Bulletin of Pure and Applied Sciences.
Botany, Vol.45 B, No.2.
July-December 2026: P.1-17
Original Research Article

Print version ISSN 0970 4612
Online version ISSN 2320 3196
Available online at www.bpasjournals.com

New Natural Methods for Combating Mold Fungi in Agricultural Products- The Isparta Example

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Keywords:
Fungicide, Antifungal, Natural Rock, Essential Oils, Black Spot, Powdery Mildew, Rust Diseases.

Received on 17.03.2026
Received on 16.05.2026
Accepted on 06.07.2026

Abstract

Fungal infections are among the leading causes of food spoilage and diseases of agricultural plants worldwide. Molds are the most damaging group of fungi to agricultural plants and products. They alter the chemical composition of foods, making them harmful. They weaken photosynthetic activity in plants and damage the structure of tissues, rendering them unable to function. Isparta province is one of the leading agricultural provinces in Turkiye. It is the first city that comes to mind in the country for apple, pumpkin, cherry, and rose production. It is also a leader in the production of numerous products such as grapes, melons, and sour cherries. Molds that infest agricultural products and plants cause fungal diseases such as black spot, powdery mildew, and rust, which are problems that farmers cannot cope with. In 2025 year, as a solution to diseases caused by mold fungi, fungicidal/antifungal solutions were prepared in Isparta by grinding natural stones, diluting them with water, and using essential oils (rate 2-5%) during the plant's growth period. These solutions were sprayed onto apple, pumpkin, cucumber, melon, grape, and rose plants at specific intervals. The experiment yielded promising results in combating fungal diseases. According to these results, plant organs with soft tissues and acidic structures are more susceptible to fungal diseases. As humidity and temperature increase, the disease increases; insufficient air circulation increases infection. Claystone, sulfur stone, serpentine stone, and limestone are strong fungicides and disrupt the pest's habitat. Cedar, pine, and juniper tar; and the oily sap of lavender, thyme, and rosemary plants also kill mold fungi by burning their hyphae and mycelia. They should be applied to the plants after rainfall, covering the entire surface. Solutions prepared from antifungal rocks and solutions prepared from essential oils should be applied alternately. This method is more effective. No harm to the plant or its product has been observed with the new techniques; on the contrary, it has increased yield. The accuracy of our method has not been proven with analytical values. Our studies to address this deficiency are ongoing.

How to cite this article: ÖZÇELİK H., SAĞLAM B., **Sude ÖCAL A. (2026).** New Natural Methods for Combat ng Mold Fungi in Agricultural Products- The Isparta Example**.** *Bulletin of Pure and Applied Sciences-Botany,* 45B (2), 1-17.

1. INTRODUCTION

Türkiye is a country suitable for agriculture due to its diverse climate, vast and fertile agricultural lands, and rich and productive soil structure. The city of Isparta is also a highly suitable area for agriculture thanks to its favorable soil characteristics, water resources, and climate. It ranks first in apple production. It is also one of the first provinces that comes to mind in pumpkin and grape production. However, 'Black Spot' disease(Karaleke in Turkish) in apple fruits and 'Powdery Mildew' disease in grapevines and pumpkins are significant problems for the country's agriculture, and especially for farmers in Isparta. The main cause of this problem is fungal (mold) infections. In this region, located in a hot and humid climate, it is one of the leading problems causing income loss for farmers. Although it has been known for years that it causes losses to agriculture, human health, and the economy, a natural solution to this problem has not been found. In terms of environmental health, soil and groundwater pollution, loss of value in the product, short shelf life of the product, etc., are the first damages that come to mind. To date, there have been no findings, drug production, or recommendations from scientific circles and agricultural organizations aimed at solving these problems for farmers. Experienced farmers have sought solutions by soaking herbaceous plants such as garlic, onions, nettles, and thyme in water, straining the water, and spraying it on diseased plants. Conventional farmers use chemical fungicides and sulfur to minimize the effects of these diseases. However, the composition of these chemicals is not fully disclosed by the manufacturing companies. It is evident that some substances in these chemicals are harmful to the environment, human health, and the ecosystem. Hearing about people in Isparta spraying their apple trees with pesticides approximately 30 times makes people reluctant to consume fruit. Chemical pesticides both increase costs and threaten our health and water resources. In the last 10 years, the number of cancer patients in Isparta has increased fivefold. This is alarming and frightening! Mold diseases cause a loss of quality and yield in agricultural products. They reduce the photosynthetic capacity of the plant and decrease its economic value

Our inspiration and hypothesis for this study are:

1. The element sulfur is of great importance in agriculture (Johnson and Lee, 2021). Keçiborlu district has significant sulfur deposits. Plant diseases are less common in this district. Previously, there was a sulfur factory in the district, the only one in the country. The products of this factory were used for plant diseases. Despite the country's poverty, there weren't as many diseases, and farmers didn't face such difficulties in producing agricultural crops; they worked less and incurred less expense.

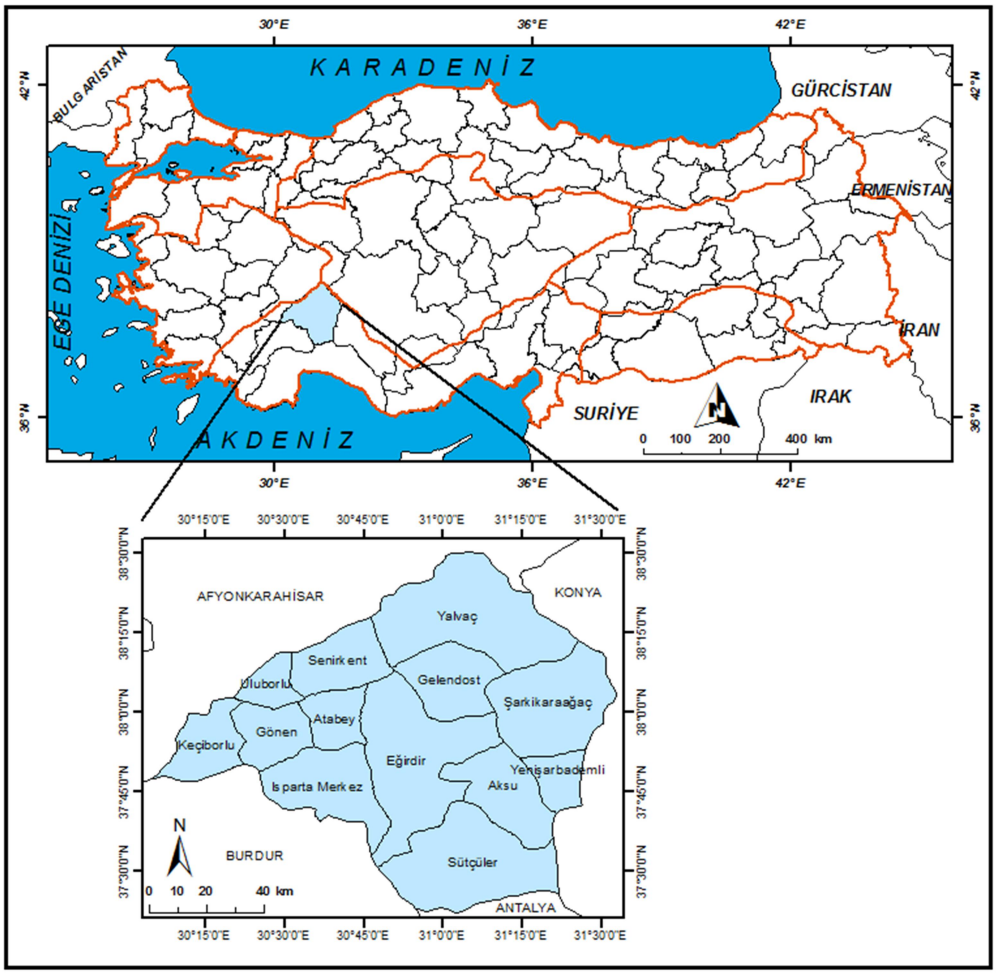
2. Could disease-resistant solutions prepared from essential oils(aromatic plant oils), or natural rocks be sprayed onto plants to prevent disease? Our inspiration for this suggestion is that plants containing essential oils and sulfur compounds are less susceptible to disease. Our shepherds treat fungal diseases occurring on the skin of animals by applying pine tar (püse in Turkish) and cedar tar (Özçelik, 2023; Öztürk and Özçelik, 1991). If the extracts of these plants are sprayed on plants infected with molds, those plants may also not get sick.

3. Another issue is that the selected diseases are fungal/mold diseases. Fungi mostly multiply in acidic environments. Since limestone is strongly alkaline (Anonymous, 2025; Korkmaz and Özçelik, 2013), it can neutralize or even alkalize the living environment of mold fungi, preventing their multiplication. The aim of this study is to produce fungicides from natural and harmless materials. The goal is to create alternative products to synthetic pesticides that harm nature and human health.

2. MATERIALS AND METHODS

The study area is Isparta province, the center of the Lakes Region (Map 1). Apple (in Gönen), grapevines and cucurbits (melon, cucumber, pumpkin), okra and roses (in the central district) were used in the experiments. Roses were grown both in greenhouses (Gülcü Veli Rose

Greenhouse, Sav town) and in open fields (Keçiborlu). Limestone, claystone, sulfur stone, serpentine, rock salt and wood ash were used as fungicide materials (Figure 1). In addition, some plant-derived essential oils (lavender, pine tar, thyme oil) were used. The number of plants included in the experiment was generally 10. Experiments were conducted in 2025 on diseased and undiseased plants **(Table 1).**



Map 1. Location Map of Isparta Province (by Ayşegül Tekeş).

2.1. Material Procurement and Application Methods:

2.1.1. Material Procurement: Sulfur stone, serpentine, and claystone were excavated from suitable locations around Lake Burdur, packed into sacks, and transported to the application area. Limestone was obtained from a soft rock on the Çay-Akşehir highway. All rock materials were spread out over a large area, dried, and then crushed into powder. Rock salt, sulfur, and copper sulfate were commercially sourced from agricultural companies. The rock salt was soaked in water a few days prior to application to dissolve it. Essential oils were obtained by distillation by us. Sufficient quantities were produced by us at the Gülcü Veli Rose Greenhouse.

Figure 1. Serpentine, sulfur, and clay deposits on the shore of Lake Burdur.

2.1.2. Preparation of Fungicide Solution from Natural Rocks: After diluting the rock materials, they were added to a backpack sprayer, filtered through a sieve. This filtration was found to be insufficient, so the filtered material was further filtered through cheesecloth. Wood ash was sifted. Essential oils (lavender, thyme, fennel) and tar were taken in the necessary quantities, dissolved in ethyl alcohol, and then added to the sprayer and diluted with sufficient water. Application was done in the afternoon-evening. A sufficient amount was sprayed on all affected organs. All applications are described in Table 1. Each application was recorded in a notebook, and before proceeding to the next application, a situation assessment was made; that is, the effect of the applications was observed and recorded with photographs and text. The photographs provided were taken by us and are original. Farmers in the area were also interviewed, their opinions were obtained and recorded. All findings were discussed and interpreted in light of the literatures.

Figure 2. Grinding natural rocks into a solution and producing essential oils.

2.1.3. Application: The equipment used was a 16-liter machine sprayer. In applications where claystone was added, the clay, no matter how much it was filtered, settled at the bottom of the pump and clogged its channels. Therefore, in trials on roses, the greenhouse's 100-liter motorized pump was used. In other applications, the clay content was reduced. Spraying was done after every rain. Therefore, the spraying dates were not periodic. For rainless periods, spraying was done every 7-10 days. The pesticide was sprayed on all parts of the plant. Spraying was done only once each time. Spraying times were generally preferred in cool, windless times, usually between afternoon and evening. Our observations were used as the basis for the report. Success rates were classified.

Success Class: 1: Weakest, 2: Weak, 3: Medium (Can be considered successful), 4: Good, 5: Most Successful (completely successful). Important findings were photographed and recorded. The findings were evaluated and interpreted in light of the literature, and recommendations were made to relevant sector.

Figure 3. Application of natural fungicide to diseased roses (powdery mildew) in Gülcü Veli Rose Greenhouse

Figure 4. Application of natural fungicides to apple trees and setup of the experiment.

Table 1. Application studies: Materials and methods.

Serial Number	Application Dates	Application (Spraying with a backpack sprayer)	Composition (total volume 16 liters)	Application Location
1	10.07.2025 26.07.2025 12.08.2025 19.09.2025	Spraying apple trees in an apple orchard.	0.5 kg rock salt + 500 gr sifted wood ash + 1 kg limestone + tap water	Güneykent/Gönen
2	10.07.2025 26.07.2025 12.08.2025 19.09.2025		(100 g Copper sulfate (in granular form) + 100 g sulfur + 1 kg dry limestone + tap water	Güneykent/Gönen
3	25.06.2025 30.08.2025	Spraying the vines in the vineyard.	0.5 kg sifted wood ash + 50 g liquid sulfur + tap water	Isparta, Central District.
4	10.07.2025 26.07.2025 12.08.2025 19.09.2025	Spraying apple trees in an apple orchard.	1 kg limestone + 1 kg claystone + 1 kg serpentine stone (dried) + 100 gr copper sulfate +0.5 kg clay (dried) + tap water	Güneykent/Gönen
5	10.07.2025	It was sprayed on apple trees and zucchini	Thyme + lavender hydrosols (in equal amounts; 1:1 ratio) added and mixed.	Isparta, Central District.
6	08.07.2025	It was sprayed on 2 linden trees and apple trees	150 grams of pine tar was dissolved in alcohol and diluted with tap water..	Isparta, Central District.
7	10.07.2025	It was sprayed on all the roses in the rose greenhouse.	50 g Fennel essential oil + 100 cc ethyl alcohol + tap water (Note: The essential oil was first dissolved in alcohol and then diluted with water).	Gulcu Veli Rose Greenhouse, Isparta, Central District.
8	11.07.2025	It was sprayed on zucchini and cucumber plants		Isparta, Central District.

3. FINDINGS AND DISCUSSION

The solutions we prepared and tested generally yielded positive results against fungal diseases. Controlling powdery mildew by making the pH alkaline was found to be successful. No signs of fungal disease were observed in the apple trees we treated. The observations are explained below in bullet points:

- A common characteristic of plants/organs affected by the disease is their acidic pH. Walnut (Juglans regia), grapevine (*Vitis vinifera*), okra (*Abelmoschus esculentus*), apple (*Malus domestica*), rose (*Rosa* spp., especially *R. banksia* and other climbing roses), melon (*Cucumis melo*), cucumber (*Cucumis sativus*), zucchini (*Cucurbita pepo*), etc., have an acidic temperament. Among wild plants, bindweed (*Convolvulus arvensis*) and sorrel (*Rumex crispus*) are among the most frequently affected by fungal diseases.
- Plants with broad leaves, soft tissue, and high moisture content are more susceptible to fungal diseases (**Everest and Özcan, 2018**). Examples include beans (*Phaseolus vulagaris*).
- The disease first affects the leaves, then spreads to the flowers, and finally to the fruit. The flowering and fruit-setting period is the most susceptible to disease. • Ambient temperature and humidity, as well as the moisture content within the organ, contribute to the spread of the disease. Leaves and flowers are

susceptible to fungal diseases due to their high moisture content.

- In the trials, spraying was done between afternoon and evening. It yielded positive results.
- Plants with exposed air (wind-facing parts) are less susceptible to disease than those with densely packed branches/leaves. Therefore, when pruning trees, a process called 'thinning' should be performed. Organs exposed to sun and wind are less susceptible to disease. This is a practice that prevents the plant from getting sick. When pruning fruit trees, lower branches are often left to facilitate harvesting. This increases temperature and humidity. Excessive watering and branches close to the ground are more susceptible to disease.
- On July 10, 2025, 150 cc of pine tar was dissolved in alcohol and diluted in water at Gülcü Veli Rose Greenhouse; it was sprayed from the central system using an industrial type (10 liter, motorized) pump until the pesticide ran out. A strong odor was released, which subsided after a while, and the leaves became shiny. After about an hour, the shine and wetness on the leaves disappeared.
- On July 10, 2025, fennel essential oil was diluted in the same way in the greenhouse and sprayed on diseased roses. A pleasant scent spread around, and the leaves became shiny. The appearance of the plants changed for the better.
- Rain largely eliminates the effect of the spraying. In other words, it washes away the pesticide. No pesticide residue remains on fruits washed with water.
- Spraying has a positive effect on the plant, like foliar fertilization. Fruit quality increases with spraying.
- The susceptibility of each plant to disease is not equal. Even if the variety is the same, the health, age, resistance of the plant, surrounding plants, etc., change the situation. The upper parts of the apple tree are airy; fruits and leaves closer to the ground and in the shade are more susceptible to disease. In experiment No. 1, there was rot and fruit worm in the apples, but no fungal infection. The prepared pesticide does not harm the fruit worms.
- The apple variety is important; black spot is very common in red apples and in Eğirdir and Gelendost. Summer apples are resistant to black spot. However, they are susceptible to fruit worms. Molds cannot infect hard tissues. Apples are sensitive during the ripening period because their tissue softens and their moisture content increases.
- Applying the solution/slurry every 15 days and changing the mixtures increases success.
- The risk of the pesticide getting into the eyes or dust during application is negligible; it has no toxic effects.
- Solution number four was prepared: Because the clay is heavy, it settled at the bottom of the pump, clogging it. The lack of a mechanism like a mixer to prevent settling made the job difficult. The solution should be used immediately after preparation before settling, or sprayed onto herbaceous plants with something like a broom, or the use of clay should be abandoned altogether. It was diluted by half and transferred to another clean pump and disposed of with difficulty. The sediment that formed while cleaning the pump was applied to vines and vegetables (July 13, 2025) and proved beneficial. No side effects were observed.

A considerable amount of solution number two was accidentally spilled into the pot of the Arapgir Purple Basil, but the plant was unharmed.

Disease is more prevalent in greenhouse environments than in open fields.

Commercial liquid sulfur was not as effective as powdered sulfur.

The physical and chemical properties of the material used are not sufficiently known.

More ideal alternatives should be sought and used. A detailed examination is necessary.

Table 2: Materials, methods, and results of natural fungicide application.
NOTE: Success class: 1 is the weakest, 5 is the strongest (completely successful).

Serial number	Pest Control Date	Application Location	Application (spraying) Process	Composition (total volume = 16 liters)	Applied Plants	Inspection Date and 2nd Spraying Date	Success Class	Estimated Duration of Effect
1	10.07.2025	Güneykent apple orchard	Easily applied with a 16-liter backpack sprayer.	0.5 kg rock salt + 500 g sifted wood ash + 1 kg limestone + tap water	Apple trees	26.7.2025	4	30-40 days
2	10.07.2025	Güneykent apple orchard		100 g copper sulfate (granular) + 100 g liquid sulfur (in powder form) + 1 kg limestone	Apple trees	26.7.2025	4	30-40 days
3	25.06.2025	Isparta Central District vineyard orchard		0.5 kg sifted wood ash + 50 g liquid sulfur + tap water	Vineyards	26.7.2025	3	30-40 days
4	10.07.2025	Isparta, Central District apple orchard	It couldn't be implemented because the clay settled to the bottom and clogged the pipes.	1 kg limestone + 1 kg claystone + 1 kg sulfur stone + 1 kg serpentine stone + tap water	Apple trees	26.07.2025	4	30-40 days
5	10.07.2025	Isparta, Central District Vegetable orchard	Easily applied with a 16-liter backpack sprayer	Thyme water + lavender hydrosols (oil-based)	Apple trees, Zucchini and Cucumber	17.07.2025	2	10-15 days
6	08.07.2025	Isparta, Central District Vegetable orchard	Dissolved tar recombined; it stuck to the pump (backpack sprayer).	150 g of pine tar dissolved in alcohol + tap water	Apple trees	15.07.2025	2	10-15 days
7	10.07.2025	Sav town, Gülcü Veli	Easily	Fennel essential oil	Various roses	20.07.2025	2	7-10 days

		Rose Greenhouse	applied with a 16-liter backpack sprayer.	is dissolved in 50 g of alcohol, and then water is added.				
	11.07.2025	Isparta, Central District Vegetable orchard			Zucchini and Cucumber	20.07.2025		
8	13.07.2025	Sav town, Gülcü Veli Rose Greenhouse	It was applied with a 100-liter motorized pump.	2 kg limestone + 2.5 cups copper sulfate + sulfur + wood ash	Various roses	20.07.2025		20-30 days

Figure 5. Results of natural fungicide application to apple scab disease and trees (Güneykent, Gönen district).

Figure 6. Powdery mildew disease in pumpkin and results of natural fungicide application (Isparta, Central district).

Figure 7. Powdery mildew disease in melons and results of natural fungicide application (Isparta, Central district).

Figure 8. Powdery mildew disease in okra and results of natural fungicide application (Isparta, Central district).

Figure 9. Applications of natural fungicides to powdery mildew disease on grapevines (Isparta, Central district).

Figure 10. Powdery mildew disease in eggplant (Isparta, Central district).

4. RESULTS AND RECOMMENDATIONS

4.1. Results: The number of plants used in the experiment is not equal. The number of plants included in the experiment is 10-30. The number of trees is small. The number of plants is insufficient for statistical analysis. Sensory analyses were not performed at all. Some of the shortcomings can be summarized as follows. pH, humidity, wind, and temperature are very effective in infection. Humidity, temperature, stagnation, and acidic pH are positive for fungal infection; wind exposure, basic pH, drought, and cold reduce infection. They disrupt the environment against fungal infection. Solutions prepared from natural basic rocks disrupt the pH of the environment; essential oils, on the other hand, show their effect in a short time by burning fungal hyphae or mycelia. In contrast, it is not expected to damage the soil and the product. Natural stones (also act as a nutrient substitute like foliar fertilizer **(WHO, 2019; Meyer, 1964; Smith, 2020; Korkmaz et al., 2012).**

Table 3: The natural stones used and their various properties (Bayhan ve Yalçın, 1990; Meyer, 1964; 1976; Türkmenoğlu vd., 1995; Anonymous, 2025).
Note: Water absorption capacity: 1 is the weakest, 5 is the strongest.

Material (Rocks)		**pH**	**Chemical composition**	**Water absorption capacity**	**Color**	**Hardness level**	**Specific gravity**
English name	**Scientific name**						
Limestone	Limestone	12,3	Calcium carbonate / $CaCO_3$	4	White	3	2,5-2,7 g/ cm^3
Claystone/ Mudstone	Marl/ Chort	7,5-9	Composed of 50-70% limestone and 30-50% clay, it is made up of very small colloidal particles..	5	Blurry green, gray, red, brown, black	2-3	4,48-4,84 g/ cm^3
Serpentine	Serpantine	8-10	Mg, Fe, Ni, Mn, Al, Zn)3 [Si2O5] [OH] 4 and it carries a faint scent.	2	Greenish-black; black, light gray	2-4,5	2,53 - 2,65 g/cm^3
Sulfur stone	Sulfur	8-9	It contains 3.3% sulfur, 10% hydrogen, 0.7% nitrogen, and 79% carbon.	4	Yellow	1,5-2,5	2.07 g/cm^3

The preparations and tests we conducted generally yielded positive results against fungal diseases. These are:

- Clay, gypsum, and sulfur stone have high basicity in lime (**Özdeniz et al., 2017**).
- Spraying essential oil solutions polishes, nourishes, and improves the appearance of plan organs. This is important for florists.
- No signs of fungal disease were observed in the apple trees we treated. The apples of trees numbered 4 were larger. The location, irrigation, and care were the same. This was thought to be due to the applied composition exhibiting foliar fertilizer properties. Although the apples of trees numbered 1 were not as large as those of trees numbered 4, they were still very beautiful. The leaves of apple trees numbered 2 were yellow. This means there was insufficient nutrition. Therefore, some of the fruits fell to the base of the tree. It was determined that these fruits were wormy, but not affected by Black Spot disease. Accordingly, the success ranking of the solutions against Black Spot disease in apples is as follows; The plots are numbered 4, 1, 3, and 2. There is rot in apple trees, including apple tree number 1. However, the source of this rot is fruit worms, i.e., butterfly larvae. This situation is thought to be independent of fungal disease. Different control methods should be applied against these pests. Our aim in this project is to combat mold fungi (powdery mildew).
- In the Gülcü Veli Gül greenhouse, 150 cc of pine tar was dissolved in alcohol and diluted.
- It was applied to approximately 40 pots (different roses) in the open area. A strong odor was released, which decreased after a while. The solution made the rose leaves shiny, but after 1 hour, the shine and wetness on the leaves decreased. In other words, the leaves absorbed the solution, and the oil in the solution partially evaporated. Using tar for spraying was not deemed appropriate. Although alcohol is a good organic solvent, it did not dissolve the tar sufficiently. A depressing odor spread in the area.
- Fennel oil was dissolved in alcohol, diluted in the same way with water, and applied to a large greenhouse. A pleasant scent spread, and the leaves became shiny. Fennel essential oil was found to eliminate fungal disease in roses. The most common fungal disease occurs in climbing roses, such as R. banksia. The texture of the climbing roses is softer.
- Agricultural antifungal production from natural rocks and plant-derived essential oils is possible. Detailed research is needed. Chondock root(Echinophora spp.): contains carvone, good for fungus (from a conversation with Prof. Dr. Tahsin Karadoğan).
- 15 cherry trees were sprayed once with a sufficient amount of water obtained by boiling and straining the roots of the chondock plant. No disease occurred, the fruit and leaves were shiny, and customer satisfaction was good. From a conversation with R. Koltuk from Atabey district (July 19, 2025).
- Near Afşar village, on the route from Keçiborlu to Sandıklı, around the Köroğlu pass (1416 m), there are very important gypsum and sulfur deposits. Plant growth is weak in these areas.
- Farmers state that liquid sulfur is not as effective as powdered sulfur, but that its liquid form is more suitable for spraying; that liquid sulfur is produced from petroleum products, not sulfur stone, that it is odorless, and therefore, despite being sold as a fungicide, it is very weakly effective and only becomes effective after 25-30 sprays on the trees. If the pesticide is effective, a few applications to the apple trees will be sufficient, saving labor, time, and effort. This results in a cost-reducing outcome.
- After spraying, the new leaves on cucumbers and eggplants were greener, more vibrant, and disease-free.
- In the classic application for apple black spot, spraying is done every 15 days after the leaves begin to sprout. If it rains, it is reapplied regardless of the day. At least four applications of pesticides are made for Black

Spot disease. Agricultural chambers are informed about the issue.

- The spraying does not prevent harvesting, flowering, or pollination. Products should be washed before consumption, and any physical stone layer on them should be removed. The spraying does not harm wild animals. It has been observed that animals are not disturbed during spraying.
- Pesticides directly or indirectly threaten human health at many stages, from production to use. We used a natural remedy we made against the fungal disease, and there was no need to use pesticides. In this way, we were able to reduce the effect of the fungal disease that infests the crops in the fields and reduces the quantity and yield of the product, and harvest from the field without harming any plants or animals. Our trials were successful, the yield and quality of the products in the field and the farmer's profit increased. It made a partial contribution to solving food shortages and quality, as well as to organic farming. The solutions we prepared were made into organic or natural pesticides. The aim is to expand and commercialize the applications.

4.2. Recommendations: Application should be done in the evening. Since evaporation is low during this period, there is sufficient time for the organs to absorb the drog. Spraying should not be done on hot days or at hot times. Heat evaporates the drog, weakening absorption. Spraying should not be done on rainy days; it should definitely be done after rain. One rainfall reduces the pesticide, but 2-3 rainfalls can completely wash it away. Spraying once a month is sufficient during rainless periods.

- A mask/goggles should be used during spraying.
- To reduce disease incidence, production should be done in conjunction with essential oil plants. For example, a row of roses, a row of lavender or fennel should be planted.
- Drip irrigation should be preferred, and unnecessary watering should be avoided. Fields should be plowed approximately once a month. This also prevents the spread of the disease. Humidity is high in weedy areas, thus creating a breeding ground for the disease.
- The presence of humidity and heat increases fungal infections. Therefore, spraying should not be done during hot and rainy periods.
- One spraying is insufficient for vines; three sprayings are appropriate.
- Okra plants are prone to mold. Growing them in greenhouses is costly due to powdery mildew. Those susceptible to powdery mildew should be grown in open fields, not greenhouses.
- Tomatoes, cucumbers, melons, etc., should be tied to stakes, meaning they should be kept in an airy environment. Moisture from the soil surface should be reduced.
- Since the acidity of the environment increases mold formation, pruning waste, fruit and leaf waste should be removed from the field. These are thought to increase mold/black spot disease by making the environment acidic. The field should be plowed frequently. Weed growth increases moisture in the tree organs.
- Gypsophila root (Gypsophila spp.), Echinophora spp., and gypsum stone can also be antifungal and should be tried.
- Our application should also be preferred in terms of health and environmental pollution.
- The food produced should be inexpensive and meet world standards. For this reason, not only disease eradication but also food quality should be prioritized. No analysis was performed on the produced food. This aspect is lacking in our study.
- Soil-plant relationships should be examined in detail. Irrigation is the quickest method for soil improvement (Kirkham, 2004). The soil composition can be altered by adding the solutions we prepared to the irrigation water. Different models can be created depending on the crop.
- The disease first affects weeds. From there, it spreads to the crops. When spraying, susceptible weeds in the field should also be treated or removed from the field. Fields should be plowed frequently, and unnecessary irrigation should be avoided.

- During pruning, the plant should be pruned in a way that allows it to receive more wind and sun.
- The surrounding disease agents should also be disinfected. If there is disease on the leaves, it will definitely spread to the fruit, because the fruit is a leaf metamorphosis; that is, its origin is a leaf.
- The global climate crisis is manifesting itself all over the world. This situation signals food scarcity, inadequacy, poor quality, and high cost **(Özçelik, 2026).** The prepared solutions should aim to reduce water loss and compensate for water deficiency in the plant. Natural remedies should not only be fungicidal but also functional. Drought-resistant plants should be encouraged in agriculture **(Özçelik, 2026).** Excessive irrigation and humidity invite disease.

ACKNOWLEDGEMENTS:

We sincerely thank TUBITAK (Project 2209A, about Natural Agricultural drog Against Apple Grapevine and Pumpkin Powdery Mildew Disease) for financially supporting our project; and also Gülcü Veli (Veli Erdoğdu and his family) Ltd. Co. for allowing us to conduct trials in their greenhouse and assisting us in our studies; and the farmers (Güneykent) who gave us the opportunity to test our pesticides in their apple orchards and agricultural products.

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