



Truffles for Dummies

All truffle species have one trait in common: they're underground, more or less hidden. If it were not for their strong odours that attract animals, their spores would not be dispersed and their reproduction would be hampered. Hundreds of species have already been formally identified and the process is ongoing. They are found almost everywhere except in extremely arid or cold climates. They are prized essentially for their flavour.

Hundreds of other species share this same morphology, and also seek refuge from hostile environments. Each has a distinctive odour and often resembles true truffles. They are classified in other genera, but some are also sought after for their aroma.

Whether true or false «truffles», they also have another trait in common: they adapted by absorbing or covering what used to be their cap. As a group, they are sometimes labelled «sequestrate fungi» because their spores are secluded within the mushroom rather than exposed to winds on their external face, on their gills for instance. For their spores to be spread, they must be eaten. To make things somewhat more complicated, a few species in that meta-group do not hide underground anymore.

By the way, Mycoboutique has the [best truffle products](#) and the best books on the topic.

Diamonds in a Haystack

Lists of ingredients that mention white, black, summer and winter truffles do not say much about the species since these adjectives apply to numerous species of differing values. Even with true truffles, eyes and noses can be deceiving: artificial flavours fool many experts and are inescapable in all truffle by-products.



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The most highly prized are the Black Périgord truffles (*Tuber melanosporum*) and the White Alba truffles (*Tuber magnatum pico*): in North America recently, prices have often exceeded \$3/g and \$7/g, respectively.

The latter grows wild in Northern Italy and the Balkans from October to February. All attempts at cultivating the species seem to have failed and scarcity has kept prices disconcertingly high until now. Always eaten raw (never cooked), its complex aroma recalls familiar garlic and cheese odours and if no precautions are taken the flavour dissipates in a few days.

Usually available at more affordable prices, the Black Périgord truffles are indigenous to France, Italy, and Spain and harvested from December to March. They are now cultivated around the world and the sale of inoculated seedlings is a thriving industry. Truffières are springing up all over, from the United States to Australia, with over 200 growers in southern Australia where 13 tonnes were produced in 2016. During the summer in the northern hemisphere, fresh winter truffles cultivated in Australia and Chile are available.

Compared to the Alba truffle, the Black truffle's aroma, strongly musky, is more persistent. Arguably the best tasting of all truffles, it is eaten raw, but can be lightly cooked. Being relatively more abundant, it is usually half the price of the other favourite and is cheaper still if it does not originate from Périgord.



Tuber magnatum pico



Tuber melanosporum



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The Second Scents

Those who have had the opportunity to taste the two most sought-after species are fortunate. Other true truffles species numbers in the hundreds: they produce a weaker scent, and in some cases, undesirable odours.

Not to be confused with the Périgord truffle to which it is genetically related, the black winter truffle (*T. brumale*) is harvested in Europe from November to March. It is related genetically to the former, but lacks the slightly reddish skin (peridium) and has larger white veins running through its flesh (gleba). It also has a much fainter aroma.

Maturing late into winter and right into spring is the « bianchetto », or smaller white truffle (*T. borchii*), found from Sicily to Finland. It resembles the Alba truffle and also has an unmistakable garlicky aroma.

Next, fruiting from May to September across Europe, are the Summer Truffles (*T. aestivum*). There are many different varieties. They are often used in gourmet preparations after their aromas have been enhanced with artificial flavours. As well, shavings at the bottom of truffle oil bottles usually are those of decorative summer truffles.

Despite its name, the Burgundy truffle (*T. uncinatum*) can also be found across Europe. It is a summer truffle that matures late into the season, earning it the nickname “autumn truffle”. It deserves its other nickname “musky truffle”.

In North America, many indigenous species with interesting flavours have been identified. Among them are the white winter and spring truffles (*T. oregonense* and *T. gibbosum*) growing underneath Douglas Firs on the West Coast and whose range is said to stretch to Ontario. Not having tasted a fresh specimen



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yet, we cannot dispute the claim of many Oregonians, Charles Lefevre and [James Trappe](#) among them, that these mushrooms flavour surpasses the Alba truffle. The reputation has been hard to establish mostly because they are often picked before they have reached maturity and they lack their full flavour.

Other valuable species are found in Eastern North America, notably the Pecan Truffle (*T. lyonii*) and the Appalachian Truffle (*T. canaliculatum*, sometimes called Michigan Truffle). Both have been seen as far north as southern Ontario and Québec. Many other native truffles have been identified in recent years, but their availability is limited.

In East Asia, we find many different species and varieties (Himalayan, Indian, Chinese...), the majority of which are at the bottom of the aromatic ladder. When freshly picked, their aroma is faint at best. In the 1990's, they flooded the European markets and prices for the precious native ones dropped abruptly temporarily. Some contamination of local orchards occurred. Chinese Truffles (*T. indicum*), which resemble the Black Périgord very closely, are especially feared.

Appearances are often deceiving, and phylogenetic investigations suggest there are many more species to be identified and named. There is a taxonomy (official Latinised names) war going on worldwide, with major financial interests at stake.

The Northern frontier

Generally, truffles grow naturally underground in temperate climates: they are not found where the soil freezes deeply. Stimulated by increasing prices, pioneers have tried to cultivate the priciest ones in marginal conditions.

Fifteen years ago, entrepreneurs imported seedlings from the U.S. to southern British Columbia, formed the [B.C. Truffle Association](#) and started growing trees inoculated with black Périgord truffle and other species.



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In 2011, we met up with John (then president of the association, seen here in his truffle field with his apprentice truffle dogs Skipper and Tobie) for a tour of his orchard southeast of Vancouver: The orchard contained 500 inoculated trees of which two thirds were hazelnuts and the remaining, oaks. After investing 10 years of care in his crops, John was hoping for a first harvest.

Success was not around the corner: in fact, the first authenticated specimen was collected March 13, 2013 at his friend and neighbour's truffière. The news raised a great deal of hope, but the phenomenon did not occur the following year: the winter of 2014 had been exceptionally cold in the area, probably too cold for fruiting. A truffle grower on Vancouver Island is said to have found some frozen truffles in his orchard.

The local venture faced an unexpected and fatal obstacle: the Eastern Filbert Blight. Caused by a fungus (*Anisogramma anomola*), the parasite spares the native species of hazelnut but attacks the European species adopted locally: all of John's and his neighbour's hazelnuts succumbed. John himself retired and, in



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2016, sold his farm near Abbotsford.



The rather disappointing results so far can possibly be explained by deficient inoculates and techniques, wrong choice of seedlings, not to mention extreme temperatures. As said previously, mushrooms of this genus can only develop in symbiosis with a few species of trees. At best, fruiting occurs after 7 years of steady care. Even in their native soil in France, Italy, and Spain, the yield for the Périgord truffle has not yet surpassed 30% of trees.

Despite the pitfalls, the trade in truffle plants remains flourishing. A Quebec company, Arborinov, offers truffle plants from the Appalachians, the native (*Tuber canaliculatum*) and Burgundy Truffle (*Tuber uncinatum*) grafted to native oak or hazelnut trees. The selected species are known to tolerate colder temperatures and the first results are encouraging.

Knowledge is progressing rapidly, and supply is increasing. Until recently, truffles were thought to be self-fertile, in no need of a partner of opposite «polarity» to reproduce. We know today that black truffles are self-sterile, being either “males”



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or “female” and, thus, they need a breeding partner to reproduce sexually. Furthermore, they naturally tend to live in groups of either polarities and thus they have only a small chance of fertilization and fructification. Our new understanding will enable truffle growers around the world to create an optimal pairing of inoculated trees. As we advance along the learning curve, and supply continues to steadily increase, cultivated truffles should become more affordable.

You can find books on truffles, gourmet truffle products, and other mushroom paraphernalia at the Mycoboutique.

Look-Alikes

Besides true truffles, numerous mushroom species fruit below ground, sheltered from bad weather, where they develop strong perfumes. Mushrooms of this type – called hypogeous - have all adopted a similar survival strategy, and thus resemble each other even when they are genetically very different. In this way, true truffles can be easily confused with other less valuable hypogea.

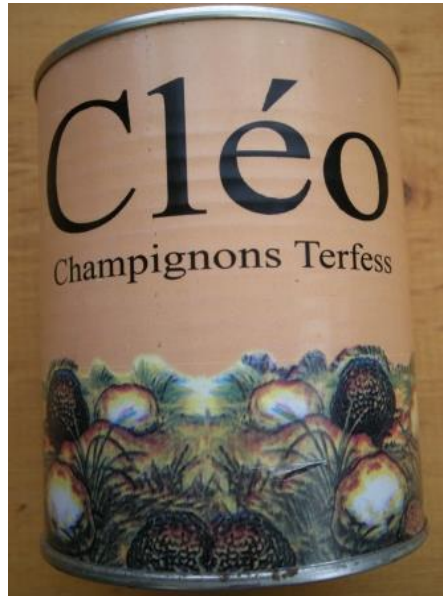
Tradition has it that the manna that saved Moses and his people from famine was none other than the ‘desert truffle’, a semi-arid zone hypogeous species found around the Mediterranean and as far as China and South Africa. In local languages it is called turma (Spanish), kama (Arabic), kmehin (Hebrew), terfezia, tirmania and Kalahari truffles.

According to popular tradition, the emergence of these ‘truffles’ is initiated by the first rains of spring. This is exactly what the Greek author Plutarch postulated more than two thousand years ago convinced that the mushrooms bloomed when lightning hit the ground.



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Canned Terfezia from Morocco



For North America, James Trappe lists ninety species, but only ten of which are recognized as 'real truffles'. In a recent publication, [Beug, Bessette and Besette](#) restrain the number to five 'true' truffles, but the debate goes on. The famed Northern Oregon 'truffle' (*Leucangium carthusianum*) for instance, does not qualify for the appellation of a 'true truffle': fairly rare, it grows under Douglas fir trees on the Oregon coast. This intensely aromatic mushroom features a pleasant fruity taste, quite similar to pineapples; it lends itself wonderfully to dessert.

Eastern Canada's deer 'truffle' (*Elaphomyces muricatus*) doesn't even have this culinary distinction: it is inedible to humans, though rodents find it delicious and indigenous cordyceps feed on them.

In effect, underground mushroom species, even those that are genetically very similar, emit dissimilar odours. This differentiation serves to highlight the degree to which environmental conditions and evolutionary adaptations, rather than genetic affiliation, affect mushroom flavour, if not relative market prices.



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Other Sequestrate fungi

The larger group of sequestrate fungi refers to an interesting evolutionary process: various species in diverse genera have survived by shielding their spores from harsh exterior conditions. The extent of the set is rather vague: according to the distinguishing feature, some puffballs, boletes and cortinarius would be granted the truffle status without the expected culinary merits.

The Chemistry behind Aromas

Odours differ greatly from one species to the next and even within the same species, depending on the location. White Alba truffles, for instance, are characterized by a few typical smells: garlic, musk, and cheese often come to mind. Now, thanks to laboratory instrumentation, it is even possible to pinpoint the village where a specimen was harvested based on its aromatic profile.

Differences in smell within a species can be significant. For example, Black truffles originating in Périgord are more prized than their central Italian counterparts, partly because of their odour (please see table for the aromatic profile), but also because of notoriety. However, without the appropriate tools, the nuances of their individual aromatic formulas might escape us.

In the laboratory, we can determine the exact makeup of an aroma. Those of us who can tolerate professional jargon will remember that dimethyl sulfide dominates the odour of Alba's White truffle, so much so that it is often synthetically added to lower grade truffle products. However, the actual aromatic profile includes many more molecules in varying proportions, each with their own perception threshold.



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***Melanosporum* Truffle from Central Italy ¹**

Percentages of volatile compounds

Dimethyl sulfide	7.5%
Acetaldehyde	4.5%
2-methylpropanal	5.0%
2-methylbutanal	4.0%
Ethanol	27.0%
2-methylpropanol	21.0%
2-methylbutanol	17.0%
Acetone	8.0%
2-butanone	2.5%
1-propanol	2.0%

¹ *The volatile organic compounds of black truffle (Tuber melanosporum Vitt.) from middle Italy*; Bellesia, F, & al.; Flavour and Fragrance Journal 1998, vol, 13, n°1, pp,56-58

This may not seem very appealing, but molecules akin to butane and propane are found in the odour of «Périgord» truffles of Central Italy. The first inhalations are surprising, as surprising as the sensation of drinking beer for the first time.

Not all truffles have desirable aromas and not all desirable aromas are desirable for everyone. Everyone will agree that the few priceless species produce intense smells: adding one specimen to an egg carton is usually enough to infuse all the eggs with its fragrance.

Companies are well on their way to mastering the synthetic chemistry and gastronomic rhetoric necessary to successfully produce and market their gourmet products. You can no longer just read the list of ingredients: you must be familiar with the codes that are used. Every word is carefully chosen, and its position meticulously planned.



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Even if chemically synthesized, the smell of any truffle is bound to make an impression and more often than not, the aroma is addictive.

Preservation

There are ways to keep truffles fresh with their aroma for up to ten days. They can be covered in rice in a jar and refrigerated, losing 5% of their initial weight daily. Better yet, they can be vacuum sealed. For longer periods, they are sometimes put in duck fat or grape seed oil. They can also be individually frozen or preserved in brine or alcohol.

All methods tend to alter the texture and/or flavour. To taste the real thing, it's best to eat them quickly. The quest to extend the shelf life of food products has always been challenging, but with truffles, it approaches epic proportions. This is because the compounds responsible for the famous truffle aroma are extremely unstable and break down quickly.

Currently, freeze drying with nitrogen is the most effective method of preserving both the aroma and consistency of truffles. While the aroma is unaffected by the freezing, the texture does change a bit and becomes spongier. Freeze dried specimens can be kept for up to one year, but must be consumed as soon as possible. If the truffles are not frozen, then they can be brined in jars with lightly salted water. After opening such a jar, the odours will disperse in under two hours.

Products galore

While some continue to find new ways to preserve highly valued truffles, others capitalize on their reputation. More often than not, the truffles in by-products are some of the less-aromatic species from the summer truffle group. Manufacturers will sometimes mix summer truffles with other mushrooms, like white button and



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porcini. Furthermore, these as well as other products are fortified with artificial flavours.

This is not difficult, as aromatic profiles are known and readily synthesized, notably di-methyl sulphide, found in white Alba truffles. Adding these artificial flavours to summer truffles goes a long way in adding credibility to the product. Even when the flavour is labelled “natural”, there is no guarantee that the product in question actually comes from a real truffle. Nevertheless, some manufacturers claim to achieve a full extraction of the compounds they add to their product. In any case, you should always read the labels of truffle products with a wary eye and not be too impressed with general claims of “white truffle”, “black truffle”, “winter truffle” or “natural flavours”.

Here is a list of a few by-products.

In jars, [sliced summer truffles](#) make up around 70% of olive oil based carpaccios that are often used for catering purposes. They are often served alongside veal carpaccio, pasta and risotto.

Truffle patés and [purées](#) are also usually made with summer truffles and olive oil. They can flavour eggs, creams and butters. Summer truffle purées typically contain bits (70%), juice (27%), some corn starch and salt.

Mushrooms do not contain fat, so [truffle oils](#) are all inevitably flavoured vegetable - mostly olive - oils. Often, small pieces of summer truffles are added as decoration. You can tell which kind of artificial flavour (black or white truffle) has been added by looking at the label. Truffle flavoured olives (60%) are usually soaked in a mixture of sunflower oil (33%) and olive oil (6.9%) that contains traces of summer truffles, garlic, citric and ascorbic acid.



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Tapenades or [tartufatas](#) are spread on crackers, or served alongside pasta and fish. They often contain around 10% summer truffles, olives, olive oil, capers, and artificial flavours. [Truffle butter](#) is regular butter with artificial flavour added. Similarly, truffle honey is honey infused with white truffle flavour. [Truffle salt](#) contains sea salt, small summer truffle pieces (5%) and artificial flavour. To add to this large sample of by-products, a wide range of pastas and [risottos](#) enhanced with truffle flavour. Truffle juice is often added to sauces and bouillons. Its value depends on which species was used for the extraction and how diluted it is. [Black truffle potato chips](#) are also available, with dried summer truffle and black truffle aroma among ingredients.

Reading the labels on fine products is always advisable.

Conclusion

For centuries, truffles have captivated our imaginations and engulfed our senses. We cannot help but appreciate the captivating aromas that have forged the mushroom's reputation. Hopefully with time, progress in cultivation techniques and genetic identification will ensure quality at affordable prices.