

Main Pests and Diseases of Zingiberaceae and Their Control

Jun'ai Hui^{1,2}, Nian Liu^{1*}

¹College of Horticulture and Landscape Architecture, Zhongkai University of Agriculture and Engineering, Guangzhou, China

²Zhongkai Guangmei Research Institute, Meizhou, China

Email: *jahui78@126.com

How to cite this paper: Hui, J.A. and Liu, N. (2023) Main Pests and Diseases of Zingiberaceae and Their Control. *American Journal of Plant Sciences*, 14, 988-993.
<https://doi.org/10.4236/ajps.2023.149067>

Received: July 13, 2023

Accepted: September 22, 2023

Published: September 25, 2023

Copyright © 2023 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

The primary diseases affecting Zingiberaceae plants include ginger plague, spot blotch, anthracnose, leaf spot, leaf blight, and soft rot. Insect pests that pose a threat to these plants encompass root-knot nematode disease, drilling bugs, beet nightshade moths, mesquite, thrips, and aphids. This article aims to summarize the defining features of the principal pests and diseases as well as their control methods. The intention is to offer theoretical support for the preservation of ginger plants.

Keywords

Zingiberaceae Plants, Diseases, Pests

1. Overview of Zingiberaceae

The Zingiberaceae family comprises approximately 50 genera and 1500 species worldwide, predominantly found in tropical and subtropical regions. In China, there are 21 genera and 226 species, primarily distributed in the southwestern and southeastern provinces and districts, with a notable prevalence in Yunnan, Hainan, and two other provinces [1] [2] [3]. While Zingiberaceae exhibits resistance to various pests and diseases, it can become susceptible to illness under conditions of waterlogged and poorly ventilated soil. This susceptibility adversely affects the growth, value, and overall development and utilization of Zingiberaceae [4]. Therefore, it is important to identify and address the main diseases and pests that affect ginger plants, as well as implement appropriate control measures. These efforts will provide the necessary theoretical support for the conservation of ginger plants.

2. The Main Diseases and Pests of Ginger Plants

2.1. Ginger Plague

Symptoms: The fungus infests underground stems and roots, primarily emerging from the stem base and displaying a dark purple appearance. Initially, the above-ground section wilts and eventually perishes. Infestation can be transmitted through irrigation water, rainwater, pests, etc. Disease severity typically peaks approximately one week after summer and autumn rainfall.

Prevention and control: Utilize a 2% solution of Chloramphenicol wettable powder diluted 300 - 500 times or a 20% solution of Pyrethrin water diluted 1000 - 1500 times. Apply the solution by spraying the stem base or irrigating the roots, depending on the disease's condition, at intervals of 7 - 10 days [4] [5].

2.2. Spot Disease

Symptoms: Leaf spots are pike-shaped or oblong, measuring 3 - 5 mm in length. They have brown edges, a yellowish-white center, and appear thinned, making them prone to rupture or perforation. In the later stages, the spots develop numerous small black dots on their surface. Severe cases result in the entire leaf being covered in spots. The disease thrives in warm and humid conditions, especially in plant depressions and areas with high field humidity.

Prevention and Control: To mitigate the spread of the disease, a mixture of 70% metribuzin wettable powder and 75% chlorothalonil wettable powder can be used in equal quantities to create a 600 times liquid solution. Alternatively, a 30% pyrimethanil solution can be prepared at a concentration of 1000 times, along with a 25% amethystat suspension at a concentration of 1500 times liquid. These preventive measures should be implemented every other week, with a total of 3 - 4 treatments [4].

2.3. Anthrax

Symptoms: Water-soaked spots, initially brown, appear on the leaf tips or margins. These spots expand downwards and inwards, forming round or pike-shaped to irregularly shaped brown spots. The spots may exhibit cloud patterns. In severe cases, the spots merge, leading to leaf dehydration.

Prevention and Control: Apply a solution of 20% azoxystrobin vinegar water dispersible granules at a concentration of 1000 - 1500 times. Alternatively, use a 20% silazole-miconazole water emulsion at a concentration of 2000 - 3000 times. Another option is to use a 40% Duo-Fu-bromoxynil wettable powder at a concentration of 800 - 1000 times. Spray the solution once every week or as needed [4].

2.4. Leaf Spot Disease

Symptoms: Leaves display irregularly shaped spots that are greyish-white in the center and brown at the edges. In severe cases, these spots merge into larger

areas, leading to leaf dehydration.

Prevention and Control: To address this issue, it is recommended to use a 52.5% *Isobacillus*-*Polybacillus* wettable powder solution diluted 800 - 1000 times, as well as a 64% Copper Hydrogen-Fumex zinc wettable powder solution, also diluted 1000 times. It is advised to spray these solutions every 7 - 10 days, depending on the severity of the condition [5].

2.5. Leaf Blight

Symptoms: In the early stage of the disease, small yellow-brown spots appear on the leaves. These spots gradually expand and can easily perforate the entire leaf. When the disease becomes severe, the leaves turn brown and eventually die.

Prevention and Control: To prevent and control the disease, a solution of 52.5% *Isobacillus*-*Multibacillus* wettable powder diluted 800 - 1000 times should be used. Alternatively, a solution of 68.75% oxamyl-manganese-zinc water-dispersible granules diluted 800 - 1000 times is also effective. It is recommended to spray these solutions once every 7 - 10 days [4] [5].

2.6. Soft Rot

Symptoms: Tuberos fleshy stems develop in a waterlogged state. Severe infection can result in quick deterioration of the underground roots, leading to soft rot in the stems and withering of the entire plant [2] [3] [4].

Prevention and Control Measures: Apply a 30% suspension of green get Bao at a dilution rate of 500 times; a 30% suspension of copper oxychloride at a dilution rate of 800 times; a 50% wettable powder of copper amylate at a dilution rate of 500 times; and a 72% soluble powder of agro-streptomycin sulphate at a dilution rate of 3000 times [4] [5].

3. Main Pests of Ginger Plant

3.1. Root-Knot Nematode Disease

Symptoms: From seedling to adult can develop, the onset of the plant in the root and rhizome can produce varying sizes of verrucous root nodules, root nodules are generally the size of a bean grain, sometimes in bunches, at first for the yellow-white protuberance, and gradually become brown, rupture, rotting. Because of the root damage, the absorption function is affected, slow growth, small leaves, dark green leaves, short stems, small branches, generally shorter than the normal plant about 50%, but the plant rarely died.

Prevention and Control: 1.8% - 2.0% abamectin emulsion 800 - 1000 times can be used to irrigate the roots at the early stage of the disease [6] [7].

3.2. Podconiosis

Disease: Commonly known as ginger borer or corn borer, this disease tends to occur in areas with moderate temperatures and high humidity. It is less likely to occur in regions with high temperatures and dry conditions. The affected plants

usually reach a height of about 20 cm. The first generation of drilling bugs begins to cause harm, starting with the young leaves and progressing to the stems at around 3 weeks of age. These insects often infest the moth at nodes 2 - 3, causing wilting of the leaves or the entire plant to wither. The second generation primarily infests the middle and upper parts of the stem, with the middle section being the most heavily infested.

Prevention and Control: The red-eye wasp serves as the primary natural predator of the heartworm during the egg stage. It should be released every three days to effectively control the population. Additionally, chemical control measures can be employed by applying chemicals to the plants before the borers enter the stalks. Foliar spraying of a 2.5% deltamethrin emulsion at a concentration of 1500 times, or 2.5% imidacloprid at a concentration of 1000 times, among other options, can be used [6] [7].

3.3. Sugar Beet Moth

Disease: The larvae of beet nightshade are the most destructive. These larvae can be divided into five age categories. The first and second age larvae gather in the egg mass on the back of the leaf and produce silk nets to feed on the leaf tissue. The third age larvae disperse and continue to cause damage. The fourth age larvae experience a significant increase in food consumption. The feeding period from the fourth to fifth age larvae is particularly harmful.

Prevention and Control: The adult beet nightshade moths exhibit characteristics such as convergence, chemotaxis, and preference for movement, feeding, and egg-laying on certain flowering honey crops. This knowledge can be utilized to set up traps for prevention and control measures. Biopesticides, such as Bt preparations, Bt insecticidal variants, and mixtures of Bt and *Bacillus thuringiensis*, are commonly used for control [6] [7].

3.4. Mesostigma

Disease: The disease is typically found on the stem, leaf margins, or abaxial surface of leaves, as well as on the inflorescences and fruiting sequences of Zingiberaceae. Occasionally, it may also be observed on the leaf surface. The parasites suck plant sap using prick-sucking mouthparts, which affects plant growth. In severe cases, it can lead to withered leaves, leaf drop, or even the death of the entire plant. Additionally, these wounds are vulnerable to viral infections after infestation.

Prevention and Control: The recommended methods for preventing and controlling this disease include using a 40% Lego emulsion at a dilution of 1000 times, a 50% trichlorfon at a dilution of 250 times, an 80% dichlorvos emulsion at a dilution of 1000 - 1500 times, and a 2.5% deltamethrin emulsion at a dilution of 2000 - 2500 times. It is generally advised to spray the plants 1 - 3 times in a continuous manner, with each interval being 7 - 10 days for optimal effectiveness [6].

3.5. Thrips

Disease: The disease affects the inflorescences, flowers, and leaves of ginger plants. It is caused by insects that pierce the plant sap using needle-like mouthparts, resulting in the appearance of numerous small white or grey-white spots on the surface of the leaves. This significantly hinders the growth of the plant. Furthermore, when the inflorescence is damaged, it leads to deformities and difficulties in achieving normal blooming or vibrant flower colors.

Prevention and Control: To prevent and control the disease, it is recommended to spray the entire plant with a 50% phoxim emulsion 1200 - 1500 times before flowering. This should be done once a week, with a total of 3 - 5 repeated applications [7].

3.6. Aphids

Disease: Adult aphids, including wakame aphids, pose a threat to various parts of the plant such as leaves, buds, and other young organs. They extract significant amounts of sap nutrients, leading to malnutrition in plants. Moreover, their excretions, known as honeydew, create an environment conducive to the growth of mold and the onset of diseases like black rot and venomous infections.

Prevention and Control: For effective prevention and control, it is recommended to employ the following spray solutions: 40% acephate at a 1000-fold dilution, 50% fenitrothion emulsion at a 1000-fold dilution, and 20% permethrin emulsion at a 2000 - 3000-fold dilution. These should be sprayed onto the affected areas every 7 to 10 days, repeating the process 3 to 4 times [6] [7].

4. Summary

The main diseases affecting ginger plants are soft rot disease, anthracnose, and major pests such as thrips and scale insects, which significantly impact ginger yield. Ginger wilt disease occurs during storage, while other diseases and pests mainly occur during the growth period. Strengthening field management is essential. Attention should be paid to ginger plantation density, timely removal of old and decaying leaves in the field, and reduction of field humidity. After harvesting ginger, proper storage methods are necessary to maintain its quality. The suitable temperature for ginger preservation is 16°C - 20°C, with a humidity range of 90% - 95%.

Funding

Quality Engineering Construction Project of Guangdong Province (KA2103116 Floriculture, KA23YY055 Floriculture); Cultivation of Model Courses on “Curriculum Thinking and Politics”—Floriculture (Zhongkai KA210315732); Cultivation of Innovative Ability of Graduate Students in Agriculture and Forestry in the Guangdong-Hong Kong-Macao Greater Bay Area and its Practices (Zhongkai KA190576107), and Project Support for the 2022 Graduate Education Reform Special Project of Zhongkai University of Agriculture and Engineering

(Zhongkai Research No.11, 2022).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Liu, N. (1994) Floral Resources of Zingiberaceae. *Guangdong Garden*, No. 3, 15-16. (In Chinese)
- [2] Pan, T. and Dai, F. (1992) Geographical Distribution of Zingiberaceae in China. *Journal of Yuzhou University*, No. 23, 23-29. (In Chinese)
- [3] Wu, D.L. (2016) Resources of the Chinese Zingiberaceae. Huazhong University of Science and Technology Press, Wuhan, 1-195.
- [4] Wu, Z.F. (1998) Main Diseases of Zingiberaceae and Their Control. *Guangxi Agricultural Science*, No. 4, 194-195. (In Chinese)
- [5] Han, J.S. (1990) Diseases of Chinese Medicinal Plants. Jilin Science and Technology Press, Changchun.
- [6] Hua, J. (2003) Disease and Pest Control of Flowers in the Ginger Family. *Bonsai*, No. 4, 28-29. (In Chinese)
- [7] Wu, Y.S., Dong, Z.L., Liu, D.M., *et al.* (2002) Main Diseases of Zingiberaceae in South China Botanical Garden and Their Control. *Chinese Materia Medica*, No. 25, 773-775. (In Chinese)