New protectants against cotton seeding diseases (root rot and gommosis)

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Abstract. One of the primary crops grown in the Republic of Uzbekistan is cotton. Root rot and gommosis, two cotton sprout diseases, seriously harm cotton cultivation. Some illnesses were shown to have significantly increased in some years. Cotton seeds coated with fungicides are sowed in Uzbekistan. Yet, outbreaks of cotton root rot and blight were frequently seen under production-related circumstances. The gums that protrude from the surface of the cotton plant's damaged organs gave gommosis its name. Many aspects of cotton's growth, including the cotyledons, leaves, stems, bracts, bolls, and fiber, are impacted by gommosis. Among the common diseases that cause significant damage to cotton are diseases of seedlings - this is gommosis and root rot. The article is devoted to the study of the action of preparations: Cruise Extra Cotton 362 g/l, Record 34% against pathogens of cotton seedlings, and iminogommosis and root rot. On the basis of the conducted studies, it was found that the studied preparations have an effective effect on the susceptibility of cotton seedlings to root rot and gommosis. The biological effectiveness of the preparation Record 34% against root rot and gommosis was 86.4% and 93%, and the preparation Cruise Extra Cotton 86.1 and 77%.

1 Introduction

Cotton is one of the main agricultural crops in the Republic of Uzbekistan. Cotton sprout diseases such as gommosis and root rot cause significant damage to cotton growing. In some years, a significant increase in these diseases was observed. In Uzbekistan, cotton seeds treated with fungicides are sown [1]. However, under production conditions, outbreaks of root rot and gommosis of cotton have often been noted.

Gommosis gets its name from the gums that protrude from the surface of the affected organs of the cotton plant. Gommosis affects cotton in all stages of its development - cotyledons, leaves, stems, bracts, bolls and fiber [2].

The cotyledon form of the disease is observed on cotton seedlings - on which small rounded, dark green oily spots form [3]. The spots gradually increase, acquire a rounded-oblong shape, gum droplets begin to appear on them, which gradually merge and, when dried, form a crust on the surface of the spots. Affected cotyledon leaves dry up and fall off prematurely. Cotyledon fora is considered the most dangerous in the spread of secondary infection, causing a leaf form and a particularly harmful stem form [4]. In herbarium samples, the causative agent of gommosis on diseased leaves and seeds can remain viable

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for more than eight years [5]. In woody tissues of stems and bolls, which do not decompose so quickly, the vital activity of the parasite lasts longer. Infected plant residues remaining on the field can become a source of infection for cotton crops next year [1, 6].

Gummosis, the causative agent of which is the bacterium \textit{Xanthomonas campestris pv. malvacearum}. Sources of cotton gummosis infection are soil, seeds, crop residues, crop plants and water. The causative agent of cotton gummosis \textit{Xanthomonas campestris pv Malvacearum} can persist on the surface of seeds [7].

Many have been investigated against seminal infection using preparations such as Bronopol, Himoya, P-4, and Dalbron [8, 9]. Marupova in her studies notes that one of the reasons for the susceptibility of seeds treated with fungicides is their adaptation to this treater. It is necessary to alternate preparations used for disinfection in time in order to suppress the adaptive ability of the pathogen [10].

One of the most widespread diseases of cotton seedlings is also a disease called root rot (rhizoctoniosis) of seedlings, caused by the fungus \textit{Rhizoctonia solani}. The disease begins to appear on the first shoots, mass development takes place before the appearance of two true leaves. Sometimes the disease can develop over a longer period of time, i.e. until the third leaf appears. In the future, the disease stops, the plants become immune to it.

Until recently, researchers noted that the fungus of the genus \textit{Rhizoctonia} affects only cotton seedlings, but later this fungus was found on 5% of the leaves and bolls of an adult cotton plant.

As a result of the study of root rot on cotton crops, Rasulov and Kamilov found that the main pathogen is the fungus \textit{Rhizoctonia solani} and, to a lesser extent, the fungus Fusarium [11]. The fungus \textit{Rhizoctonia solani} is a soil organism and almost always lives in the soil as a saprophyte, but under favorable conditions it passes to a parasitic way of life.

Such conditions develop with poor-quality pre-sowing tillage, low sowing properties of seeds, and poor care for young plants [12]. It is very important to destroy the soil crust that appears after the rain in time. Delay in this agricultural method leads to drying, and when the bark is broken, the root neck of plants is damaged and conditions are created for the infection to penetrate into the tissues of a living plant [13].

Root rot appears on the root neck, i.e. on the stem near the soil and under it. On the affected area (root collar), first yellowish, then turning brown, as if depressed, and under wet conditions - watery spots in the form of sores are formed. Usually, under favorable conditions, these spots grow and simultaneously deepen into the tissues, and then a constriction sometimes forms in this place. On the affected areas, the bark is often macerated, i.e. soak [14].

The issues of developing effective means of combating phytopathogenic microorganisms are constantly in the center of attention of science and industry and are undoubtedly one of the urgent tasks in modern conditions of agricultural development.

This article is devoted to the study of the action of new preparations against pathogens of cotton seedlings, namely gummosis and root rot.

2 Materials and methods

To study the effect of new modern promising preparations against diseases of cotton seedlings, namely gummosis and root rot, we used the following preparations: Cruise Extra Cotton 362 g/l (thiamethoxam 350 g/l + mefenoxam 3.34 g/l + fludioxonil 8.34 g/l) consumption rate 3.0 l/t. Record 34% (Carboxin 170 g/l + Tiram 170 g/l) consumption rate 5.0 l/t.

The effect of the preparations was tested both in the laboratory and in the field. Laboratory studies were carried out at the Tashkent State Agrarian University at the
Field experiments were carried out not in the fields of the Institute of Plant Protection, the Institute of Genetics and Experimental Biology and in some farms of the Tashkent region on an artificial background and in natural conditions.

The study of the effect of new preparations on plants and pathogens of cotton seedlings (Xanthomonas campestris pv. malvacearum; Rhizoctonia solani) was carried out according to the method of Kokhabidze and Egorov [13, 14]

To establish the screening of the effect of the Extra Cotton 362 preparation on the growth and development of Xanthomonas campestris pv malvacearum, 1 ml of the suspension of the cotton gummosis pathogen was inoculated on PSA, in each cup holes were made, into which 0.5 ml of the test preparation was added. In total, there were 4 recesses in each cup: 2 recesses with the test preparation and 2 recesses where water was added - this is a control of 0.5 ml of water. The repetition of the experiment is 4 times. Cups with seeded cultures are kept for 72 hours at a temperature of 30 to 35 °C.

To study the effect of the preparation Record 34% developed in the Republic by the company JV Swiss Agro against root rot and gummosis of cotton, field trials were carried out. When setting up a field experiment, cotton seeds were soaked in water (600 l/t), covered with a tarpaulin, and left for a day. Then the seeds were infected with Xanthomonas campestris pv malvacearum. For this purpose, a 30-day culture of the causative agent of cotton gummosis was used. Infected seeds were dried for a day, then part of the seeds were treated with Record 34% and Vitavax 200 FF 34% used as a reference. Untreated cotton seeds served as control.

Experiment options:
1. Seeds infected with the causative agent of cotton gummosis (infectious background) and treated with the preparation Record 34%;
2. Seeds infected with the causative agent of cotton root rot (artificial infectious background) and treated with Record 34%;
3. Seeds infected with the causative agent of cotton gummosis (infectious background) and treated with Vitavax 200 FF;
4. Seeds infected with cotton root rot and treated with Vitavax 200 FF;
5. Cotton seeds infected with gummosis (infectious background);
6. Cotton seeds infected with root rot (infectious background).

The repetition of the experiment is 4 times. The total number of germinated seedlings per 1 square meter and the number of infected were taken into account.

3 Results and discussion

The results of a laboratory experiment to study the effect of the preparation Cruise Extra Cotton on the root rot pathogen showed that the growth of colonies varies from the dose of the preparation used and the day of growth. The growth of colonies of a 3-day culture of Rhizoctonia solani varied up to 1.2 cm, and in a 14-day culture from 4.2 to 4.5 cm. The best inhibitory effect on the growth of Rhizoctonia solani was obtained in the 1 t/25 L variant (Figure 1).
The effect of Cruise Extra Cotton on the causative agent of cotton gummosis in laboratory conditions showed that in none of the variants did the growth zones of *Xanthomonas campestris pv. malvacearum* appear (Figure 2).

The action of the preparation Record 34% on pathogens of root rot and gummosis of cotton was carried out in the field. The results of the conducted studies are presented in Table 1. The table data show that the number of seedlings in the control is 59.4 pieces, and in the variants treated with the preparation Record 34% and Vitavax 200 FF 86.4 and 92.6 seedlings per tenth running meter. The greatest susceptibility to gummosis was manifested in the control variant and amounted to 59.93%, while in the variants treated with the studied preparations it was 4.17% and 3.02%. The table shows that the incidence of root rot and
gummosis in the variants treated with the preparation Record was 2.78% and 4.17% and Vitavax 200 FF was 1.51% and 3.02%.

Table 1. Actions of the preparation Record 34% on the susceptibility of cotton seedlings to root rot and gummosis.

<table>
<thead>
<tr>
<th>Options</th>
<th>Consumption rate, l/t</th>
<th>Number of seedlings per 10 linear meter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number of seedlings</td>
</tr>
<tr>
<td>Record 34%</td>
<td>0.5</td>
<td>86.4</td>
</tr>
<tr>
<td>Vitavax 200 FF (standard)</td>
<td>0.5</td>
<td>92.6</td>
</tr>
<tr>
<td>Control</td>
<td>-</td>
<td>59.4</td>
</tr>
</tbody>
</table>

The study of the effect of Cruise Extra Cotton on the causative agent of cotton gummosis and root rot was also carried out in the field. Seeds of variety C-6524 were used for the work, Cruise Extra Cotton 362 was taken as a reference. Cotton seeds were infected with *Xanthomonas campestris pv. malvacerum* and *Rhizoctonia solani* according to the generally accepted method. The data of the conducted studies are presented in tables. The table shows that the incidence of root rot and gummosis in the control was 21.6% and 14.8%, and in the variants treated with the studied preparations 2.8% and 3.2%, 3.0% and 3.4%.

The biological effectiveness of the preparation Cruise Extra Cotton against root rot and gummosis of cotton was 86.1% and 77%, and the preparation Cruise Extra Cotton 87.0% and 78.3% (Table 2).

Table 2. Effect of Cruise Extra Cotton 362% on the susceptibility of cotton seeds to root rot and gummosis.

<table>
<thead>
<tr>
<th>Options</th>
<th>Consumption rate of the preparation</th>
<th>Root rot</th>
<th>Gummision</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Damage, %</td>
<td>Biological efficiency, %</td>
</tr>
<tr>
<td>Control untreated (seeds)</td>
<td>-</td>
<td>21.6</td>
<td>-</td>
</tr>
<tr>
<td>Cruise Extra Cotton - Standard (Processed)</td>
<td>3.0</td>
<td>2.8</td>
<td>87.0</td>
</tr>
<tr>
<td>Cruise Extra Cotton 362 (Processed)</td>
<td>3.0</td>
<td>3.0</td>
<td>86.1</td>
</tr>
</tbody>
</table>

The biological effectiveness of the preparation Record 34% against cotton gummosis and root rot was 89.4% and 93.0%, and the effectiveness when using Vitavax 200 FF was 94.2% and 95.0% (Table 3).
Table 3. Biological effectiveness of the preparation Record 34% to diseases of seedlings of cotton.

<table>
<thead>
<tr>
<th>Options</th>
<th>Consumption rate of preparation, l/t</th>
<th>Biological efficiency, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Root rot</td>
</tr>
<tr>
<td>Record 34%</td>
<td>0.5</td>
<td>89.4</td>
</tr>
<tr>
<td>Vitavax 200 FF (standard)</td>
<td>0.5</td>
<td>94.2</td>
</tr>
</tbody>
</table>

4 Conclusions

Thus, on the basis of the conducted research, we found:

1. Preparations Record and Vitavax have a positive effect on the germination of cotton seeds. The number of seedlings in the control was 59.7 pcs, and in the variants treated with preparations it corresponded to: 86.4 and 92.6 pcs per ten linear meter.

2. The studied preparations also have a depressing effect on the susceptibility of cotton seedlings to root rot and gummosis. In the control, the susceptibility was 26.26% and 59.93%, and in the experimental variants 2.8% and 4.17%; 1.51% and 3.02%.

3. The biological effectiveness of Cruise Extra Cotton against root rot and gummosis was 86.1% and 77%.

4. On the basis of the conducted studies against diseases of cotton seedlings, Vitavax 200 FF, Record 34%, and Cruise Extra Cotton can be recommended for treating cotton seeds.

References

8. Abdualimov Sh., Karimov Sh., Boltiev B. The use of stimulants is an effective way to increase the resistance to gummosis disease and accidental germination of seeds // Journal of Agrochemical protection and plant quarantine.- 2017.- N1.- p. 53-54.

