Analysis of pathogenic characteristics of fungi causing alternariosis disease in vegetable crops

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Abstract. In the article, in order to increase the yield and quality of vegetable crops grown in our Republic, the use of modern technology in their cultivation, the introduction of productive and suitable varieties for local conditions, and a number of factors have a special place in the effective protection of vegetables from various diseases. It is known that alternaria diseases of vegetable crops have been studied and scientifically based control measures have been developed. It has been proven that it is possible to recommend a chemical method against Alternaria disease in our country.

1 Introduction

Alternaria is a brown disease. Fungal disease. Affects leaves and fruits. At first, large round brown spots with concentric circles appear on the lower part, and then spots appear on the upper leaves.

Over time, the spots multiply, merge and cover a significant part of the leaf. Severely damaged leaves die. In fruits, the disease usually develops in the form of depressed round concentric black spots on the base of the fruit, as well as in places of tissue rupture. In wet weather, a black velvet coating appears on the spots. Alternaria is especially dangerous in hot summers and years with frequent dew and rain. The infection persists in post-harvest residues and can be spread by seeds. The causative agent of the Alternaria fungus - plants have special formations during the growing season.

Chlamydospores of the fungus can survive in the soil. Additional sources of infection can serve as damaged remains of other plants - pepper and eggplant. It is recommended to implement an integrated system to protect potatoes from Alternaria disease. It is necessary to pay attention to potato varieties that are less affected by the disease. Preparation of seed...
material should include a number of methods. Planted seed potatoes must be subjected to phytopathological analysis and removal of diseased roots before storage at a temperature of +15°C, +18°C for 10-15 days or at the end of the storage period. Before planting, tubers should be treated with approved chemicals or biofungicide. In this case, you can also use growth regulators, the action of which is based on stimulating the protective reactions of plants.

Alternaria disease of potatoes and tomatoes. According to the results of the study, Alternaria species with small spores, such as *A. tenuissima* and *A. arborescens*, are often found on almost all plants. *A. alternata* and *A. infectoria* species are rare. Alternaria disease primarily affects the leaves, stems, roots and fruits of the plant and is considered very harmful. This disease causes potato yield loss of 10-50%, tomato yield loss can reach 78-90%.

Different species of *Alternaria* have different toxicities. Most of the fungal phytotoxins are secondary metabolites, low molecular weight components that are not necessary for normal growth and reproduction. Phytotoxins can be divided into two categories: specific and non-specific. The main mechanism of pathogenicity of *Alternaria spp*. It is possible to separate different metabolites with phytotoxic effects during their life. Different species of *Alternaria* have different toxicities. Most of the fungal phytotoxins are secondary metabolites, low molecular weight components that are not necessary for normal growth and reproduction. Phytotoxins can be divided into two categories: specific and non-specific toxins that have a weak phytotoxic effect, affect a wide range of plant species and, among others, are an additional virulence factor. These are entry mechanisms and enzymatic processes.

Until recently, the causative agents of *Alternaria* fungi, which are widespread in nature, found in soil and decaying plant residues, were considered typical saprotrophs. In recent years, species with pathogenic properties affecting important agricultural crops, including corn, ornamentals, oilseeds, cauliflower, broccoli, carrots and potatoes, tomatoes, citrus fruits, apple trees, and grapes have been reported. Information is increasing.

2 Research methods

Y.N. Fadeyev’s method was used in the artificial contamination of vegetable crops. The types of fungi were determined using a MIKMED-5 microscope and BMS-2 binoculars. The methods of M.K. Khokhryakov, I.A. Dudka, S.P. Wasser and others were used to collect herbarium samples from diseased vegetable crops, and the method of N.A. Naumova was used to isolate fungal species from diseased seeds. In the identification of *Alternaria* species that cause Alternaria disease in vegetable crops, the identifiers of N.A. Naumov, P. Neergard, T.A. Dobrazrakova, M.A. Litvinov, E.G. Simmons, M.B. Ellis, J. Rotem, A.M. Levkina and other scientific sources were used.

Protection of tomatoes from Alternaria disease is carried out by a number of measures. In particular, when growing tomatoes, special attention should be paid to varieties with high disease resistance. This increases the yield and reduces the cost of protection measures. The seeds should be treated with an approved fungicide.

Crops should be properly rotated. In this case, after 3-4 years, tomatoes should be replanted in their original place. In addition, considering that the fungus *A. solani* also infects potatoes, tomato planting should be avoided near this crop.

In order to increase the resistance of plants to diseases, it is necessary to strictly follow agrotechnological methods. In protected soil conditions, it is necessary to maintain temperature and humidity regimes that prevent the development of dry spots. It is recommended to use approved fungicides against Alternaria disease.
3 Research results and their analysis

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**Table 1.**

<table>
<thead>
<tr>
<th>Strain</th>
<th>Pathogenicity</th>
<th>Toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>85</td>
<td>90</td>
</tr>
<tr>
<td>S2</td>
<td>75</td>
<td>80</td>
</tr>
<tr>
<td>S3</td>
<td>90</td>
<td>95</td>
</tr>
<tr>
<td>S4</td>
<td>80</td>
<td>85</td>
</tr>
</tbody>
</table>

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**References**

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Table 1. Artificial infection rate of isolated Alternaria fungal strains on vegetable crops (Laboratoriya tajribalari, 2014-2015 yillar)

<table>
<thead>
<tr>
<th>Test cultures</th>
<th>Potato</th>
<th>Carrot</th>
<th>Cabbage</th>
<th>Onion</th>
<th>Tomato</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternaria alternata</td>
<td>2+</td>
<td>2+</td>
<td>2+</td>
<td>1+</td>
<td>3+</td>
<td>-</td>
</tr>
<tr>
<td>A.tenuissima</td>
<td>2+</td>
<td>1+</td>
<td>3+</td>
<td>2+</td>
<td>2+</td>
<td>-</td>
</tr>
<tr>
<td>A.longissima</td>
<td>1+</td>
<td>1+</td>
<td>1+</td>
<td>1+</td>
<td>2+</td>
<td>-</td>
</tr>
<tr>
<td>A.infectoria</td>
<td>2+</td>
<td>1+</td>
<td>1+</td>
<td>1+</td>
<td>2+</td>
<td>-</td>
</tr>
<tr>
<td>A.solani</td>
<td>4+</td>
<td>3+</td>
<td>2+</td>
<td>1+</td>
<td>4+</td>
<td>-</td>
</tr>
<tr>
<td>A.radicina</td>
<td>1+</td>
<td>3+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>A.brassicae</td>
<td>-</td>
<td>-</td>
<td>3+</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>A.brassicola</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>A.porri</td>
<td>-</td>
<td>-</td>
<td>4+</td>
<td>-</td>
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<td>A.cucumerina</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>A.solani f.sp lycopersici</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>

Reminder: 2+ - weak damage; 3+ - average damage; 1+ - there are signs of disease; 4+ - severely damaged.

4 Conclusion

The virulence of Alternaria species is related to the properties of enzymes and largely depends on the immune status of host plants, and pathogenicity is determined by the ability of these fungi to produce toxins.

The effectiveness of the fight against Alternaria depends on the correct selection of the strategy and tactics of protection measures based on the objective data obtained from the monitoring of these mycopathogens. In order to completely combat the Alternaria disease in tomatoes and potatoes, it is necessary to develop a system of flexible ecological protection measures based not only on the use of effective fungicides of various genes, but also on the increase and application of non-specific control methods of tomato and potato plants [1].

From herbarium samples collected from 18 vegetable crops, 11 Alternaria species and 1 form of Alternaria species were identified. 3 of the commonly identified species: A. sapssapiannui - pepper, A. japonica - cabbage, turnip, radish, radish and lettuce, A. ramulosa - parsley were returned for the first time for our republic. A pure culture of 200 strains belonging to the genus Alternaria was isolated.

Among vegetable crops: turnip, radish, rapeseed, radish, parsley, eggplant, garlic, onion, dill, lettuce, cilantro, celery and beets, the disease of alternaria was studied for the first time.

In the conditions of Tashkent region, potato, tomato and cabbage crops from vegetable crops were affected by alternaria spotting and alternaria black rot disease during the storage period of fruits [7].
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