

What are Biosolids and why are we testing them?

Biosolids act just like other manure-based fertilizers; this project was conducted to determine the optimal percentage of biosolids added to a potting mix to achieve the best plant growth as shown in *figure 1*. NHTI is partnered with DES to study the uptake of PFAs and heavy metals in crops, and this project is to help determine if biosolids are a valuable nutrient source.

FIGURE 1. Radish sprouts growing in 75% biosolids



Biosolids are a substance derived from sewage sludge that have gone through a treatment process which makes them safe to handle. It is a rich source of nutrients such as phosphorus and magnesium and has high organic content. Home gardeners are not permitted to use biosolids, however, large-scale crop farms are allowed.

Concerns with Biosolids

As biosolids are a product of human waste, they accumulate hazardous materials such as toxins, pharmaceuticals and heavy metals. One of these materials is polyfluoroalkyl substances (PFAs), a chemical compound found in water resistant products (*figure 5*).

Maine has placed a ban on biosolid usage due to high amounts of PFAs.

PFAs has been linked to the following concerns (UBC News, 2023);

- Hormonal disruption
- Cardiovascular disease
- Developmental delays
- Cancer

FIGURE 5. Various examples of products that contain PFAs (Cook, 2021)



Experimental Process and Methods

Biosolids	Fertilized			Non-Fertilized		
0%	F1	F2	F3	NF1	NF2	NF3
15%	F4	F5	F6	NF4	NF5	NF6
30%	F7	F8	F9	NF7	NF8	NF9
45%	F10	F11	F12	NF10	NF11	NF12
60%	F13	F14	F15	NF13	NF14	NF15
75%	F16	F17	F18	NF16	NF17	NF18

FIGURE 3. Experimental layout

The pots were separated into fertilized and non-fertilized groups (*figure 3*). The soil base for the pots was a 2:1:1 mix of mushroom compost, peat moss, and a perlite/vermiculite mix. The varying percentages of biosolids were added to the pots based on soil mass.

FIGURE 4. All radish pots on Mar 28th



Data Results and Conclusion

The **Total Plant Mass** averages formed a bell curve, with the average of the non-fertilized weights being higher than the fertilized weights, except for the 0% biosolids. The 30% biosolids had the largest plant mass results.

Differences in **Leaf Height** were not observed between fertilized and non-fertilized plants. The radishes in the 30% biosolids had the largest leaves. It appears that excessive fertilizer was directed into leaf growth rather than root.

A steady decline was observed in the **Root Height** results. Non-fertilized plants had longer root growth than fertilized plants, except for those treated with 60% biosolids. A reason for this discrepancy has not been determined.

FIGURE 6. Pots NF7, NF8 and NF9. A radish formed in pot NF7.



The optimal percentage of biosolids that should be added to a potting mix is 30%, with no need for additional fertilizer. Biosolids contain a high amount of phosphorus, therefore any additional phosphorus will stunt plant growth. This percentage rate could also be applied to other manure-based fertilizers.

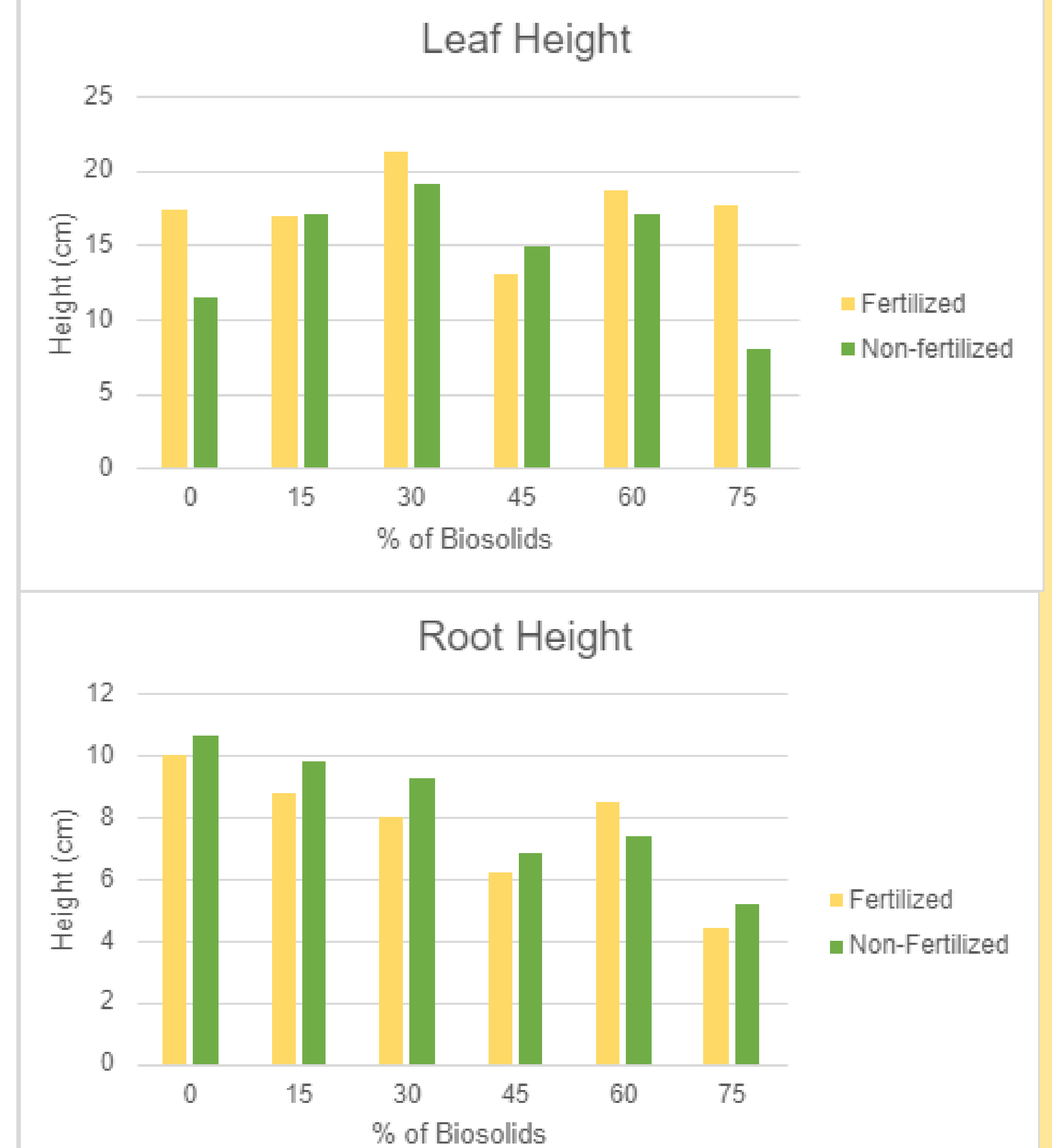
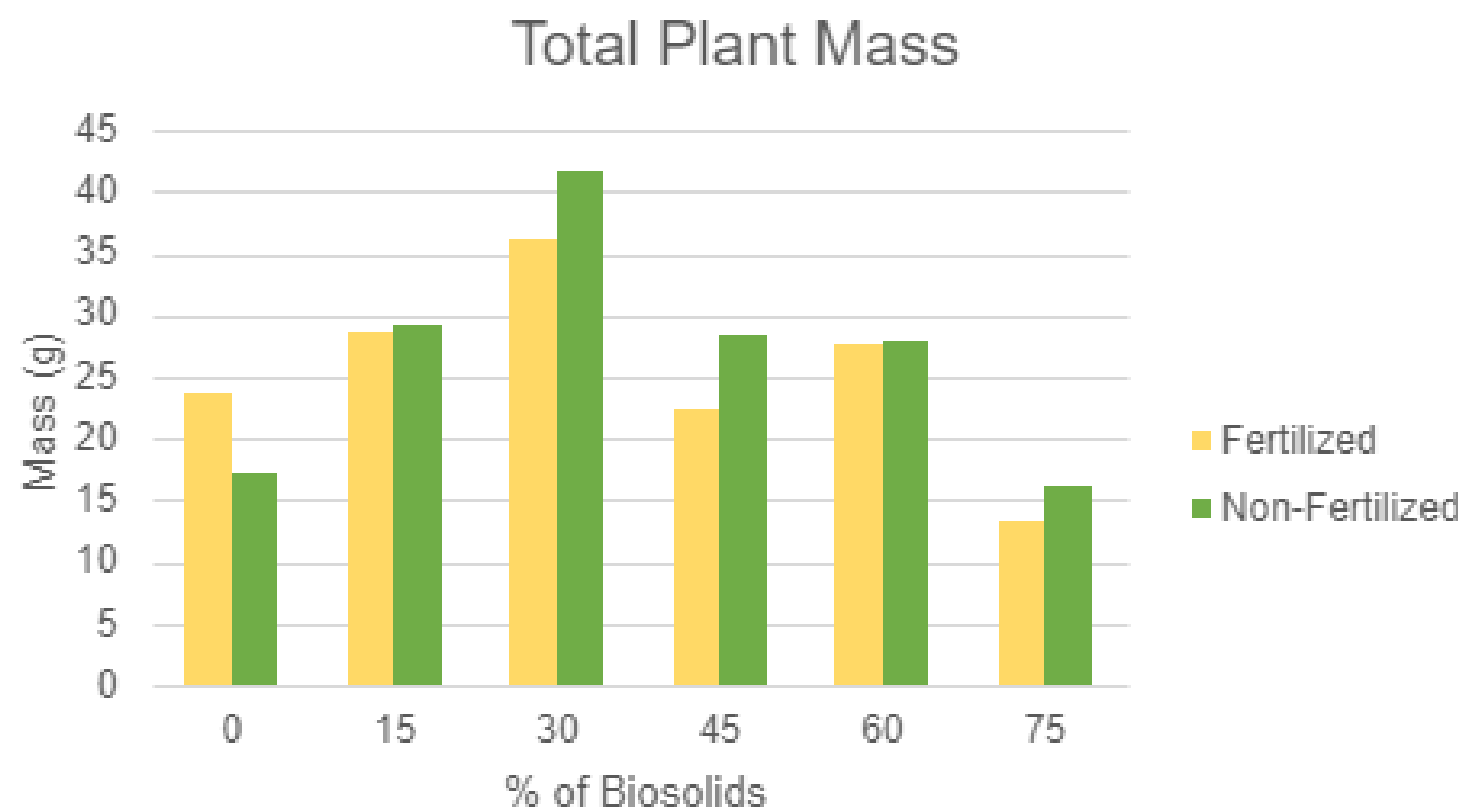


FIGURE 4. Total plant mass (graph one) is average weight of the radishes by grams. Leaf Height (graph two) and Root Height (graph three) were measured in centimeters and were calculated separately.

References and Acknowledgments

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