Larixifol & Bacilifol Product Report

- 2023 -

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About us

AgroShield LLC is a leading agricultural supply company that was founded in 2015 by industry experts with more than 60 years of combined experience. The founders established the company as a low-dose herbicide supplier for grass weed problems in soybeans, cotton, and alfalfa. Over the years, the company has evolved into one of North America's fastest-growing agricultural supply companies, offering new, environmentally friendly solutions for crop and water protection.

Introduction

AgroShield has developed two all-natural products that, when used together, improve soil quality, increase resistance to disease, and enable greater nutrient uptake, allowing fertilizer usage to be reduced by up to 50 percent. AgroShield introduces **Larixifol** and **Bacilifol**.

Bacilifol and Larixifol are innovative, all-natural products that are able to provide many of the same benefits as foliar sprays and seed treatments. Specifically, these products:

- unlock soil nutrients for improved uptake
- reduce loss from evaporation
- produce Auxin, a plant growth regulator which boosts growth and yield
- increase the secretion of metabolites which degrade cell walls of fungus and bacteria
- cure and prevent plant disease
- trigger plant immune systems
- provide general anti-fungal and antibacterial benefits

Larixifol Overview

Larixifol is a microemulsion derived from a Larch wood extraction process developed and controlled as a trade secret by AgroShield LLC. This innovative product has been developed with a wide range of usage portfolios and has been successfully marketed as a seed treatment for outdoor use on crops such as corn, soybeans, potatoes, oilseed crops, cucumbers, melons, sugar beets, sunflowers, and others. The product has gained popularity, and the main customer in Nebraska has increased their purchase every year for the last four years, treating seeds for over 50,000 farmed acres with Larixifol.

The versatility of Larixifol doesn't stop there. It has also been used as a foliar spray, indoors and outdoors, with potential benefits that are yet to be discovered. In a 2019 Colorado Springs oilseed crop trial, it was observed that Larixifol completely eradicated spider mites with 2-3 staged applications.

Larixifol contains 12% Taxifolin, which is highly purified in a micro-emulsion. Its main active ingredient, dihydroquercetin, is obtained from Dahurian Larch trees. This ingredient enhances plant resistance to diseases, pests, and adverse climatic conditions. Furthermore, Larixifol can be used as a seed treatment or foliar spray to promote growth processes and photosynthesis. The results from previous trials indicate that Larixifol-treated plants experienced greater initial growth and lower mortality rates than the control plants. In addition, the product has been found to be effective in treating late-stage infections in hemp.

Overall, Larixifol is a groundbreaking product that is leading the way for all-natural plant amendments. It has a wide range of applications, and its effectiveness has been demonstrated in numerous trials. This report highlights Larixifol trials of industrial hemp, apples, soybeans, and corn. Its versatility and potential benefits make Larixifol a promising product for farmers and growers, and its continued development and exploration will undoubtedly yield even more exciting results in the future.

Bacilifol Overview

Bacilifol is a highly concentrated starter based on Bacillus amyloliquefaciens that is available in a wettable powder form. Unlike many other Bacillus amyloliquefaciens products in the market, Bacilifol is unique in that it is marine-based. At temperatures above 32° C (90° F), liquid products would be in danger of deterioration while Bacilifol would remain stable. A longer shelf life and a greater temperature range would allow buyers to store the product for longer and in a less climate-controlled environment without damaging the product. Additionally, this special feature provides immediate growth spurts to all forms of plant life when applied as a foliar or seed treatment.

The current pack size of Bacilifol is 1kg, but it will be available in 2.2lb. foil packages soon. Bacilifol is highly effective and has the potential to benefit almost any crop, shrub, ornamental, or turf. The product has been sprayed on ornamentals and has shown remarkable results.

One of the key features of Bacilifol is that it acts as a natural plant health improvement additive. When applied to plants, Bacilifol strengthens the plant's immune system and makes it more resilient to diseases and pests. It also improves the plant's nutrient uptake and utilization, resulting in healthier and more vigorous growth. As a result, plants treated with Bacilifol are less likely to require synthetic fertilizers or pesticides, making it an excellent option for organic growers.

Bacilifol is also suitable for use as a seed treatment. A customer in Nebraska who buys Larixifol every year is now considering Bacilifol as a replacement for Quick roots as his go-to starter for a seed treatment. The company believes that Bacilifol has the potential to be a game-changer in the retail market as a foliar spray.

In conclusion, Bacilifol is a concentrated wettable powder starter based on Bacillus amyloliquefaciens that is marine-based. It has demonstrated remarkable results in ornamentals, lettuce, prune trees, and other crops. This report focuses on trials where Bacilifol was tested on tomatoes, grapes, and golf greens. Bacilifol acts as a natural plant health improvement additive, making plants more resilient to diseases and pests and improving nutrient uptake and utilization. Bacilifol has the potential to be a game-changer in the retail market as a foliar spray, and it is suitable for use as a seed treatment.

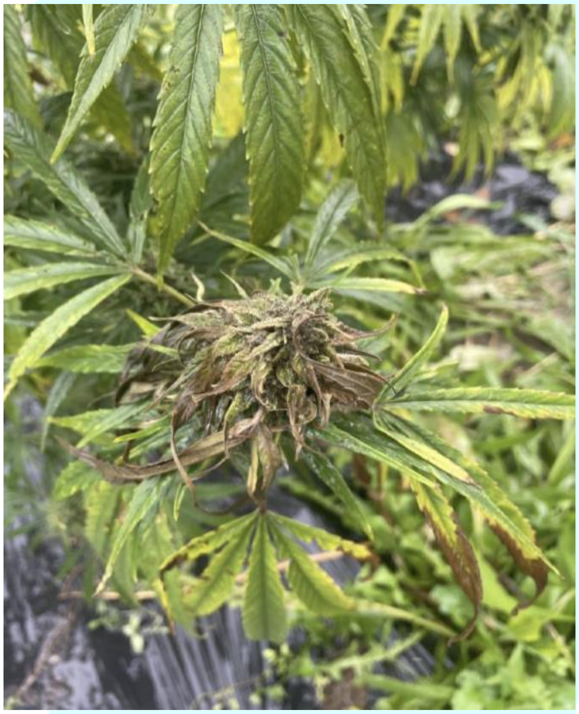
Larixifol on CBD Hemp

Overview

In this trial, CBD hemp was grown outdoors and in greenhouses near Romulus, NY USA, Larixifol was used both as a seed treatment and as a late foliar spray. CBD Hemp Seeds were treated with Larixifol before planting. The Larixifol-treated seeds grew a more vibrant and healthy plant. The end result was a strong and oil-rich plant that was ready for harvest.

Outdoor Hemp Infection

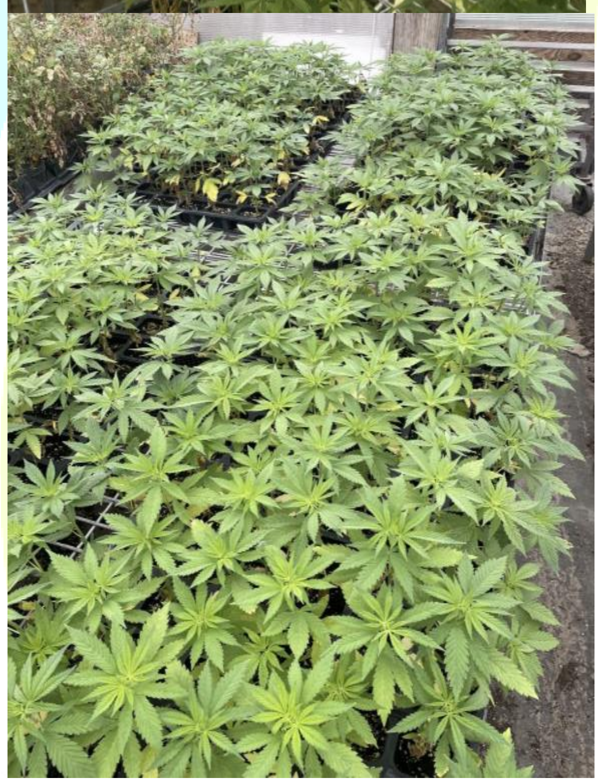
The untreated control group of the CBD Hemp study was severely infected with the fungus, Botrytis. The Larixifol-treated seeds have shown no signs of infection prior to harvest.




CBD Hemp in Greenhouses

Our continual interest has been in hemp in the greenhouse setting. Larixifol-treated seeds have been stronger and more disease resistant in this setting venue. As the plants reached maturity, the greenhouse was infected with spider mites and aphids. To further our studies, there were three (3) applications of Larixifol as a foliar spray to non-control plants. The untreated control group of the CBD Hemp study has shown the greatest number of Spider Mites and Aphids. The foliar spray applications of Larixifol. significantly reduced the pest population of the treated plants via a two-stage attack—suffocation and larva egg development. If any were present on the treated plants. These plants were ready for harvest.



In Summary

The CBD hemp was completely void of botrytis, which was rampant in the adjacent control plants. In greenhouse tests, the Larixifol-treated seeds and foliar spray received a much lower count of Thrips, Aphids, and Spider Mites compared to the control group. In addition to plant protection with Larixifol, researchers also documented stronger initial growth, increased biomass, and better oil production in the crowns of the plants. The Larixifol plants were overall healthier and able to withstand most growth pressures.

Larixifol on Apples

Overview/ Methodology

This trial was conducted in a block of apple trees at the BAAR Scientific Research Farm on Mott Rd. in Phelps, NY. Trial was established on McIntosh trees, which were 9 ft tall and ~35 years old. Four replicates of single tree plots were used. Apple trees were sprayed with Larixifol at a rate of 10 fl oz/A. Trees were sprayed, using a handgun that was attached to a Friend Commercial sprayer, which was modified for small plot research. Applications were made at 100 gallons per Acre, with 7 gallons of spray solution that was mixed for application to the four trees; operated at 125 PSI.

LEFT PHOTO IS CONTROL, NO FRUIT AND DISEASE AFFECTED. RIGHT PHOTO IS DOUBLE NICKLE, NO FRUIT AND HIGH RATE OF DISEASE.

LEFT PHOTO IS LARIXIFOL, NO DISEASE AND HAS FRUIT. RIGHT PHOTO IS CAPTAN, NO DISEASE AND HIGHER NUMBER OF FRUIT.

Results

Apple scab was severe in this trial. Foliage on the nontreated trees had 16.42 % area of the foliage with apple scab. While the Larixifol-treated foliage had 15.83 % area with apple scab, that level of scab was not different significantly from the nontreated foliage. Trees treated with Double Nickel (this is not an organic or natural process) had 20.0 % area with apple scab. The severity of apple scab was the highest in 2021, compared to any year since 1993 (When the apple scab trials first began). Since the season was extremely favorable for apple scab, Dr. Becker suggested an evaluation in another season. Also, perhaps an evaluation at a higher rate of Larixifol may be valuable. Oblique banded leafroller is a lepidopteran pest that feeds on apple foliage in the spring. The nontreated foliage had 14.75% area with damage (= holes). The foliage treated with Larixifol had 4.8% area with damage, which was significantly reduced compared to the nontreated foliage. The Larixifol-treated foliage had damage that was numerically less, but statistically similar to the Bacillus amyloliquifaciens product Double Nickel.

Larixifol on Soybeans

Overview/ Methodology

This trial was conducted at BAAR Scientific Research Farm on Mott Rd in Phelps, NY. Soybean seeds were provided by AgroShield and had been pretreated with Larixifol. Seeds were planted at 70000 seeds per acre on May 27, 2022, using a John Deere 2-row vacuum planter. The planter had one hopper (row) of treated seeds and 1 (hopper) row of untreated seeds. Rows were on 2.5 ft centers and 20 rows were planted, with all rows being 100 feet long. Five plots were established for Larixifol-treated soybeans and five plots were established for nontreated. On Aug 1, 4 plants were dug from each of the 5 replicates. Each plant was measured for height to the base of the top leaf. Plants were subsequently cut at the soil line, then the roots and entire plant “top” were weighed, separately. Top weights included stems, leaves, and pods.

Results From Whole Plant Assays

Results of the whole plant assays showed that plants were of similar height and weight. However, the roots from Larixifol-treated seeds had increased node production in the roots as well as less weight, significantly at p=0.10, compared to the roots from nontreated seeds. Soybean yield was measured on Nov 9, 2021, by counting plants and hand removal of all the plants within 10 feet of a row. (Excessive rainfall inhibited the combine from entering the field as 3.07 inches and 8.84 inches of rain was recorded in September and October, respectively.) The yield was determined by threshing the plants using a stationary thresher. The collected seeds were weighed. Bushels per A was determined using the weight per bushel value of 73.96 lbs per bushel, due to moisture readings around 20 %.

Soybean Yield Results

Plants per foot was recorded as 2.42 for Larixifol-treated beans, compared to 3.42 plants per foot from nontreated beans. This rather large difference is likely due to a planter issue. However, the yield results of 39.2 grams of beans per plant from Larixifol-treated seed, compared to 28.93 grams of beans per plant from non-treated bean, appear as a phenomenal difference, likely due directly to Larixifol. The final yield result that was calculated from 10 feet of row showed that the BU/A were rather similar, and not different significantly at p=0.10.

In Summary

The takeaway from this trial was the phenomenal additional production of beans per plant from the Larixifol-treated seed. It was suggested by Dr. Becker that this trial should be conducted again following the planting of similar beans per foot of row.

UNTREATED SOYBEAN LARIXIFOL TREATED

SOYBEAN LEFT UNTREATED, RIGHT

LARIXIFOL TREATED SOYBEAN

Larixifol on Corn

Overview/ Methodology

Larixifol was used in this study as a seed treatment on corn. Corn seeds were provided by AgroShield that had been pretreated with Larixifol. The corn variety was DKC47-55RIB (VT2PRIB). Seeds were planted at 32000 seeds per acre on May 18, 2021, using a Kinze 12-row planter. Two rows of treated and two rows of untreated were planted into a single 300-foot-long plot. Five plots were established for each treated and nontreated, and served as 5 replicates; each plot was 40 ft long. On Aug 1, 4 plants were dug from each of the 5 replicates. Plants were measured for height to the base of the top leaf. Plants were subsequently cut at the soil line, then the roots and entire plant "top" were weighed, individually.

Results

According to Dr. Becker, the results indicate that while plants were slightly shorter with less top weights; the variability was sufficient so that no significant difference between the treatments was observed; even at p=0.1. Root data were just the opposite, where roots treated with Larixifol were slightly larger, compared to roots not treated, however, due to variability, there was no difference, significantly between the treatments (p=0.1). Corn yield was evaluated on Nov 4, by hand harvesting 30 corn ears from each of the 5 replicates per treatment. (Due to 3.07 inches of rain in September and 8.84 inches of rain in October, the combine could not enter the field to harvest the plots in a timely manner). Corn ears were individually shelled using a hand-operated corn sheller. The subsequent grain was weighed and test weights were recorded. Grain was all less than 15% moisture, but accuracy was lacking with my moisture meter. Each set of data was compared for differences using a T-Test calculator for 2 independent means. The yield was estimated on a per-acre basis, estimating stand at 30000 plants per Acre as an estimate. The results from a two-sample t-test on each of these paired means were not significant (=NS) at p=0.1.

Yield Results: Grain yield was almost 1.0 pounds higher from the 30 ears collected from the Larixifol treatments. This observation was interesting by itself since the Larixifol-treated seed had plants that were slightly shorter with slightly lower plant weights, compared to the non-treated. Test weights were similar for each treatment.

In Summary

Larixifol-treated seed (DKC47-55RIB) produced a higher yield, compared to a non-treated seed.



LEFT UNTREATED, RIGHT LARIXIFOL TREATED CORN SEEDS.

LEFT UNTREATED, RIGHT LARIXIFOL TREATED CORN SEEDS.

LEFT UNTREATED, RIGHT LARIXIFOL TREATED CORN SEEDS.


Bacilifol on Tomatoes

Overview/ Methodology

An experiment was established during the 2022 tomato growing season at the Eastern Shore Agricultural Research and Extension Center of the Virginia Polytechnic Institute and State University [Virginia Tech], located at Painter, VA. The soil type at the experimental site is a Bojac sandy loam (thermic Typic Hapludults) with 59% sand, 30% silt, and 11% clay in the Ap (plowed A) horizon (0–46 cm). The experiment was established in a randomized complete block design with four replications. Experimental plots were 20 feet long with 10 tomato plants per plot. Plants were established in a single planting row, with 2-ft in-row spacing [4,356 plants/acre]. Experimental plots were 5 feet apart within the planting bed, and planting beds were 5 feet apart from center to center. Plantings beds were 24-in width at the base, and 22-in at the top, with 12-in height at the center, and 11-in height on both sides (bed shoulders), forming a trapezoid shape. Planting beds were covered with a reflective plastic mulch 5 mil thick and 5 ft wide. Previous to the establishment of the plastic, a single irrigation drip line was buried 2- in depth along the center of the planting bed.

Treatment Establishment

After planting beds were completed (covered with plastic mulch), we irrigated them using the drip system with 3-in (81,462 gals per care) of water distributed in 7 days in 2 irrigation cycles per day [between May 9th and May 16th]. On May 27th, 5 weeks old tomato plants ‘CR-4491’ [Lipman’s variety] were hand- planted at the experimental site, followed by the first treatment application. No pre-plant fertilizer was applied before the establishment of the plants. Plants were irrigated daily using a timer established on the east side of the experiment [beginning of the main irrigation line] and by the historical evapotranspiration data for our region between the months of June, July, and August. Additionally, crop coefficients were used to adjust the irrigation to plant requirements, following a single crop coefficient model.

Essential nutrients were supplied following statewide recommendations. Plots received ≈200 lb/acre of nitrogen (N) through the irrigation system during a 3.5-month-season via a weekly injection during the second daily irrigation cycle. Plots were fertigated using a solution with nutrient levels of 6% N, 0% phosphorus (P), and 8% potassium (K). Pest and disease scouting was conducted weekly. Throughout the season, disease and insect levels were considered minimal, though some plants were affected by stink bugs and bacterial spots. Plants were trained three times in the season to maintain the stem upright and avoid fruit damage, using wooden stakes, 5-ft long, vertically buried between each plant in the center of the bed and tied up using plastic twine in a horizontal direction, crossing the plants and the stakes, and positioned every 10 inches. Throughout the season, plants were sprayed with Manzate Pro-Stick - 1.5 lb/A on July 13, Intrepid insecticide - 16 fl-oz/acre, and Manzate Pro-Stick - 1.5 lb/A on July 18.

Evaluated Variables

As reported, we collected plant tissue samples at weeks 6 and 12 after transplanting for foliar analysis. Samples were composed of 10 leaves from the top half of the plants, from 5 randomly selected plants from each experimental plot. Samples were analyzed by a third-party plant analysis laboratory for N, P, K, calcium, magnesium, sulfur, zinc, boron, iron, copper, and manganese tissue content. We also evaluated plant height at 4, 8, and 12 weeks after transplant, measuring from the base of the plant, from the surface [center] of the planting bed to the newest top leaves, and from 5 randomly selected plants from the experimental plots. We collected plant biomass from two randomly selected plants from each experimental plot 12 weeks after transplant. Plants were cut at the base, collected in paper bags (10 gals), and stored in a dry air oven at about 100°F for 7 days. Dry biomass weight was measured as a representation of the canopy biomass accumulation per treatment. Additionally, we collected foliar disease ratings at 4, 8, and 12 weeks after transplanting. The rating scale is described in Table 1. Fruit yield was collected in three harvests starting at week 9 after transplanting. We collected marketable fruit numbers and weight, and unmarketable fruit numbers and weight. Additionally, total fruit number and weight, and average fruit weight was calculated from the collected data. A marketable fruit was defined as fruit without visible blemishes, and at least 50% external red color. The average fruit weight was determined by dividing the marketable fruit weight of each treatment by its corresponding fruit number.

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Results

The first stage of the analysis showed no main effect of the rates of application and frequency, nor an interaction between variables. Given that there was no difference among BacilifolTM treatments, we selected the lowest rate (1 lb/acre) in combination with applications every 30 days. This treatment was selected due to its reduced number of applications and low rate of the product, which would likely result in the less expensive option for farmers. We proceed to compare this treatment against the control treatment. In the second stage of analysis [1 lb./acre + 30-day frequency of application vs control], data showed no effect of the treatment on plant height at 4, 8, and 12 weeks after transplanting, with averages of 22.8, 32.1, and 30.6 inches, respectively. Additionally, there was no treatment effect on foliar disease rating at all evaluation dates, with averages of 0, 0.78, and 1. All ratings stayed below the threshold level of 2, suggesting a low disease pressure throughout the season. Additionally, plant biomass was not affected by the treatments with an average dry weight of 106.4 grams per plant. Tomato yield was not affected by the foliar treatments compared to the control. Plants resulted in an average marketable fruit number of 61 fruits per plant, with an average weight of 19.9 lb./plant. Plants also produced an average of 19.9 unmarketable fruits per plant, with an average weight of 14.4 lb. The average fruit weight for marketable tomatoes was 148.9 grams per fruit. Lastly, treatments did not affect total fruit number and weight with averages of 76 fruits and 24 lbs. per plant . Similarly, treatments did not affect nutrient content in tomato tissue at 6 and 12 weeks after transplant.

At 6 weeks after transplanting, nitrogen, phosphorus, and potassium levels in tissue were within range with an average of 3.0, 0.25, and 2.55%, respectively. Similarly, sulfur and zinc levels were within an adequate range for correct plant development with 0.3% and 38 ppm. Conversely, calcium, magnesium, manganese, boron, iron, and copper were higher than the desired level in plant tissue. At 12 weeks after transplanting, nitrogen, potassium, phosphorus, sulfur, and zinc were also within sufficiency levels. However, calcium, magnesium, manganese, boron, iron, and copper continued to be higher than the recommended level. These concentrations are likely related to the natural availability of these nutrients in the soil, as no micronutrients were applied to the plantation throughout the life of the experiment.

In Summary

- The growing season was very hot and dry this season. Bacilifol was added to the tape irrigation but, for all plants including the control. No way to avoid that.
- Due to the accelerated growing season, the harvest began 21 days earlier than normal due to the ripening of the fruit.
- Because this was done for a commercial operation, the desired fruit needed to be a certain size, green (or pink) and flawless skin. In a commercial operation there is nothing that will be vine ripe. The desired tomatoes are green and then "gassed" with ethanol to make them turn ripe.
- The data does show an increase of biomass and fruit. There would also be more fruit if it was allowed to continue.
- Bacilifol helps young plants to develop biomass earlier with greater initial height and earlier flowering.
- Bacilifol when added to drip or tape irrigation maintains a healthier plant during stress season.
- Bacilifol used in a foliar application increases biomass and total fruit.

Bacilifol on Grapes

Overview/ Methodology

AgroShield conducted a trial in partnership with BAAR Scientific on the effectiveness of Bacilifol as a foliar spray to treat botrytis and downy mildew in vignole grapes. The trial proved to be a great success with Bacilifol-treated plants exhibiting significantly better results than the control group.

Bacilifol on Botrytis

Botrytis, a fungus that affects certain grape varieties, gets into all vinifera grapes and always some of the French hybrids. In the trial, Bacilifol-treated grape plants showed a remarkable reduction in botrytis severity. The non-treated clusters had 49% botrytis, while Bacilifol-treated plants cut the severity of botrytis in half, regardless of whether it was one or two pounds of treatment. Additionally, by alternating Bacilifol with a botrytis-specific product called Elevate, the severity of botrytis decreased to 23%, which was still rather high but indicated the severity of the season. The Bacilifol and Elevate treatment was not significantly different from Bacilifol alone, which showed the potential of Bacilifol to reduce the severity of botrytis.

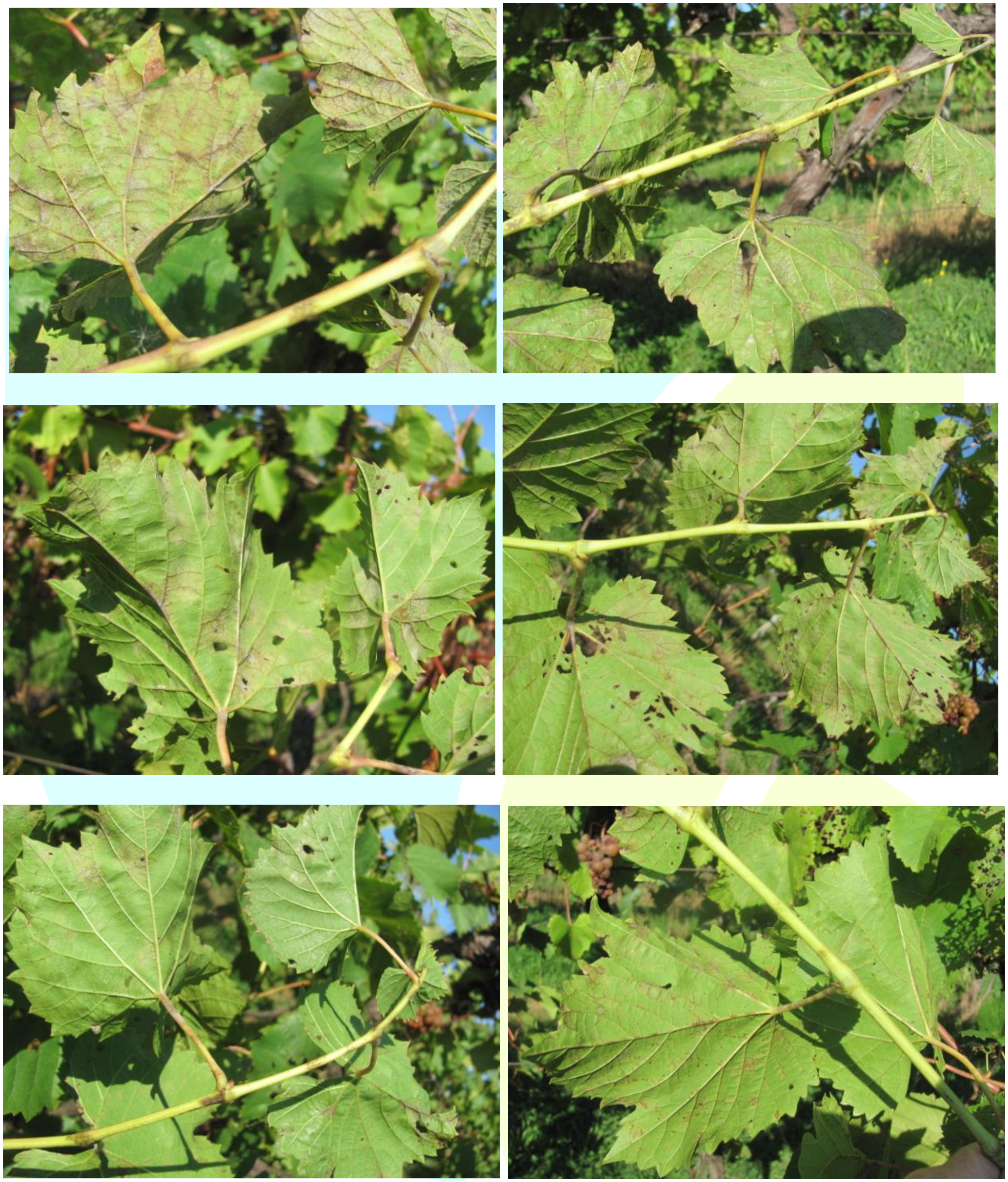


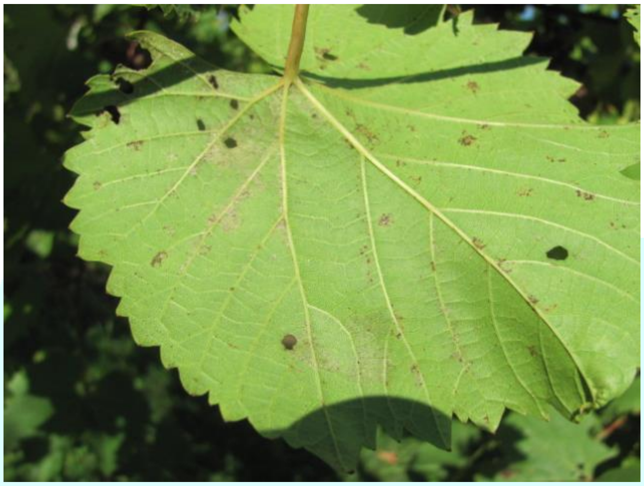


Bacilifol on Downy Mildew

Downy mildew is another disease that affects grapes, which occurs on the leaves later in the growing season. Bacilifol-treated plants also showed a reduction in downy mildew severity, although not as much as botrytis. The trial revealed that Bacilifol decreased downy mildew rates from 20% to 14% or 12%, depending on the rate of application. When Bacilifol was alternated with a downy mildew specialist called Ranman, the downy mildew severity decreased to 5%. The trial showed that Bacilifol increased the effectiveness of fungicide applications against botrytis and downy mildew, leading to longer-term efficiency and effectiveness. Additionally, Bacilifol reduced the amount of fungicide usage, which has a positive impact on the environment and treatment costs. Overall, Bacilifol is a promising solution for grape growers looking for an all-natural and effective way to combat botrytis and downy mildew. The trial conducted by AgroShield and BAAR Scientific proved that Bacilifol can significantly reduce the severity of these diseases, improving the quality and yield of grape crops.

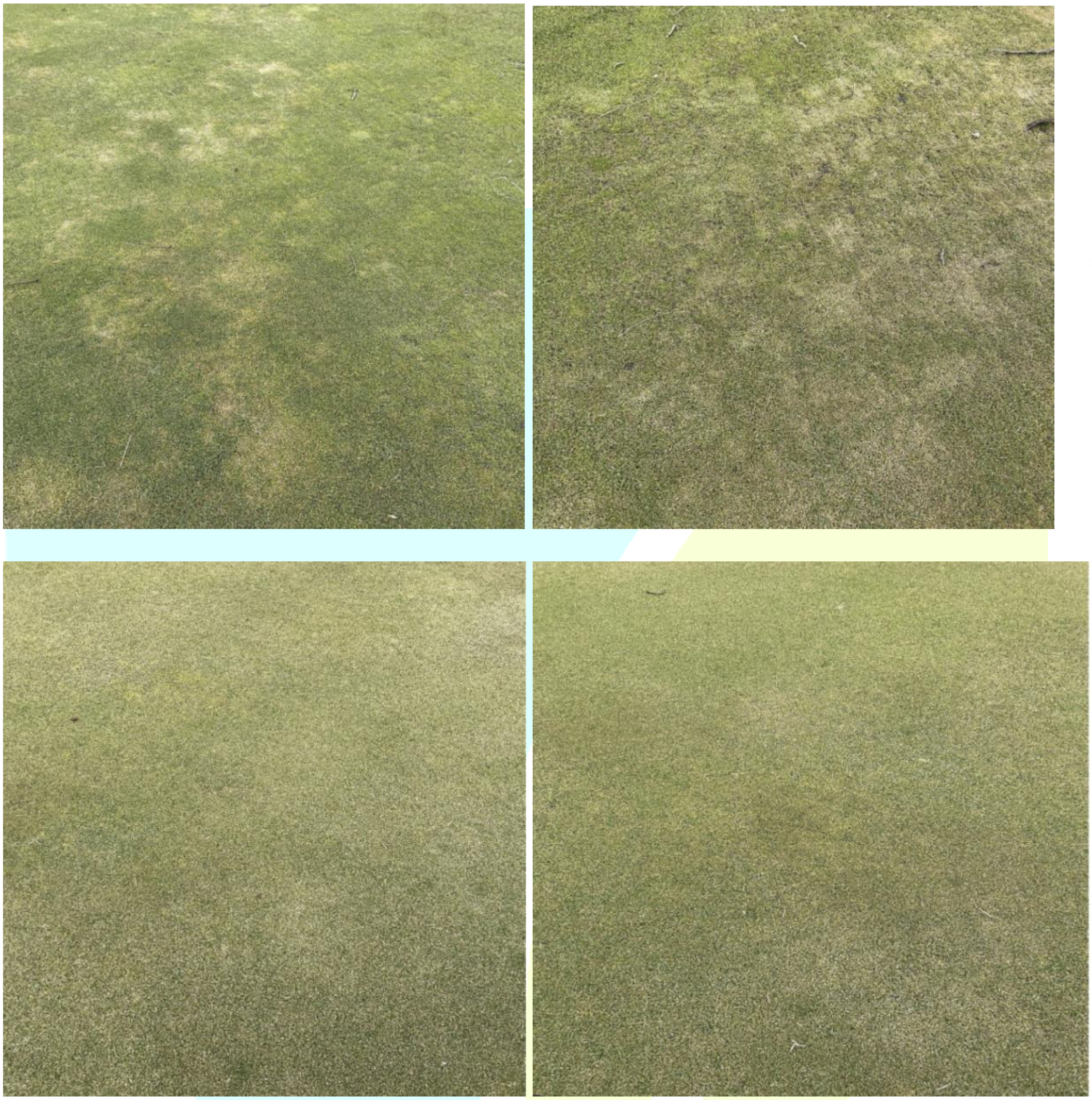




Bacilifol on Golf Greens

Overview/ Methodology

The trial was conducted in the Northeast US, where golf courses use fungicides to combat pathogens called Snow Mold. The aim of this study was to investigate the efficacy of Bacilifol in enhancing the effectiveness of fungicides and extending their residual. A cocktail of products, including Chlorothalonil, Propiconazole, and Iprodione, was used, and one pound of Bacilifol was added to the fungicide tank mix per acre. The application was made by a conventional sprayer to the green surface and the surrounding six feet of collar. On twenty-seven greens, only twenty were treated with fungicide and Bacilifol, while the other seven were treated with fungicide only. The trial was conducted during a winter season that was not favorable for maintaining healthy turf due to many freeze and thaw cycles, including rain. After the application, the researchers waited for spring with much anticipation to observe the results. The objective of this study was to compare the effectiveness of Bacilifol-treated surfaces versus fungicide-only-treated surfaces in preventing Snow Mold.

Results

On the surfaces where Bacilifol was added to the fungicide application, the turf was blemish-free and ready to be mowed. In contrast, on the surfaces treated with fungicide only, Snow Mold occurred. This indicates that Bacilifol increased the effectiveness of the fungicide application, thereby extending the residual and preventing Snow Mold from occurring. The researchers observed that early mowing on surfaces treated with fungicide only spread the infection and should be avoided until further treatment. The trial provided evidence that adding Bacilifol to the fungicide application increases its effectiveness and extends the residual. Given the low cost of Bacilifol, it is recommended that it be included in the tank mix. This can help increase the bio-products in the tank mix and improve plant health. This trial demonstrates the importance of incorporating bio-products in plant maintenance programs.

In Summary

The study showed that Bacilifol is a cost-effective solution for enhancing the effectiveness of fungicide applications. Incorporating Bacilifol in tank mixes with other chemicals can boost the bio-products and improve plant health, making it an ideal addition to any plant maintenance program. This study provides valuable insights for golf courses and other institutions involved in plant maintenance. It is recommended that future studies be conducted to explore the effectiveness of Bacilifol in different plant maintenance settings and under different climatic conditions.