

Ein Beitrag zur Systematik und Entwicklungsbiologie Höherer Pilze: Hefe-Typen der Basidiomyceten

Teil III: Ustilago-Typ

H. PRILLINGER¹, CH. DÖRFLER², G. LAASER³, G. HAUSKA⁴

¹ Raiffeisen Bioforschung, Reitherstraße 21–23, A-3430 Tulln; N.Ö.

² Birkenstraße 3, D-8051 Kranzberg

³ Dachstraße 20, D-8000 München 60

⁴ Lehrstuhl für Zellbiologie und Pflanzenphysiologie,
Universität Regensburg, D-8400 Regensburg

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Abstract: In this and three further papers 205 yeasts and yeast states of Basidiomycetes and presumed relatives were investigated comparatively on the basis of the carbohydrate (neutral sugars) pattern of purified cell walls, urease-activity, diazonium blue B reaction, the production of extracellular amyloid compounds (EAS), fermentation of carbohydrates, and ubiquinone data. A clustering leading to the Protomyces-, the Microbotryum-, the Ustilago-, the Dacrymyces-, and the Tremella-type became apparent, especially from the qualitative and quantitative cell wall carbohydrate pattern. The different yeast types correspond well with 5S rRNA clusters known from the literature. 58 strains clustered within the Ustilago-type comprising the phragmobasidial smut fungi parasitizing monocotyledonous hosts (*Ustilago* s.str., *Sporisorium*, *Moesziomyces*, *Schizonella*, *Farysia*), the *Tilletiales* (*Tilletia*, *Entyloma*), the *Exobasidiales*, the *Cryptobasidiales* (*Microstroma*), and some anamorph yeasts (*Tilletiopsis*, *Sterigmatomyces*). The main characteristics of the Ustilago-type are: 1. The absence of EAS; 2. The dominance of glucose, presence of galactose and small amounts of mannose (absence of xylose) in the cell wall of yeast states. 3. A positive DBB-reaction and urease-activity. The predominance of glucose in the cell wall - similar to hyphal states of Homobasidiomycetes -, a type B secondary structure of the 5S rRNA and the partial occurrence of the complex hetero-bifactorial (A-factor: extracellular function, few, commonly two alleles; B-factor: intracellular function, multiple alleles) mating system (*U. maydis*, *U. filiformis*) in parasitic smut species suggest that the Ustilago-type is derived in comparison with the Microbotryum-type. The concept of a „yeast-basidium“ as a simple basidiomycetous meiosporangium is introduced to understand the close phylogenetic relationship of *Graphiolales* and *Ustilaginales* s. str. (pseudotrivial, phragmobasidial smuts of monocots) detected by methods of molecular systematics (e.g. cell wall sugars, 5S rRNA sequences, absence of EAS, ferrichromes). The close relationship of the *Tilletiales* especially *Entyloma* species with the *Exobasidiales* as indicated by the cell wall carbohydrate pattern and 5S rRNA sequences gives support to the concept that simple holobasidia (e.g. *Microstroma*, *Exobasidium*) have evolved via „siphonal“ germination tubes of chlamydospores (*Tilletia*, *Entyloma*). The plastic simple holobasidium at the beginning of the ontogenesis in *Entyloma* and *Tilletia* reappears but in a less plastic form at the end of the ontogenesis in the *Exobasidium*-species. This was further corroborated by the unfrequent occurrence of transversely septate phragmobasidia in *Exobasidium karstenii*.

