



“STUDIES ON VARIOUS DISEASES AND INSECT PESTS OF VEGETABLE TOMATO”

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ABSTRACT

The studies on various diseases and insect pests of vegetable tomato have contributed to a better understanding of the causes and methods of control for these issues. The research has helped in the development of strategies for disease and insect management, such as breeding for disease resistance, the use of pesticides, and the implementation of integrated pest management techniques. These efforts have led to improved tomato yields and quality, and have also helped to reduce the negative impacts of diseases and insects on the environment.



KEYWORDS: *Tomato, control, various diseases and pests.*

INTRODUCTION

The continuous development of economy and society has brought about global climate and environmental problems. The occurrence of diseases and insect pests seriously affects people's life. The incidence and occurrence of plant diseases and insect pests is higher and higher and more complex. Therefore, it is very important to study the prevention of plant diseases and insect pests, as well as the diagnosis and remedial measures of plant diseases and insect pests. The origin of tomato is South America. Tomato is one of the important economic crops, which not only contains rich vitamins, but also can be used as fruit. In recent years, with the popularity of Western food, tomato sauce is more and more popular. The demand for tomato is increasing, and it has gradually become an important food in people's daily life. Therefore, tomato plays an extremely important role in agricultural vegetable production and vegetable trade. As one of the most widely cultivated vegetables in the world, tomato has not only high yield, wide adaptability, but also high nutritional value. But, like other crops, tomato is affected by various diseases and pests in its growth process. Diseases include tomato virus disease, tomato nematode disease, tomato deficiency disease, tomato physiological disease, tomato bacterial disease, and tomato fungal disease. Pests mainly include leaf miner, greenhouse whitefly, Alfalfa noctuid moth, tobacco green worm, cotton bollworm, and *Polyphagotarsonemus latus*, etc. Usually, the occurrence of tomato diseases and pests is greatly affected by the local environment, varieties, cultivation, and management factors, so the types of tomato diseases and pests in different regions are different.

The cultivation area of facilities and open-field tomatoes has gradually increased. If improper field management can increase the probability of infection by diseases and pests, leading to outbreaks of diseases and pests, which has a significant impact on tomato yield and quality. Field investigation

revealed that common tomato diseases in Indore, mainly include early blight, late blight, yellow leaf curl virus, brown spot, coal pollution, gray mold, leaf mold, navel rot, leaf curl disease, mosaic; common tomato pests mainly include leaf miner and greenhouse whitefly. According to the statistical data analysis of field investigation, it can be seen that the incidence of tomato diseases and pests in different farm households varies greatly in the field, with the yield loss of 1%–5% in the area with mild onset and more than 30% in the area with severe onset. At present, although many studies have reported the infection and detection of tomato pests and diseases in different regions, there is a lack of systematic reports on the detection of the main pests and diseases of tomatoes commonly found in Indore. Therefore, it is very necessary to take 10 common diseases and 2 common insect pests in Indore area as the research objects, and collect and collate the relevant data to provide theoretical basis for targeted early warning and prevention and control in the field. The occurrence of tomato diseases and pests in different regions seriously affects tomato production. If the control is not timely, it will lead to yield reduction or even crop failure.

RESULTS AND DISCUSSION:

Tomato is a round or oblong shaped fruit that is commonly used as a vegetable in cooking. It is juicy and fleshy, with a bright red color and a slightly sweet and acidic taste. Tomatoes are rich in vitamins and minerals such as vitamin C, potassium, and lycopene. They can be eaten raw or cooked in many dishes, such as salads, sauces, soups, stews, and pizzas. Tomatoes are a staple ingredient in many cuisines worldwide. Synthetic insecticides are widely used in most developing countries to control insect pests of food crops. This has contributed to the environmental pollution through air or as residues in food. In the last years is the use of environmentally biopesticides, such as plant extracts widely increased.

Disease and pest prevention is the best way to reduce yield loss and reduce pesticide application to produce pollution-free vegetables. When plants grow to the point where symptoms of pests and diseases already occur, even if people can make accurate diagnosis and appropriate treatment, it is also a passive remedy. Although this is also very necessary, at this time, the application of agricultural chemicals and pesticides has poor control effect and is easy to cause environmental pollution, which leads to excessive pesticide residues in vegetables, and at the same time leads to more and more resistance of pests and diseases, making the work of crop disease resistance more and more difficult, which is an undesirable result. Therefore, early prediction and prevention of diseases and pests are very important. Research on tomatoes (Diaz-Pendon et al., 2010; Gilbertson and Batuman, 2013) shows how susceptible a plant is to be influenced by diseases and pests. With regard to how to effectively control diseases and insect pests and help vegetable farmers to improve the yield of tomato, the most important thing is to make accurate identification of diseases and insect pests. Therefore, the identification of tomato diseases and insect pests is the most serious challenge for scientific and technical personnel.

The traditional method of artificial detection of diseases and insect pests completely depends on the observation experience of the grower, or ask experts for guidance. Such a method is not only slow, but also is of low efficiency, high cost, strong subjectivity, low accuracy, and timeliness. With the continuous development of the Internet, the application of information technology provides new methods and ideas for crop diseases and insect pests' identification. Using efficient image recognition technology can improve the efficiency of image recognition, reduce the cost, and improve the recognition accuracy. Therefore, experts and scholars at home and abroad have done a lot of research, in which deep learning has become the research focus. The application of deep learning in crop diseases and insect pests' identification can greatly reduce the workload and shorten the identification time. Complex network structure and huge data samples are the biggest characteristics of deep learning. The emergence of deep learning technology provides strong technical support for image recognition.

Harvest: The first harvest is ready in 10-12 weeks after transplanting. The harvest period continues for 8-10 weeks. Tomatoes are harvested ripe (in red color) for the local market.

Climate and soils: Tomato is a cool season crop thriving best in the winter months, but it can be grown through the year in different parts of the country, provided that the temperature is suitable for tomato fruit set. The best soil for tomato production is the silt soil or the loamy clay soil, but it can be grown in a wide variety of soils provided that they have good drainage and a sufficient fertility level.

Common pests and diseases:

Insects: An insect is a type of arthropod that has six legs, a three-part body (head, thorax, and abdomen), and two wings. They form the largest group of animals on Earth, with over a million known species. Insect control refers to the management and regulation of insect populations in order to minimize damage to crops, forests, and human health. It can involve using physical, chemical, or biological methods to eliminate or reduce the number of insects. Common methods include insecticide sprays, pheromone traps, biological control using natural predators, and genetically modified crops that are resistant to insect damage.

Tomato fruit worm (*Helicoverpa zea*): This caterpillar is a common pest that feeds on tomato leaves, fruit, and stems.

Tomato Hornworm (*Manduca quinquemaculata*): This large caterpillar can cause significant damage to tomato plants by eating the leaves, stems, and fruit.

Aphids: Aphids are small, pear-shaped insects that feed on the sap of tomato plants, causing yellowing and wilting of leaves.

Whiteflies: Whiteflies are tiny, white, flying insects that feed on tomato leaves, causing yellowing and wilting.

Colorado Potato Beetle (*Leptinotarsa decemlineata*): This beetle feeds on the leaves of tomato plants, causing defoliation and reducing yields.

These are just a few of the many insects that can damage tomato plants. To prevent and control infestations, it is important to regularly monitor tomato plants for signs of insect damage and to implement integrated pest management practices, such as using row covers, handpicking, and biological controls. Tomato plants are subject to infestation by the sucking insects, white fly (*B. tabaci*) and cotton aphid (*A. gossypii*). American bollworm (*Heliothis armigera*) attacks the ripened and pre-ripened fruits, contaminating them with faeces and exposing them to fungi and bacteria. Cotton leaf worm (*Spodoptera littoralis*) primarily damages the Summer crops. It causes defoliation, but also it can bore into and feed on interior of fruits. Leaf miner (*L. trifolii*) attacks also tomato leaves causing various losses.

Diseases: Tomato plants are subject to infestation by tomato leaf curl, spodoptera leaf spot, late blight (*Phytophthora infestans*), bacterial leaf spot (*Xanthomonas vesicatora*), Blossom end rot (caused by water stress) and nematodes (*Meloidogyne* spp.).

Integrated Pest Management (IPM):

This involves combining different methods like cultural practices, biological control, and minimal use of chemical pesticides to control insect pests in tomato crops.

Biological Control: This involves the use of natural predators such as ladybugs, lacewings, and parasitic wasps to control pests.

Crop rotation: This involves alternating tomato crops with other crops to reduce the build-up of pests and diseases.

Use of resistant varieties: Certain tomato varieties have been developed with built-in resistance to common insect pests.

Proper sanitation: Regular cleaning of the tomato field can reduce pest populations and the spread of diseases.

Chemical control: When necessary, chemical insecticides can be used to control pests, but should be used in conjunction with other pest control methods.

Monitoring: Regular monitoring of tomato crops for the presence of pests is important to detect infestations early and respond promptly.

CONCLUSION:

Tomato is affected by various diseases and pests during its growth process. If the control is not timely, it will lead to yield reduction or even crop failure. How to control the diseases and pests effectively and help the vegetable farmers to improve the yield of tomato is very important, and the most important thing is to accurately identify the diseases and insect pests. Compared with the traditional pattern recognition method, the diseases and pests recognition method based on deep learning can directly input the original image. Instead of the tedious steps such as image preprocessing, feature extraction and feature classification in the traditional method, the end-to-end structure is adopted to simplify the recognition process and solve the problem that the feature extractor designed manually is difficult to obtain the feature expression closest to the natural attribute of the object. Based on the application of deep learning object detection, not only can save time and effort, but also can achieve real-time judgment, greatly reduce the huge loss caused by diseases and pests, which has important research value and significance. Through the above research, the key technology of tomato pest image recognition in natural environment is broken through, which provides reference for intelligent recognition and engineering application of plant diseases and pests detection.

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