





Northeast
Sustainable Agriculture
Research and Education

Improving Soil Tilth and Productivity with Mycorrhizal and Saprophytic Fungi

By Matthew Harhai







Shaggy Mane, *Coprinus comatus*

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Blewit, *Collybia nuda*



Parasol, *Macrolepiota procera*

Date collected	sample ID	treatment	rep	soil grams	volume sampled cm3	bulk density
3/29/2022	PT1	Parasol	1	50	47.88	1.04
3/29/2022	PC1	Control	1	46	47.88	0.96
3/29/2022	PT2	Parasol	2	44	47.88	0.91
3/29/2022	PC2	Control	2	43	47.88	0.89
3/29/2022	PT3	Parasol	3	51	47.88	1.06
3/29/2022	PC3	Control	3	51	47.88	1.06
3/29/2022	BT1	Blewit	4	49	47.88	1.02
3/29/2022	BC1	Control	4	45	47.88	0.93
3/29/2022	BT2	Blewit	5	43	47.88	0.89
3/29/2022	BC2	Control	5	54	47.88	1.12
3/29/2022	BT3	Blewit	6	47	47.88	0.98
3/29/2022	BC3	Control	6	49	47.88	1.02
3/29/2022	ST1	Shaggy Mane	7	51	47.88	1.06
3/29/2022	SC1	Control	7	44	47.88	0.91
3/29/2022	ST2	Shaggy Mane	8	46	47.88	0.96
3/29/2022	SC2	Control	8	47	47.88	0.98
3/29/2022	ST3	Shaggy Mane	9	45	47.88	0.93
3/29/2022	SC3	Control	9	45	47.88	0.93

3/29/2023	Sample ID	Treatment	Rep	Soil Grams	Volume Sampled cm3	Bulk Density
3/29/2023	PT1	Parasol	1	37	47.88	0.77
3/29/2023	PC1	Control	1	66	47.88	1.37
3/29/2023	PT2	Parasol	2	42	47.88	0.87
3/29/2023	PC2	Control	2	50	47.88	1.04
3/29/2023	PT3	Parasol	3	38	47.88	0.79
3/29/2023	PC3	Control	3	69	47.88	1.44
3/29/2023	BT1	Blewit	4	33	47.88	0.68
3/29/2023	BC1	Control	4	57	47.88	1.19
3/29/2023	BT2	Blewit	5	31	47.88	0.64
3/29/2023	BC2	Control	5	57	47.88	1.19
3/29/2023	BT3	Blewit	6	42	47.88	0.87
3/29/2023	BC3	Control	6	46	47.88	0.96
3/29/2023	ST1	Shaggy Mane	7	44	47.88	0.91
3/29/2023	SC1	Control	7	45	47.88	0.93
3/29/2023	ST2	Shaggy Mane	8	50	47.88	1.04
3/29/2023	SC2	Control	8	52	47.88	1.08
3/29/2023	ST3	Shaggy Mane	9	46	47.88	0.96
3/29/2023	SC3	Control	9	39	47.88	0.81

Averages 2022		Bulk Density Grams / cm³
	PT	1
	PC	0.97
	BT	0.96
	BC	1.02
	ST	0.98
	SC	0.94
Averages 2023		Bulk Density Grams / cm³
	PT	0.81
	PC	1.28
	BT	0.73
	BC	1.11
	ST	0.97
	SC	0.94

From 2022 to 2023:

Parasol Treatment:

A 19 % average reduction in soil density.

Parasol Control:

A 25 % average increase in soil density.

Blewit Treatment:

A 25 % average reduction in soil density.

Blewit Control:

A 9 % average increase in soil density.

Shaggy Mane Treatment:

From an average of .98 bulk density to .97 bulk density.

Shaggy Mane Control:

No change from an average of .94 bulk density to .94 bulk density.

3/22/2023	Sample ID	Treatment	Rep	Soil Grams	Volume Sampled cm3	Bulk Density
3/22/2024	PT1	Parasol	1	45	47.88	0.93
3/22/2024	PC1	Control	1	48	47.88	1.002
3/22/2024	PT2	Parasol	2	48	47.88	1.002
3/22/2024	PC2	Control	2	48	47.88	1.002
3/22/2024	PT3	Parasol	3	45	47.88	0.93
3/22/2024	PC3	Control	3	50	47.88	1.04
3/22/2024	BT1	Blewit	4	47	47.88	0.98
3/22/2024	BC1	Control	4	48	47.88	1.002
3/22/2024	BT2	Blewit	5	56	47.88	1.16
3/22/2024	BC2	Control	5	54	47.88	1.12
3/22/2024	BT3	Blewit	6	37	47.88	0.77
3/22/2024	BC3	Control	6	53	47.88	1.1
3/22/2024	ST1	Shaggy Mane	7	48	47.88	1.002
3/22/2024	SC1	Control	7	52	47.88	1.08
3/22/2024	ST2	Shaggy Mane	8	47	47.88	0.98
3/22/2024	SC2	Control	8	54	47.88	1.12
3/22/2024	ST3	Shaggy Mane	9	49	47.88	1.02
3/22/2024	SC3	Control	9	53	47.88	1.1

Comparing the treatment sites of 2023, to the treatment sites of 2024: increase in soil density in all but two of the treatment sites. In BT3 the density decreased from .87 grams/cm³ to .77 grams/cm³, and in ST2 the density decreased from 1.04 grams/cm³ to .98 grams/cm³.

Comparing the control sites of 2023 to the treatment sites of 2024: decrease in density of the Parasol Controls from an average of 1.28 grams/cm³ to 1.01 grams/cm³

The blewit controls from 2023 to 2024 shows a decrease in density in two of the three samples.

The shaggy mane controls from 2023 to 2024 shows an increase in density of all of the controls, from an average of .94 grams/cm³ to 1.1 grams/cm³.

Averages 2024		Bulk Density Grams / cm ³
	PT	0.95
	PC	1.01
	BT	0.97
	BC	1.07
	ST	1
	SC	1.1

Shaggy Mane Treatment:

A 2% average increase in soil density.

Shaggy Mane Control:

A 15% average increase in soil density.

From 2022 to 2024:

Parasol Treatment:

A 5% average reduction in density

Parasol Control:

A 4% average increase in density

Blewit Treatment:

A 2% average increase in soil density

Blewit Control:

A 5% average increase in soil density.

Reasons for decreases from 2022 to 2023:

Added mulch, benefits of blewit and parasol inoculations.

Possibility that the mushroom cultures expired. Mulch could have attracted worms which aerated the soil and contributed to the density decrease.

Reasons for density increases (nearly across all samples) from 2022 to 2024:

No added mulch, and organic material.

Intense rainfall, approximately, two weeks prior to sampling in 2024.

Possible revised experiment...