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TRITICALE: A CASE OF NOMENCLATURAL MISTREATMENT

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Summary

A brief history of the wheat-rye hybrid triticale is provided, and an as complete as possible list of published names referring to this taxon is annotated with nomenclatural details. Only 2 of 6 generic names and 2 of 33 specific names appear to be valid and legitimate. The correct nothogeneric name for plants derived from *Triticum* × *Secale* crosses is × *Triticosecale* Wittmack ex A. Camus. No correct name at species level is available for the commonest crop triticales. It is recommended that crop triticales be named by appending the cultivar name to the nothogeneric name, e.g. × *Triticosecale* 'Newton'.

Introduction

Triticale is widely accepted (see, for example, *Cultivated Code,* Article 8) as the common name of the intergeneric hybrid × *Triticosecale,* which covers hybrids between *Triticum* (wheat) and *Secale* (rye). For the requirements of the agricultural industry, not least the application of law in terms of Cultivar Registration and Plant Breeders' Rights, a stable and correct nomenclature of these plants is essential. This requirement has become more urgent recently, since the use of triticale as a crop is increasing and its inclusion in internationally agreed certification schemes is imminent. Moreover, the number of new names (all invalid or illegitimate) appearing in the literature appears to be growing in parallel with the increasingly sophisticated techniques being employed to breed new and improved triticale cultivars.

In investigating the nomenclatural background of this crop I was amazed at the degree of confusion that had been caused by a virtually total lack of adherence to the requirements of the Codes of Nomenclature. At the same time a number of general points concerning the nomenclature of hybrids emerged, in at least one case suggesting to me the need for an emendment to be made to the Code.

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The aim of this paper is to set out these general points and the specific matters relating to triticale in the hopes that they will lead to a sounder nomenclatural treatment of triticale.

The Nature of Triticale

Valuable reviews of triticale from the evolutionary and plant-breeding points of view have been provided by Zillinsky (1974), Müntzing (1979) and Gupta and Priyadarshan (1982), among others. Because of the existence of these thorough reviews only a few essential points will be mentioned here, followed by a fuller treatment of the nomenclatural aspects, which are virtually the only ones to have been treated badly or incompletely by the previous reviewers.

The first *Triticum* × *Secale* hybrids were reported by A. S. Wilson in Scotland in 1875, using *Triticum* as the female parent. The parents were hexaploid *Triticum* (genomic constitution ÁÁB̂B̂DD) and diploid *Secale* (RR). Since the hybrids were sterile, they were presumably tetraploids of the constitution ÁB̂DR. The first fertile triticales were obtained by W. Rimpau in Germany in 1888, resulting from the spontaneous doubling of the chromosome number in a sector of a hybrid plant similar to that produced by Wilson. The cytological nature of these octoploid amphidiploids (ÁÁB̂B̂DDRR) was not established until the pioneering work of G. K. Meister and colleagues in Russia in the period 1918–1934, when further similar plants were produced. From the 1930s onwards the detailed scientific study of triticale was taken up by several groups of workers in different countries. The use of colchicine as a chromosome number doubling agent, discovered in 1937, soon revolutionized the production of fertile amphidiploid triticales. Recombined octoploid triticales have been obtained by crossings between octoploid strains, and by crossings between octoploid strains and tetraploid hybrids (the latter contributing unreduced female gametes). Octoploid triticale is today grown as a successful crop in some parts of the world where local conditions favour it, but it seems unlikely that it will become an important crop in Europe or North America.

Most modern strains of triticale are hexaploids. The first hexaploids (AABBRR) were produced in 1938 by A. Derzhavin from crosses between tetraploid *Triticum* (AABB) and diploid *Secale* (RR) treated with colchicine, although triploid (ABR) crosses had been produced much earlier (the first by F. Jesenko in 1913). Fertile amphidiploids involving several interspecific combinations have now been made in this way. More recently it has been found that the use of colchicine to double the chromosome number of the parental species (to octoploid and tetraploid respectively), and then to cross these to produce the hexaploid triticale direct, is a more productive method than the use of colchicine to double the chromosome number of a sterile triploid F_1 hybrid.

The above hexaploids contain two sets each of the A, B and R genomes, and may be called *primary triticales*. Many strains of triticale have been produced by intercrossing various primary triticales, involving the segregation of nonparental combinations of characteristics within each of the three genomes; these are known as *recombined triticales*. *Secondary hexaploid triticales* have been produced by first crossing primary or recombined hexaploids (AABBRR) with primary or recombined octoploids (ÁÁB̂B̂DDRR) to form a heptaploid (AÁB̂B̂DRR), and then selecting from F_2 or later generations or from backcrosses to primary or recombined hexaploids. In these plants there has been recombination between the A, B and R genomes of hexaploid triticale and the Á, B̂ and R genomes of octoploid triticale. Selection from backcrosses to octoploid triticales can also produce secondary octoploids. Another route for the production of secondary hexaploids has been the crossing of primary or recombined hexaploids (AABBRR) with hexaploid *Triticum* (ÁÁB̂B̂DD). This results in a hexaploid (AÁB̂B̂DR) which, after selfing or backcrossing followed by selection as above, can give rise to promising secondary hexaploid triticale lines. The two methods can also be combined, the selected lines derived from octoploid × hexaploid triticale crosses being later crossed with hexaploid *Triticum,* followed by further selection.

Nearly all the most promising modern strains of triticale are secondary hexaploids. They all contain two genomes that are A and/or Á and two that are B and/or B̂. The third pair of genomes is provided by the D and/or R genomes in various proportions (one to six pairs of each, totalling seven) according to the particular selection concerned. Those that have mostly D chromosomes are closer to wheat and can be considered genetically as *Triticum* in which some D chromosome pairs have been substituted by R chromosome pairs. Conversely, those that have mostly R chromosomes are closer to triticale and can be considered genetically as triticale in which some R chromosome pairs have been substituted by D chromosome pairs. For this reason the various selections are known as substitution lines. Most promising triticale strains have mostly R chromosomes with only one or few D chromosome pairs. For example, chromosome 2D might be present instead of 2R, because the former carries a daylength insensitivity locus that is advantageous in northern areas. Variation is also present according to which

species of *Triticum* and *Secale* are involved and to whether the cytoplasm is from *Secale* or *Triticum,* which depends upon the direction of the original wheat/rye cross and upon the direction of the later wheat/triticale cross. Strains with a hexaploid wheat cytoplasm and only one R chromosome pair are genetically very similar to *Triticum,* and in fact some commercial modern wheat cultivars are of this sort. Taxonomically they are triticale rather than *Triticum,* but the distinction is becoming increasingly blurred. As triticale breeding forges ahead the ancestry of the strains is becoming more and more complex, in many cases involving more than two original species and sometimes, due to chromosomal translocations, involving the substitutions of parts of chromosomes rather than of whole ones.

Tetraploid triticales were obtained by K. D. Krolow in the 1970s, primarily by crossing hexaploid triticale (AABBRR) with *Secale* (RR) to produce an ABRR tetraploid, and then by selfing to produce segregates with the constitutions AARR, BBRR and (AB)(AB)RR. More recently AARR tetraploids have been obtained by crossing diploid *Triticum* (AA) with *Secale* (RR). Although the tetraploids are themselves unlikely to be exploitable, they might be used in the future in obtaining novel hexaploids via crosses with octoploids.

Finally, and of purely academic interest, A. Müntzing synthesized a decaploid triticale in the 1950s by crossing octoploid triticale and diploid *Secale* to produce a pentaploid (ÁB̀DRR), which was then treated with colchicine. This was cytologically unstable.

Names Coined for Triticale

I have searched the literature in order to provide as complete as possible a list of names at the generic and specific levels that are applicable to triticales. The agricultural literature is a notoriously difficult one for the taxonomist. In general he is less familiar with it than normally is the case, and many agricultural authors are less careful than he is in citing literature and when providing new names. It is therefore likely that extra names may come to light from more lengthy study of the archives. In several cases the literature suggested earlier uses of certain names that I have not been able to confirm. These suggestions ranged from vague hints that the name used was not new to a definite statement that the name had been coined in a particular earlier paper. The absence of the name in the earlier reference in even the latter case has convinced me that most of these suggested earlier uses are spurious, but probably not all are.

Two lists are provided, one of genera and one of species. In both cases names that are invalid and/or illegitimate have the preceding number placed in parentheses.

Generic Names

1. ×**AEGILOTRICALE** Tschermak, in Tschermak and Bleier, Ber. Dt. Bot. Gesell. 44: 113 (1926) = *Aegilops* × *Triticum* × *Secale.* This would be the correct generic name for triticale if bread wheat could be legitimately considered a bigeneric hybrid, *Aegilops* × *Triticum.* The correct name for the latter cross appears to be ×*Aegilotriticum* P. Fournier, Quatre Flores de France, p. 89 (1935); the earlier ×*Aegilotricum* Wagner ex Tschermak, in Tschermak and Bleier, Ber. Dt. Bot. Gesell. 44: 113 (1926), is not formed correctly and is therefore invalid. However, bread wheat (*Triticum aestivum* L.) is the lectotype of the generic name *Triticum,* and so could not be considered to be an *Aegilops* × *Triticum* hybrid.

2. ×**TRITICOSECALE** Wittmack ex A. Camus, Bull. Mus. Nat. Hist. Natur. Paris 33: 539 (1927) = *Triticum* × *Secale.* This is the correct name for triticale. The original publication of the name by Wittmack, Sitzungsber. Ges. Naturf. Freunde Berlin 1899: 59 (1899), is invalid as the parents were given as 'Weizen' and 'Roggen', without their Latin equivalents.

(3). ×**TRITISECALE** Lebedeff, Z. Zuchtung, Reihe A Pflanzenzuchtung 19: 523 (1934) = *Triticum* × *Secale.* This publication is invalid, because the parents were not referred to by their Latin names. The name would be illegitimate even if it were valid since it is superfluous, having the same circumscription as ×*Triticosecale* Wittmack ex A. Camus.

(4). ×**SECALOTRICUM** Kostoff, Rev. Int. Bot. Appl. Agric. Trop. 16: 251 (1936) = *Secale* × *Triticum.* This name is invalid because it was not formed properly, and would be superfluous, even if it were valid, having the same circumscription as ×*Triticosecale* Wittmack ex A. Camus. The name was spelt ×*Secalotriticum* in one place by Gupta and Baum (1986, p. 147), but this was presumably a typographical error.

(5). ×**TRITICALE** Tschermak ex Müntzing, Zuchter 8: 188 (1936) = *Triticum* × *Secale.* This name is illegitimate since it is superfluous, having the same circumscription as ×*Triticosecale* Wittmack ex A. Camus. The name was used earlier by Lindschau and Oehler, Zuchter 7: 232 (1935), but was then invalid as the Latin names of the parents were not used.

(6). **TRITICUM** Subgroup **TRITICALE** (Tschermak ex Müntzing) Mackay, Proc. 3rd Int. Wheat Genet. Symp., 1968, p. 46 (1968), based on × *Triticale* Tschermak ex Müntzing. This name is invalid because the basionym was not fully cited, no clear indication of rank was given, and a nothogeneric name cannot be used as an infrageneric name unless it is described and typified.

Specific Names

(1). **× Triticosecale Rimpaui** Wittmack, Sitzungsber. Ges. Naturf. Freunde Berlin 1899: 59 (1899). Invalid, because at the time × *Triticosecale* was not validly published. A brief diagnosis was given; the name was coined for *Triticum aestivum* × *Secale cereale* artificial awnless octoploids. See nos. 6 and 29.

(2). **× Triticosecale Schlanstedtense** ("Schlanstedtensis") Wittmack, Op. cit., p. 59 (1899). Similarly invalid; the name was coined for *Triticum aestivum* × *Secale cereale* artificial awned octoploids.

(3). **× Triticosecale Blaringhemii** A. Camus, Bull. Mus. Nat. Hist. Natur. Paris 33: 539 (1927). No description given, but refers back to Blaringhem, C. R. Hebd. Séances Acad. Sci. Paris 175: 635–637 (1922), where a reasonable description is provided. The name refers to artificial *Secale cereale* × *Triticum spelta* octoploids. Two varieties were validly described: var. *breviaristatum* A. Camus and var. *longiaristatum* A. Camus.

(4). **× Triticosecale Neoblaringhemii** A. Camus, Op. cit., p. 539 (1927). No description given, but refers back to Blaringhem, Bull. Soc. Bot. Fr. 71: 1158–1168 (1924), where a reasonable description and photograph are provided. The name refers to artificial *Secale cereale* × *Triticum turgidum* hexaploids.

(5). **Triticum Secalotricum Saratoviense** Meister, Proc. U.S.S.R. Congr. Genet. Plant- & Animal-Breeding, 1929, pp. 40, 43 (1930). The two trivial epithets were variously spelt with upper and lower case initial letters; Zillinsky, Adv. Agron. 26: 344 (1974), misquoted the first as '*Secalotriticum*'. Invalid, since the name is clearly a trinomial. The name was used for natural *Triticum aestivum* × *Secale cereale* octoploids, and a good description was provided. See nos. 7 and 9.

(6). **× Triticale Rimpau** Lindschau & Oehler, Zuchter 7: 232 (1935). This was intended as a nomen novum for × *Triticosecale rimpaui* Wittmack, but this is invalid. Lindschau and Oehler's name is invalid also because no Latin description was given; moreover *Rimpau* was not intended as an epithet, but was shorthand for "Der RIMPAUsche Weizen-Roggenbastard". See no. 1.

(7). **× Triticale Meister** Lindschau & Oehler, Op. cit., p. 232 (1935). This was intended as a nomen novum for the invalid *Triticum secalotricum saratoviense* Meister. As with × *Triticale Rimpau, Meister* was not intended as an epithet, so × *T. meister* is also invalid. See no. 5.

(8). **× Triticale Taylor** Müntzing, Zuchter 8: 188 (1936). Invalid, because it is a nomen nudum, and because *Taylor* was not intended as an epithet, but as a name for Taylor and Quisenberry's artificial octoploid wheat × rye hybrids in the same form as Lindschau and Oehler's names.

(9). **× Secalotricum Saratoviense** Kostoff, Rev. Int. Bot. Appl. Agric. Trop. 16: 251 (1936). A nomen novum for *Triticum Secalotricum Saratoviense* Meister, which was invalid. Kostoff's binomial is invalid also because no Latin description was given and because the nothogeneric name × *Secalotricum* is invalid. See no. 5.

(10). **× Triticale aestivum** Sánchez-Monge, Proc. 1st Int. Wheat Genetics Symp., 1958, p. 191 (1959). Nomen nudum for octoploid triticale variants derived from *Triticum aestivum.*

(11). **× Triticale dicoccoides** Sánchez-Monge, Op. cit., p. 185 (1959). Nomen nudum for hexaploid triticale variants derived from *Triticum dicoccoides.*

(12). **× Triticale dicoccum** Sánchez-Monge, Op. cit., p. 185 (1959). Nomen nudum for hexaploid triticale variants derived from *Triticum dicoccum.*

(13). **× Triticale durum** Sánchez-Monge, Op. cit., p. 185 (1959). Nomen nudum for hexaploid triticale variants derived from *Triticum durum.*

(14). **Triticum dicoccum-cereale** Kiss, Z. Pflanzenzüchtung 55: 326 (1966). Nomen nudum for hexaploid *Triticum dicoccum* × *Secale cereale.* The name is invalid also because it contains a condensed formula, not an epithet. See no. 24.

(15). **Triticum durocereale** Kiss, Op. cit., p. 326 (1966). Nomen nudum for hexaploid *Triticum durum* × *Secale cereale.* The name is invalid also because it contains a condensed formula, not an epithet. See nos. 26 and 27.

(16). **Triticum triticale** Kiss, Op. cit., pp. 319, 326 (1966). Nomen nudum for hexaploid triticale with genomic constitution ABR.

(17). **Triticum turgidocereale** Kiss, Op. cit., p. 326 (1966). Nomen nudum for hexaploid *Triticum turgidum* × *Secale cereale.* The name is invalid also because it contains a condensed formula, not an

epithet. Kiss stated that his name was based on × *Triticale turgidocereale* of Nakajima, but I have not found this name in any of Nakajima's papers. See nos. 18 and 31.

(18). **×Triticale turgidocereale** Kiss, Op. cit., p. 326 (1966). Name probably mistakenly attributed by Kiss to Nakajima and given in synonymy under *Triticum turgidocereale* Kiss, hence invalid. See nos. 17 and 31.

(19). **×Triticale korai** Kiss, Op. cit., p. 322 (1966). Nomen nudum, and invalid also because *korai* was not intended as an epithet, but to designate one of Kiss's octoploid triticales in the same form as Lindschau and Oehler's names.

(20). **Triticum aestivosecale** Mackey, Proc. 3rd Int. Wheat Genetics Symp., 1968, p. 46 (1968). Nomen nudum for octoploid triticale with genomic constitution ÁB̀DR. The name is invalid also because it contains a condensed formula, not an epithet.

(21). **Triticum turgidosecale** Mackey, Op. cit., p. 46 (1968). Nomen nudum for hexaploid triticale with genomic constitution ABR, and invalid also because it contains a condensed formula, not an epithet.

(22). **×Triticale hexaploide** Larter, Can. J. Pl. Sci. 50: 122 (1970). Nomen nudum for hexaploid triticale derived from *T. turgidum* × *S. cereale.*

(23). **×Triticale carthlico-vavilovi** Baum, Euphytica 20: 305 (1971). Nomen nudum for amphiploid *T. carthlicum* × *S. vavilovii,* and invalid also as it contains a condensed formula, not an epithet.

(24). **×Triticale dicoccocereale** Baum, Op. cit., p. 305 (1971). Nomen novum for *Triticum dicoccum-cereale* Kiss (1966); similarly a nomen nudum and invalid. See no. 14.

(25). **×Triticale dicoccoidecereale** Baum, Op. cit., p. 305 (1971). Nomen nudum for amphiploid *T. dicoccoides* × *S. cereale,* and invalid also as it contains a condensed formula, not an epithet.

(26). **×Triticale durocereale** (Kiss) Baum, Op. cit., p. 305 (1971). Intended as a combinatio nova for *Triticum durocereale* Kiss, but invalid as the basionym citation was not quoted in full. See no. 15.

(27). **Triticum durosecale** Baum, Op. cit., p. 303 (1971). This was quoted by Baum as "*T. durosecale* Kiss", presumably in error for *T. durocereale* Kiss. Baum's name is therefore a nomen nudum and invalid also because it contains a condensed formula, not an epithet. See no. 15.

(28). **×Triticale duro-montanum** Baum, Op. cit., p. 305 (1971). Nomen nudum for amphiploid *T. durum* × *S. cereale,* and invalid also because it contains a condensed formula, not an epithet.

(29). **×Triticale rimpaui** (Wittmack) Baum, Op. cit., p. 305 (1971). Intended as a combinatio nova for × *Triticosecale rimpaui* Wittmack, but invalid as the basionym was invalid and its citation was not quoted in full. See no. 1.

(30). **×Triticale timopheevi-cereale** Baum, Op. cit., p. 305 (1971). Nomen nudum for amphiploid *T. timopheevi* × *S. cereale,* and invalid also because it contains a condensed formula, not an epithet.

(31). **×Triticale turgidocereale** (Kiss) Baum, Op. cit., p. 305 (1971). Intended as a combinatio nova for *Triticum turgidocereale* Kiss, but invalid as the basionym was invalid and its citation was not quoted in full. See nos. 17 and 18.

(32). **×Triticale octoploide** Zillinsky, Adv. Agron. 26: 344 (1974). This was quoted by Zillinsky as "*Triticale octoploide* Larter", a name for octoploid triticales, but I have not found the name in any of Larter's papers. The name is therefore attributable to Zillinsky but is a nomen nudum.

(33). **Triticum secalum** Zillinsky, Op. cit., p. 345 (1974). This is a nomen novum proposed for Wittmack's × *Triticosecale,* but is invalid as the full citation of the replaced synonym is not given. Zillinsky proposed three formae, *octoploide, hexaploide* and *tetraploide,* applicable to plants of different ploidy level; these are nomina nuda.

Discussion

Some points are mentioned here because, although they are well understood and widely accepted, they have rather frequently not been adhered to with respect to triticale. Others are less well understood (though unequivocally stated in the Codes), while some are contentious or represent my own opinions. In this discussion the term 'generic name' will be used in the normal sense, to represent the name of a genus not treated as a hybrid (e.g. *Triticum*), whether or not it might be derived by intergeneric hybridization. The term 'nothogeneric name' will be used to represent the name of an intergeneric hybrid, and should be prefixed by a multiplication sign whether or not this was given in the original place of publication (e.g. × *Triticosecale*). In fact none of the five nothogeneric names in the above list was originally given a multiplication sign by its author.

Names at the generic level.—The rules for describing generic and nothogeneric names are quite different. Essentially, generic names need a description (in Latin since 1935) and (since 1958) require a type, while nothogeneric names are validated solely by reference to the parental genera and do not

have types (Article H9). Therefore the application of a generic name is determined by its type, while the application of a nothogeneric name is decided by its stated parentage. Despite these differences, the multiplication sign is ignored for purposes of homonymy and synonymy (Article H3.4). Hence ×*Hordelymus* (*Hordeum* × *Elymus*) is a later homonym of the generic name *Hordelymus*.

It is not possible to leave out the multiplication sign and convert a nothogeneric into a generic name, or vice versa. This is relevant in the case of ×*Triticale* which, although illegitimate and not given a multiplication sign when first validly published, was clearly intended as a nothogeneric name for *Triticum* × *Secale* and cannot now be used as a generic name. As a nothogenus it is a later synonym of ×*Triticosecale*.

For any combination of genera only one nothogeneric name can be correct (Article H4). ×*Triticosecale* is therefore correct for both *Triticum* × *Secale* and the reciprocal cross, despite the stated preferences of some breeders.

The Code makes it clear (Articles 6.6 and H9) that in order to be validly published the *Latin* names of the parental genera must be cited. The original publication of ×*Triticosecale* by Wittmack in 1899 falls foul of this requirement, as only the vernacular names ('Weizen' and 'Roggen') of the parents were cited, and the name was not validated until the publication of Camus in 1927. Many other nothogeneric names of agricultural plants are similarly invalidated, e.g. ×*Tritisecale* Lebedeff and ×*Triticale* Tschermak ex Lindschau & Oehler. This results from the traditional use in such literature of vernacular names in lieu of Latin ones, and indeed this use is sanctioned in connection with the use of cultivar names (Cultivated Code, Article 27), e.g. Potato 'Duke of York' in lieu of *Solanum tuberosum* 'Duke of York'. It seems to me advisable to change the Code with regard to the publication of nothogeneric names, so as to validate names such as ×*Triticosecale* Wittmack that are implicitly (though not explicitly) invalidated at present. A reasonable compromise might be to require the citation of Latin parental names only from 1935 or some other appropriate past date.

Several nothogeneric names used in the agricultural literature are invalid because they are not formed correctly, i.e. (Article H6.2) with the names of the parental genera "combined into a single word, using the first part or the whole of one, the last part or the whole of the other (but not the whole of both) and, if desirable, a connecting vowel". Hence ×*Secalotricum* is invalid, because its second half (*-tricum*) is not the first part, nor the last part, nor the whole of *Triticum,* but the two ends with the middle omitted. Careful attention to this requirement should be paid by the authors of nothogeneric names.

The Codes permit both a nothogeneric name and a generic name to exist side by side for essentially the same entity, but the two names must differ other than by the preceding multiplication sign. For example, ×*Pucciphippsia* and *Maltea* are valid nothogeneric and generic names respectively of plants usually considered to be *Puccinellia* × *Phippsia* hybrids (Article H6.2, Example 5). Graft-hybrids (prefixed by an addition sign) also require different names from sexual hybrids between the same parents (Cultivated Code, Article 23), e.g. +*Crataegomespilus* and ×*Crataemespilus* respectively for *Crataegus*/*Mespilus* combinations (a third name would be required if one wished to give recombinants of these two genera a normal generic name). According to the Code (Article H9.1, Example 3) somatic hybrids are not to be treated differently from sexual hybrids, though one could argue that they were actually closer to graft-hybrids and would be better treated like them, or even differently from both.

Several authors, most recently Gupta and Baum (1986, p. 146), have failed to appreciate the implication of the fact that *T. aestivum* is the lectotype species of *Triticum*. Despite the fact that *T. aestivum* carries the genomes of at least three diploid species, two of them currently placed in the genus *Aegilops* and one in *Triticum, T. aestivum* itself cannot be considered a hybrid between *Aegilops* and *Triticum*. Should the genomic constitutions of the species be used to delimit the genera (a practice that should, in my opinion, be totally abandoned), the generic nomenclature indicated by Löve (1984) must be followed.

Names at the specific level.—At the specific level the rules for describing species and nothospecies are identical (Article H10.1), except that the multiplication sign may be inserted before the specific epithet to denote hybridity. Again, the multiplication sign is ignored for purposes of homonymy and synonymy, but in this case it can be omitted or inserted as preferred (Article H10.2).

With regard to the use of specific epithets for taxa treated as hybrids, there are important limitations that do not apply to non-hybrid taxa. Each interspecific hybrid combination must have one specific epithet (Article H4). Hence ×*Triticosecale blaringhemii* is the correct name for the hybrid *Secale cereale* × *Triticum spelta*. It must apply to all hybrids (e.g. reciprocal crosses, segregants, backcrosses) that are derived from those two species, and cannot apply to any hybrids that have any other species in their parentage. This rule therefore holds for all specific epithets under a nothogeneric name, and

for those specific epithets under a generic name that are prefixed with a multiplication sign. No such limitations apply, however, to plants not treated as hybrids (whether or not they have a hybrid origin). If triticale were provided with a generic name the various strains could be provided with specific names following any taxonomic delimitations required. For example, all triticales could be placed in one species, or each ploidy level could be treated as a different species, or (at the other extreme) every strain or cultivar could be given a separate specific name.

In the agricultural literature, and in literature concerned with hybrids, one often encounters names at the specific level that do not fulfill the conditions laid down by the Code for them to be considered specific epithets. It is often difficult to decide which names were "intended as epithets" (Article 23.6a), but probably *×Triticale Taylor* and similar ones were not, even though *Taylor* was often printed in italics and with a lower case initial letter. The Code is more precise in its definition of names that are to be considered formulae rather than epithets (Article H10.3). Following it, the following examples at the specific level are formulae, not epithets: *dicoccum-cereale, carthlico-vavilovi, durocereale* and *aestivosecale.* On the other hand, *triticale* could be used as a specific epithet because more than the terminations of the two parental names (*Triticum* and *Secale*) have been omitted.

As in the case of names at the generic level, the Codes permit both nothospecific and specific names to exist side by side for plants of the same parentage, so long as the two names differ by other than the preceding multiplication sign. For example, *Spartina × townsendii* and *S. anglica* both refer to derivatives of *S. alterniflora × S. maritima,* the former for the sterile F_1 and the latter for the fertile amphidiploid.

Conclusions and Recommendations

Triticale has suffered more than most taxa from careless nomenclatural practice. Of 6 and 33 generic and specific names respectively investigated, only two of each appear to me to be both valid and legitimate, and none of these dates from later than 1927. Perusal of the lists provided will show that virtually every major rule of the nomenclatural Codes has been broken, often several with respect to a single name. This malpractice continues unabated in the agricultural and horticultural literature, and can be stopped only by a closer and more fruitful cooperation between plant breeders and nomenclaturally expert taxonomists.

For triticale, *×Triticosecale* Wittmack ex A. Camus is the correct nothogeneric name. Under it, *×T. blaringhemii* A. Camus is the correct name for plants of the parentage *S. cereale × T. spelta,* and *×T. neoblaringhemii* A. Camus for plants of the parentage *S. cereale × T. turgidum.* No name is available at the specific level for the commonest commercial triticales, nor for plants of the original combination *S. cereale × T. aestivum.* However, if the Code were changed so that *×Triticosecale* Wittmack were rendered valid, *×T. rimpaui* Wittmack would become available for the latter.

Conversely, there is no separate generic name available for triticale; if one were deemed necessary it would need to be coined and described properly according to the requirements of the Code. *Triticosecale, Triticale, Tritisecale* and *Secalotricum* are not available for this, as they were originally coined as nothogeneric names. Triticale remains ideal as the vernacular name for wheat-rye hybrids.

In deciding what terminology to adopt for triticales, one has equally to consider the requirements of the Codes, the needs of plant breeders for an unambiguous and universally applicable system, and the actual biological situation that pertains. None of the numerous proposals that have been made has satisfied all these requirements, and none of them has become widely adopted. The formal proposal by Baum (1971) to conserve the name *Triticale* Müntzing, and to typify it, fell short on several counts, and was rejected (McVaugh, 1973). Two possible approaches offer themselves:

1. A new generic name should be coined and validly published, and under it the various sorts of triticale should be described as species (and infra-specific taxa) with whatever circumscriptions seem appropriate. This approach is advocated by Gupta and Baum (1986, p. 147) and (more equivocally) by Gupta (1986, p. 29), and has the advantage that the species within the new genus could be delimited without any restrictions as to parentage. The main disadvantage is that it seems likely that no characters could be found that would distinguish the new genus from *Triticum,* and, as described previously, the distinction between *Triticum* and *×Triticosecale* is becoming increasingly blurred. It also seems most unlikely that the cultivars could be grouped into species, but Gupta and Baum (1986, p. 147) suggest that the new genus be treated as monotypic (in which case the correct epithet would be *blaringhemii* or *neoblaringhemii*).

In my view, should the need for the treatment of triticale under a generic name be demonstrated, it would be best to do this under *Triticum.* The maintenance of *Secale* and *Triticum* as distinct genera, with triticales being placed under the latter, would be wholly analogous with the established situation

regarding *Aegilops* and *Triticum,* and similarly acknowledge the fact that separation of *Triticum* and triticales is impossible in practice. Whatever generic name triticales were described under, the nothogeneric name ×*Triticosecale* would still be available for sterile hybrids, etc.

2. Triticales should be described under the nothogenus ×*Triticosecale.* As pointed out previously, if the different sorts of triticale are described at the specific level, every different interspecific combination would require a different (and single) specific epithet. Since the parentage of many modern cultivars is very complex, involving contributions ranging from a whole genome to a part of a chromosome from each parental species, this approach is not practicable.

Hence the method strongly advocated here is to use the various cultivar names of triticales in direct combination with the nothogeneric name, e.g. ×*Triticosecale* 'Newton', ×*T.* 'Bokolo', etc. Should a useful classification of cultivars be produced at some future date, it could be conveniently indicated by the usual designation of cultivar groups (Cultivated Code, Article 26).

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LECTOTYPIFICATION OF *COWANIA SUBINTEGRA* KEARNEY, BASIONYM OF *PURSHIA SUBINTEGRA* (KEARNEY) HENRICKSON (ROSACEAE)

Clark Schaack[1]

Summary

Examination of the type collections of *Purshia subintegra* (Kearney) Henrickson, a critical and necessary step, during the study of apparent hybridization between central Arizona *Purshia,* revealed that a holotype had not been designated by Kearney for the basionym, *Cowania subintegra.* Additionally, it was found that, though a holotype had not been designated, isotypes had been recognized. Label data of all specimens bearing the isotype designation was found to be discordant with Kearney's protologue in site location and, excepting POM 282632, collection number. The specimen accessioned

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