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APPLICATION OF NEW FUNGICIDES AGAINST THE DISEASES OF AGRICULTURAL CROPS

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ПРИМЕНЕНИЕ НОВЫХ ФУНГИЦИДОВ ПРОТИВ БОЛЕЗНЕЙ СЕЛЬСКОХОЗЯЙСТВЕННЫХ КУЛЬТУР

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Abstract. This article outlines the results of the research conducted on farms Changimardon bogi in Parkent District of Tashkent Region and Behruz Baraka Fayz in Tashkent District of Tashkent Region on the origin and spread of downy mildew disease of the grapevine and phytophthora disease of potato plant, the symptoms of the diseases and their damage, and the data on the biological efficacy of new fungicide Pilarzox 25.5% SC applied against these diseases. As a result of our research: In the variant with Pilarzox 25.5% SC fungicide treatment at a rate of 1.2 l/ha against downy mildew disease of grapevine, the spread of the disease was 4.7%, the development of the disease was 0.7%, and the biological efficiency was 91.0%. The highest biological efficacy of potato plant against phytophthora disease was observed in the variant with Pilarzox 25.5% SC fungicide treatment at a rate of 2.5 l/ha. At the same time, the development of the disease was 2.4% in the leaves, 2.1% in the stems, and the biological efficiency was 89.5% in the leaves and 89.2% in the stems.

Аннотация. В статье изложены результаты исследований, проведенных в хозяйствах «Чангимардон боги» Паркентского района Ташкентской области и «Бехруз Барака Файз» Ташкентского района Ташкентской области по возникновению и распространению ложной мучнистой росы винограда и фитофтороза картофеля, симптомы болезней и их повреждения, а также данные о биологической эффективности нового фунгицида Pilarzox 25,5% SC применяющегося против этих заболеваний. В результате наших исследований: в варианте с Pilarzox 25,5% SC обработка фунгицидом из расчета 1,2 л/га против ложной мучнистой росы винограда, распространение болезни 4,7%, развитие болезни 0,7%, биологическая эффективность 91,0%. Наибольшая биологическая эффективность растений картофеля против фитофтороза отмечена в варианте с Pilarzox 25,5% SC. Обработка фунгицидами из расчета 2,5 л/га. При этом развитие болезни в листьях составило 2,4%, в стеблях — 2,1%, а биологическая эффективность в листьях — 89,5%, в стеблях — 89,2%.

Keywords: grapevine, potato, disease, downy mildew, mildew, phytophthora, *Plasmopara viticola*, *Phytophthora infestans*, vegetation period, fungicide, biological effectiveness.

Ключевые слова: виноград, картофель, болезнь, ложная мучнистая роса, мучнистая роса, фитофтора, *Plasmopara viticola*, *Phytophthora infestans*, вегетационный период, фунгицид, биологическая эффективность.

Introduction

Demand for food is growing year by year as the world's population grows. The main food products of the population are agricultural products. The most important task facing agricultural workers and specialists is providing the world's population with qualitative and environmentally friendly food. To accomplish this task, agricultural workers need to cultivate the land, take proper care of the plants, and develop effective control measures against pests that can damage the plant and reduce its productivity.

In recent years, the quantity and quality of agricultural crops have been declining under the influence of pests. This is due to the fact that pathogenic microorganisms are adapting to climatic conditions and effective control measures are not carried out in a timely manner. Development and implementation of modern measures to combat pathogenic microorganisms will allow to obtain high and qualitative yields from agricultural crops.

Comments from Literature

Downy mildew in vineries is one of the most dangerous diseases of grapes. The disease affects all green organs of the plant. On the affected grapevine leaves appear yellowish-brown, angular spots. At high humidity, a soft, white moldy layer is formed on the underside of the leaf, consisting of sporangiophores and sporangia of the pathogen. Damaged vine leaves often fall off.

The disease is caused by oomitset *Plasmopara viticola* lower fungus belonging to the order *Peronosporales*. The fungal obligate parasite, whose hyphae enter between cells, penetrates the cells with gaustors 4–10 μm in diameter and feeds by absorbing nutrients [10]. In the countries with humid and warm summers, when the disease is strongly developed and no control measures are taken, the grape crop can be completely lost [13].

Potatoes are an agricultural crop rich in starch, which is necessary for human nutrition. Phytophthora is one of the main diseases of potatoes and remains one of the most dangerous diseases in potato-growing countries. The disease has several names: phytophthora, phytophthorosis, potato disease, potato plague, potato mold, potato rot. In England and America, it is called late rot because it appears late during the season [6, 7].

In 1845–1847, the disease affected all the fields in Great Britain, Belgium, France, western Germany, and northwestern Russia, and it became a tragedy for the people. The epiphytosis of phytophthora — the “potato plague” of these years has caused a severe famine in Ireland, where the population lives almost exclusively on potatoes. A. de Bari’s research allowed to determine the causes of phytophthora and the characteristics of the disease progression as well as the *Ph. infestans* pathogenic fungi [11, 12].

The disease is caused by the fungus *Phytophthora infestans* [2, 4, 11, 12]. Dark brown spots of dying tissue appear on the affected leaves. In the stems and leaf stalks, the disease occurs in the form of a separate or whole brown elongated stripe, which is completely covered. In dry weather, damaged tissue dries out, and in humid weather, it rots. The spots on the peel of the affected tubers are slightly deep, in brown or other colors depending on the color of the peel. Early damage to potato stalks reduces the yield of tubers. Damaged tubers rot during storage [2, 4].

The disease is very dangerous and under its influence, the yield of potatoes can be reduced by up to 70% [12].

Location and Methods of Research

Measures to control diseases of agricultural crops under our research experiments were conducted in 2021 in the fields of the farm “Behruz Baraka Fayz” in Tashkent district of Tashkent region, and the farm “Changimardon bogi” in Parkent district of Tashkent region.

We tested new fungicides against phytophthora of potato in the fields of “Behruz Baraka Fayz” farm in Tashkent district of Tashkent region, and against downy mildew disease of grapevine in the fields of “Changimardon bogi” farm in Parkent district of Tashkent region.

1. We experimented fungicides Pilarzox 25.5% SC at a consumption rate of 0.7–1.2 l/ha against downy mildew of grapevine and as a standard variant Lacerta Max 32.5% CE at a rate of 0.5 l/ha with spraying during the growing season of plant.

2. We experimented fungicides Pilarzox 25.5% SC at the rate of 0.45–0.75 l/ha against potato phytophthora disease and as a standard Ridomil Star WP at a rate of 2.5 kg/ha with spraying during the growing season of plant.

The spread of the disease was determined based on the following formula:

$$\mathrm{P} = \frac{n \cdot 100}{N}$$

where, P — spread of disease, %; n — number of affected plants in samples, pieces; N — total number of plants in samples, pieces [8, 14, 15, 19, 20].

We calculated disease severity according to the following formula:

$$R = \frac{\Sigma(\mathrm{a} \times \mathrm{b}) \times 100}{\mathrm{N} \times \mathrm{K}}$$

where, R — disease severity %; Σ(a × b) — the sum of the multiplication of the affected plant parts in terms of expression; N — total number of observed plant parts; K — the highest score on the scale [14–17, 19, 20]. The disease index was determined according to the following empirical formula:

$$\mathrm{K_{и}} = \mathrm{T} \times \mathrm{P}/100$$

where, $K_{и}$ — disease index; T — spread of disease, %; P — disease severity, %.

We determined the biological efficiency of fungicides using the following formula:

$$C = \frac{(Ab - Ba)}{Ab} * 100$$

where, C — biological efficiency of preparations, %; Ab — disease severity in control variant, %; Ba – disease severity in experimental variant, % [1, 3, 9, 11, 12, 18–21].

Research Results

We conducted our first experiments in the fields of the farm “Changimardon bogi” in Parkent district of Tashkent region against the downy mildew disease of grapevine. Spraying of fungicides on diseased vineyards was carried out on May 3, 20 and June 8, 2021, at a rate of 600 liters of

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working solution per hectare. At the same time, the air temperature of 24 °C and the wind speed of 1–2 m/sec. was considered.

As a result of our research, it was observed that the spread of the disease in the control variant was 12.8%, the severity of the disease was 7.8% and the disease index was 0.998%. The highest biological efficiency in the experimental variant was observed in the treatment with Lacerta Max 32.5% CE used as a standard fungicide at a rate of 0.5 l/ha. At the same time, the severity of the disease was 0.6%, and the biological efficiency was 92.3%. In the variant treated with fungicide Pilarzox 25.5% SC at a rate of 0.7 l/ha, the disease severity was 0.9%, and the biological efficiency was 88.5%. While in the variant treated with fungicide Pilarzox 25.5% SC at a rate of 1.2 l/ha, the spread of the disease was 4.7%, the development of the disease was 0.7%, and the biological efficiency was 91.0% (Figure 1, 2).

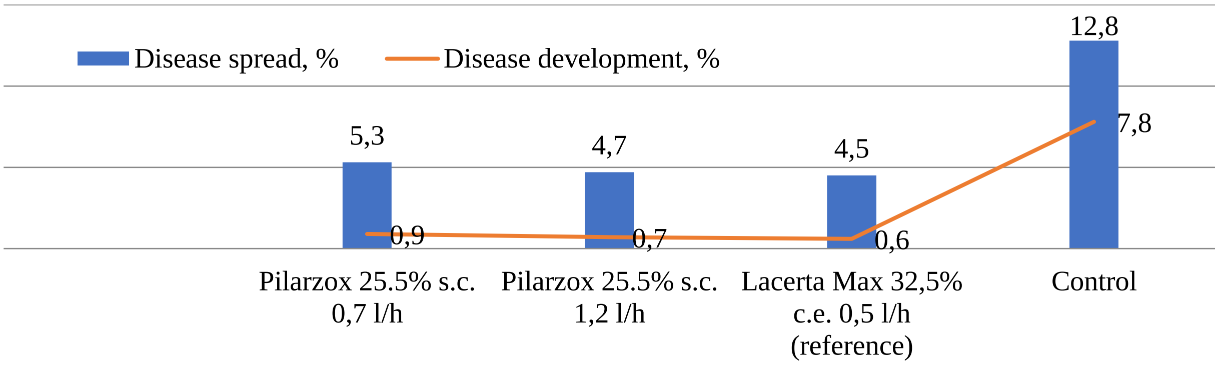

Figure 1. Spread and severity of downy mildew disease of grapevine (Field experiments. “Changimardon bogi” farm in Parkent district of Tashkent region, 2021)

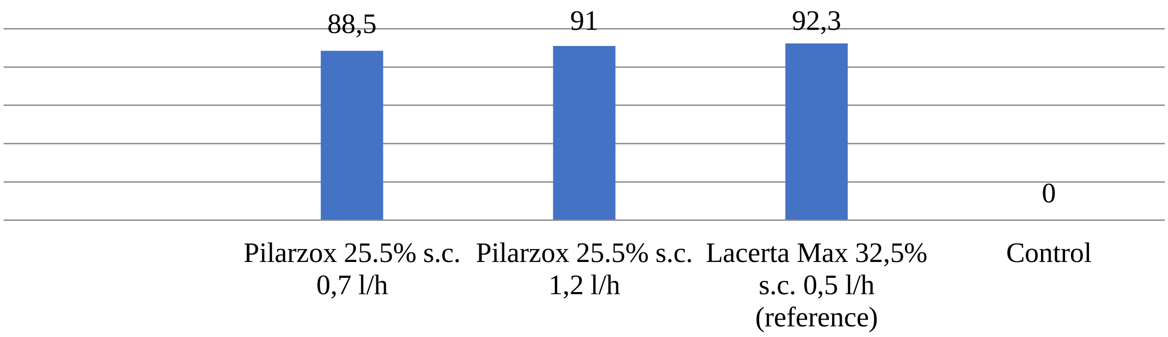

Figure 2: Biological efficacy of fungicides against downy mildew disease of grapevine (Field experiments. “Changimardon bogi” farm in Parkent district of Tashkent region, 2021)

We conducted our next experiments against phytophthora of potatoes in the fields of the farm “Behruz Baraka Fayz” in Tashkent district of Tashkent region. Spraying of fungicides on potato fields where phytophthora is prevalent was carried out on June 11, 26 and 10, 2021, at a rate of 300 liters of working solution per hectare. At the same time the air temperature of 26 °C and the wind speed of 1–2 m/sec. was considered. As a result of our research, the prevalence of the disease in the control variant was 12.5% in the leaves, 10.4% in the stems, and the disease index was 2.9% and 2.0%.

The highest biological efficiency in the experimental variant was observed in the variant treated with fungicide Pilarzox 25.5% SC at the rate of 0.75 l/ha. At the same time, the severity of the disease was 2.4% in the leaves, 2.1% in the stems, and the biological efficiency was 89.5% in the leaves and 89.2% in the stems. In the variant treated with this fungicide at the rate of 0.45 l/ha, the biological efficiency was 85.5% in the leaves and 86.75 in the stems. In the variant where the fungicide Ridomil Star WP was applied as a standard, slightly lower biological efficacy was observed, including 85.1% in the leaves and 86.2% in the stem (Table).

Table

BIOLOGICAL EFFICACY OF FUNGICIDES AGAINST PHYTOPHTHORA DISEASE IN POTATOES
(Field experiments. "Behruz Baraka Fayz" farm in Tashkent district of Tashkent region, 2021)

№	*Options*	*Damaged organ of the plant*	*Disease spread, %*	*Disease development, %*	*Index disease*	*Biological effectiveness, %*
1	Pilarzox 25.5% SC 0.45 l/h	Sheet	22.3	3.3	0.7	85.5
		Stem	11.2	2.6	0.3	86.7
2	Pilarzox 25.5% SC 0.75 l/h	Sheet	23.4	2.4	0.6	89.5
		Stem	12.3	2.1	0.3	89.2
3	Ridomil star WP 2.5 kg/h (reference)	Sheet	11.8	3.4	0.4	85.1
		Stem	10.1	2.7	0.3	86.2
4	Control	Sheet	12.5	22.8	2.9	—
		Stem	10.4	19.5	2.0	—

Discussion

When we analyzed the literature on this regard, we found that in the studies of J. J. Gomez Zeledon (2015) in Central America, Metalaxyl-M preparation showed the highest biological efficacy against downy mildew disease of grapevine [16]. As for our condition, the fungicide Mancolaxil 72% WP containing Metalaxyl-M has been recommended for use against the downy mildew disease of grapevine. But we tested new fungicides also in our experiments and recommended them for production.

Phytophthora disease is a common potato disease in many potato-growing countries, including Russia, and causes great damage to potato yields. In Russia, in the study of M. A. Kuznetsova et al. (2019) Orvego (amethoctradine + dimetomorph, 0.8 l/ha), Infinito + Signum (fluopicolid + propamocarb hydrochloride + boskaslide + piraclostrobin, 1.6 l/ha + 0.3 l/ha), Polyram + Signum (metiram + boskalid + pyraclostrobin, 2.5 kg/ha + 0.3 l/ha), Poliram (metiram 2.5 kg/ha) preparations can be seen to have the highest biological efficacy [5].

In our study, new fungicide Pilarzox 25.5% s.c. containing Cimoxanil 170 g/l + Ciazafomide 85 g/l was proven to show high effectiveness in stopping the development of potato phytophthora disease.

Conclusion

As a result of our field experience in the control of downy mildew disease of grapevine, we can say that treatment with fungicide Lacerta Max 32.5% CE at a rate of 0.5 l/ha or Pilarzox 25.5% SC at a rate of 0.75 l/ha can stop the development of this disease at a high level.

When the first signs of phytophthora disease appear in potatoes, the first treatment with fungicide Pilarzox 25.5% SC at a dose of 0.75 l/ha and the second treatment after 15 days, then the third treatment after 30 days, stops the development of the disease. Application of this fungicide against phytophthora disease of potatoes enables to achieve high yields of potatoes.

References:

1. Avazov, S., & Sodiqov, B. (2020). White rot diseases of sunflower and measures against them. *Society and innovations, 1*(2), 23-28. https://doi.org/10.47689/2181-1415-vol1-iss2-pp23-28

2. Vorobeva, Yu. V. (1983). Genetika fitoftorovykh gribov. *Soobshchenie II. Genetika,* (19 I-II), 1786-1789. (in Russian).

3. Dementeva, M. I. (1985). Fitopatologiya. Moscow. (in Russian).

4. Zhuromskii, G. K. (1999). Rasovyi sostav *Phytophthora infestans* (Mont.) de Bary - vozbuditelya fitoftoroza kartofelya v usloviyakh Belarusi. *Akhova raslyn,* (5), 30-31. (in Russian).

5. Kuznetsova, M. A., Rogozhin, A. N., Demidova, V. N., & Smetanina, T. I. (2019). Effektivnaya zashchita kartofelya ot boleznei razlichnoi etiologii v usloviyakh Moskovskoi oblasti. *Agrarnaya nauka,* (3), 49-53. (in Russian). https://doi.org/10.32634/0869-8155-2019-326-3-49-53

6. Naumova, N. A. (1965). Fitoftoroz kartofelya. Moscow. (in Russian).

7. Popkova, K. V. (2005). Obshchaya fitopatologiya. Moscow. (in Russian).

8. Sagdiev, M. T., Amanova, M., & Omonlikov, A. U. (2019). Vliyanie regulyatora rosta na urozhainost’ pertsa sladkogo. *Evraziiskii soyuz uchenykh,* (61), 50-52. (in Russian). https://doi.org/10.31618/ESU.2413-9335.2019.7.61.62

9. Sodikov, B. (2018). Chemical protection of *Helianthus annuus* L. from *Botrytis cinerea* Pers. *Bulletin of Science and Practice, 4*(10), 219-222. (in Russian).

10. Sodikov, B. S., & Khuzhaev, O. T. (2019). Khimicheskaya zashchita podsolnechnika ot al’ternarioza. *Aktual’nye problemy sovremennoi nauki,* (4), 188-199. (in Russian).

11. Sodikov, B., Rakhmonov, U., & Khamiraev, U. (2021). *Phytopthora infestans* zamburugining fitotoksik va patogenlik khususiyatlarini urganish. *Agro kimyo himoya va o’simliklar karantini,* (2), 69-71.

12. Khamiraev, U. K., & Sodikov, B. S. (2021). Zashchita kartofelya ot fitoftoroza. *Aktual’nye problemy sovremennoi nauki,* (1), 91-97. (in Russian).

13. Khasanov, B. A., & Gulmurodov, R. A. (2010). Mevali va engok mevali darakhtlar, tsitrus, rezavor mevali butalar khamda tok kasalliklari va ularga karshi kurash. Tashkent.

14. Chumakov, A. E., Minkevich, I. I., Vlasov, Yu. I., & Gavrilova, E. A. (1974). Osnovnye metody fitopatologicheskikh issledovanii. Moscow. (in Russian).

15. Allayarov, A., Zuparov, M., Khakimov, A., & Omonlikov, A. (2021). Application of the biopreparation ‘Orgamika F’against fusarium disease of cabbage and other cole vegetables. *E3S Web of Conferences,* EDP Sciences. V. 284, 03011. https://doi.org/10.1051/e3sconf/202128403011

16. Gómez Zeledón, J. J. (2016). *Plasmopara viticola*, the downy mildew of grapevine: phenotypic and molecular characterization of single sporangium strains infecting hosts with different resistance levels.

17. Khakimov, A. A., Omonlikov, A. U., & Utaganov, S. B. (2020). Current status and prospects of the use of biofungicides against plant diseases. *GSC Biological and Pharmaceutical Sciences*, *13*(3), 119-126. https://doi.org/10.30574/gscbps.2020.13.3.0403

18. Khakimov, A., Salakhutdinov, I., Omolikov, A., & Utaganov, S. (2022). Traditional and current-prospective methods of agricultural plant diseases detection: A review. *IOP Conference Series: Earth and Environmental Science, vol. 951, no. 1. IOP Publishing. p. 012002*.

19. Sattarovich, S. B., Normamadovich, R. U., Kakhramonovich, K. U., & Mirodilovich, A. M. (2020). Fungal diseases of sunflower and measures against them. *PalArch’s Journal of Archaeology of Egypt/Egyptology*, *17*(6), 3268-3279.

20. Sodiqov, B. S. (2019). Chemical protection of sunflower from downy mildew. *Generating Knowladge Through Research, 1*(1), 63-65.

21. Sodiqov, B. S., & Kholmurodov, E. A. (2018). White rot disease of the sunflower plant and its control. *Journal of agrochemical protection and plant quarantine,* (5), 54-55.

Список литературы:

1. Avazov S., Sodiqov B. White rot diseases of sunflower and measures against them // Society and innovations. 2020. V. 1. №2. P. 23-28. https://doi.org/10.47689/2181-1415-vol1-iss2-pp23-28

2. Воробьева Ю. В. Генетика фитофторовых грибов. Сообщение II // Генетика. 1983. Т. 19 I-II. С. 1786-1789.

3. Дементьева М. И. Фитопатология. М: Агропромиздат, 1985. 397 с.

4. Журомский Г. К. Расовый состав *Phytophthora infestans* (Mont.) de Bary - возбудителя фитофтороза картофеля в условиях Беларуси // Ахова раслын. 1999. №5. С. 30-31.

5. Кузнецова М. А., Рогожин А. Н., Демидова В. Н., Сметанина Т. И. Эффективная защита картофеля от болезней различной этиологии в условиях Московской области // Аграрная наука. 2019. №3. С. 49-53. https://doi.org/10.32634/0869-8155-2019-326-3-49-53

6. Наумова Н. А. Фитофтороз картофеля. М.: Колос, 1965. 188 с.

7. Попкова К. В. Общая фитопатология. М.: Дрофа, 2005. 445 с.

8. Сагдиев М. Т., Аманова М., Омонликов А. У. Влияние регулятора роста на урожайность перца сладкого // Евразийский союз ученых. 2019. №61. С. 50-52. https://doi.org/10.31618/ESU.2413-9335.2019.7.61.62

9. Содиков Б. С. Химическая защита *Helianthus annuus* L. от *Botrytis cinerea* Pers. // Бюллетень науки и практики. 2018. №4. С. 219-222.

10. Содиков Б. С., Хужаев О. Т. Химическая защита подсолнечника от альтернариоза // Актуальные проблемы современной науки. 2019. №4. С. 188-199.

11. Содиқов Б., Рахмонов У., Хамираев Ў. Phytopthora infestans замбуруғининг фитотоксик ва патогенлик хусусиятларини ўрганиш // Agro kimyo himoya va o’simliklar karantini. 2021. №2. P. 69-71.

12. Хамираев У. К., Содиков Б. С. Защита картофеля от фитофтороза // Актуальные проблемы современной науки. 2021. №1. С. 91-97.

13. Хасанов Б. А., Гулмуродов Р. А. Мевали ва ёнғоқ мевали дарахтлар, цитрус, резавор мевали буталар ҳамда ток касалликлари ва уларга қарши кураш. Ташкент. 2010. 316 с.

14. Чумаков А. Е., Минкевич И. И., Власов Ю. И., Гаврилова Е. А. Основные методы фитопатологических исследований. М.: Колос, 1974. 192 с.

15. Allayarov A., Zuparov M., Khakimov A., Omonlikov A. Application of the biopreparation ‘Orgamika F’against fusarium disease of cabbage and other cole vegetables // E3S Web of Conferences. EDP Sciences, 2021. V. 284. P. 03011. https://doi.org/10.1051/e3sconf/202128403011

16. Gomez Zeledon J. J. *Plasmopara viticola*, the downy mildew of grapevine: phenotypic and molecular characterization of single sporangium strains infecting hosts with different resistance levels. 2016.

17. Khakimov A. A., Omonlikov A. U., Utaganov S. B. Current status and prospects of the use of biofungicides against plant diseases // GSC Biological and Pharmaceutical Sciences. 2020. V. 13. №3. P. 119-126. https://doi.org/10.30574/gscbps.2020.13.3.0403

18. Khakimov A., Salakhutdinov I., Omolikov A., Utaganov S. Traditional and current-prospective methods of agricultural plant diseases detection: A review // IOP Conference Series: Earth and Environmental Science. IOP Publishing, 2022. V. 951. №1. P. 012002.

19. Sattarovich S. B., Normamadovich R. U., Kakhramonovich K. U., Mirodilovich A. M. Fungal diseases of sunflower and measures against them // PalArch's Journal of Archaeology of Egypt/Egyptology. 2020. V. 17. №6. P. 3268-3279.

20. Sodiqov B. S. Chemical protection of sunflower from downy mildew // Generating Knowladge Through Research, 2019. V. 1. №1. P. 63-65.

21. Sodiqov B. S., Kholmurodov E. A. White rot disease of the sunflower plant and its control // Journal of agrochemical protection and plant quarantine. 2018. №5. P. 54-55.

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