NOMENCLATURE COMMUNICATIONS

(3067) Proposal to conserve the name *Ustilago tritici* against *U. passerinii* and *U. ehrenbergiana* (*Basidiomycota*: *Ustilaginaceae*) and associated typification of *Tilletia caries* (*T. tritici*, nom. illeg.)

Sarah Hambleton, Julie Carey & Scott A. Redhead

Agriculture and Agri-Food Canada, Ottawa Research and Development Centre, 960 Carling Avenue, Ottawa, Ontario K1A 0C6, Canada
Address for correspondence: *Sarah Hambleton, sarah.hambleton@agr.gc.ca*

DOI https://doi.org/10.1002/tax.13331

(3067) ***Ustilago tritici*** (Pers.) Rostr. in Overs. Kongel. Danske Vidensk. Selsk. Forh. Medlemmers Arbeider 1890(2): 15. 30 Aug 1890 (*Uredo segetum* var. *tritici* Pers., Tent. Disp. Meth. Fung.: 57. 14 Oct–31 Dec 1797, nom. sanct. (Persoon, Syn. Meth. Fung.: 224. 1801)), nom. cons. prop.
Neotypus (hic designatus): Finland, Regio aboënsis [= Turku], Kakskerta, Monnonen, in infected seeds of *Triticum aestivum* L., 28 Jun 1936, *Kari* in Fungi Exs. Fenn. No. 231 (DAOM No. 983785). MBT 10024666.

(=) *Ustilago passerinii* A.A. Fisch. Waldh., Aperçu Syst. Ustilag.: 12. Apr–Mai 1877, nom. rej. prop.
Typus: non designatus.

(=) *Ustilago ehrenbergiana* A.A. Fisch. Waldh. in Verh. Bot. Vereins Prov. Brandenburg 21(Sitzungsber.): 26. 1879 (post 28 Feb [preprint]), nom. rej. prop.
Typus: non designatus.

The name *Ustilago tritici* (Pers.) Rostr. (in Overs. Kongel. Danske Vidensk. Selsk. Forh. Medlemmers Arbeider 1890(2): 15. 1890) is today commonly used for an economically important loose smut of wheat that is well known to plant pathologists and wheat breeders worldwide (Vánky, Smut Fungi World: 1294–1296. 2012). The basionym, *Uredo segetum* var. *tritici* Pers. (Tent. Disp. Meth. Fung.: 57. 1797) lacked a description but was directly linked to Bjerkander (in Kongl. Vetensk. Acad. Handl. 36: 326. 1775) where a provisional, hence invalid name, "*Lycoperdon tritici*?", was coined. The disease, in 1775 called "sot", investigated by Bjerkander was likely caused by another fungus, *Tilletia caries* (DC.) Tul. & C. Tul., which has at times also been mislabelled as "*Tilletia tritici*". When the latter name is used, the authorship has been cited as either '*T. tritici* (Bjerkand.) G. Winter' or '*T. tritici* (Pers.) G. Winter', and most often that binomial is applied to *T. caries*, the causal agent of common bunt of wheat. Problematically, a valid potential basionym for the epithet '*tritici*', *Uredo segetum* var. *tritici*, has been linked to two different species now classified in two different genera, in separate families and orders, both infecting wheat. As explained below, these two fungi create superficially similar infections of seeds.

Germ theory investigators of the eighteenth century oftentimes referred to microorganisms (bacteria, protozoans or fungi such as yeasts) as "animalcules" (animicula) or "worms" or "poisonous insects" (Santer in Perspect. Biol. Med. 52: 566–578. 2009). In 1775 Clas Bjerkander (l.c.: 317), a Swedish pastor, studied the cause of "Kol-eller Sot-ax i Hvetet" (Coal or Soot-ears in wheat) and developed three theories on its cause. One theory involved a nest of insects; another he compared to a type of puffball, *Lycoperdon bovista* (nowadays classified in *Bovista* or *Bovistella*). In making the comparison to *L. bovista*, Bjerkander coined "*Lycoperdon tritici*" but provided no standalone description or diagnosis: "*Månne detta Sot, eller denna missväxt, är af Svampaktig natur?* (Lycoperdon tritici?) Någon liknelse här til tyckes det vara, när jämförelse göres dem imellan" (*Could this soot, or this growth, be of a fungusy nature?* (Lycoperdon tritici?) There seems to be some similarity here, when comparison is made between them).

Apart from that indicated above, Bjerkander did not otherwise mention "*Lycoperdon tritici*". However, via the comparison with *L. bovista*, he (l.c.: 326–327) provided comparative diagnostic details spread over several paragraphs.

"1) Lycoperdon bovista har en hinna omkring sig, hvilken öfverst spricker sönder, när den är mogen. Så har ock Sot-hvetet en dylik tunn skorpa, som under växandet är grön, men blir sedan gråaktig, och stundom under rägn-väder går sönder." (Lycoperdon bovista has a membrane around it, which cracks at the top when it is ripe. Sot wheat also has such a thin crust, which is green during growth, but then turns greyish, and sometimes breaks during rainy weather.)

"2) Lycoperdon har i förstone en gulaktig, flytande och illa luktande materia, som mognar til gråaktigt mjöl, och derefter mister lukten. Så förhåller det sig äfven med Sotet: när det växer, är det klibbigt, men torkas til et dammande väsende, och derefter förlorar sin lukt (Julii 14)." (Lycoperdon has at first a yellowish, liquid and foul-smelling matter, which ripens into a greyish flour, and then loses its smell. This is also the case with Sot: when it grows, it is sticky, but dries to a dusty substance, and the residue loses its smell (July 14).)

Because "*Lycoperdon tritici*" was provisional, it is not validly published (*ICN* Art. 36.1(a); Turland & al. in Regnum Veg. 159. 2018). Vánky (l.c.: 880) wrongly considered "*Lycoperdon tritici*" to be not validly published because it was a nomen nudum (Art. 38.1), but the comparison with *Lycoperdon bovista* provides a diagnosis.

Subsequently, Persoon (l.c. 1797) published the name "*Uredo segetum* β. [= var.] *Tritici*" as one of three varieties (Art. 37.4) of *Uredo segetum* (Bull.) Pers. (nom. rej.) without description or

Proposals to Conserve or Reject Names **edited by John H. Wiersema, Konstanze Bensch, Melanie Schori & John McNeill** | published online: 23 Mar 2025 |
© 2025 His Majesty the King in Right of Canada. *TAXON* published by John Wiley & Sons Ltd on behalf of International Association for Plant Taxonomy. Reproduced with the permission of the Minister of Agriculture and Agri-Food Canada.
This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

diagnosis but with direct reference to Bjerkander's diagnoses of "*Lycoperdon tritici*" as explained above. Hence, *U. segetum* var. *tritici* was validly published. In the subsequent sanctioning publication, Persoon (l.c. 1801) provided a one-word diagnosis, "subeffusa" for "*Uredo segetum* β. *Uredo Tritici*" (nom. sanct.) and again a direct reference to Bjerkander's "*Lycoperdon tritici*". The name *Uredo segetum* "β. *Uredo tritici*" is to be interpreted as a varietal name under Art. 24.4 and 37.4, as is one of Persoon's (l.c. 1797) other varieties in the *Code* appendices, e.g., "*Uredo segetum* var. *hordei* Pers., Tent. Disp. Meth. Fung.: 57. 14 Oct–31 Dec 1797, nom. sanct. (Persoon, Syn. Meth. Fung.: 224. 31 Dec 1801)" (Wiersema & al., Int. Code Nomencl. (Shenzhen Code): Appendices I–VII. 2018+ [https://naturalhistory2.si.edu/botany/codes-proposals]).

The name, *Uredo segetum*, has been rejected under Art. 56. It was proposed for rejection by Gams & Boerema (in Taxon 44: 225. 1995) because that binomial had been applied to several species historically and its continued use caused confusion. However, neither *Uredo segetum* var. *hordei* nor *U. segetum* var. *tritici* are based upon the name *U. segetum*, hence both varietal names, although unavailable under the rejected name, are legitimate and may serve as basionyms for other combinations (Art. 56 Note 1).

Much of what Gams & Boerema (l.c.) said of the confusing history of *Uredo segetum* applies to *U. segetum* var. *tritici*, except that this name is still being cited as a basionym and sometimes mistakenly thought of as being sanctioned at the rank of species, as previously noted by Boerema & al. (in Netherlands J. Pl. Pathol. 98(Suppl. 1): 23–24. 1992).

Winter (Rabenh. Krypt.-Fl., ed. 2, 1(1[Pilze Deutschl.]): 110. 1884) published the binomial *Tilletia tritici* with an accompanying description, citing as a basionym, "*Lycoperdon tritici* Bjerkander" (l.c.), which as noted above is not a valid name. Winter did not cite either of Persoon's (l.c. 1797, 1801) publications where *Uredo segetum* var. *tritici* was published and sanctioned. Additionally, Winter cited as a synonym *U. caries* DC. (in Lamarck & Candolle, Fl. Franç., ed. 3, 5/6: 78. 1815). Arguably, the name *Tilletia tritici* might either be considered to be an illegitimate replacement name for *U. caries*, or a legitimate new combination and name at new rank based upon the sanctioned name *U. segetum* var. *tritici* Pers. The latter interpretation could potentially be supported by Art. 41.4 and 52.4 because the diagnosis in Bjerkander (l.c.) is the same as that for *U. segetum* var. *tritici*. However, Winter applied the name *Tilletia tritici* to what is commonly called "stinking smut", and currently called *T. caries*, whereas Persoon apparently personally saw a "loose smut", as noted by Boerema & al. (l.c.), who focussed on the word "subeffusa". Furthermore, Winter (l.c.) commented: "Der Bjerkander'sche Name ist der älteste und bezieht sich auf diese Species, nicht auf Ustilago segetum, wie mir Herr Dr. Zopf in Berlin auf meine Anfrage hin freundlichst mittheilt. Es geht dies schon daraus hervor, dass Bjerkander den charakteristischen Geruch besonders erwähnt" (Bjerkander's name is the oldest and refers to this species, not to *Ustilago segetum*, as Dr. Zopf in Berlin kindly informed me in response to my inquiry. This is already evident from the fact that Bjerkander specifically mentions the characteristic smell), so it definitely was not Winter's intent for his name to be "applying to the same taxon" (Art. 41.4) as Persoon's, so there is no basis for treating *Tilletia tritici* Winter, nom. illeg. as a combination based upon Persoon's *Uredo segetum* var. *tritici*. Of course, typification of *Uredo segetum* var. *tritici* on a "loose smut" is necessary to protect the usage of Persoon's name.

Whereas usage of the epithet '*tritici*' at the rank of species was first validated by Winter (l.c.) as *Tilletia tritici*, for "stinking smut", it was next used at the rank of species as *Ustilago tritici* (Pers.) Rostr. (l.c.) and applied to a "loose smut", which is still known today as *Ustilago tritici*. At the rank of species, the epithet '*tritici*' for the "loose smut" is antedated by the heterotypic synonyms *U. passerinii* A.A. Fisch. Waldh. (Aperçu Syst. Ustilag.: 12. 1877) and *U. ehrenbergiana* A.A. Fisch. Waldh. (in Verh. Bot. Vereins Prov. Brandenburg 21(Sitzungsber.): 26. 1879) according to Nielsen (in Canad. J. Bot. 63: 765–771. 1985) and Vánky (l.c.: 1295). For the latter species epithet, several places of publication have been cited because the name *Ustilago ehrenbergiana* was published three times in 1879 by Alexander Alexandrovitch Fischer von Waldheim. All three publications were obtained and dated. The first was in a separate print (preprint?) of a report from a 28 February 1879 meeting of the Botanical Society of Brandenburg (as reported in Hedwigia 18: 100. 1879) later published in Verh. Bot. Vereins Prov. Brandenburg 21: 26. "1880", followed by Varšavškie Univ. Izv. 1879(2), Neoffic. Otd. 2: 13. 1879 in April, and finally by Hedwigia 18: 100. 1879 in July. All indicate that the name is based upon collections by Ehrenberg gathered near Rosetta, Egypt on *Aegilops bicornis* (Forssk.) Jaub. & Spach and *Triticum turgidum* L. The former, *Ustilago passerinii*, was described from *Aegilops ovata* L. collected near Parma ("Parme"), Italy by Passerini. No confirmable original material was locatable in any herbarium by Nielsen (l.c.) for either synonymous species names, including BAK, BUCM, DAOM, G, Grignon, H, IMI, IRAN, LE, M, MA, MPU, NY, PC, PRM, S, TRTC, W, and ZT and presumably other herbaria where no studied material was located. He did examine what he presumed might be an isotype of *U. ehrenbergiana* at HGB (ex herb. Magnus) and what presumably was an isotype of another name, *U. schumanniana* Henn. (in Bull. Herb. Boissier 1: 115. 1893) that also presumably was based upon another isotype of *U. ehrenbergiana* at BPI. His research indicated that "*U. tritici*" was the common *Ustilago* species on *Aegilops* in Europe and the Mediterranean region, including these specimens. For now we prefer not to lectotypify them and to leave the names untypified.

The typification of *Uredo segetum* var. *tritici* Pers. remains problematic. Because it was published "solely by reference to a previously and effectively published description or diagnosis", that of Bjerkander (l.c.), it is to be typified by an element from the entire context of that description or diagnosis under Art. 7.8. But does Art. F.3.9, which permits a type of a sanctioned name to "be selected from among the elements associated with the name in the protologue and/or the sanctioning treatment", override Art. 7.8? If we consider Bjerkander's diagnoses to be associated with Persoon's name in the protologue, this would appear to be so, thus elements associated with Persoon's (l.c. 1801) sanctioning treatment can be considered. However, no original specimens or illustrations exist either from Bjerkander's diagnoses, Persoon's protologue (Persoon, l.c. 1797), or the sanctioning publication (Persoon, l.c. 1801). There are two specimens labelled "*Ustilago tritici* Pers." in the Persoon Herbarium (blue stamped "Herb. Persoon") and formerly incorporated in Musei Botanici Lugduno-Batavi:

1) "Hb. Pers." (Indian ink directly handwritten on small sheet with three smutted wheat heads), "Herb. Lugd. Bat. 90. O. H. No. 910.264-251" (glued-on blue paper), "Herb. Lugd. Bat. [printed black ink] Ustilago Tritici Pers. [handwritten pencil]" and signed in pencil but unreadable [to us] on glued-on white label. Barcode L 0119213.

2) "Herb. Lugd. Bat. 90. O. H. No. 910.264-252" (glued-on blue paper), "ustilago tritici Canini | chiendent barbu Ergoté [handwritten

in black ink]" on a loose label in packet with one smutted head. Barcode: L 0119214.

Neither can be confirmed as original material because of the lack of date and any location plus the fact that the binomial "*Ustilago tritici*" "Pers." was not validated until 1890 by Rostrup (l.c.). We also note that in a study of *Clavariaceae* (s.l.) in the Persoon Herbarium by Adamčík (in Sydowia 61: 191–207. 2009), he (l.c.: 191) concluded that, "Most of the specimens were collected in the last period of Persoon's active research of fungi and none of them should be connected with protologue and used as a type."

Therefore, we opt to designate a neotype, from Europe, on *Triticum aestivum* L. that is in agreement with current usage. In doing so, we chose a specimen from which spores were examined and DNA could be extracted and sequenced, and differentiated from other taxa, including *Tilletia caries*. Furthermore, because *Tilletia caries* itself has never been typified, we hereby also designate a lectotype and an epitype, thereby ensuring that the names *Ustilago tritici* and *Tilletia caries* (*T. tritici*, nom. illeg.) of species that may be present on the same host are generically differentiated (Nguyen & al. in Mycologia 117: 60–75. 2025).

Candolle (l.c.), when describing the basionym for *Tilletia caries*, *Uredo caries* DC., did not cite specimens nor indicate he had seen any. He referred to three publications, two of which he mentioned as having illustrations ("ic."). The first, as "*Carie*. Tessier" has no illustrations (Tessier, Résult. Expér. Rambouillet Relativ. Malad. Froment Appell. Carie: 1–19. 1785). The second (Tessier, Traité Malad. Grains: 1–351. 1783) had one plate facing page 294 with 4 figures showing infected wheat heads but no details on the fungus. The third (Prevost, Mém. Cause Imméd. Carie ou Charbon des Blés: 1–80, pl. 1–3. 1807) published details of the fungus showing germination of the teliospores with basidia and basidiospores. These illustrations are considered to be original material, and one of these is selected as lectotype below. Because this lectotype cannot be critically identified in order to precisely apply the name to this species of *Tilletia*, an epitype is also selected.

Specimens housed in the Canadian National Mycological Herbarium (DAOM) (eight for *Ustilago tritici* and nine for *Tilletia caries*) were selected as potential type specimen candidates using the following criteria: collected on host *Triticum*, with provenance in Europe, with plentiful material exhibiting morphology consistent with the original descriptions and historical usage the past century, and with DNA sequences successfully generated to serve as reference DNA barcodes. For *U. tritici*, one specimen met all these criteria and was selected as neotype (Fungi Exsiccati Fennici No. 231). For *T. caries*, of the two that met all criteria the one below was selected as epitype and is consistent with those studied by Nguyen & al. (l.c.). The latter study was a genome-based analysis co-authored by us, and concluded that *Tilletia laevis* J.G. Küh, was a synonym of *T. caries* as typified here.

Tilletia caries (DC.) Tul. & C. Tul. in Ann. Sci. Nat., Bot., sér. 3, 7: 113. 1847 ≡ *Uredo caries* DC. in Lamarck & Candolle, Fl. Franç., ed. 3, 5/6: 78. 1815 ≡ *Tilletia tritici* G. Winter, Rabenh. Krypt.-Fl., ed. 2, 1(1[Pilze Deutschl.]): 110. 1884, nom. illeg. – **Lectotypus (hic designatus):** [icon in] Prevost, Mém. Cause Imméd. Carie ou Charbon des Blés: pl. I, fig. 22. 1807, depicting typical *Tilletia* spore germination. MBT 10024668). **Epitypus (hic designatus):** Poland, Białystok Prov., pr. Jeziorowskie et Kruklanki, 54°05′ N, 21°59′E, 160 m alt., 23 Jul 1994, *Scholz* in Vanky, Ustil. Exs. No. 1033 (DAOM No. 983784). MBT 10024669.

Sequence Data: Neotype *Ustilago tritici*: GenBank PV029096 (partial-ITS1-5.8S-ITS2-partial); Epitype *Tilletia caries*: GenBank PV029097 (ITS1-5.8S-ITS2), PV033757 (*RPB2*), PV033756 (*EF1a*).

If this conservation proposal is rejected, then any typification of two long-synonymized names, *Ustilago passerinii* and *U. ehrenbergiana*, will likely threaten a long-established use of *U. tritici*.