# The Role of Liquid Soil Aerator on Turf Density and Turf Tissue Color and the Implications to the Overall Health and Appearance of Lawns

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## Question

What effect does Liquid Soil Aerator have on turf cover and density; turf color and color consistency which may contribute to the overall appearance of lawns?

### Purpose

This investigation was designed to determine if the application of Liquid Soil Aerator substantially improve the overall appearance of lawns enough to justify the application of the product. Soil scientists agree that compacted soils impact plant growth and health in many ways. This investigation was conducted approximately 60 days after Liquid Soil Aerator application and near the end of the summer where daytime temperatures for 2003 exceeded 100 degrees at least 18 times.

### Test Sites

Liquid Soil Aerator was applied on over 500 lawns by GrassRoots Lawn Care Company at the rate of 4 oz per 1000 sq. ft. This company headquarted out of Broken Arrow, OK has seven branch locations throughout Oklahoma. These customers specifically requested the Liquid Soil Aerator application for various reasons usually related to soil compaction. One hundred and forty seven test sites were selected at random from the customer list representing all seven locations.

### Tests Performed

### Turf Cover

Turf cover was evaluated by using a 36 sq. in. quadrat frame sampler with ten random repetitions per site. The total square inches of exposed soil was measured then subtracted from 36. This difference was then divided by 36 to determine the percent cover. The outcome represents an averaged result. The check was measured on the adjacent untreated area. The results were then assigned by using the following key:

| | | Liquid Soil Aerator | | Untreated | |
|---|---|---|---|---|---|
| 95-100% | Cover | 106 | 72.1% | 24 | 16.3% |
| 85-94% | Cover | 14 | 9.5% | 37 | 25.2% |
| 75-84% | Cover | 15 | 10.2% | 63 | 42.9% |
| 65-74% | Cover | 6 | 4.1% | 11 | 7.5% |
| 55-64% | Cover | 1 | 0.7% | 4 | 2.7% |

| | | | | | |
|---|---|---|---|---|---|
| 45-54% | Cover | 3 | 2.0% | 5 | 3.4% |
| 35-44% | Cover | 0 | 0.0% | 2 | 1.4% |
| 25-34% | Cover | 2 | 1.4% | 1 | 0.7% |

The Turf Cover investigation supports user claims that Liquid Soil Aerator increases turf cover. The results clearly illustrate the high turf cover percentage following application. As reported 72.1% of the treated lawns had between 95-100% turf cover on their lawn. The check (adjacent lawns) had only 16.3% with 95-100% cover. The average cover for the Liquid Soil Aerator lawns was 93.5%.

## Turf Shoot Density

Turf shoot density was evaluated by randomly selecting ten repetitions per site. Each site 1.0 sq. in. was measured by counting the total number of shoots. Shoots are the stems that originate from the soil. Only shoots that had blades attached were counted. These ten sites were averaged for the final result. The check was counted on the adjacent untreated area. The results were then applied using the following key:

| | Liquid Soil Aerator | | Untreated | |
|---|---|---|---|---|
| Over 5.0 shoots per sq. in. | 53 | 36.1% | 5 | 3.4% |
| 4.4 to 5.0 shoots per sq. in. | 58 | 39.5% | 14 | 9.6% |
| 3.7 to 4.3 shoots per sq. in. | 24 | 16.3% | 38 | 26.0% |
| 3.0 to 3.6 shoots per sq. in. | 5 | 3.4% | 54 | 37.0% |
| 2.3 to 2.9 shoots per sq. in. | 5 | 3.4% | 21 | 14.4% |
| 1.6 to 2.2 shoots per sq. in. | 1 | 0.7% | 9 | 6.2% |
| 0.9 to 1.5 shoots per sq. in. | 1 | 0.7% | 5 | 3.4% |

The Turf Shoot Density investigation supports user claims that Liquid Soil Aerator increases turf density. Again the results clearly illustrate the high turf density after Liquid Soil Aerator application. As reported 75.6% of the treated lawns had turf density over 4.4 shoots per in. sq. The untreated lawns had only 13.3% of the lawns over 4.4 shoots per sq. in. This investigation supports the users claims that Liquid Soil Aerator increases turf density.

## Turf Tissue Color

Turf color was evaluated by using the Munsell® Color Charts for Plant Tissues. This method of color determination provides an exact match of the color of turf tissues. Ten random samples from the treated lawn and ten random samples from adjacent untreated area were matched for color.

The complete Munsell® notation is written: Hue Value/Chroma

Three Classes of Hue:

| | |
|---|---|
| 7.5 GY | Dark Green Color |
| 5 GY | Medium Green Color |
| 2.5 GY | Pale Green to Yellow |

The Value notation indicates the degree of lightness or darkness of a color whereas 0/ = black and 10/ = pure white. The lower the number the more healthy the turf grass.

The Chroma notation of a color indicates the strength (saturation) or degree of departure of a particular Hue from a neutral gray of the same Value. The Chroma scale extends from /0 for a neutral gray out to /12. The higher the number the more healthy the turf grass.

Healthy plant tissue for Bermuda and Fescue turf grass is indicated in decreasing quality:

| Color | Liquid Soil Aerator | | Untreated | |
|---|---|---|---|---|
| 7.5 GY 4/4 | 14 | 93.3% | 1 | 6.7% |
| 7.5 GY 5/6 | 2 | 66.7% | 0 | 00.0% |
| 7.5 GY 5/4 | 2 | 100.0% | 1 | 33.3% |
| 5 GY 3/4 | 2 | 100.0% | 0 | 00.0% |
| 5 GY 4/8 | 39 | 79.6% | 10 | 20.4% |
| 5 GY 4/6 | 71 | 62.8% | 42 | 37.2% |
| 5 GY 4/4 | 23 | 29.1% | 56 | 70.9% |
| 5 GY 5/8 | 7 | 28.0% | 18 | 72.0% |
| 5 GY 5/6 | 7 | 35.0% | 13 | 65.0% |
| 5 GY 5/4 | 5 | 21.7% | 18 | 78.3% |

Plant tissue stress for Bermuda and Fescue grass is indicated in increasing severity by:

| | | | | |
|---|---|---|---|---|
| 5 GY 6/8 | 0 | 00.0% | 2 | 100.0% |
| 5 GY 6/6 | 0 | 00.0% | 1 | 100.0% |
| 5 GY 6/4 | 0 | 00.0% | 2 | 100.0% |
| 5 GY 7/4 | 0 | 00.0% | 2 | 100.0% |
| 2.5 GY 5/4 | 0 | 00.0% | 1 | 100.0% |
| 2.5 GY 5/2 | 1 | 16.7% | 5 | 83.3% |
| Dormant | 0 | 00.0% | 1 | 100.0% |

The Turf Tissue Color was designed to determine if Liquid Soil Aerator makes lawns greener than untreated lawns. GrassRoots Lawn Care Company was especially concerned about this since they depend on satisfied customers within an extremely competitive market. They strive to have the best yard in the area so as to maintain the excellent reputation they currently have in Oklahoma. The results strongly indicate that Liquid Soil Aerator promotes greener lawns than the untreated lawns. A major reason for doing the investigation late in the summer was to compare Liquid Soil Aerator in the most extreme climate conditions. Major differences in color were noted as shown in the results section. Only one treated yard was in plant stress as compared to 14 untreated lawns. Review the results section again to compare the treated vs. untreated.

## Turf Color Consistency

Turf color consistency was determined by calculating the areas of color that were significantly less than the sampled Munsell® Color Chart Rating for that particular lawn. These areas generally show up as "hot spots" or areas where severely compacted soils or other factors such as uneven watering or underlying parent material is near the surface. As noted above this investigation occurred at the end of August 2003 following at least 18 days that exceeded 100 degrees F. Oklahoma summers and especially this particular summer are normally dry with few rain events. The lack of adequate rainfall combined with extremely high daytime temperatures will induce severe stress on most lawns, even when irrigated. For this reason, this test includes only treated lawns with Liquid Soil Aerator, because the untreated lawns in most cases had such

severe stress that proper measurement of "hot spots" was very difficult. The sq. ft. of the area (most cases the front lawn) minus the "hot spots" divided by the total area equals the "Turf Color Consistency" for the lawn. (eg front lawn = 1800 sq. ft minus the "hot spot" of 260 sq. ft. divided by 1800 =86% Turf Color Consistency). The values then were placed into the key as follows:

| Value | Lawns | Result |
|---|---|---|
| 100% = 95-100 | 93 | 63.7% |
| 90% = 85- 94 | 15 | 10.3% |
| 80% = 75-84 | 20 | 13.7% |
| 70% = 65-74 | 6 | 4.1% |
| 60% = 55-64 | 4 | 2.7% |
| 50% = 45-54 | 7 | 4.8% |
| 40% = 35-44 | 1 | 0.7% |

Average Turf Color Consistency: 91.1%

The Turf Color Consistency investigation supports user claims that Liquid Soil Aerator maintains consistent color throughout the lawn. This is not suprising in that when soil has been "aerated" many changes occur. Nutrients that were locked up are now released. Atmospheric oxygen and nitrogen diffuse into the soil thus increasing microbial activity converting raw elements into a usable plant food source. Water management improves by the increased pore space with soil that is now less compacted. The results indicate that the average turf color consistency after Liquid Soil Aerator application is 91.1%. Having consistency this high in late August is very encouraging. No evaluation on the untreated lawns was done mainly because the "hot spots" were too numerous and widespread that made precise measurements very difficult. Photos of lawn comparisons help illustrate the difference of treated vs untreated lawns.

### Qualitative Assesment

A qualitative assessment of the lawns was performed to compare the treated lawns with 20-30 lawns in the surrounding area. The assessments were made by walking through the area and making comparisons of turf cover, density, color, and color consistency. This assessment is crucial for professional lawn care applicators who depends on quality lawns in a competitive market. Ratings were then assigned to the treated lawn as shown below.

| | | |
|---|---|---|
| Best Yard | 62 | 41.9% |
| Tied for Best | 22 | 14.9% |
| Second Best | 7 | 4.7% |
| Top 90% | 16 | 10.8% |
| Top 80% | 7 | 4.7% |
| Top 70% | 7 | 4.7% |
| Top 50% | 7 | 4.7% |
| Total | | 86.4% |

This assessment supports the claim by users that the application of Liquid Soil Aerator improves the health and overall appearance of their lawns.

## Conclusion

Each of the four tests support the claims by users that Liquid Soil Aerator increases turf cover and makes lawns greener and thicker than before application. This investigation was performed in seven cities of Oklahoma: Lawton, Oklahoma City/Edmond, Enid, Stillwater, Ponca City, Bartlesville, and Tulsa/Broken Arrow. The tests were conducted on sandy loam, clay loam, gumbo, silty clay, and clay soils.