Physarum roseum Berk. & Broome, *Journal of the Linnean Society* Botany 14(no. 74): 84 (1873, publ. 1875). [IndexFungorum 243061; Physaraceae, Physarales]


**Vernacular names.** Japanese: akamojihokori.

**Diagnostic features.** Sometimes similar to *Physarum pulcherrimum* Berk. & Ravenel, but more reddish, and with translucent stalks which are free from lime.
On natural substratum. Plasmodium maroon or bright red. Hypothallus membranous. Sporocarps stalked sporangia, grouped or scattered, bright pink to red purple or red scarlet. Sporotheceae globose, fragile, (0-1-) 0.2-0.3(-0.6) mm diam. Stalk slender, cylindrical, erect, longitudinally wrinkled, concolorous or paler, ochraceous brown, dark brown, limeless, without calcium carbonate, translucent, expanded at the base, (0.4-)0.7-1(-1.2) mm long. Peridium membranous, scarlet or bright purplish red, almost smooth, with included clusters of purplish red lime globules, dehiscence irregular to petaloid. Capillitium reticulate, open, formed by a net of filaments with large reddish to purple nodes, the nodes few, large, bright red, angular or irregularly branched, connected by pale pinkish tubules. Columella absent. Spores purplish black en masse, pale pinkish brown in transmitted light, minutely spinulose, the warts rather dispersed and irregularly distributed, with scattered clusters of darker warts, 7-10 μm diam.

ASSOCIATED ORGANISMS & SUBSTRATA: Animalia. Sylvilagus brasiliensis L. (dung). Fungi. Fungi indet. [as ‘lichen of living tree’] Plantae. Albizia saman (Jacq.) Merr. [as Enterolobium saman (Jacq.) Prain and Samanea saman (Jacq.) Merr.] (bark, twig, wood); Carya hunanensis C.C. Cheng & R.H. Chang, Carya sp. (bark); Castanopsis cuspidata (Thunb.) Schottky; Cinnamomum verum J. Presl (leaf); Euphorbia sp. (leaf); Gramineae indet. (leaf); Linderæ erythrocarpa Makino; Mangifera indica L.; Muscopsida indet.; Nephrosperma van-houtteanum (H. Wendl. ex Van Houtte) Balf. f. (leaf); Persea borbonia (L.) Spreng. (leaf); Pinus densiflora Siebold & Zucc. (wood), Pinus sp. (twig); Plantae indet. (bark, leaf, liana, stump, stump, twig, wood); Poinciana sp. (bark); Quercus glauca Thunb., Q. variabilis Blume; Rhizophora sp. (bark); Syzygium jambos (L.) Alston (trunk). Associated organism of type specimen. Plantae indet. [as ‘dead bark’].

INTERACTIONS & HABITATS: Most information about this species is based on sporocarps and spores (the dispersal phase), and observed associations with other organisms usually only indicate the physical substratum on which sporocarps form. Other observations are rare, particularly of trophic phases (myxamoebae and swarm cells [individual haploid amoeba-like cells], and plasmodia [multi-nucleate, diploid, and often extensive cytoplasm]), and dormant phases (microcyst and sclerotia). As a result, very little is known about nutrition and interactions beyond broad statements that myxomycetes feed on living bacteria and fungi, and on non-living organic material (Martin & Alexopoulos, 1969). A study of temperate secondary forest in Japan, including the present species, showed that myxomycete diversity is greater when leaf litter is derived from more than one tree species and from tree species with different peaks for leaf fall (Takahashi, 2013). A similar study, in warm temperate forest, also in Japan, investigated seasonality in myxomycete sporocarp production, and noted a pronounced peak of sporocarps of the present species in early October (Takahashi & Hada, 2012). There is some evidence that this species prefers broadleaf wood to conifer wood in Japan (Takahashi ET AL., 2009). There are observations of this species on dead bark, dead leaves, decaying wood, lianas, and dung. It has been recorded from the following habitats: amenity & protected areas (including shrines); mangroves; ruderal observations of this species on dead bark, dead leaves, decaying wood, lianas, and dung. It has been recorded from the following habitats: amenity & protected areas (including shrines); mangroves; ruderal observations of this species on dead bark, dead leaves, decaying wood, lianas, and dung.


Warm-temperate to tropical. Apparently native throughout its known range. Records up to 2870 m above
sea level in USA, 2400 m above sea level in Colombia, 1460 m above sea level in El Salvador, 1200 m above sea level in Dominica, 1100 m above sea level in Madagascar, 1050 m above sea level in India, and 400 m above sea level in Australia.

**ECONOMIC IMPACTS**: No evaluation has been made of any possible positive economic impact of this fungus (e.g. as a recycler, as a source of useful products, as a provider of checks and balances within its ecosystem, etc.). No reports of negative economic impacts have been found.

**INFRASPECIFIC VARIATION**: Two subspecific taxa have been described. Both are treated by *SpeciesFungorum* [accessed 25 August 2017] as synonyms of *P. roseum*.

**DISPERAL & TRANSMISSION**: Primarily by airborne spores, particularly for longer distances; some local dispersal may also occur by movement of myxamoebae and plasmodia.

**CONSERVATION STATUS**: Previous evaluations. None. **Information base.** Over 350 records (specimens, databases and bibliographic sources combined, excluding duplicates) from at least January 1860 to July 2012, with observations in January, February, March, April, May, June, July, August, September, October and December. A study in Thailand showed inconclusive evidence of seasonality in appearance of sporocarps (KO ET AL., 2011). **Estimated extent of occurrence** [calculated using http://geocat.kew.org]. Over 59.1 million km² (Africa: 6.3 million km²; Asia: 30.6 million km²; Australasia: insufficient data; Europe: insufficient data; Indian Ocean: 0.2 million km²; North America: 11.5 million km²; Pacific Ocean: 2.6 million km²; South America: 7.9 million km²). **Estimated area of occupancy** [calculated using http://geocat.kew.org]. Well over 364 km². The method for estimating area of occupancy has produced an artificially low figure. The species is likely to be under-recorded, despite the admirable and well-organized enthusiasm of often amateur myxomycete experts, because compared with recording of flowering plants and vertebrates, so few people have the skills to search for and identify it. Some of the plants with which it is associated are common and widespread species. **Threats. Habitat destruction.** At least one site for this species has been destroyed now by a housing development. Mining operations may also threaten some populations of this species (REA-MAMINTA ET AL., 2015). Insufficient information to enable other threats to be identified. **Population trend.** In general not known. Abundant in high elevation forests, and common in mango plantations and middle elevation forests in Thaïwan (TRAN ET AL., 2008). Common in Taiwan (LIU ET AL., 2013). Occasional in both Himachal Pradesh and south India [state unspecified] (STEPHENSON ET AL., 1993). Occasional to abundant in Vietnam (TRAN ET AL., 2014). Of datable records, c. 15% are pre-1961, 70% post-1960 but pre-2001, and 15% post-2000. Reported as rare in the USA (HAGELSTEIN, 1939). **Evaluation.** Using IUCN criteria (IUCN SPECIES SURVIVAL COMMISSION. 2006 IUCN Red List of Threatened Species [www.iucnredlist.org]. Downloaded on 15 May 2006), the species is assessed globally as Least Concern. **In situ conservation actions.** None explicitly directed at this species, but many of the sites from which it has been recorded are protected, for example as nature reserves. **Ex situ conservation actions.** Physarum species, including the present species (CLARK, 1995) grow readily in culture and, using simple techniques, can be induced to sporulate. There are, however, no living strains of this species listed by the Straininfo website [www.straininfo.net, accessed 4 August 2017]. Four partial nucleotide sequences of small subunit ribosomal RNA were found in a search of the NCBI GenBank database [www.ncbi.nlm.nih.gov, accessed 13 August 2017].

**NOTES**: The reproductive system of this species has been studied in pure culture, and it has been shown to be nonheterothallic and presumed apomictic. The same research was the first report of successful completion of life cycle *in vitro* for this species (CLARK, 1995; CLARK & HASKINS, 2010). *Physarum roseum* is one of a number of myxomycetes which have been recorded from forest patches on volcanic and ultramafic soils, and research has begun on the likely relationships between those species and the heavy metal environments in which they have been found. This research is exploring both the potential for myxomycetes to play a part in bioremediation of heavily polluted sites, and the possible threats which such specialized organisms face from mining operations (REA-MAMINTA ET AL., 2015). For further help with identification, the excellent keys provided by POULAIN ET AL. (2011) should be consulted.


Sources additional to those already cited from literature and the internet.

- Checklist of Fungi of the British Isles [www.fieldmycology.net/GBCHKLST/GBchklst.asp].
- Cybertruffle [www.cybertruffle.org.uk].
- Discover Life (myxomycete pages) [www.discoverlife.org/mp/20q?guide=Myxomycetes].
- Fungus Conservation Trust CATE2 Database [www.abfg.org].
- GBIF [www.gbif.org].
- Google [www.google.co.uk].
- Landcare Research New Zealand [http://nzfungi2.landcareresearch.co.nz].
- Mycoportal [www.mycoportal.org].
- Mycotaxon Regional Checklists in Downloadable Format [www.mycotaxon.com/resources/weblists.html].
- Nomen.mycetozoa.com - an online nomenclatural information system of Eumycetozoa [http://eumycetozoa.com].
- USDA Fungal Databases [https://nt.ars-grin.gov/fungaldatabases].

T.I. Kryvomaz¹, D.W. Minter² & A. Michaud³

¹Kyiv National University of Construction and Architecture, Kyiv, Ukraine
²CABI Europe, Egham, UK
³La Croizette, F-38360 Engins, France