Phellinus noxius **System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Fungi	Eumycota	Hymenomycetidae	Aphyllophorales	Hymenochaetaceae

Common name limu mea (Samoan, Samoan Archipelago), brown root rot (English, worldwide)

Synonym *Fomes noxius* , Corner, 1932

Similar species *Phellinus lamaensis*

Summary Root and crown rot caused by Phellinus noxius is pantropical in distribution. Also known as brown root rot disease, it is present in native forests but most often noticed in disturbed areas. It has a broad host range and causes major losses in timber and hardwood plantations, agroforests and landscapes. The fungus forms an infection centre and spreads from tree to tree by root contact. It can exist on decaying roots in the soil for more than 10 years.

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Species Description
A thick, dark brown to black crust forming around infected roots and lower stems is diagnostic for brown root rot disease. Decayed wood is white and reddish-brown to black strands are usually seen near the surface. Conks occasionally grow from the crust, are brown to black on the upper surface and gray-brown on the lower, or spore-forming surface.
\r\nThe mycelial crust that forms around infected roots and lower stems is diagnostic for *P. noxius*. Mycelium is present between the bark and sapwood. Decayed wood is white, soft and crumbly, laced with reddish strands of hyphae that turn black with age. Fruiting bodies may grow from the crust and are effused, effused-reflexed, or resupinate. They are brown to black and rough on the sterile surface, gray to gray-brown on the fertile surface (Brooks, 2002b).

Lifecycle Stages
The main vegetative stage of *P. noxius* is a dikaryotic mycelium. Sexual spores are produced on specialized cells called basidia and are wind dispersed. The basidiospores germinate to form a homokaryotic mycelium which fuses with a compatible homokaryotic mycelium to form the dikaryotic stage (Adaskaveg and Ogawa, 1990).

Uses
P. noxius and other wood decay fungi play an important role in the forest ecosystem as primary decomposers.

Habitat Description
The disease may be found in open places in the primary forest canopy, including areas disturbed by storms, landslides, etc. Most often it is encountered in secondary forests, on land cleared for hardwood plantations, agroforestry, or human habitation. It is less often found in wet, poorly drained soils (Brooks, 2002a).

Reproduction
Sexual reproduction by basidiospores, asexual by fragmentation of mycelium and possibly by arthroconidia (Chang, 1996).

Nutrition
P. noxius is able to metabolize lignin as well as the complex polysaccharides of wood (Adaskaveg and Ogawa, 1990).

General Impacts
Brown root rot is reported as a disease of forest trees in Southeast Asia and the Pacific. It is usually cited, however, for its damage to forest and hardwood plantations, fruit orchards, and landscapes. Mahogany, rubber, hoop pine, and cocoa plantings have been seriously affected. Plantations and orchards cannot be replanted for many years due to the longevity of *P. noxius* in the soil and its broad host range (Brooks, 2002a).

Management Info
Push-heap-and-burn clearing was used in hoop pine plantations in Queensland (Bolland, 1984) to remove infected stumps and some roots. However, remaining diseased roots are an inoculum source until all fungal mycelium is dead. Planting grasses with deep, fibrous root systems may speed up root decomposition. Flooding fields for more than one month may eliminate the fungus (Chang, 1996). When replanting infested areas, space trees as far apart as practical. Rogue out plants with symptoms of yellowing, wilting, or leaf drop as soon as possible.

Pathway
Dispersion is possible through transport of infested soil.

Principal source: Farr, D.F., Bills, G.F., Chamuris, G.P., and Rossman, A.Y. 1989. Fungi on plants and plant products in the United States. APS Press, USA.
\r\nHawksworth, D.L, Kirk, P.M., Sutton, B.C., and Pegler, D.N. Ainsworth and Bisby's Dictionary of the Fungi, 8th ed. CAB International, UK.
\r\n Brooks, F.E. 2002a. Brown root rot disease in American Samoa's tropical rain forests. Pacific Science 56: 377-387.
\r\nBrooks, F.E. 2002b. Brown root rot. The Plant Health Instructor. DOI: 10.1094/PHI-1-2002-0923-01.
\r\nPegler, D.N. and Waterston, J.M. 1968. *Phellinus noxius*: C.M.I. Descriptions of pathogenic fungi and bacteria, No. 195. C.M.I., UK.
\r\nBolland, L. 1984. *Phellinus noxius*: cause of a significant root-rot in Queensland hoop pine plantations. Australian Forestry 47: 2-10.
\r\nChang, T.T. 1996. Survival of *Phellinus noxius* in soil and in the roots of dead host plants. Phytopathology 86: 272-276.
\r\nAdaskaveg, J.E., and Ogawa, J.M. 1990. Wood decay pathology of fruit and nut trees in California. Plant Disease 74: 341-352.

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ALIEN RANGE

[1] AMERICAN SAMOA
[1] AUSTRALIA
[1] CAMEROON
[1] CONGO
[1] COTE D'IVOIRE
[1] FIJI
[1] FRENCH GUIANA
[1] GHANA
[1] INDIA
[1] INDONESIA
[1] KENYA
[1] MALAYSIA

[1] NIGERIA
[1] PAPUA NEW GUINEA
[1] SRI LANKA
[1] TANZANIA, UNITED REPUBLIC OF
[1] NORTHERN MARIANA ISLANDS
[3] SAMOA
[1] TAIWAN
[1] VANUATU

BIBLIOGRAPHY

19 references found for **Phellinus noxius**

Managment information

Adaskaveg, J.E., and Ogawa, J.M. 1990. Wood decay pathology of fruit and nut trees in California. Plant Disease 74: 341-352.
Summary: An overview of wood decay pathology of fruit and nut trees, problems in commercial orchards, and a table of fungi collected in California, Oregon, and Washington

Bolland, L. 1984. *Phellinus noxius*: cause of a significant root-rot in Queensland hoop pine plantations. Australian Forestry 47: 2-10.
Summary: The impact of *Phellinus noxius* in hoop pine (*Araucaria cunninghamii*) in Queensland, Australia, plantations is presented, along with the biology of the pathogen, disease symptoms and distribution, and a host list for the region.

Brooks, F. 2001. Brown Root Rot Disease, No. 4, Pests and Diseases of American Samoa. ASCC, American Samoa.
Summary: Based on a 2-yr survey of Tutuila Is., American Samoa, for *Phellinus noxius*. Includes details on the pathogen, survey, a partial host list, and management recommendations.
Available from: http://www2.ctahr.hawaii.edu/adap2/Ascc_Landgrant/Dr_Brooks/BrochureNo4.pdf [Accessed July 2006]

Brooks, F.E. 2002. Brown root rot. The Plant Health Instructor. DOI: 10.1094/PHI-1-2002-0923-01.
Summary: This introductory lesson plan for high school or college students offers text and images of the signs and symptoms of brown root rot disease, plus pathogen biology, disease cycle and epidemiology, management and significance worldwide.
Available from: http://www.apsnet.org/education/LessonsPlantPath/BrownRootRot/default.htm [Accessed July 2006]

Chang, T.T. 1996. Survival of *Phellinus noxius* in soil and in the roots of dead host plants. Phytopathology 86: 272-276.
Summary: Arthroconidia, basidiospores, and mycelium of *Phellinus noxius* in soil tested for survival at different soil water potentials. Infested woody debris appears to be the long-term soil survival mechanism for this organism, which doesn t appear to form chlamydospores.

Chang, T.T., and Yang, W.W. 1998. *Phellinus noxius* in Taiwan: distribution, host plants and the pH and texture of the rhizosphere soils of infected hosts. Mycological Research 102: 1085-1088.
Summary: The geographic distribution of *Phellinus noxius* on Taiwan and some affected hosts.

Hodges, C.S., and Tenorio, J.A. 1984. Root disease of *Delonix regia* and associated tree species in the Mariana Islands caused by *Phellinus noxius*. Plant Disease 68: 334-336.

Iosua, F., and Peseta, O. 2003. ACIAR Project FST/2001/ 045: Development of forest health surveillance systems for South Pacific countries and Australia. Pacific Forest Health Workshop, Suva, Fiji.
Summary: Workshop addressing current and future needs for management policy to direct use of native and existing hardwood plantations. Lists insect and disease (*Phellinus noxius*) pests of Samoan forests and timber.

Lee, S.S., and Zakaria, M. 1993. Fungi associated with heart rot of *Acacia mangium* in penisular Malaysia. Journal of Tropical Forest Science 5: 479-484.
Summary: Methodology of initial identification of *Phellinus noxius* in *Acacia* trees in peninsular Malaysia, description of rot.

Nandris, D., Nicole, M., and Geiger, J.P. 1987. Root rot diseases of rubber trees. Plant Disease 71: 298-306.
Summary: *Phellinus noxius* is one of the most destructive pathogens of rubber trees. Signs of the fungus and symptoms of the disease are followed by several methods of detection: visual examination of the roots, stick-trapping , and remote sensing. Preventive and curative methods are mentioned.

Neil, P.E. 1986. A prliminary note on *Phellinus noxius* root rot of *Cordia alliodora* plantings in Vanuatu. Eurasian Journal of Forest Pathology 16: 274-280.
Summary: A survey of the distribution and impact of *Phellinus noxius* on *Cordia alliodora*, newly introduced in Vanuatu as a high value timber for potential export.

Singh, S., Bola, I., and Kumar. J. 1980. Diseases of plantation trees in Fiji Islands: I. Brown root of mahogany (*Swietenia macrophylla* King). Indian Forester 106: 526-532.
Summary: Touches on nursery practices, site praparation for mahogany planting, disease symptoms, establishment and spread of infection, effects of root pruning and status in natural forests.

Thrower, L.B. 1965. Parasitism of cacao by *Fomes noxius* in Papua -- New Guinea. Trop. Agriculture, Trin. 42: 63-67.
Summary: Symptoms of *Fomes noxius* (*Phellinus noxius*) on cacao in Fiji, including field and experimental observations.

General information

Brooks, F.E. 2002. Brown root rot disease in American Samoa s tropical rain forests. Pacific Science 56: 377-387.
Summary: A summary of research on the incidence of brown root rot disease in the native forests of American Samoa, including host range.
Available from: http://www2.ctahr.hawaii.edu/adap2/Ascc_Landgrant/Dr_Brooks/TechRepNo37.pdf [Accessed July 2006]

Corner, E.J.H. 1932. The identification of the brown-root fungus. The Gardens Bulletin, Straits Settlements 5 (12): 317-350.
Summary: Identified by Corner in this 1932 paper as *Fomes noxius* sp. nov., it is compared with two similar species, *F. lamaensis* and *F. pachyphloeus*. These species were later reclassified by Cunningham in the genus *Phellinus*. Corner describes his field and laboratory observations, including drawings of the disseptiments of these species that clearly define them from each other.

Farr, D.F., Bills, G.F., Chamuris, G.P., and Rossman, A.Y. 1989. Fungi on plants and plant products in the United States. APS Press, USA.
Summary: Used for classification table of fungi, p. 3, the big red book lists fungi and their hosts in the U.S. in host-pathogen and pathogen-host indexes.

Hawksworth, D.L., Kirk, P.M., Sutton B.C., and Pegler, D.N. 1995. Ainsworth & Bisby s dictionary of the fungi. CAB International, UK.
Summary: Used for family classification of *Phellinus* spp., this text gives definitions of mycological terms as well as short descriptions of various fungal taxa.
Pegler, D.N. and Waterston, J.M.. 1968. *Phellinus noxius*: C.M.I. Descriptions of Pathogenic fungi and bacteria, No. 195. Commonwealth Mycological Institute, UK.
Summary: CABI fact sheet describes the morphology and anatomy of *Phellinus noxius*, the disease it causes, geographical distribution and transmission.
Quanten, E. 1997. The polypores (Polyporaceae s.l.) of Papua New Guinea: A Preliminary Conspectus. Opera Botanica Belgica, Vol. 11, National Botanic Garden of Belgium.
Summary: A throrough, well-edited treatment that covers many of the polypores in Oceania. Helpful line drawings, Exhaustively annotated herbarium notes.