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The Effect of Floating Row Covers on the Growth and Insect Resistance of Green Bean Plants

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Abstract

This study examined the use of floating row covers as an aid to plant germination and growth, as well for the prevention of insect feeding damage. A garden row was prepared by rototilling, adding a ½" layer of compost, lightly rototilling, and raking the surface smooth. A string line was stretched and a 1" furrow was created along two 6 foot sections, separated by a 1 foot buffer. Green bean seeds were placed every 2 inches in the furrow and lightly covered. One 6 foot section was covered with a piece of floating row cover, which was secured at the edges with wooden poles. After 2 weeks of growth the plants were evaluated for germination, growth, and insect feeding damage. The uncovered treatment had a germination rate of 19%, compared to 14% for the covered. The uncovered treatment had a mean growth of 7.2 cm, compared to 10.2 cm for the covered. The insect damage for the uncovered beans was 6.8%, compared to 7.6% for the covered bed. There was a significant difference in heights, according to a 2 tailed T test, while no significance was measured in the insect feeding damage.

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Crop damage from insects is a problem that has plagued humans since the domestication of crops. Many insects follow a migratory pattern from the south, completing their life cycles on host plants. The life cycle of the plant and insect exist as a symbiosis. Recent advancements in biotechnology have introduced genetic resistance from insect feeding into various crops. The presence of genetically modified (GM) plants may alter the feeding behavior of crop damaging insects, placing additional feeding pressure on non-genetically modified crop species. The resulting non-GM plants may face additional feeding pressure from insects. This insect pressure poses widespread challenges to farmers who are growing plants that do not contain the genetic modifications. Floating row covers may be a viable option for vegetable growers desiring to grow crops without the use of insecticides.

Literature Review

In Rekika et al.'s (2008) study of row covers, germination of carrot seeds did not improve, but improved germination by 0.5 days. Covering carrot rows with row covers reduced the infestation by carrot weevils by 65-75%. Thompson (2018) investigated the use of row covers for the prevention of Yellow Vine Disease in squash. He found that the using row covers for the first four weeks significantly reduced the incidence of Yellow Vine Disease.

Materials and Methods

Materials

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- Rototiller
- Garden Rake
- Garden Hoe
- String line
- Green Bean Seed
- 4' x 6' piece of floating row cover
- Compost
- Measuring tape
- Ruler

Methods

- Locate a garden bed at least 15' in length with consistent soil conditions and light
- Rototill the bed to destroy weeds and loosen soil
- Spread a 1/2" layer of compost over the garden bed and incorporate with rototiller
- Stretch a string line down the center of the garden bed and secure until tight
- Use a garden rake to create a 1" furrow below the string. Make the furrow 6' in length, followed by a 1' section without a furrow, followed by a second 6' furrow.
- Place the green bean seed at 2" intervals in the furrow
- Cover the seed with 1" of soil and gentle tamp
- Cover one garden bed section with a 6' foot section of floating row cover and secure the sides and ends with wooden stakes laid on their sides to prevent the wind from moving the row cover
- Water bean seeds if excessively dry and hoe to remove weeds
- Measure height of seedlings at highest point
- Determine % insect feeding by approximation

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Results and Data

Covered			Uncovered		
#	Height (cm)	% Defoliation	#	Height (cm)	% Defoliation
1	9.1		5	5.8	20
2	9.5		0	8.6	15
3	10.5		0	6.8	5
4	10.8		0	6	5
5	10	20	5	9	7
6	12.4	0			
7	7.9	10			
SUM	70.2 cm	35 %		36.2 cm	52 %
MEAN	10.02857143 cm	5 %		7.24 cm	10.4 %
STANDARD DEVIATION	1.420931954 cm	7.637626158 5		1.479188967 cm	6.767569726 %
STANDARD ERROR	0.5370617973 cm	2.886751346 %		0.6615134163 cm	3.02654919 %
SUMMARY	10.0 cm +/- .54	5.0% +/- 2.9		7.2 cm +/- .66	10.4 % +/- 3.0
T Test Height	T Test Defoliation				
0.02372710632	0.3506144306				
<i>Significant</i>	<i>Not Significant</i>				

Conclusions

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The data indicate a number of patterns regarding plant growth and insect defoliation. The bean plants grew to a mean height of 10.0 cm +/- .54 cm under the row cover, where the uncovered plants grew to a mean height of 7.2 cm +/- .66 cm. With respect to defoliation, the covered plants experienced 5.0% +/- 2.9% defoliation, while the uncovered plants experienced 10.4% +/- 3.0% defoliation. With respect to the significance of the data, as determined by a 2-tailed T test, the plant height result was .023, a significant value, whereas the plant defoliation value was an insignificant .35.

A number of factors may have influenced the results of this study. First, the initial planting of bean seeds experienced very poor germination, necessitating replanting of the seed. Second, the replanted seed, from a different batch, experienced low germination, possibly due to high temperatures. Finally, strong wind conditions blew the row cover off of the plant bed, possibly damaging some of the bean seedlings.

Future studies could replicate the experiment when temperatures are lower, possibly improving germination rates. Additionally, soil testing prior to planting would ensure proper soil fertility. Germination testing would also prevent low germination rates.

References

Rekika, D., Stewart, K., Boivin, G. & Jenni, S. (2008). Floating row covers improve germination

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