

= *Auricularia auricula* @-@ judae =

*Auricularia auricula* @-@ judae, known as the Jew 's ear, wood ear, jelly ear or by a number of other common names, is a species of edible Auriculariales fungus found worldwide. The fruiting body is distinguished by its noticeably ear @-@ like shape and brown colouration; it grows upon wood, especially elder. Its specific epithet is derived from the belief that Judas Iscariot hanged himself from an elder tree; the common name "Judas 's ear" eventually became "Jew 's ear", while today "jelly ear" and other names are sometimes used. The fungus can be found throughout the year in temperate regions worldwide, where it grows upon both dead and living wood.

In the West, *A. auricula* @-@ judae was used in folk medicine as recently as the 19th century for complaints including sore throats, sore eyes and jaundice, and as an astringent. Although it is not widely consumed in the West, it has long been popular in China, to the extent that Australia exported large volumes to China in the early twentieth century. Today, the fungus is a popular ingredient in many Chinese dishes, such as hot and sour soup, and also used in Chinese medicine. It is also used in Ghana, as a blood tonic. Modern research into possible medical applications have variously concluded that *A. auricula* @-@ judae has antitumour, hypoglycemic, anticoagulant and cholesterol @-@ lowering properties.

= = Taxonomy and naming = =

The species was first mentioned in the scientific literature as *Tremella auricula* by Carl Linnaeus in his 1753 *Species Plantarum*, and later (1789) described by Jean Baptiste François Pierre Bulliard as *Tremella auricula* @-@ judae. However, the genus *Tremella* is now reserved for fungal species that live as parasites on other fungi. *Tremella auricula* @-@ judae is now considered a basionym. In 1791, Bulliard transferred the species to the genus *Peziza*. In 1822, Elias Magnus Fries transferred the species to *Exidia*, and, in so doing, sanctioned the name. In 1860, Miles Joseph Berkeley described the species as a member of *Hirneola*, a genus described by Fries in 1848, now considered synonymous with *Auricularia*.

The species was given the name *Auricularia auricula* @-@ judae in 1888 by Joseph Schröter. The specific name of *A. auricula* @-@ judae comprises *auricula*, the Latin word meaning ear, and *Judae*, meaning of Judas. Under binomial nomenclature, a species name can comprise only two words; but the taxonomists responsible for this naming hyphenated the specific name to "bend the rules" and keep the name "within the letter of the law". The name was criticised by mycologist Curtis Gates Lloyd, who said "*Auricularia auricula* @-@ Judae is cumbersome and in addition is a slander on the Jews". Though critical of Lucien Marcus Underwood, saying he "would probably not have known the Jew 's ear from the calves ' liver", he followed him in using *Auricularia auricula*, which was in turn used by Bernard Lowy in an article on the entire genus. Despite this, *Auricularia auricula* @-@ judae is the currently recognised name for the species by many sources, though *Auricularia auricula* is still occasionally used.

As well as the obligate synonyms from Bulliard, Fries and Berkeley, there are numerous other synonymous names. Mycologist George Willard Martin, writing in 1943, noted that the species was known by at least 12 binomials, of which none appeared to be valid, and noted that "the citations given for the various names are extremely erratic". Mycologist Mary F. Barrett attributes "such multiplication of names" to "the wide distribution of the Judas ' ear, its ability to grow upon many different kinds of decaying wood, and to its great variation in size, colour and shape".

The fungus is associated with Judas Iscariot because of the belief that he hanged himself on an elder tree after his betrayal of Jesus Christ. Folklore suggests that the ears are Judas 's returned spirit, and are all that are left to remind us of his suicide. The common name of the fungus was originally "Judas 's ear", but this was later shortened to "Judas ear" and, in the late 19th century, shortened again to "Jew 's ear". Common names for the fungus which refer to Judas can be traced back to at least the end of the 16th century; for instance, in the 17th century, Thomas Browne wrote of the species:

In Jews ' ears something is conceived extraordinary from the name, which is in propriety but

fungus sambucinus , or an excrescence about the roots of elder , and concerneth not the nation of the Jews , but Judas Iscariot , upon a conceit he hanged on this tree ; and is become a famous medicine in quinsies , sore throats , and strangulations , ever since .

While the term " Jew 's meat " was a deprecatory term used for all fungi in the Middle Ages , the term is unrelated to the name " Jew 's ear " . A further change of name to " jelly ear " was recommended in the List of Recommended Names for Fungi . The idea was rejected by mycologist Patrick Harding who considered it " to be the result of political correctness where it is not necessary " , and who " will continue to call [ the species ] Jew 's ear " , explaining that , while anti @-@ Semitism was commonplace in Britain , the name " Jew 's ear " is in reference to Judas , who was a Jew . However , the name has been adopted in some recent field guides .

Unrelated common names include the " ear fungus " , " common ear fungus " , " the Chinese Fungus " , " the pig 's ear " , " the wood ear " , " the black wood ear " , " the tree ear " , and " Kikurage " . The species was known as " fungus sambuca " among herbalists , in reference to Sambuca , the generic name for elder .

#### = = Description = =

The fruit body of *A. auricula* @-@ judae is normally 3 to 8 centimetres ( 1 @.@ 2 to 3 @.@ 1 in ) across , but can be as much as 12 centimetres ( 4 @.@ 7 in ) . It is distinctively shaped , typically being reminiscent of a floppy ear , though the fruit bodies can also be cup @-@ shaped . It is normally attached to the substrate laterally and sometimes by a very short stalk . The species has a tough , gelatinous , elastic texture when fresh , but it dries hard and brittle . The outer surface is a bright reddish @-@ tan @-@ brown with a purplish hint , often covered in tiny , downy hairs of a grey colour . It can be smooth , as is typical of younger specimens , or undulating with folds and wrinkles . The colour becomes darker with age . The inner surface is a lighter grey @-@ brown in colour and smooth . It is sometimes wrinkled , again with folds and wrinkles , and may have " veins " , making it appear even more ear @-@ like .

#### = = Microscopic features = =

The spores of *A. auricula* @-@ judae are long and sausage shaped , ranging in size from 16 to 18 micrometres ( ?m ) long by 6 to 8 ?m thick . The spores themselves are white , cream or yellowish , and are hyaline . The spores can sometimes be seen in a whitish mass on the underside of the fruit body . The species has elongated cylindrical basidia with three transverse septa ( internal cross @-@ walls dividing the hyphae ) . Basidia 60 @-@ 72x 4 @-@ 7.5?m ; sterigmata lateral , well developed , 3 @-@ 4.5?m long . Spores smooth , hyaline , reniform to allantoid , 14 @-@ 18 ? 6 @-@ 8?m , guttulate . Hairs on the fruit body are from 85 to 100 ?m in length , and 5 to 6 ?m in diameter . They are hyaline , lack a central strand and have rounded tips . They do not grow in dense tufts .

#### = = Similar species = =

*Auricularia auricula* @-@ judae is similar to *A. fuscusuccinea* in colour and texture , and " may be confused with it if only external features are considered " . The spore and basidia sizes of the two species are slightly different , but this is not a reliable way to tell them apart . *A. cornea* is another similar species in the same genus , but has distinct internal differences , is normally more pilose ( more covered in soft hair ) and tends to fruit in larger numbers .

#### = = Habitat , ecology and distribution = =

*Auricularia auricula* @-@ judae grows upon the wood of deciduous trees and shrubs , favouring elder . In up to 90 % of cases , the mushroom is found on elder , but it is often incorrectly assumed to grow exclusively on elder . It has also been recorded on *Acer pseudoplatanus* ( known in the

United Kingdom as sycamore ) , beech , ash , spindle , and in one particular case , the sycamore draining board of an old sink in Hatton Garden . Recently , *A. auricula judae* has been recorded from semi evergreen to evergreen and wet evergreen shola forests in the Western Ghats , India . This species occurs scattered and in clusters on dead or dying branches of trees , on main trunk , decaying logs , etc . This species occurs during the monsoon period in large imbricate clusters and under high humid conditions produces exceptionally large sized basidiomes . *A. auricula judae* growing in wet evergreen and shola forests shows remarkable variation in size , shape and colour . In Australia , it is found in Eucalyptus woodland and rainforests ; in the rainforests , it can grow in very large colonies on fallen logs . It favours older branches , where it feeds as a saprophyte ( on dead wood ) or a weak parasite ( on living wood ) , and it causes white rot .

Commonly growing solitarily , it can also be gregarious ( in a group ) or caespitose ( in a tuft ) . Spores are ejected from the underside of the fruit bodies with as many as several hundred thousand an hour , and the high rate continues when the bodies have been significantly dried . Even when they have lost some 90 % of their weight through dehydration , the bodies continue to release a small number of spores . It is found all year , but is most common in autumn . It is widespread throughout temperate and sub tropical zones worldwide , and can be found across Europe , North America , Asia , Australia , South America and Africa . There has been some debate about the appearance of the species in the tropics ; while it has been frequently reported there , Bernard Lowy , in an article on *Auricularia* , said that " of the specimens I have examined , none could be assigned here " .

= = Uses = =

= = Food = =

*Auricularia auricula judae* has a soft , jelly like texture . Though edible , it was not held in high culinary regard in the west for many years . It has been likened to " eating an Indian rubber with bones in it " , while in 19th century Britain , it was said that " it has never been regarded here as an edible fungus " . It has a mild flavour , and is useful for mixed mushroom recipes , but is still considered bland in the west . It can be dried and rehydrated , sometimes swelling to a very large size . Young specimens are best , but the species is not edible when raw , needing to be cooked thoroughly . The whole fruit body can be eaten , but should be thoroughly washed before cooking . Cooking can sometimes take a comparatively long time . The nutritional content of 100 g ( 3 @ 5 oz ) of dried fungus includes 370 kcal , 10 @ 6 g of protein , 0 @ 2 g of fat , 65 g of carbohydrate , 5 @ 8 g ash , and 0 @ 03 % mg of carotene . Fresh mushrooms contain about 90 % moisture . Dried specimens may be ground up into a powder and used to absorb excess liquid in soups and stews , as it rehydrates into tiny fragments .

Both *A. auricula judae* and the similar *A. polytricha* are popular in China , where the medicinal use of food is common ; a soup containing the species is used medicinally for dealing with colds and fevers by reducing the heat of the body . There is evidence that the species were being cultivated in China as early as the Tang dynasty ( 618 ? 907 ) . Li Shizhen , in his *Pen Tsao Kang Mu* , quotes Tang Ying chuan from that period as saying " ... put the steamed bran on logs , cover with straw , Wood Ear will grow " . In the early 20th century , large volumes of *A. auricula judae* were exported from Australia to China , and it is today still sold in Asian food shops for culinary use . It is also popular in Vietnam , although the climate is there more suited to *A. polytricha* . A report on small scale fungi cultivation concluded that *A. auricula judae* would be suitable for cultivation only in cooler climates . According to a 2010 publication , the annual production of *Auricularia* species worldwide is the fourth highest among all industrially cultivated culinary and medicinal mushrooms , and in China , the estimated output was roughly 1 @ 655 million tonnes ( based on 2003 data ) , most of which are *A. polytricha* however ( which has by and large replaced *A. auricula judae* in international trade ) .

*Auricularia auricula* @-@ judae is also in cultivation elsewhere in the world , for instance , in Ghana . In the Brong @-@ Ahafo and Ashanti regions , it is grown with what is referred to as the " plastic bag method " . Sawdust is packed into polypropylene bags and then sterilised by steam for several hours . Once the sawdust has cooled , Sorghum grain spawn is added , and the bags are kept in moderately dark conditions . Once the sawdust is exposed to a humid environment , *A. auricula* @-@ judae fruit bodies begin to grow . Elsewhere in the world , a study on the use of mushrooms by the Bini people inhabiting a remote village in southern Nigeria found that the local inhabitants collected and ate *A. auricula* @-@ judae , but that it was not one of the mushrooms they used medicinally .

Collection of the mushroom for culinary use has also been documented in Nepal . However , the Nepalese do not consider it a choice mushroom for eating ; of the three grades given to edible mushrooms , it was given the worst . Again , unlike other mushrooms , no medicinal use was reported . The mushroom has also been the only non @-@ morel species exported from Nepal for culinary use .

Other places where *A. auricula* @-@ judae has been recorded as commonly consumed include Poland , Mozambique and Indonesia , while , in Bolivia , Goeldi 's monkeys have been recorded as commonly eating the sporocarps .

= = = Folk medicine = = =

*Auricularia auricula* @-@ judae has been used as a medicinal mushroom by many herbalists . It was used as a poultice to treat inflammations of the eye , as well as a palliative for throat problems . The 16th @-@ century herbalist John Gerard , writing in 1597 , recommended *A. auricula* @-@ judae for a very specific use ; other fungi were used more generally . He recommends the preparation of a liquid extract by boiling the fruit bodies in milk , or else leaving them steeped in beer , which would then be sipped slowly in order to cure a sore throat . The resultant broth was probably not dissimilar to the Chinese soups that use *A. polytricha* . Carolus Clusius , writing in 1601 , also said that the species could be gargled to cure a sore throat , and John Parkinson , writing in 1640 , reported that boiling in milk or steeping in vinegar was " the onely use the are put unto that I know " .

Writing in 1694 , herbalist John Pechey described *A. auricula* @-@ judae by saying " It grows to the Trunk of the Elder @-@ Tree . Being dried it will keep a good year . Boyl 'd in Milk , or infus 'd in Vinegarm ' tis good to gargle the Mouth or Throat in Quinsies , and other inflammations of the Mouth and Throat . And being infus 'd in some proper Water , it is good in Diseases of the Eyes . " The species also saw use as an astringent due to its ability to absorb water . There are recorded medicinal usages from Scotland , where it was again used as a gargle for sore throats , and from Ireland , where , in an attempt to cure jaundice , it was boiled in milk . The medicinal use of *A. auricula* @-@ judae continued until at least 1860 , when it was still sold at Covent Garden ; at the time , it was not considered edible in the United Kingdom .

Medicinal use in Indonesia was also recorded in the 1930s , and was more recently reported in modern @-@ day Ghana . A report for the 2005 Commonwealth Forestry Conference examining the possible effects of deforestation in southern Ghana on medicinal and edible fungi found that *A. auricula* @-@ judae was in use as a blood tonic .

= = = Pharmacology = = =

*Auricularia auricula* @-@ judae has been the subject of research into possible medicinal applications . Experiments in the 1980s concluded that two glucans isolated from the species showed potent antitumour properties when used on mice artificially implanted with Sarcoma 180 tumours . This was despite the conclusion of earlier research indicating that , while aqueous extracts from several other fungal species had antitumour effects , extracts from *A. auricula* @-@ judae did not . Further , research on genetically diabetic mice showed that a polysaccharide extracted from *A. auricula* @-@ judae had a hypoglycemic effect ; mice fed with food including the polysaccharide

showed reduced plasma glucose , insulin , urinary glucose and food intake .

Another chemical extracted from the species was an acidic polysaccharide ( made up of mostly mannose , glucose , glucuronic acid and xylose ) which showed anticoagulant properties . The article concluded that " the polysaccharides from these mushrooms may constitute a new source of compounds with action on coagulation , platelet aggregation and , perhaps , on thrombosis " . Another study reported that the species may be effective in stopping platelet binding in vitro , with possible uses regarding hypercholesterolemia . Research has shown that *A. auricula judae* can be used to lower cholesterol levels generally , and , in particular , is one of two fungi shown to reduce the level of bad cholesterol .

= = Cultural depictions = =

The species is referred to in Christopher Marlowe 's play *The Jew of Malta* . Ithamore proclaims : " The hat he wears , Judas left under the elder when he hanged himself " . Later , the species was probably partially the inspiration for Emily Dickinson 's poem beginning " The Mushroom is the Elf of Plants " , which depicts a mushroom as the " ultimate betrayer " . Dickinson had both a religious and naturalistic background , and so it is more than likely that she knew of the common name of *A. auricula judae* , and of the folklore surrounding Judas 's suicide .