

## First report of *Tuber aestivum* var. *uncinatum* from Iran based on morphological and molecular characteristics

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Truffles are the most delicious, rare and most expensive edible fungi in the world. Interest on truffles has continuously grown in Iran during the past two decades. The oldest data on Iranian truffles were reported by Chatin who proposed the names *Terfezia aphroditis* Chatin and *T. hanotauxii* Chatin for samples collected in Iran (Chatin 1897, Esfandiari & Petrak 1950). During the last 70 years, several species have been added to the checklist of Iran's desert truffles (Daneshpajuh 1991, Ammarellou *et al.* 2014, Jamali 2016).

Following research on Iranian desert truffles, we received some specimens (from forests of Golestan province (east northern of Iran), which had different ascocarps and spores from those published for Iranian *Tuber* species. Their ascocarps were subglobose or irregularly globose, 2–5 cm in diameter. They were black or grayish black, with very large pyramidal warts on their surface. Fruit bodies were overall similar to those of *T. aestivum* Vittad., but had a darker gleba, and a more intense odor (Fig. 1). Asci were globose, about 62.5 µm, with 2–4 spores irregularly clustered inside. Spores were broadly ellipsoid or subglobose, 17.5–35 × 12.5–20 µm, yellow to brown, ornamented with a mesh reticulum about 4 µm high (Fig. 2).

To highlight the morphology, they were analyzed by Scanning Electron Microscopy (SEM). From the SEM images, the surface topography on the *T. uncinatum* can be observed. This shows a polygon structure similar to honeycomb with a diameter about 5 µm (Fig. 3).

In molecular studies, three 28S nLSU sequences were produced from analyzed samples. The sequences were very similar (99% identical, 2–10 bp different) to four homologous sequences in GenBank identified as *Tuber aestivum* (FJ809843, GU979101, KC934931, and KF523368). None of these differences were shared by more than one sequence; therefore, no intraspecific phylogenetic structure could be hypothesized with this marker. Interestingly, each of the three newly produced 28S nLSU sequences (MG385625–MG385627) from Iranian specimens collected at the same site (Chenarli), had a 1bp difference with the others in a different site, suggesting that, intraspecific genetic variability is high within a single site. Based on morphological and molecular analyses, these collections were identified as *Tuber aestivum* var. *uncinatum*, therefore, being the first report of this intraspecific taxon for the Iranian mycobiota. The voucher specimen of this variety is preserved under IR-ZN 1395 C in the Iranian Truffle Collection at the Research Institute of Modern Biological Techniques, University of Zanjan, Zanjan (Iran).

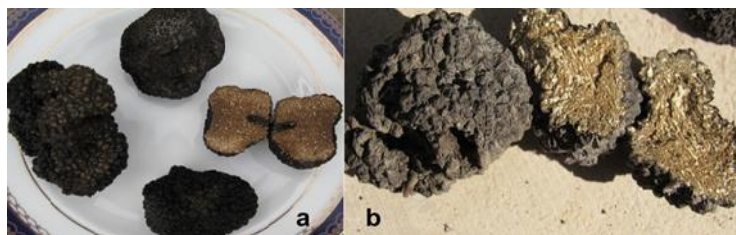


Fig. 1. Morphological characteristics of *T. aestivum* var. *uncinatum*: a. Fresh ascocarp, b. Dried ascocarp.



Fig. 2. Microscopic characteristics of *T. aestivum* var. *uncinatum*: a. Four mature ascospores in an ascus with 4 µm high reticula, b. Two ascospores in an ascus.

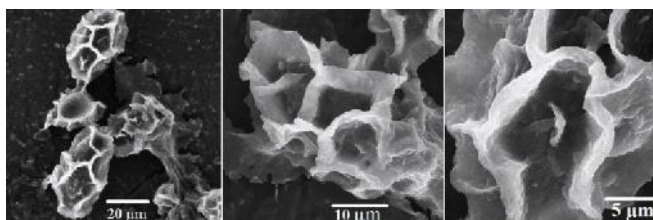


Fig. 3. Thorny reticulations of *T. uncinatum* var. *uncinatum* spores under SEM.

## نخستین گزارش از *Tuber aestivum* var. *uncinatum* از ایران مبتنی بر ویژگی‌های مورفولوژیکی و مولکولی

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### خلاصه

قارچ‌های دنبلان از لذیذترین، نادرترین و گران‌ترین قارچ‌های خوراکی دنیا می‌باشند. در ادامه پژوهش‌های مستمر روی دنبلان‌های کوهی ایران، نمونه‌هایی از قارچ‌های دنبلان جنگلی از مناطقی از استان گلستان در تابستان ۱۳۹۵ طی پیمایش کشوری رویشگاه‌های آن‌ها مشاهده گردید که بخشی از مطالعات مربوطه در ایران و بخش تکمیلی آن در اسپانیا انجام گرفت. براساس ویژگی‌های میکروسکوپی، میکروسکوپی و مولکولی، این قارچ با نام علمی *T. aestivum* var. *uncinatum* برای نخستین بار از ایران گزارش و با شماره دسترسی IR-ZN 1395 C در کلکسیون قارچ‌های دنبلان پژوهشکده فناوری‌های نوین زیستی دانشگاه زنجان نگهداری می‌شود.

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