, in Maire, Fl. Afr. Nord 3: 295. 1955. Based on *L. temulentum* var. *oliganthum* Godr.

3b. **Lolium rigidum** var. [β] **rottboellioides** Heldr. ex Boiss., Fl. Orient. 5: 680. 1884. *Rottboellia loliacea* cited as syn.

Rottboellia loliacea Bory & Chaub., Exped. Sci. Mor. 3 (pt. 2-Bot.): 46, pl. 3, fig. 2. 1832–1836. As "Rottboella." (Modon, Greece, lectotype, G! isotypes, G-Boissier! P!)

Crypturus loliaceus (Bory & Chaub.) Link, Linnaea 17: 387. 1843. Based on *Rottboellia loliacea* Bory & Chaub.

Lolium lepturoides Boiss., Diagn. Pl. Orient. Nov. I. 2 (fasc. 13): 67. 1853. Name superfluous when published; *Rottboellia loliacea* Bory & Chaub. cited as syn.

L. phoenice Rouv., Monogr. Lolium 36, pl. 1, figs. 8, 9. 1853. =*L. rigidum* pro parte, *L. loliaceum*.

Arthrochortus loliaceus Lowe, Jour. Bot. Kew Misc. 8: 301–302. 1856. ("Insula Deserta Septentrionali Ilheo Chao," Madeira Islands, lectotype, *R. T. Lowe 864*, "Flat Dez'a.," June 3, 1850, G! isotype, K! From same location is *Lowe 894*, "N. Dez'a.," May 30–June 2, 1855, K! P! US!) See discussion in text.

Lolium rigidum β *lepturoides* (Boiss.) Fiori & Paol., Fl. Anal. Ital. 1: 103. 1896–1898. Boiss. pro sp.

L. rigidum γ *loliaceum* (Bory & Chaub.) Halac., Consp. Fl. Graec. 3: 446. 1904. Based on *Rottboellia loliacea* Bory & Chaub.

L. lowei Menezes, Gram. Arch. Madeira 47. 1906. As new name for *Arthrochortus loliaceus* Lowe.

L. subulatum var. *rottboellioides* (Heldr.) Fedtsch., Bul. Jard. Bot. Pierre Grand 14 (Suppl. 2): 92. 1914. Presumably based on *L. rigidum* var. *rottboellioides* Heldr. ex Boiss.

L. loliaceum (Bory & Chaub.) Hand.-Mazz., Annal. Naturhist. Hofmus. Wien 28: 32. 1914. Based on *Rottboellia loliacea* Bory & Chaub. (as "Rottboella").

L. lepturoides Boiss. forma *maritima* Batt. & Trab., Bul. Soc. Hist. Nat. Afr. Nord 9: 17. 1918.

L. teres Lindb. f., Acta Soc. Sci. Fenn., n. ser., B. 1(2): 19, fig. 4a. 1932.

L. loliaceum β *aristatum* (Lindb. f.) Hayek, Repert. Sp. Nov. Fedde Beih. 30(3): 299. 1933. Based on *L. subulatum* forma *aristatum* Lindb. f. Non pro var.

L. rigidum var. *teres* (Lindb. f.) Maire, in Jahand. & Maire, Cat. Pl. Maroc 3: 866. 1934.

L. rigidum subsp. *lepturoides* (Boiss.) Senn. & Mauric., Cat. Fl. Rif Orient. 135. 1934. Boiss. pro sp.

L. rigidum var. *teres* (Lindb. f.) Maire forma *maroccanum* (Senn. & Mauric.) Emberger & Maire, Suppl. Cat. Maroc. IV: 945. 1941. Based on *L. rigidum* subsp. *maroccanum* Senn. & Mauric., nom. nud.

L. crassiculme Rech. f., Denkschr. Akad. Wiss. Math.-Naturw. Wien. 105 (Halbb. 2, Abt. 1): 175, fig. 14. 1943. (Crete, dist. Sitia, *Rechinger 12481*, holotype W! isotype US!)

4. **Lolium subulatum** Vis., Fl. Dalm. 1: 90. pl. 3. 1842.

L. rigidum Weiss ex Nyman, Consp. Fl. Eur. 845. 1882. As syn.

L. rigidum var. *subulatum* (Vis.) Charrel, Oest. Bot. Zeitschr. 42: 411. 1892.

L. temulentum var. *subulatum* (Vis.) Husnot, Gram. France, Belg., Brit., Suisse 86. 1896–99.

L. mayeri A. Braun ex Asch. & Graebn., Syn. Fl. 2: 760. 1902. As syn.

L. subulatum forma *aristatum* Lindb. f., Öfv. Finsk. Vet.-Soc. Förh. 48(13): 12. 1905–06. ("Dalm., insula Moleda, Porto Palazzo, in campo sicco.") Lemmas having awns to 5 mm. long in upper florets.

L. suffultum Sieber ex Huter, Oest. Bot. Zeitschr. 58: 33. 1908. Sieb., Avis Pl. 3. 1821, name only. (Near Larnaka, Cyprus, *Sintenis & Rigo*, 4 Mar. 1880; type not located; possible type in herb. W! (12625) by these collectors, in 1880, "campis pr. Larnaka" named as "*L. subulatum* fma. *aristulata*" (nom. ined.); also specimen in K! as *L. suffultum* came from herb. J. Gay and is inscribed "Sieber misit Decembre 1821".)

L. perenne ζ *subulatum* (Vis.) Fiori, Nuov. Fl. Anal. Ital. 1: 155. 1923.

L. subulatum forma *ramosum* Bouly de Lesd., Publ. Soc. Dunk. 1934: 91. 1934. Inflorescence branched.

L. subulatum var. *mucronatum* Gombault, Bul. Soc. Bot. France 84: 469. 1937. (Qalaat el Hosn, Syria, *Gombault 2930*, 29 Apr. 1934, holotype, P!)

L. rigidum subsp. *subulatum* (Vis.) Thiebaut, Fl. Lib.-Syr., 3rd part, 312. 1953. Combination invalid under Art. 33, 1961 International Code of Botanical Nomenclature, because of incomplete citation of basionym.

6. **Lolium temulentum** L., Sp. Pl. 83. 1753.

L. album [Gerarde] Huds., Fl. Angl., ed. 2, 1: 55. 1778. As syn.

L. annuum Lam., Fl. Fr. 3: 620–621. 1778. Hudson (Fl. Angl., ed. 2, 1: 55. 1778) also used this name (as syn. of *L. temulentum*) but as part of a pre-Linnaean polynomial.

Craepalia temulenta (L.) Schrank, Baier. Fl. 1: 382. 1789. Based on *L. temulentum* L.

Lolium annuum Gilib., Exerc. Phyt. 2: 520. 1792.

L. temulentum var. *mutica* Retz., Fl. Scand. Prodr. 28. 1795. Nom. nud.

L. arvense With., Bot. Arr. Veg. Brit., ed. 3, 2: 168. 1796. =awnless variant of *L. temulentum;* however, has been used by some authors (e.g., Schrad., Fl. Germ. 399. 1806; Braun, Flora 17: 258. 1834) as a synonym of *L. remotum* Schrank.

L. maximum Willd., Sp. Pl. 1: 462–463. 1797.

Bromus temulentus Bernh., "Cat. Pl. Hort. Erfurt. 49. 1799."

Lolium speciosum Stev. ex Bieb., Fl. Taur.-Cauc. 1: 80. 1808. (Iberia, Georgia, USSR, lectotype LE!)

L. temulentum α *aristatum* Stokes, Bot. Mat. Med. 1: 161. 1812. Awns twice as long as the "calyx."

L. temulentum β *submuticum* Stokes, Bot. Mat. Med. 1: 162. 1812. Awns flaccid, capillary, one-half as long as "calyx."

L. temulentum A. *arvense* Lilj., Utk. Sv. Fl. 80. 1816. Basionym not cited. Type not located. Description suggests both *L. temulentum* and *L. remotum*.

L. giganteum Hort. ex Roem. & Schult., Syst. Veg. 2: 750. 1817. As syn. of *L. maximum* Willd.

L. temulentum β *subbivalve* Saint-Amans, Fl. Agen. 50. 1821. Aberrant: lower spikelets with two glumes.

L. arvense With. var. *geniculatum* Dum., Obs. Gram. Belg. 98. 1823.

L. arvense With. var. *hostii* Dum., Obs. Gram. Belg. 98. 1823.

L. arvense With. var. *liniforme* Dum., Obs. Gram. Belg. 98. 1823.

L. decipiens Dum., Obs. Gram. Belg. 98, pl. 2, fig. 8. 1823. Probably=*L. temulentum* or *L. remotum*.

L. gracile Dum., Obs. Gram. Belg. 99. 1823. Identity uncertain, but believed to=*L. temulentum*, as claimed by Asch. & Graebn., Syn. Fl. 2: 751. 1902.

L. temulentum [var.] b. *ramosum* Guss., Fl. Sicul. Prodr. 1: 152. 1827. Spike branched.

L. arvense α *minus* Gaud., Fl. Helv. 1: 354. 1828.

L. arvense β *speciosum* (Link) Gaud., Fl. Helv. 1: 354. 1828. Based on *L. speciosum* Link, Enum. Pl. Hort. Berol. 1: 98. 1813, a later homonym, non Stev. ex Bieb., 1808.

L. scabrum J. S. Presl, in K. B. Presl, Rel. Haenk. 1: 267. 1830. ("In montanis Peruviae," *Haenke*, lectotype PR!. My earlier annotation of this as being *L. multiflorum* may have been in error. It now seems more likely that it is either transitional between *L. temulentum* and *L. multiflorum* or *L. perenne*.)

L. asperum Roth ex Kunth, Enum. Pl. 1: 436. 1833. As syn. of *L. arvense* With.

L. temulentum α *macrochaeton* A. Braun, Flora 17: 252. 1834. Florets strongly awned.

L. temulentum β *leptochaeton* A. Braun, Flora 17: 252. 1834. Weakly awned or awnless.

L. robustum Reichenb., Icon. Fl. Germ. & Helv. 1: 2, pl. 4, fig. 1340. 1834.

L. arvense var. *tenue* G. Meyer, Chloris Hanov. 613–614. 1836. Has only 2 or 3 florets per spikelet.

L. campanulatum Schrad. ex Tin., Fl. Luxemb. 42. 1836. As syn. of *L. arvense* With.

L. temulentum b. *robustum* (Reichenb.) Mutel, Fl. Fr. 4: 142, pl. 91, fig. 641. 1837. Reichenb. pro sp.

L. temulentum c. *robustissimum* Mutel, Fl. Fr. 4: 142, pl. 91, fig. 642. 1837.

L. temulentum d. *laevigatum* Mutel, Fl. Fr. 4: 142, pl. 91, fig. 643. 1837.

L. temulentum e. *dissitum* Mutel, Fl. Fr. 4: 142, pl. 91, fig. 644. 1837.

L. temulentum β *muticum* Noulet, Fl. Sous-Pyr. 732. 1837. Florets muticous.

L. gracile Hegetschw. & Heer, Fl. Schweiz 105. 1840. Non Dumort., 1823. Either *L. temulentum* or *L. remotum*.

L. temulentum [var.] β *speciosum* (Stev. ex Bieb.) Koch, Syn. Fl. Germ. & Helv., ed. 2, 957. 1843. Bieb. pro sp.

L. temulentum γ *laeve* Koch, Taschenb. Deutsch. & Schw. Fl. 596. 1844. Sheaths and culms glabrous.

L. temulentum var. *longiaristatum* Parn., Grasses Brit. 304, pl. 142. 1845. With long awns. (Cantire, Scotland, holotype, K!)

L. temulentum c. *gussonii* Parl., Fl. Ital. 1: 535. 1848.

L. temulentum β *pauciflorum* K. Koch, Linnaea 21: 434. 1848. Nom. subnud.

L. temulentum β *craepalia* Opiz, Seznam Rostl. Kvet. Ceske 60. 1852. Nom. nud.

L. temulentum γ *pauciflorum* Opiz, Seznam Rostl. Kvet. Ceske 60. 1852. Nom. nud.

L. infelix Rouy., Monogr. Lolium 39, pl. 3. 1853. = *L. temulentum*, *L. remotum*, *L. rigidum* pro parte and *L. canariense*.

L. aegyptiacum Bellardi ex Rouy., Monogr. Lolium 43. 1853. As syn. of *L. speciosum* Stev. ex Bieb.

L. berteronianum Steud., Syn. Pl. Glum. 1: 340. 1854. = awned variant of *L. temulentum*. (Chile, *Bertero 1108*, lectotype P! isotypes P!)

L. temulentum γ *oliganthum* Godr., in Gren. & Godr., Fl. Fr. 3: 615. 1856. (Esterel, France, *Loret* in 1859, lectotype P!)

L. temulentum β *leptochaetum* A. Braun 1. *robustum* (Reichenb.) Asch., Fl. Brand. 1: 876. 1864. Reichenb. pro sp.

L. temulentum β *leptochaetum* A. Braun 2. *arvense* (With.) Asch., Fl. Brand. 1: 876. 1864. With. pro sp.

L. pseudo-linicola Genn., Nuov. Giorn. Bot. Ital. 2: 97. 1870. Identity uncertain, but believed to = *L. temulentum*.

L. temulentum β *gracile* Regel, Act. Hort. Petrop. 7: 593. 1881. (Zeravschan valley, Tadzhik SSR, *O. Fedschenko*, 14 May 1869, holotype LE! isotype W!) See discussion in text.

L. gussonei Nyman, Consp. Fl. Eur. 844. 1882. As syn.

L. temulentum [var.] β *prostratum* Kuntze, Act. Hort. Petrop. 10: 252. 1887. ("Auf Dunen bei Lenkoran," Azerbaijan SSR, *O. Kuntze*, May 1886, lectotype NY! isotype NY!) Lectotype appears to be environmental modification and annual despite description as either annual or perennial.

L. longiglume Cariot & Saint-Lager, Étud. Fl., ed. 8, 2: 955. 1889. *L. temulentum* L. listed as syn.

L. longiglume forma *macrochaetum* (A. Braun) Cariot & Saint-Lager, Étud. Fl., ed. 8, 2: 955. 1889.

L. longiglume forma *microchaetum* Cariot & Saint-Lager, Étud. Fl., ed. 8, 2: 955. 1889. Awns slender, shorter than lemmas, sometimes absent in upper florets.

L. linicola b. *pseudo-linicola* (Genn.) Richt., Pl. Eur. 1: 121. 1890. Genn. pro sp.

L. temulentum β *gracile* (Dumort.) Goiran, Bul. Soc. Bot. Ital. 1899: 288. 1899. Based on *L. gracile* Dumort. Non var. *gracile* Regel.

L. temulentum γ *leptochaeton* a. *speciosum* (Bieb.) Goiran, Bul. Soc. Bot. Ital. 1899: 288. 1899. Bieb. pro sp.

L. temulentum γ *leptochaeton* b. *robustum* (Reichenb.) Goiran, Bul. Soc. Bot. Ital. 1899: 288. 1899. Reichenb. pro sp.

L. temulentum α *agricolum* Neuman, Sver. Fl. 730. 1901.

L. temulentum A. *macrochaeton* A. Br. [subsp.] II. *oliganthum* (Godr.) Asch. & Graebn., Syn. Fl. 2: 751. 1902. Godr. pro var.

L. temulentum B. *arvense* [subvar.] I. *robustum* (Reichenb.) Asch. & Graebn., Syn. Fl. 2: 751. 1902.

L. temulentum B. *arvense* [subvar.] II. *speciosum* (Stev. ex Bieb.) Asch. & Graebn., Syn. Fl. 2: 751. 1902.

L. temulentum B. *arvense* II. *speciosum* (Stev. ex Bieb.) Asch. & Graebn. b. *gussonei* (Parl.) Asch. & Graebn., Syn. Fl. 2: 751. 1902. Based on *L. temulentum* c. *gussonii* Parl.

L. temulentum [var.] 2. *pseudolinicola* (Genn.) Asch. & Graebn., Syn. Fl. 2: 751. 1902. Genn. pro sp.

L. temulentum var. *semiglabrum* Litv., Sched. Herb. Fl. Ross. Mus. Bot. Acad. Imp. Sci. Petrop. 5: 135. 1905. (Near Farab, Turkmen SSR, *N. Androssow*, 15 May 1902, holotype LE! isotype G!) See discussion in text.

L. temulentum b. *arvense* forma α *speciosum* (Stev. ex Bieb.) Brand, in

Koch, Syn. Deutsch. Fl., ed. 3, 3: 2806. 1907.

L. temulentum b. *arvense* forma β *robustum* (Reichenb.) Brand, in Koch, Syn. Deutsch. Fl., ed. 3, 3: 2806. 1907.

L. temulentum var. *macrochaeton* subvar. *laeve* Thell., Vierteljahrs. Nat. Ges. Zurich 52: 440. 1907. Culm completely glabrous.

L. temulentum forma *macrochaeton* (A. Braun) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 314. 1913. Based on *L. temulentum* var. *macrochaeton* A. Braun.

L. temulentum forma *commune* Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 314. 1913. Culm rough.

L. temulentum forma *laeve* Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 314. 1913. Culm smooth.

L. temulentum forma *arvense* (Bab.) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 314. 1913. Should be cited as "(With.)," the author of *L. arvense*, as Babington himself recognized. Described by Junge as awnless or with short awns.

L. temulentum forma *robustum* (Koch) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 314. 1913.

L. temulentum forma *speciosum* (Koch) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 315. 1913.

L. temulentum β *leptochaeton* A. Braun subvar. *lacvigatum* Rouy, Fl. Fr. 14: 312. 1913. Culm smooth.

L. temulentum β *leptochaeton* A. Braun subvar. *scabrum* Rouy, Fl. Fr. 14: 312. 1913. Culms scabrous. Rouy's citation of Koch, pro var., appears erroneous.

L. temulentum β *leptochaeton* A. Braun subvar. *muticum* (Boiss.) Rouy, Fl. Fr. 14: 312. 1913. Boiss., Fl. Orient. 5: 681. 1884. pro var. Florets awnless.

L. temulentum var. *tenuis* Schult. ex Fedtsch., Bul. Jard. Bot. Pierre Grand 14 (Suppl. 2): 91. 1915. Nom. nud.

L. temulentum var. *macrochaeton* forma *lere* Pamp., Museum—Boll. Rep. San Mar. 1 (2): 4. 1917. Blades and culms glabrous.

L. temulentum forma *oliganthum* (Godr.) Bouly de Lesd., Publ. Soc. Dunk. 1934: 93. 1934. Godr. pro var.

L. temulentum forma *subbivalve* (Saint-Amans) Bouly de Lesd., Publ. Soc. Dunk. 1934: 93. 1934. Saint-Amans pro var.

L. temulentum forma *ramosum* Bouly de Lesd., Publ. Soc. Dunk. 1934: 94. 1934. Spike branched.

L. temulentum forma *macrochaeton* (A. Braun) Vierh. & Rech. f., Oest. Bot. Zeitschr. 84: 193. 1935. Later homonym.

L. cuneatum Nevski, Act. Inst. Bot. Acad. Sci. URSS I. 2: 40. 1936. ("In valle Kuhitang-darja, lg. S. Nevski 18 VI 1931, no. 311," holotype LE! isotype K!) See discussion in text.

L. temulentum var. *cylindricum* Jansen & Wachter, Ned. Kruidk. Arch. 52: 212. 1942. Spike cylindric; spikelets immersed in rachis. Aberrant variant.

L. temulentum forma *leptochaeton* (A. Braun) Rech. f., Fl. Aeg. 787. 1943. Rechinger considered this as having slender flexuous awns; however, Braun considered it as weakly or not awned.

L. temulentum forma *muticum* (Boiss.) Rech. f., Fl. Aeg. 787. 1943. Boiss., Fl. Orient. 1884, pro var., non Noulet, 1837.

L. temulentum forma *scabrum* (Koch) Jansen & Wachter, in Jansen, Fl. Neerl. 1(2): 105. 1951. Koch did not publish a valid combination.

L. temulentum monstr. *compositum* Jansen, Fl. Neerl. 1(2): 105. 1951. Spikelets branched.

L. temulentum monstr. *bracteatum* Jansen, Fl. Neerl. 1(2): 105. 1951. Nom. nud.

L. temulentum subsp. *gussonei* (Parl.) Pign., Arch. Bot. Biogr. Ital. 34: 7. 1958. Based on *L. temulentum* c. *gussonii* Parl.

7. **Lolium remotum** Schrank, Baier. Fl. 1: 382. 1789.

L. complanatum Schrad., Neu. Jour. Bot. Schrad. 4: 73. 1810. Type not located; original description inconclusive. In absence of type specimen it is impossible to be certain of identity. Reichenbach (Icon. Fl. Germ. & Helv. 1: 2, pl. IV, fig. 1341. 1834) illustrates what I consider a variant of *L. remotum*. Several old exsiccatae labeled *complanatum* by other collectors=*L. remotum*.

L. linicolum A. Braun, Flora 17: 258. 1834. As syn. of *L. arvense* With., which Braun used in the sense of *L. remotum*.

L. arvense b. *complanatum* (Schrad.) Mutel, Fl. Fr. 4: 141, pl. 91, fig. 640. 1837.

L. linicola Sonder ex Koch, Syn. Fl. Germ. & Helv., ed. 2, 957. 1843.

L. linicola [var.] β *complanatum* (Schrad.) Koch, Syn. Fl. Germ. & Helv., ed. 2, 957. 1843. Schrad. pro sp.

L. infelix Rouv., Monogr. Lolium 39, pl. 3. 1853. = *L. temulentum*, *L. remotum*, *L. rigidum* pro parte, and *L. canariense*.

L. sonderi Rouv., Monogr. Lolium 44, pl. 3, figs. 7, 10. 1853.

L. linicolum β *aristatum* Doell, Fl. Bad. 1: 113. 1857. Lemmas long-awned.

L. remotum [var.] b. *aristatum* (Doell) Asch., Fl. Brand. 1: 876. 1864. Based on *L. linicolum* β *aristatum* Doell, 1857.

L. remotum [var.] b. *aristatum* (Doell) Asch. [subvar.] 1. *asperum* (Roth ex Kunth) Asch., Fl. Brand. 1:876. 1864. Based on *L. asperum* Roth ex Kunth.

L. remotum [var.] b. *aristatum* (Doell) Asch. [subvar.] 2. *laeve* Asch., Fl. Brand. 1: 876. 1864. Culm smooth.

L. remotum [var.] c. *complanatum* (Schrad.) Asch., Fl. Brand. 1: 876. 1864. Schrad. pro sp.

L. temulentum var. *linicola* (Sond. ex Koch) Benth., Fl. Austral. 7: 667. 1878. Sond. ex Koch pro sp.

L. remotum α *submuticum* Celak., Prodr. Fl. Boehm. 728. 1881. Awnless or with very short awn. Culm rough or smooth.

L. remotum α *typicum* Beck, Fl. Nied-Oest. 1: 113. 1890. Spikelets 5- to 8-flowered, about as long as adjacent internodes.

L. remotum β *oliganthum* Beck, Fl. Nied.-Oest. 1: 113. 1890. Spikelets 3- to 5-flowered, shorter than internodes just above them.

L. temulentum δ *remotum* (Schrank) Fiori & Paol., Fl. Anal. Ital. 1: 103. 1896–1898.

L. temulentum β *linicolum* (A. Braun) Neuman, Sver. Fl. 730. 1901. Braun pro sp.

L. remotum var. *rodriguezii* Merino, Fl. Descr. Ilustr. Gal. 3: 395. 1909. Merino cited "Contr. à la Fl. de Gal., Supl. IV," but this publication not located. A robust variety with awns 2 to 3 times longer than lemmas. It is possible this may=*L. temulentum* instead of *L. remotum*.

L. remotum var. *rodriguezii* forma *polystachyum* Merino, Fl. Descr. Ilustr. Gal. 3: 395. 1909. Inflorescence with 4 or 5 branches. See var. *rodriguezii*.

L. remotum forma *typicum* (Beck) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 315. 1913.

L. remotum forma *complanatum* (Koch) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 315. 1913.

L. remotum forma *oliganthum* (Beck) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 315. 1913.

L. remotum forma *aristatum* (Doell) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 315. 1913.

L. remotum forma *asperum* (Asch.) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 315. 1913.

L. remotum forma *laeve* (Asch.) Junge, Jahrb. Hamb. Wiss. Anst., Beih. 3, 30: 316. 1913.

L. remotum forma *cristatum* Bouly de Lesd., Publ. Soc. Dunk. 1934: 92. 1934. Aberrant: crested spike.

L. remotum forma *ramosum* Bouly de Lesd., Publ. Soc. Dunk. 1934: 92. 1934. Spike branched.

L. remotum monstr. *compositum* Jansen, Fl. Neerl. 1: 106. 1951. Spike branched.

Names under **Lolium** referring to hybrids

Lolium festucaceum Link, Hort. Reg. Bot. Berol. 1: 273. 1827. = *Festuca pratensis* × *Lolium perenne*.

L. festucoides Rasp., in Saig. & Rasp., Ann. Sci. Obs. 2: 243–244. 1829. = *Festuca pratensis* × *L. perenne*.

L. jechelianum Opiz, Lotos 2: 229. 1852. ("Krumau 1851. Jechl Frankfurt a. M. Bagge"; holotype, PR! = aberrant form with congested spikelets, possibly *L. multiflorum* × *L. perenne*.)

Lolium × *hybridum* Hausskn., Mitt. Geogr. Ges. Thür. VI. Bot. Ver. Gesamtthür. 32. 1887. =*L. multiflorum* Lam. × *L. perenne* L.

Lolium × *hubbardii* Jansen & Wachter, Fl. Néerl. 1(2): 110. 1951. =*L. multiflorum* Lam. × *L. strictum* Presl.

L. rigidum var. *longiglume* Meld., in Rech. f., Ark. Bot. (n.s.) 2: 299. 1952. Glume longer than the spikelet. Believed to be *L. rigidum* × *L. temulentum*.

Dubious names

Lolium gmelini Honck., Vollst. Syst. Verz. Aller Gew. Teutschl. 328. 1782. Based on pre-Linnean polynomial by J. F. Gmelin.

L. repens Honck., Vollst. Syst. Verz. Aller Gew. Teutschl. 328. 1782.

L. annuum Bernh., "Sem. Hort. Erf. 1801."

L. appenninum Brouss., Cat. Hort. Monsp. 35. 1804. Nom. nud.

L. canadense Michx. ex Roem. & Schult., Syst. Veg. 2: 893. 1817.

L. lucidum Dum., Obs. Gram. Belg. 98. 1823. According to Ascherson & Graebner (Syn. Fl. 2: 751. 1902) this = *L. temulentum;* however, type not seen and original description inconclusive.

L. cechicum Opiz, in Berchtold & Opiz, Oekon.-Techn. Fl. Böhm. 1: 379. 1836. Specimen so-named and collected by Jechl in herb. PR appeared to be an awned variant of *L. perenne* but also resembled *L. remotum.* Type uncertain; original description inconclusive.

L. ambignum Desportes, Fl. Sarthe & Mayenne 329. 1838.

L. ambignum B. *ramosum* Desportes, Fl. Sarthe & Mayenne 329. 1838.

L. macilentum Delastre, Fl. Départ. Vienne 498. 1842.

L. bromoides Kittel, Taschenb. Fl. Deutschl., ed. 2, 117. 1844.

L. cylindricum K. Koch, Linnaea 21: 434. 1848.

L. durum K. Koch, Linnaea 21: 434–435. 1848.

L. glumosum Plan.-Gir., Ensayo Fl. Gallega 409. 1852. Merino (Fl. Gal. 3: 393. 1909) considered this a variety of *L. perenne;* however, type not located and original description inconclusive.

L. aechicum Opiz; error in Rouy., Monogr. Lolium 17, 35. 1853. for *L. cechicum* Opiz.

L. triticoides Janka, Linnaea 30: 622. 1859–60.

L. romanum Sang., Atti Accad. Pont. Lincei ser. 1. 18: 221, 753, pl. 4, fig. 2. 1865.

L. temulentum β *canadense* (Michx.) Wood, Amer. Bot. & Flor., pt. 2, 406. 1871. Based on *L. canadense* Michx. ex Roem. & Schult.

L. strictum α *typicum* forma *macilenta* (Delastre) Posp., Fl. Oest. Küstenl. 1: 149. 1897. Based on *L. macilentum* Delastre.

Agropyrum lepturoide Lojac., Fl. Sicul. 3: 373. 1908. Identity unknown; *Lolium lepturoide* listed as syn.

Lolium lepturoide Lojac., Fl. Sicul. 3: 373. 1908. As syn. of *Agropyrum lepturoide* Lojac.

L. subulatum De Deg. ex Lojac., Fl. Sicul. 3: 373. 1908. As syn. of *Agropyrum lepturoide* Lojac.

L. perenne var. *planellae* Merino, Fl. Descr. Ilustr. Gal. 3: 393. 1909. New name for *L. glumosum* Plan.-Gir.

L. rigidum var. *tenue* (Godr.) Dur. & Schinz forma *macilentum* (Delastre) Maire & Weiller, in Maire, Fl. Afr. Nord 3: 294. 1955. Based on *L. macilentum* Delastre.

Excluded names

Lolium distachyon L., Mant. Pl. 187. 1771. (Also "distachyum".) ("In Malabaria. Koenig," holotype, LINN-99.11!) *Digitaria* sp.

L. bromoides Huds., Fl. Angl., ed. 2, 1: 55. 1778. *Vulpia bromoides* (L.) S. F. Gray or *V. myuros* (L.) C. C. Gmel.

L. procumbens Hall. ex Beaux., Ess. Agrost. 166. 1812. As syn. of *Sclerochloa dura* (L.) Beauv.

L. tenellum L. ex Beauv., Ess. Agrost. 166. 1812. As syn. of *Brachypodium* sp.

L. festuca Rasp., in Saig. & Rasp., Ann. Sci. Obs. 2: 244. 1829. = *Festuca pratensis* Huds. ("*F. elatior* L."; see Mutel, Fl. Fr. 4: 111. 1837, as syn. of *F. pratensis.*)

L. coelorachis Forst. ex Steud., Nom. Bot., ed. 2, 2: 64. 1841. As syn. of *Lepturus repens* (G. Forst.) R. Br.

L. distachyum Willd. ex Steud., Nom. Bot., ed. 2, 2: 65. 1841. Non Linnaeus, 1771. As syn. of *Leptochloa monostachya* (? *Enteropogon monostachyos* (Vahl) K. Schum. ex Engl.)

L. elegans Steud., Syn. Pl. Glum. 1: 341. 1854. ("Un. agric. mixta cum L. perenni. Prov. Oran. Afr. bor.," holotype, P!) *Catapodium tuberculosum* Moris (*Castellia tuberculosa* (Moris) Bor)

L. cylindricum (Willd.) Asch. & Graebn., Syn. Fl. 2: 761. 1902. Based on *Rottboellia cylindrica* Willd., Sp. Pl. 1: 464. 1797. *Monerma cylindrica* (Willd.) Coss. & Dur.

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