ISSN: 2707-1146
e-ISSN: 2709-4189

https://doi.org/10.36719/2707-1146/54/46-50

Khalida Ashrafova
Azerbaijan State Agricultural University
https://orcid.org/0009-0004-3392-7483
elvira.memmedova19941104@gmail.com
Solmaz Mammadova
Azerbaijan State Agricultural University
https://orcid.org/0009-0006-0081-0742
memmedovas928@gmail.com
Konul Babayeva
Azerbaijan State Agricultural University
https://orcid.org/0000-0002-0022-2063
rkqbabayeva@rambler.ru
Muhammet Keskinbichak
Azerbaijan State Agricultural University
https://orcid.org/0009-0000-7853-6778
muhammetkeskinbicak1@gmail.com

Application of Chemical Control in Corn Crops

Abstract

In Azerbaijan, corn is considered the most cultivated crop after winter cereals. Corn is widely used both as food and as animal feed in agriculture. In modern economy, the use of ecologically sound seeds plays a leading role and optimizes the cultivation process. The use of high-quality, certified seeds with low disease and high yield potential is considered an important production factor and is the main criterion for achieving high performance in agricultural enterprises. The Azerbaijani government aims to meet the country's need for agricultural products, especially rice, through domestic production, and thereby strives to become free from imports. As a cover crop, corn is a good predecessor that clears the soil of weeds for subsequent crops. Compared to other cereals, corn is less damaged by pests and does not fall asleep during harvest. However, various diseases and pests observed in corn crops lead to reduced yield. Among the most common diseases affecting corn in the country are helminthosporiosis, common smut, and loose smut.

Keywords: *corn, disease, common smut, loose smut, stalk*

Introduction

FAO, (2020) defines nutrition as one of the most important needs of humanity and as the consumption of sufficient amounts of nutrients necessary for long-term growth, development, healthy and sustainable life, and is becoming a problem with the increase in the world population. The fact that a large part of the world's population, which is increasing irreversibly, is struggling with severe hunger is discussed all over the world and solutions are proposed in each case (FAOSTAT, 2020).

Corn is a valuable crop that yields high grain and silage yields under good agrotechnical conditions. It yields even higher yields under irrigated conditions. In areas where there are no natural pastures, corn plays a key role in strengthening the feed base of livestock. Corn occupies a leading place among crops grown under irrigated conditions (Seyidaliyev, Gurbanov, Mammadova, 2013).

In our republic, this plant is sown on 100-110 thousand hectares for fodder purposes, and on 10-12 thousand hectares for grain purposes. In the Sheki-Zagatala zone of Azerbaijan, specialized in corn cultivation, under irrigation conditions, 80-90 tons of grain and more are obtained per hectare, and 800-1000 tons of silage and more are obtained from fodder crops (Ismayilov, Mammadov, 2012).

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Increasing the productivity of corn, which is used as a fodder and technical crop, is of great importance in the implementation of the program for the rapid development of agriculture (Gurbanov, 2017; Gurbanov, Ibrahimov, Huseynov, 2017; Mammadov, 2017)

Thanks to the phytochemical content of corn kernels, its health benefits have been the subject of many scientific studies (Hagiwara, Miyashita, Nakanishi, Sano, Tamano, Kadota, Koda, Nakamura, Imaida, Ito, Shirai, 2001). Due to the anthocyanin pigments in the composition of corn, colon cancer is prevented by corn; Breeding Techniques and Cultivation helps to reduce the risk, purple corn extract is rich in anthocyanin content, helps to improve diabetes complications, helps in the treatment of diabetes, obesity, and heart diseases, supports aging and various diseases thanks to its antioxidant activity was determined (Simla, Boontang, Harakotr, 2016).

Research

In the experimental fields of ADAU, we encountered common smut and loose smut diseases in the cultivated varieties “ADAU-80,” “Ganja,” and “Mahsuldar.” To combat these diseases, we applied Shansli EC at a rate of 0.75 L/ha by spraying, achieving high effectiveness. Additionally, we observed damage caused by the corn stalk borer, cotton bollworm, and winter cutworm. To control these pests, we applied Karate pesticide through spraying.

Corn Cultivation and Its Importance (Sadigov, 1974) corn is one of the main agricultural crops in the global farming system and is the second most cultivated crop in Azerbaijan after winter cereals.

Although corn is most widely grown in South America, its origin is believed to be Mexico. Due to its high demand for heat and moisture, it is primarily cultivated in Azerbaijan’s Sheki-Zagatala, Balakan, Gazakh, and Lankaran regions. Globally, 20% of corn production is used as food, 20% for industrial purposes, and 60% as livestock feed. This highlights its crucial role in livestock development (Gurbanov, 2017).

Given Azerbaijan’s favorable conditions for corn cultivation, it is possible to harvest crops twice a year. Corn is a nutritious food source, containing essential nutrients in its kernels, silk, and leaves. The corn stalk is rich in calcium (Ca), B vitamins, PP, E, A, and C vitamins, amino acids, sugars, and other beneficial compounds.

Diseases and Pests Affecting Corn Yield. Several diseases and pests significantly impact corn productivity. The most common diseases include:

• Leaf Spot Disease, is caused by the fungus Cochliobolus carbonum. It leads to spot formation on leaves, which eventually dry out. The pathogen overwinters in plant residues in the soil. When temperatures rise in spring, the overwintered spores reactivate, infecting the plant and damaging the leaves.

• Helminthosporiosis, is caused by the fungus Cochliobolus heterostrophus. This disease manifests as brown spots on the leaves, primarily damaging them. The fungus overwinters in plant residues in the soil and can sometimes spread through contaminated seeds (Jafarov, 2024).

• Common Smut and Loose Smut, which primarily affect corn ears.

• Common smut can also develop on the stems, causing them to break. The stem form of the disease is considered highly dangerous.

• Infected ears develop blister-like swellings, which initially appear firm and covered with a grayish-white layer. As the disease progresses, cracks form on the swellings, releasing chlamydospores in the form of dust. These spores spread to healthy plants and overwinter in plant residues, maintaining their viability for 7-8 years.

Common Smut and Loose Smut in Corn

• Common Smut Disease is caused by the fungi Ustilago zeae. These fungi do not infect the root system.

• This disease is more severe in dense plantings (Jafarov, 2024).

• Young corn seedlings are resistant to infection, but chlamydospores infect the plants when they develop 3-4 leaves.

• The ideal conditions for disease development are temperatures of 18-20°C and rainfall, which accelerates its spread.

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e-ISSN: 2709-4189

• In Azerbaijan, common smut is most prevalent in the Sheki-Zagatala and Quba-Khachmaz regions.

Loose Smut Disease

• Loose smut is one of the most widespread diseases in corn.
• Unlike common smut, it only affects the ears and tassels.
• Infected ears turn into black, oval, cone-shaped masses, while infected tassels blacken, wither, and fall off.
• The disease is caused by the fungus Sorosporium reilianium (Jafarov, 2001).
• Black powdery spores develop on the ears and tassels, which then disperse and infect healthy plants.
• Loose smut can reduce corn yield by up to 20%.
• Both diseases' pathogens overwinter in plant residues in the soil, enabling them to survive and spread in future growing seasons.

Disease Control Measures in Experimental Corn Fields. In the ADAU experimental nursery, we cultivated the corn varieties "ADAU-80," "Ganja," and "Mehsuldar". Despite treating the seeds with 75% Vitavax before sowing and strictly following all agrotechnical guidelines, we still observed common smut and loose smut infections in our corn fields. Since environmental conditions were favorable for disease development, the infection spread rapidly. To combat this, we treated our experimental field with the Shansli EC systemic fungicide. This fungicide has both curative and preventive effects, targeting multiple diseases.

For application, we prepared a solution of 75 ml of Shansli EC in 30 liters of water and sprayed it across the affected area. The results of this treatment are presented in the following table.

Table 1. Results of Fungicide Treatment in Corn Fields Application Details.

Fungicide Name	Application Rate	Crop	Disease	Application Time	Number of Application
Shansli	0.750L/ha	Corn	Common Smut	During Vegetation	1 time
			Loose Smut		

After spraying,we monitored the field every three days and observed that the disease progression had stopped. During the growing season, the pests of corn primarily damage the ears, which leads to a reduction in yield. Among these pests are the field moth, corn stem borer, cotton bollworm, rodents, and others that damage the corn plant (Khalilova, Ismayilzadeh 2016). The field moth (Loxostege sticticalis) produces 3–4 generations in Azerbaijan and is polyphagous, with the caterpillars of the third generation being the main culprits damaging the corn ears.

Table 2.

Crop	Disease	Fungicide Name	Infected Plants Treatment
Corn	Common Smut	Shansli	55
Corn	Loose Smut	Shansli	40

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The corn stem borer (Pyrausta nubilalis Hb.), as its name suggests, damages the stem. In Azerbaijan, it produces two generations, and the moths are active at night. The first generation of moths flies at the end of May and the beginning of June, after which they lay fertilized eggs on the lower part of the corn plant. The larvae that hatch feed on and damage the stem. The cotton bollworm (Helicoverpa armigera) is widely spread across all regions of Azerbaijan. It produces 3 to 4 generations and damages many plants. It primarily feeds on the ears of corn, causing harm. The autumn grain moth (Agrotis segetum Schiff.) is a dark brown-colored moth. The larvae that hatch from the eggs are grayish-brown in color and mostly damage the lower parts of corn plants, gnawing on the stems near the soil and the root collar, which harms the plant.

To combat these pests, all agro-technical measures must be followed. In autumn, deep plowing should be carried out because these pests overwinter in the soil on plant residues. Deep plowing helps destroy some of them. Before sowing in early spring, seeds should be treated with pesticides. During the vegetation period, if these pests are observed, spraying should be carried out using the following pesticides: Pharaoh (1.5 kg/ha), Resonance (1.5 kg/ha), Karate (0.2 kg/ha), or Desis (0.6 kg/ha). In our experimental field, we conducted spraying with Karate to combat these pests in corn plants. The results of the Karate treatment are shown in the table below

Table 3.

Pest name	Pesticide Name	Spraying Count	Number of Damaged Plant	5days after spraying	10 days after spraying
The corn stem borer	Karate	1 Time	38	3	-
The cotton bollworm	Karate	1 Time	75	6	-
The autumn grain moth	Karate	1 Time	112	28	2

This table shows the effectiveness of Karate treatment against different pests, with a noticeable reduction in the number of damaged plants over time. Let me know if you need any further refinements! As seen from the table, we applied Karate pesticide once, and the results are satisfactory.

Conclusion

Firstly agrotechnical measures should be implemented for combating all these diseases. Deep freezing of crop stubble should be carried out, crop rotation must be used, fields should be cleared of weeds, resistant varieties should be employed, and seeds should be treated before sowing. It is advisable to apply fungicides (such as Shansli EC) during the vegetation period in fields already infected.

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Received: 21.09.2024
Accepted: 03.03.2025