Diseases that provoke fungi in leguminous cereals and measures of fighting against them

J H Rakhmanov1, R A Gulmurodov2, S S Tukhtamishev3, T T Soatov2, and Sh Gulmurodova2

1Scientific-Research Institute of Protecting Plants, 100140 Tashkent, Uzbekistan
2Tashkent State Agrarian University, 100140 Tashkent, Uzbekistan
3Gulistan State University, 120100 Gulistan, Uzbekistan

*Email: jalilrahmanov76@mail.ru

Abstract. Many crop losses have been observed in all states due to diseases in which fungi come from leguminous grain crops such as mung bean, peas and beans. In particular, this situation was noted in scientific observations conducted in several regions of our republic where legumes are grown. Fuzariosis, which occurs in leguminous grain crops, has been studied in studies on root rot, anthracnosis, ascochitosis, flour-dew and other fungi diseases, at what time of their appearance, spread, development and damage to the crop. From these diseases, root rotting in chickenpox and fuzariosis, as well as anthracnosis in mung bean and beans, root rot in fuzariosis, rapid spread and development of flour-dew diseases in connection with weather conditions have been identified.

1. Introduction

Peas are grown in more than 100 countries around the world. More than 50% of the crop grown in the world is accounted for by the countries of Canada, Russia and China [1]. It has been studied that the cultivation of peas in 70% of leguminous crops in Pakistan, as well as the main damaging diseases are aschokhitosis, fusariosis macro, root rot [2]. In 1985-88 years, 31 species of fungi were found in the root tunic, paws, leaves, legumes and seeds. Approximately 92 % of 3-year planted pea fields in 1996-98% in the world fell to the countries such as India, Pakistan, Turkey, Iran, Australia and Mexico. It has been shown that the pea crop has been growing in the Asian, European and African countries from year to year, as well as suffering from anthracnosis, fuzariosis, ascochitosis, root rot, rust and other diseases [3].

At the roots of leguminous plants, depleted bacteria are formed, which absorb free nitrogen from the air and play an important role in increasing soil fertility [4]. Pea is a plant that is grown on dry farming lands, it has been adapted to certain conditions for centuries. In irrigated lands, aschokhitosis and root rot diseases occur.

Peas are one of the most important crops in the Russian Federation, which is 72-85% of the cultivated area occupied by leguminous crops. One of the important reasons for low yield from peas is that the plant suffers from various diseases during the entire vegetation period. The most common and harmful diseases in the middle Volga region include root rot, rust, flour-sew, aschokhitosis, anthracnosis, etc. [5]. In 1991-1995 in Kirov region of Russia, the prevalence of ascochytosis in peas reaches 100% in some years, the development of the disease is 40-50%, root rot was 50-60%, respectively [6].

Aschokhitosis is common in all regions where peas are grown. It damages the leaves, stems, legumes, seeds and roots. In the years of epiphytosis, askoxytosis can damage the surface of pea leaves up to 75%. Damage to the seeds can reach up to 40%. Aschokhitosis infection can survive up to 9 years in the seeds
It was determined that when peas damaged by aschohitosis diseases cultivated in Indian conditions sown in 5 months at an air temperature of 25°C-30°C plants in field conditions damage for 60-100% [8, 9]. During the flowering of peas in different weather conditions of Russia, Armenia and Uzbekistan, the development of ascocytosis caused by the outbreak of the disease, due to the violation of assimilation processes, the spilling of leaves from plants, the stems are broken. This results in the loss of 13-90% of grain yield [10,11,12].

Flower-dew disease is common in all regions of the world as well as in Uzbekistan. Flour-dew strongly develops under conditions with air temperature 20-25°C and humidity 70-80%. Late sown crops usually cause stronger damage. Often, damaged plants do not die, but the leaves and stems remain small, photosynthesis decreases, and as a result of a violation of the physiological processes in the plant, the yield can decrease by 15% and even more. Obligate parasite ascomycete fungi in flour-dew damage leguminous crops including mung bean and Erysiphe communis f. phaseoli beans [13].

Considered the most common diseases in the world are considered to be anthracnose in leguminous crops that provokes fungi Botrytis fabae Sard. Chocolate anthracnose or botrychosis in beans reduces the yield by more than ½ [14], in favorable years for fungal growth and reproduction, more than 80% of the yield may be lost [15].

Beans and mung bean obligate provoke parasitic rust disease Uromyces phaseoli bazidiomiset fungus. It can be met in Uzbekistan and infect mung bean too. In the countries where winter is continental fungi passes from the season to season with uredinioras. Shrub-shaped varieties of beans are less often damaged, low-growth early varieties are stronger [13].

2. Materials and Methods
Our research was carried out in 2018-2020 in some farmers’ associations fields of mung beans, beans and peas of Tashkent, Jizzakh, Namangan and Kashkadarya regions.

Taking into account the root rot and salinity diseases of leguminous grain crops, there were taken 10 samples from the fields up to 10 hectares, 20 samples from the fields up to 11-25 hectares, 30 samples from the fields up to 26-50 hectares and 50 samples from the fields up to 51-100 hectares. 10 plants from each sample are controlled. The development of root rot is taken into account by the appearance of sprouts and legumes. Here, the degree of damage is carried out using a scale of 4 points: 1 point – 10% of the surface of the leaf is infected; 2 points – 11-25%; 3 points – 26-50%; 4 points – higher than 50% is considered infected. Accounting for sagging and rot in older plants is carried out from the flowering period until 2-3 weeks before harvesting [16].

When determining the root rot disease of peas, there were extracted 15 (total 150 pc) from 10 pplaces of each area. Each obtained sample is tied to separate bunches. Root rot is carried out using the following 4-point scale:

0-no damage;
1-weak brown or darkening of root bud or of the main stem;
2-significant darkening of the root bud and the main stem, decay of the stem and side roots;
3-the main stem is strongly brown, the damaged tissue is covered with white, gray or brown powder, the plant is easily watered from the soil;
4-plants have disposal.

Take into account was conducted three times: after 2-3 leaves have come out, it is carried out in the period of flowering and fertilization.

Detection of diseases of aschohitosis, flour-dew, rust, false flour-dew, brown and yellow stains, in the diagonally of each field, at least 150 pieces of plant from 10 locations are controlled. The degree of damage is estimated on the basis of a scale of 4 points:

0-the disease is not observed;
1–up to 10% of the leaf is damaged;
2–up to 25% of the leaf is damaged;
3–up to 50% of the leaf is damaged;
4–more than 50% of the leaf is damaged

Observation work on legumes is carried out 2 times: during flowering and fertilization.
If the diseases were evenly distributed in the investigated fields, the samples were taken in a diagonal direction or along the height. At a time when the spread of the disease was not smooth, samples were taken in a chess method according to several parallel gone lines. When considering plant diseases, the following are the main ones: the prevalence or frequent occurrence of the disease and the development of the disease.

The prevalence of diseases was found based on the following formula [16]:

\[ P = \frac{n \cdot 100}{N} \]

Here,

\( P \) – disease prevalence, %;
\( n \) – number of sick plants in the sample, pc;
\( N \) – total number of plants in the sample, pc

The level of development of diseases of the upper legume plant can be found according to the following formula [16];

\[ R = \frac{\sum (a \cdot b)}{N} \]

Here,

\( R \) – degree of development of the disease, in %;
\( \sum (a \cdot b) \) – the sum of the multiples of (b) the number of plants corresponding to a certain % or points (v);
\( N \) – total number of plants taken into account.

The lost crop due to the studied diseases of leguminous plants can be found on the basis of the following formula. [16];

\[ B = \frac{(A - a) \cdot 100}{A} \]

Here,

\( B \) – lost crop, %;
\( A \) – harvest of healthy plants, c/ha;
\( a \) – harvest of diseased plants, c/ha.

Among all crops, it is necessary to fight diseases in order to obtain a quality and high harvest from the crops of mung beans, beans and peas. Currently, fungal diseases are widespread in cereals, as well as in leguminous cereals. Therefore, there were used seedling preparations of peas, mung beans and bean seeds by spraying from the State Chemical Commission List (2016). Accounts were prepared based on edited books of Sh. Khodjaev [17] and conducted experiments based on the methods of WIPP (VIZR) [18].

3. Results and Discussion

Our research on the spread of diseases of leguminous cereals was carried out on the basis of Route Monitoring in Tashkent, Jizzakh, Kashkadarya and Namangan regions.

In 2018, the spread of mung bean diseases in the experimental base of Scientific-Research Institute of Protecting Plants of Uzbekistan in Qibray District of Tashkent region was the same. If fusariosis root rot was equal to 22.5%, then anthracnosis disease, was equal 18.1%. If root rot was equal to 28.9% in “Beksherkhan” Farmer’s association in Zafarabad District of Jizzakh region, then anthracnosis disease amounted 26.1%. In the “Khumo” farming association of the same district was observed disease prevalence of fusariosis root rot 16.8%, with anthracnosis 24.4%.

In the spring of 2019, diseases in republic were encountered in different cases. The prevalence of mosh diseases in the experimental base of Tashkent region Qibray district was the same. Fusariosis root rot was equal to 21.5%, anthracnosis disease amounted to 22.6%. If fusariosis root rot spread 16.5% in the farm “Forish Yo’llari” in Zafarabad District of Jizzakh region, antrocnose disease amounted to 28.9%. “S. Sindarov” farming of the same district fusariosis observed the prevalence of the disease in the root rot 14.3%, with anthracnosis 23.9%. There were determined the prevalence of the disease in the “Qarshi Agro” farm in Qarshi district fusariosis root corrosion.
was 18.5%, anthracnosis 31.2%.

| No | Places where surveillance is carried out                        | Diseases, %                  |
|----|---------------------------------------------------------------|------------------------------|
|    |                                                               | Spread of disease, % | Development of disease, % | Spread of disease, % | Development of disease, % | Spread of disease, % | Development of disease, % |
|    |                                                               | 2018                       |                            | 2019                   |                            | 2020                       |
| 1  | experimental base of SRIPPU in Qibray District of Tashkent region | 22.5                       | 9.9                        | 18.1                   | 7.6                      | -                         | -                         |
| 2  | Zafarabad district, “Beksherkhon” farm                        | 28.9                       | 10.2                       | 26.1                   | 11.7                     | -                         | -                         |
| 3  | Zafarabad district, “Khumo” farm                              | 16.8                       | 7.4                        | 24.4                   | 10.6                     | -                         | -                         |
| 1  | experimental base of SRIPPU in Qibray District of Tashkent region | 21.5                       | 4.2                        | 22.6                   | 4.8                      | -                         | -                         |
| 2  | Zafarabad district, “S. Sindarov” farm                        | 16.5                       | 3.3                        | 28.9                   | 6.7                      | -                         | -                         |
| 3  | Zafarabad district, “S. Sindarov” territory                   | 14.3                       | 2.9                        | 23.9                   | 4.9                      | -                         | -                         |
| 4  | Karshi district, “Karshi Agro” farm                           | 18.5                       | 3.7                        | 31.2                   | 7.3                      | -                         | -                         |
| 1  | experimental base of SRIPPU in Qibray District of Tashkent region | 20.9                       | 4.1                        | 19.9                   | 4.0                      | 30.1                      | 6.5                       |
| 2  | Zafarabad district, “Rakhmonjon Bobo” farm                    | 22.7                       | 4.5                        | 28.2                   | 6.5                      | 21.7                      | 8.4                       |
| 3  | Yangikurgan district, “Dostlik: farmx”                        | 24.1                       | 5.9                        | 26.5                   | 9.1                      | 28.8                      | 10.1                      |

Due to that in the spring of 2020, there were observed chronic rains in all regions of republic, and as a result of low temperature, the types of diseases increased. If the prevalence of mung bean diseases in the experimental base of Scientific-Research Institute of Protecting Plants of Uzbekistan in Qibray District of Tashkent region amounted to 20.9% of fusariosis root rot, anthracnosis disease is equal to 19.9%, then prevalence of flour dew disease amounted to 30.1%. When fusariosis root rot in the farm “Rakhmonjon Bobo” in Zafarabad District of Jizzakh region was equal to 22.7%, anraknoz disease was equal to 28.2%. Flour dew disease has spread 21.7%. In the fields of “Dostlik” farm in Yangikurgan District of Namangan region were observed diseases of fusariosis root rot 24.1%, antaknoz 26.5% and flour dew 28.8%. The state of diseases in the three-year mung bean crop is fully reflected in Table 1. Fusariosis root rot, anthracnosis and flour-dew disease, which are considered the main diseases in the mung bean crop, were observed to cause damage to all farms in the spread area. In 2018-2020 in the experimental base of Scientific-Research Institute of Protecting Plants of Uzbekistan in Qibray District of Tashkent region was observed the prevalence of fusariosis root rot disease from 13.5-14.3% to 25.6% in the plant of beans. It was reported that with anthracnosis, the disease spread 13.8-24.6%. In 2018-2019, rust disease was not observed in the territory. It was found out that fusariosis root rot and anthracnosis diseases in the fields of the farm “Dildora Azizbek” in Yangikurgan District of Namangan region are more common than an
average of 20%.

Table 2. Spreading area of disease types in the bean crop (Tashkent, Jizzakh, Namangan regions, spring season, 2018-2020.)

| No | Places where surveillance is carried out | 2018 | 2019 | 2020 |
|----|-----------------------------------------|------|------|------|
|    |                                         |      |      |      |
|    |                                         | Spread of the disease, % | Development of the disease, % | Spread of the disease, % | Development of the disease, % |
| 1  | experimental base of SRIPPU in Qibray District of Tashkent region | 14.3 | 3.6  | 13.8 | 4.3  | - | - |
| 2  | Yangikurgan district, “Dostlik: farm” | 25.6 | 11.2 | 24.6 | 10.6 | - | - |
| 1  | experimental base of SRIPPU in Qibray District of Tashkent region | 24.5 | 5.2  | 23.5 | 5.1  | - | - |
| 2  | Yangikurgan district, “Dildora Azizbek” farm | 19.8 | 4.3  | 33.7 | 8.4  | - | - |
| 1  | experimental base of SRIPPU in Qibray District of Tashkent region | 13.5 | 4.0  | 10.9 | 4.7  | 9.2 | 2.3 |
| 2  | Zafarabad district, “Zangori Pakhta” farm | 20.2 | 4.7  | 17.5 | 5.1  | 7.6 | 1.9 |
| 3  | Yangikurgan district, “Dostlik: farm” | 16.4 | 3.1  | 19.2 | 4.4  | 10.1 | 3.3 |

In 2020, in the experimental base of Scientific-Research Institute of Protecting Plants of Uzbekistan in Qibray District of Tashkent region, in the farm “Dildora Azizbek” in Yangikurgan District of Namangan region and “Zangori Pakhta” in Zafarabad District of Jizzakh region, fuzariosis root rot disease was 13.5-20.2%, anthrax disease was 10.9-19.2%, respectively. In our republic in 2020, chronic rain and low temperature, high humidity caused by rust disease in beans 7.6-10.1% increase was observed. The prevalence of diseases is fully reflected in Table 2 on the bean crop area.

In order to determine the prevalence of pea diseases, monitoring was carried out in Tashkent, Jizzakh and Kashkadarya regions. According to the results of the observation, fuzariosis root rot, aschokhitosis and flour-dew diseases are more damaging in the regions. In the seasons of 2018-2020, the prevalence of fuzariosis root rot disease in Tashkent region was 18.5-21.7%. In Jizzakh region, it was observed that this figure was on average 4.8-21.4%. The Kashkadarya branch of the Research Institute of grain leguminous crops was equal to 5.1-21.7% in the experimental areas.

Aschokhitosis disease in the spring season of 2018-2020 years, the prevalence of the disease in the above-mentioned regional farms increased to 8.9-29.1%. This disease is a type of anthracnosedisease according to the literature analysis. It was repeated that our scientists gave full information about this. Since 2020 was high humid, it was observed that flour-dew disease spread to 14.4-19.7%. In previous years, this disease was not observed in crop fields that we have monitored. Data on diseases of peas are presented in Table 3.

The main damaging diseases in leguminous cereals are root rot and fuzariosis root rot diseases, which negatively affect the thickness of seedlings by the number of seedlings. Therefore, it is desirable to plant the seed material in the fields that are sown after spring and summer planting. Several seed-based drugs, registered by the State Chemical Commission and allowed for use against diseases, were tested in...
laboratory conditions and in small fields in 2018-2019. And in 2020, Vitavaks 200F in 34% s.sus.k., in production conditions, Hercules 6% s.e.sus and Selest Top 312 FS, sus.k. scientific studies on their preparations have been conducted.

Table 3. Spreading area of disease types in the pea crop (Tashkent, Jizzakh, Kashkadarya regions, spring season, 2018-2020)

| No | Places where surveillance is carried out                        | Diseases, % |
|----|---------------------------------------------------------------|-------------|
|    |                                                               | Fusariosis root rot | Anthracnus | Flour-dew |
|    |                                                               | Spread of the disease, % | Development of the disease, % | Spread of the disease, % | Development of the disease, % |
|    |                                                               | 2018        | 2019        | 2020        |
| 1. | experimental base of SRIPPU in Qibray                       | 20.0        | 16.4        | 18.5        |
|    | District of Tashkent region                                  | 9.5         | 3.1         | 7.4         |
|    |                                                               | 22.6        | 19.2        | 23.5        |
|    |                                                               | 11.5        | 4.9         | 11.2        |
| 2. | Forish district,"Bagbon" farm                               | 19.7        | 12.8        | 21.2        |
|    |                                                               | 9.5         | 2.5         | 8.6         |
|    |                                                               | 23.3        | 26.7        | 29.1        |
|    |                                                               | 11.7        | 5.3         | 12.1        |
| 3. | Zamin district,"Pishogar" territory                          | 21.4        | 4.8         | 21.2        |
|    |                                                               | 9.7         | 0.8         | 8.6         |
|    |                                                               | 23.2        | 2.5         | 29.1        |
|    |                                                               | 11.4        | 0.5         | 12.1        |
| 4. | SRICP Kashkadarya branch                                    | 21.7        | 5.1         | 21.2        |
|    |                                                               | 9.8         | 1.2         | 8.6         |
|    |                                                               | 17.6        | 8.9         | 29.1        |
|    |                                                               | 8.3         | 1.8         | 12.1        |
| 5. | experimental base of SRIPPU in Qibray                       | 20.0        | 5.1         | 21.2        |
|    | District of Tashkent region                                  | 9.5         | 1.2         | 8.6         |
|    |                                                               | 22.6        | 8.9         | 29.1        |
|    |                                                               | 11.5        | 1.8         | 12.1        |
| 6. | Forish district,"Bagbon" farm                               | 19.7        | 21.2        | 21.2        |
|    |                                                               | 9.5         | 8.6         | 8.6         |
|    |                                                               | 23.3        | 29.1        | 29.1        |
|    |                                                               | 11.7        | 12.1        | 12.1        |
| 7. | SRICP Kashkadarya branch                                    | 21.7        | 5.1         | 21.2        |
|    |                                                               | 9.8         | 1.2         | 8.6         |
|    |                                                               | 17.6        | 8.9         | 29.1        |
|    |                                                               | 8.3         | 1.8         | 12.1        |

Of the drugs tested as seedling in the season 2018-2020, Hercules (tebuconazole), Daltebu (tebuconazole), Selest Top 312 FS (tiametoxam + fludioxanil + dithiobenzonazole), the template is an option Vitavaks 200FF, 34% s.sus.k. (carboxyn+tiram). The following results were achieved on the same spending standards shrines. Vitavaks 200FF, 2.5 l/t of preparations in the fight against fusariosis root rot disease in mung bean crop-biological effect when seed material is neutralized in the calculation of the norm reached an average 80.4-88.9%. Hercules 6% s.e.sus. when the drug was administered at a consumption of 0.5 l/t, 89.8% biological efficiency was achieved. Currently, the biological efficacy of Selest Top 312 FS 0.5-0.6 l/t seeds from modern calculated seed preparations was 84.7-90.7%. The plant’s fertility reached the highest figure, that is, 92.4%.

In experimental variants, the disease was observed in 19.4-2.8% when the disease prevalence in control variants of fusariosis root rot disease in planted fields of beans reached 4.18%. Biological effectiveness of the drugs Vitavax 81.0% when used in the normative consumption of 2.5 l/t, biological effect was 0.5 81.7% when the drug Hercules was used 0.5 l/t, and finally biological effect was 82.9% when Selest Top 312 FS 0.5 l/t was used. When these drugs were used, the fertility was higher than 90%.

Seeds of peas were also conducted in research that neutralized with the aforementioned seeddorizers. The results showed that the main damaging fusariosis root rot disease prevalence was 26.6% in control variants. When vitavax 200FF-2.5 l/t was used, the biological effect was 90.5%, when Hercules used 0.5 l/t, the biological effect was 89.6%, when Selest Top used 0.5 l/t, the disease prevalence was 1.9%, and
the biological effect was 91.0%. In the spring season, it was found that the use of expectorant drugs against fusariosis root rot disease has a good effect on legumes.

4. Conclusions
As in all countries where leguminous grain crops are grown, fusariosis root rot, anthracnosis, flour-dew, rust and other diseases are noted in mung beans and beans in our republic, fusariosis root rot, aschokhitosis and flour-dew diseases are noted in the peas, and in our observations in 2018-2020, a wide spread of several farms of Tashkent, Jizzakh, Kashkadarya and Namangan region was determined. In the three-year monitoring conducted on the experimental base of Scientific-Research Institute of Protecting Plants of Uzbekistan in Qibray District of Tashkent region, the lesion of mung beans with fusariosis root rot averaged 21.6%, with anthracnosis 20.2%. The prevalence of diseases in other places has also been close to the above indicators. Relatively strong prevalence of diseases in the mung bean plant was observed in the spring season 2020 year, and here flour-shudring was equal to 30.1%.

In the regions where the bean plant was observed, it was noted that fusariosis root rot and anthracnosis diseases spread to a different extent in the cross section of the years. There was also a prevalence of rust disease in beans up to 7.6-10.1% due to strong humidity in 2020.

In the regions observed in the pea plant, fusariosis was found to cause more damage to root rot, aschokhitosis and flour-dew diseases. In 2018-2020, the prevalence of aschokhitosis disease was found in the farms, where the spring season was observed, up to 8.9-29.1%. Since 2020 is favorable for diseases, there was recorded the prevalence of flour-dew disease 14.4-19.7%, which was not observed in other years.

In 2018-2020, when the study conducted on against root rot diseases of leguminous grain crops with processed seed such as Vitavaks 200F 34% s.sus.k., Hercules 6% s.e.sus. and Selest Top 312 FS, sus.k., in laboratory and field conditions, it was found that these drugs gave a good result.

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