

## = Russula emetica =

*Russula emetica*, commonly known as the sickener, emetic russula, or vomiting russula, is a basidiomycete mushroom, and the type species of the genus *Russula*. It has a red, convex to flat cap up to 8 @. @ 5 cm ( 3 @. @ 3 in ) in diameter, with a cuticle that can be peeled off almost to the centre. The gills are white to pale cream, and closely spaced. A smooth white stem measures up to 10 @. @ 5 cm ( 4 @. @ 1 in ) long and 2 @. @ 4 cm ( 0 @. @ 9 in ) thick. First described in 1774, the mushroom has a wide distribution in the Northern Hemisphere, where it grows on the ground in damp woodlands in a mycorrhizal association with conifers, especially pine.

The mushroom's common names refer to the gastrointestinal distress they cause when consumed raw. The flesh is extremely peppery, but this offensive taste, along with its toxicity, can be removed by parboiling or pickling. Although it used to be widely eaten in Russia and eastern European countries, it is generally not recommended for consumption. There are many similar *Russula* species that have a red cap with white stem and gills, some of which can be reliably distinguished from *R. emetica* only by microscopic characteristics.

## = = Taxonomy = =

*Russula emetica* was first officially described as *Agaricus emeticus* by Jacob Christian Schaeffer in 1774, in his series on fungi of Bavaria and the Palatinate, *Fungorum qui in Bavaria et Palatinatu circa Ratisbonam nascuntur icones*. Christian Hendrik Persoon placed it in its current genus *Russula* in 1796, where it remains. According to the nomenclatural database MycoBank, *Agaricus russula* is a synonym of *R. emetica* that was published by Giovanni Antonio Scopoli in 1772, two years earlier than Schaeffer's description. However, this name is unavailable as Persoon's name is sanctioned. Additional synonyms include Jean @-@ Baptiste Lamarck's *Amanita rubra* ( 1783 ), and Augustin Pyramus de Candolle's subsequent new combination *Agaricus ruber* ( 1805 ). The specific epithet is derived from the Ancient Greek *emetikos* / ????????? ' emetic ' or ' vomit @-@ inducing '. Similarly, its common names of sickener, emetic russula, and vomiting russula also refer to this attribute.

*Russula emetica* is the type species of the genus *Russula*. According to Rolf Singer's infrageneric classification of *Russula*, it is also the type of the section *Russula*. In an alternative classification proposed by Henri Romagnesi, it is the type species of subsection *Emeticinae*. A molecular analysis of European *Russula* species determined that *R. emetica* groups in a clade with *R. raoultii*, *R. betularum*, and *R. nana*; a later analysis confirmed the close phylogenetic relationship between *R. emetica* and the latter two *Russulas*.

## = = Description = =

The sticky cap of *R. emetica* is 2 @. @ 5 ? 8 @. @ 5 cm ( 1 @. @ 0 ? 3 @. @ 3 in ) wide, with a shape ranging from convex ( in young specimens ) to flattened, sometimes with a central depression, and sometimes with a shallow umbo. It is a bright scarlet or cherry red, and in maturity, the margins have fine radial grooves extending 2 ? 7 mm ( 0 @. @ 08 ? 0 @. @ 3 in ) towards the center of the cap. The cuticle can be readily peeled from the cap almost to the centre. The brittle flesh is white ( or tinged with red directly under the cap cuticle ), measures 4 ? 9 mm ( 0 @. @ 2 ? 0 @. @ 4 in ) thick, and has a very sharp and peppery taste. Gills are closely spaced, white to creamy @-@ white, and have an attachment to the stem ranging from adnate to adnexed or completely free. They are intervenose ( containing cross @-@ veins in the spaces between the gills ) and occasionally forked near the cap margin. Fruit bodies have a slightly fruity or spicy smell.

The white stem measures 4 @. @ 5 ? 10 @. @ 5 cm ( 1 @. @ 8 ? 4 @. @ 1 in ) long by 0 @. @ 7 ? 2 @. @ 4 cm ( 0 @. @ 3 ? 0 @. @ 9 in ) thick, and is roughly the same width throughout its length, although it can be a bit thicker near the base. Its surface is dry and smooth, sometimes marked by faint longitudinal grooves. It is either stuffed ( filled with a cottony pith ) or partially hollow, and lacks a ring or partial veil.

*Russula emetica* produces a white to yellowish @-@ white spore print . Spores are roughly elliptical to egg @-@ shaped , with a strongly warted and partially reticulate ( web @-@ like ) surface . They have dimensions of 8 @. @ 8 ? 11 @. @ 0 by 6 @. @ 6 ? 8 ?m , and are amyloid , meaning that they will stain blue , bluish @-@ grey , to blackish in Melzer 's reagent . Basidia ( spore @-@ bearing cells ) are club @-@ shaped , four @-@ spored , hyaline ( translucent ) , and measure 32 @. @ 9 ? 50 by 9 @. @ 0 ? 11 @. @ 6 ?m . Cystidia located on the gill face ( pleurocystidia ) are somewhat cylindrical to club @-@ shaped or somewhat spindle @-@ shaped , and measure 35 ? 88 by 7 @. @ 3 ? 12 @. @ 4 ?m . They are yellowish , and contain granular contents . Cheilocystidia ( found on the edges of the gills ) , which are similar in shape to the pleurocystidia , are thin @-@ walled , hyaline , and measure 14 ? 24 by 4 @. @ 4 ? 7 @. @ 3 ?m . Clamp connections are absent from the hyphae .

The red pigments of this and other russulas are water @-@ soluble to some degree , and fruit bodies will often bleach or fade with rain or sunlight ; the cap colour of older specimens may fade to pink or orange , or develop white blotches . The main pigment responsible for the red colour of the fruit bodies is called russularhodin , but little is known of its chemical composition .

= = Toxicity = =

As its name implies , the sickener is inedible , though not as dangerous as sometimes described in older mushroom guides . The symptoms are mainly gastrointestinal in nature : nausea , diarrhoea , vomiting , and colicky abdominal cramps . These symptoms typically begin half an hour to three hours after ingestion of the mushroom , and usually subside spontaneously , or shortly after the ingested material has been expelled from the intestinal tract . The active agents have not been identified but are thought to be sesquiterpenes , which have been isolated from the related genus *Lactarius* and from *Russula sardonia* . Sesquiterpenoids that have been identified from *R. emetica* include the previously known compounds lactarorufin A , furandiol , methoxyfuranalcohol , and an unnamed compound unique to this species .

The bitter taste does disappear on cooking and it is said to then be edible , though consumption is not recommended . The mushroom used to be widely eaten in eastern European countries and Russia after parboiling ( which removes the toxins ) , and then salting or pickling . In some regions of Hungary and Slovakia , the cap cuticle is removed and used as a spice for goulash . Both the red squirrel ( *Sciurus vulgaris* ) and the American red squirrel ( *Tamiasciurus hudsonicus* ) are known to forage for , store and eat *R. emetica* . Other creatures that have been documented consuming the mushroom include the snail *Mesodon thyroideus* , several species of slugs ( including *Arion ater* , *A. subfuscus* , *A. intermedius* , *Limax maximus* , *L. cinereoniger* , and *Deroceras reticulatum* ) , the fruit flies *Drosophila falleni* and *D. quinaria* , and the fungus gnat *Allodia bipexa* .

= = Similar species = =

*Russula emetica* is one of over 100 red @-@ capped *Russula* species known worldwide . The related beechwood sickener ( *R. nobilis* ) is found under beech in Europe . Many , such as the bloody brittlegill ( *R. sanguinaria* ) , are inedible ; this species can be distinguished from *R. emetica* by the reddish flush in its stem . *R. aurea* , however , is edible . It has a yellow stem , gills and flesh under its red cap . The edible *R. rugulosa* ? common in mixed woods in the eastern and northern United States ? has a wrinkled and pimpled cap cuticle , cream spores , and mild taste . Another inedible species , *R. fragilis* , has notched gills , and its stem stains blue with naphthol . The uncommon European subspecies *R. emetica longipes* is distinguished by its longer stem and ochre gills . The paler European mushroom *R. betularum* , found in coniferous forests and moorland , is sometimes considered a subspecies of *R. emetica* . *R. nana* is restricted in distribution to arctic and subarctic highland meadows where dwarf willow ( *Salix herbacea* ) or alpine bearberry ( *Arctostaphylos alpina* ) are abundant .

= = Distribution and habitat = =

Like all species of *Russula*, *R. emetica* is mycorrhizal, and forms mutually beneficial partnerships with roots of trees and certain herbaceous plants. Preferred host plants are conifers, especially pines. Fruit bodies grow singly, scattered, or in groups in sphagnum moss near bogs, and in coniferous and mixed forests. The fungus occasionally fruits on humus or on very rotten wood. The mushroom is known from North Africa, Asia, Europe, and North America, and can be locally very common. There is some doubt over the extent of its range in North America, as some sightings refer to the related *R. silvicola*; initially the name "*Russula emetica*" was often applied to any red capped white *Russula*. Sightings in Australia are now referred to the similarly coloured *R. persanguinea*.

A multi year field study of the growth of *R. emetica* production in a scots pine plantation in Scotland found that total productivity was 0.24 – 0.49 million mushrooms per hectare per year (roughly 0.1 – 0.2 million mushrooms / acre / year), corresponding to a fresh weight of 265 – 460 kg per hectare per year (49 – 85 lb / acre / year). Productivity was highest from August to October. The longevity of the mushrooms was estimated to be 4 – 7 days. In a study of the fungal diversity of ectomycorrhizal species in a Sitka spruce forest, *R. emetica* was one of the top five dominant fungi. Comparing the frequency of fruit body production between 10-, 20-, 30-, or 40 year old forest stands, *R. emetica* was most prolific in the latter.