



## Rust of Lemongrass

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West Indian lemongrass (*Cymbopogon citratus*) is a perennial grass commonly grown as an ornamental in Hawai'i. It is grown as a crop in Australia and elsewhere for extraction of its lemon-scented oil. The leaves are used as an ingredient in Asian cuisine in Hawai'i. Herbal teas made from the leaves are believed to have a calming effect on the nervous system.

Lemongrass plants in Hawai'i often have an abnormal number of brown and dying leaves. Depending on climatic conditions, lemongrass can become severely infected with a rust disease caused by *Puccinia nakanishikii* which is often responsible for the dying leaves. Heavily infected leaf tissues become discolored and necrotic in streaked patterns that correspond to the leaf veins.

The rust disease can damage plants severely enough that significant economic damage results when lemongrass is cultivated on a commercial scale. Backyard plants grown for condiment or as ornamentals can be damaged to the point that they need to be removed, particularly in high-rainfall areas or rainy seasons.

This publication describes the symptoms of lemongrass rust and outlines what growers can do to manage this common and damaging disease.

### The host

West Indian lemongrass, *Cymbopogon citratus* (DC.) Stapf. (family Poaceae), called lanpine or lukini in Hawaiian, is a densely-tufted perennial grass native to southern India and Sri Lanka. Other reported hosts of the rust disease pathogen are *Cymbopogon nardus* (in Sri Lanka) and perhaps some other species of *Cymbopogon*. The plant genus *Cymbopogon* comprises at least 40 species of evergreen, tufted perennial grasses known for their essential oils, which have cosmetic, culinary and medicinal uses. They grow in warm-temperate, subtropi-

cal, and tropical regions, such as savannah grasslands in Africa and Asia. In Java, India, and Ceylon these grasses are widely cultivated.

Lemongrass plants with the rust disease are safe for humans to use in cooking recipes or as teas after drying the leaves, or as flavoring for beverages, or as additives to cosmetics.

### The pathogen

*Puccinia nakanishikii* Dietel is a fungus first reported in Hawai'i in 1985. The disease has been reported in Hawai'i, California, Thailand, New Zealand, and may be established in other locations where lemongrass is cultivated. It can occur virtually everywhere lemongrass grows in Hawai'i, but it is more severe in warmer, higher-rainfall locations.

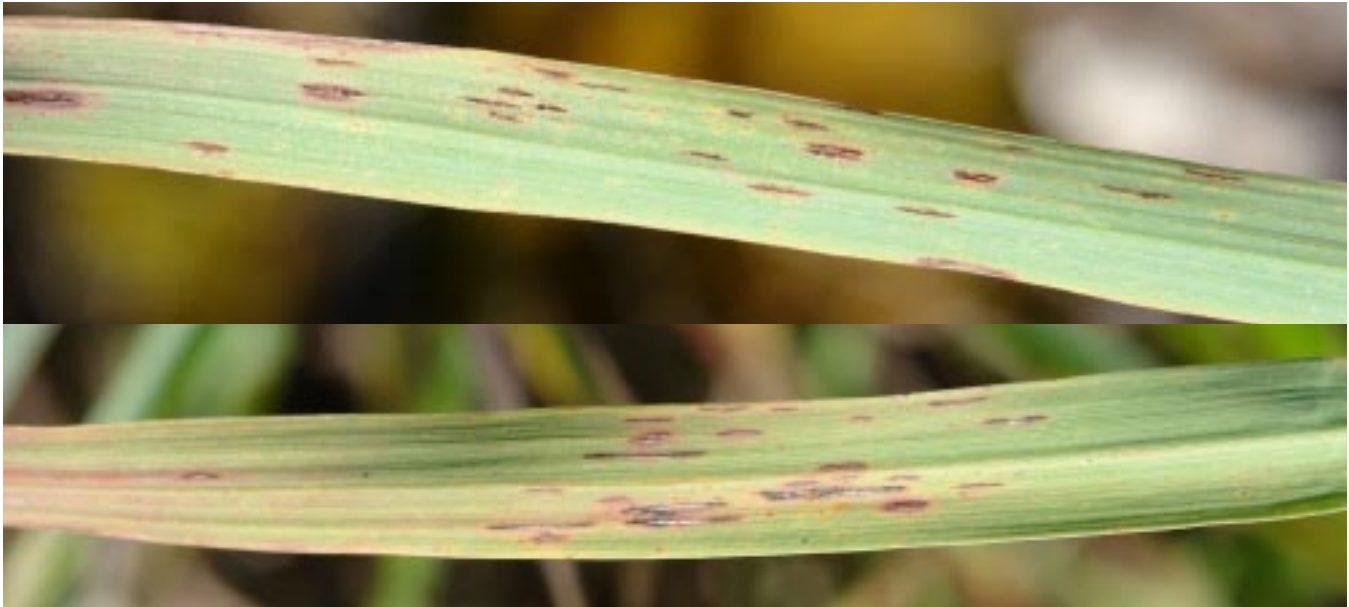
The rust occurs in both the uredinial and telial states in Hawai'i, the former producing lighter brown pustules than the latter. Pustules are produced on both upper and lower leaf surfaces. Ellipsoidal urediniospores measure about 22–28  $\mu\text{m}$  by 22–25  $\mu\text{m}$  and contain three or four germ pores in an equatorial pattern.

Conditions favoring disease development are high rainfall, high humidity, and warm air temperatures. Wind disseminates spores among lemongrass plants.

In Brazil, another rust of lemongrass caused by another *Puccinia* species (*Puccinia cymbopogonis*) has been reported. This disease has not been reported in Hawai'i.

### Disease cycle

Very little has been published about the disease cycle of lemongrass rust. Spores (mainly urediniospores) are dispersed by wind, splashing rain, or irrigation water. The spores land on wet or moist lemongrass leaves and may infect them during periods of very high relative humidity.



The symptoms of lemongrass rust appear on both the lower and upper leaf surfaces of leaves of *Cymbopogon citratus*.

Photos: S. Nelson

Infections eventually result in lesions that release more spores to further spread infections. Spores may survive on infected or fallen lemongrass leaves.

### Disease symptoms

Initial symptoms are tiny, light yellow spots that develop into brown spots and elongated, stripe-like, brown lesions that coincide with leaf veins and develop on both sides of the leaf. Lesions on the lower leaf surface erupt and develop dark, cinnamon-brown uredinial pustules. Lesion development can be substantial, with coalescing lesions forming large leaf spots or blights and causing premature death of leaves.

The principal negative effects of lemongrass rust on the plant are defoliation (direct effect) and poor leaf and oil yield (indirect effect). The rust disease is normally not fatal to lemongrass plants, even though defoliation may be severe.

### Integrated management practices

- Keep plants growing vigorously; use composts, mulches, and fertilizer to stimulate growth.
- Intercrop or polycrop lemongrass with non-hosts of the pathogen; avoid planting large numbers of lemongrass plants close to one another.
- Do not purchase or distribute rusted plants.
- Grow plants under plastic or rainproof cover to protect their leaves from rainfall.

- Periodically prune, cut back, or thin out diseased lemongrass plants so that disease-free re-growth can occur; destroy diseased plant material (do not use it around pruned lemongrass plants as mulch).
- Keep weeds under control to reduce relative humidity in the lemongrass plant canopy.
- Plant lemongrass in well drained soils in a relatively dry or well ventilated area to minimize the time of leaf wetness after rainfall.
- Minimize overhead irrigation; lemongrass grows well in dry areas.

### Fungicides registered in Hawai'i for lemongrass rust

There is only one fungicide product registered for use on lemongrass rust in Hawai'i, Trilogy (Table 1). There is no published research in Hawai'i evaluating this product for controlling lemongrass rust.

### Biological control

A potential biological control agent, a *Darluca* mycoparasite species, was often observed in uredinia of diseased lemongrass in coastal counties of California (Koike, 1999). It is unknown if this mycoparasite exists in Hawai'i, nor has the extent of the mycoparasitism and whether or not it provides effective disease control been determined.



A heavily rusted lemongrass plant with some entirely brown and blighted leaves

## References

- Bandara, J.M.R.S. 1981. *Puccinia* rust of citronella and lemongrass in Sri Lanka. *Plant Disease* 65:164–165.
- Cummins, G.B. 1945. Descriptions of tropical rusts-VII. *Bulletin of the Torrey Botanical Club*, Vol. 72, No. 2 (Mar.–Apr., 1945), p. 205–222.
- Cummins, G.B. 1971. The rust fungi of cereals, grasses, and bamboos. Springer-Verlag, New York.
- Gardner, D.E. 1985. Lemongrass rust caused by *Puccinia nakanishikii* in Hawaii. *Plant Disease* 69: 1100.
- Gardner, D.E., and C.S. Hodges, Jr. 1989. The rust fungi (Uredinales) of Hawaii. *Pacific Science* 43: 41–55.
- Gardner, D. 1996. Rust and smut fungi of Hawaii: An annotated host index on angiosperms and ferns. Pacific Islands Ecosystems Research Center, Technical Report 100. [www.botany.hawaii.edu/faculty/duffy/techr/100.pdf](http://www.botany.hawaii.edu/faculty/duffy/techr/100.pdf).
- Koike, S.T. 1999. Rust disease on lemongrass in California. *Plant Disease* 83: 304.
- Neal, M.C. 1965. In gardens of Hawaii. Bernice P. Bishop Museum Special Publication 50. Bishop Museum Press, Honolulu.
- Simon, J.E., A.F. Chadwick, and L.E. Craker. 1984. Herbs: An indexed bibliography. 1971–1980. The scientific literature on selected herbs, and aromatic and medicinal plants of the temperate zone. Archon Books, Hamden, Conn. 770 p.
- Williams, J., D. Lawrence, N. Mawji, and M. Sutherland (eds). 2004. The American Horticultural Society A-Z encyclopedia of garden plants. DK Publishing, Revised U.S. edition.



Symptoms of rust on West Indian lemongrass (*Cymbopogon citratus*) in Hawaii, caused by the plant-pathogenic fungus, *Puccinia nakanishikii*



Initially, infections appear as tiny yellow spots that develop into the larger brown spots or stripe-like lesions along or near leaf veins. The spots or stripes develop on both the lower and upper leaf surfaces. Erupting pustules on abaxial leaf surfaces contain cinnamon-brown urediniospores. Small, chlorotic yellow halos may appear around lesions.



Coalescing lesions from heavy infections may cause significant foliar necrosis and premature leaf death.

**Table 1. Fungicides currently registered in Hawai'i for application to lemongrass. The only product that lists rust on the pesticide label is Trilogy.**

***Product name and EPA Registration number\****

Ridomil Gold EC Fungicide, 100-801

Rampart, 34704-924

Rootshield granules, 68539-3

Messenger (Disc.), 69834-2

EBC-151 (Disc.), 69834-2

Messenger Seed Treatment, 69834-2

Trilogy (neem oil), 70051-2

Fungi-Phite, 83472-1

\*Ridomil, Rampart, and Fungi-Phite are for oomycete pathogens (e.g., *Phytophthora* and *Pythium*) that normally infect roots under wet conditions. They are not labeled for rust pathogens. Messenger and EBC are harpin protein products that supposedly increase plant health and plant defenses against diseases. Rootshield is a biopesticide product that protects against soil-borne diseases (e.g., root rots). The information in Table 1 was obtained from the Hawaii Pesticide Information Retrieval System (HPIRS) using the keyword "herb." The data were provided by Mike Kawate (UH-CTAHR).

### **Acknowledgments**

Mike Kawate, UH-CTAHR for information about lemongrass pesticides; Barbara Fahs (Hiiakas Healing Herb Garden, island of Hawai'i), for information about lemongrass, rust disease management, and for access to diseased lemongrass plants; Fred Brooks (UH-CTAHR) for review.