Improper Soybean Seed Handling Effects on Germination

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Importance

Every time a farmer plants soybeans in their field, they need to buy the seeds. Farmers meet with seed producers which sell seeds with a variety of different coatings. Not only do farmers spend 200-300 dollars on bags of seed, they are counting on the seeds to make them a profit. Even if the seeds are engineered to produce great plants. The seed's germination process could be affected by something simple, the seeds being dropped. If a purchased bad of seeds was dropped by the farmer or even the seeds were damaged in handling, the seeds could germinate much later than non-damaged or even not germinate at all. Not only is that a waste of money as you lose profit, seeds could be damaged without the farmer knowing.

Other's Work/Literary Review

Minimizing Mechanical Damage to Soybean Seed:

M. K. Misra (n.d.). Minimizing Mechanical Damage to Soybean Seed. Retrieved January 11, 2019, from file://Users/student/Downloads/PM0999.pdf

Summary:

This article by M. K. Misra of Iowa State University discussed how mechanical damage can affect soybean seeds. Similar to this project, the article showed tested the effects on germination when dropped from three meters. The result show that it does have a negative effect. IN all of the 4 soybean seed types showed there is 2-3 percent less germination. It did not test any further, like this project does. The project performed there helped come to a conclusion on the hypothesis. The article also showed ways to avoid damage to soybean seed in harvesting, cleaning, and handling. The article was very useful in gaining knowledge for the project.

Evaluation:

The article by M. K. Misra was a very credible and useful source. The author and article had no form of bias. It is a very informational article to help with this project. Even though it is an older source it was a very credible one.

Maintaining soybean seed quality:

Delouche, J. C. (2016). Maintaining soybean seed quality. Retrieved January 12, 2019, from file://ir.library.msstate.edu/bitstream/handle/11668/13158/H-4.pdf?sequence=1

This report by J. C. Delouche of Mississippi State University discussed how soybeans and their germination can be negatively affected by a variety of different reasons. What was most useful to this project was the section about Handling, Bulk Storage, Aeration, and Drying. This portion of the report discusses how all handling and conveying of seeds must be done gently as possible while still efficient to minimize damage to the seeds and to have the process be done quickly. Another interesting point was a test looking at the moisture content of the seeds when dropped. This was a factor that was not recognized and one that will be looked at in the future.

Evaluation:

This report by J. C. Delouche was a very informative report. It focused mainly on many different types of mechanical damage in the harvesting and cleaning phases. The main focus was on the Handling, Bulk Storage, Aeration, and Drying Portion but that was still filled with useful facts. The whole report was informative as well as credible. Like the last it is not a very current source but it was an unbiased multiple sided useful source.

Handle Soybean Seeds Carefully:

Staton, M. (2018, October 04). Handle soybean seed carefully. Retrieved January 12, 2019, from https://www.canr.msu.edu/news/handle_soybean_seed_carefully

Summary:

This web article by M. Staton discussed how the soybean seed is a very fragile thing and germination can be significantly reduced if damaged. It states that iit is fragile because the embryo is located just inside the seed coat. If damaged the radical can be damaged causing a weak root system or even no growth of the seed. Damage to the seed an be done in machinery or human error in dropping a bag of seed. Common machinery damage is done when transported through augers or on conveyors. The author also mentioned a test performed by researchers at the Ohio State University. The researchers evaluated multiple seed transportation devices and looked at the seed damage. This article will be very useful in helping forming the hypothesis.

Evaluation:

This website article by M. Staton was a very useful and current source. This source not only was credible but also showed results of tests performed by The Ohio State University showing how damage affects the soybean. This website article was a very current, unbiased, factual source.

Hypothesis/Anticipated Results

If bags of soybean seeds are dropped from different heights then the more the seeds are damaged or the higher they have been dropped from the germination will be further slowed or prevented.

Materials

1. 9 Plastic Bags
2. 450 Soybean seeds
3. Tape measure
4. 150 centimeter drop
5. 300 centimeter drop
6. 36 feet of paper towel
7. Graduated cylinder
8. Water

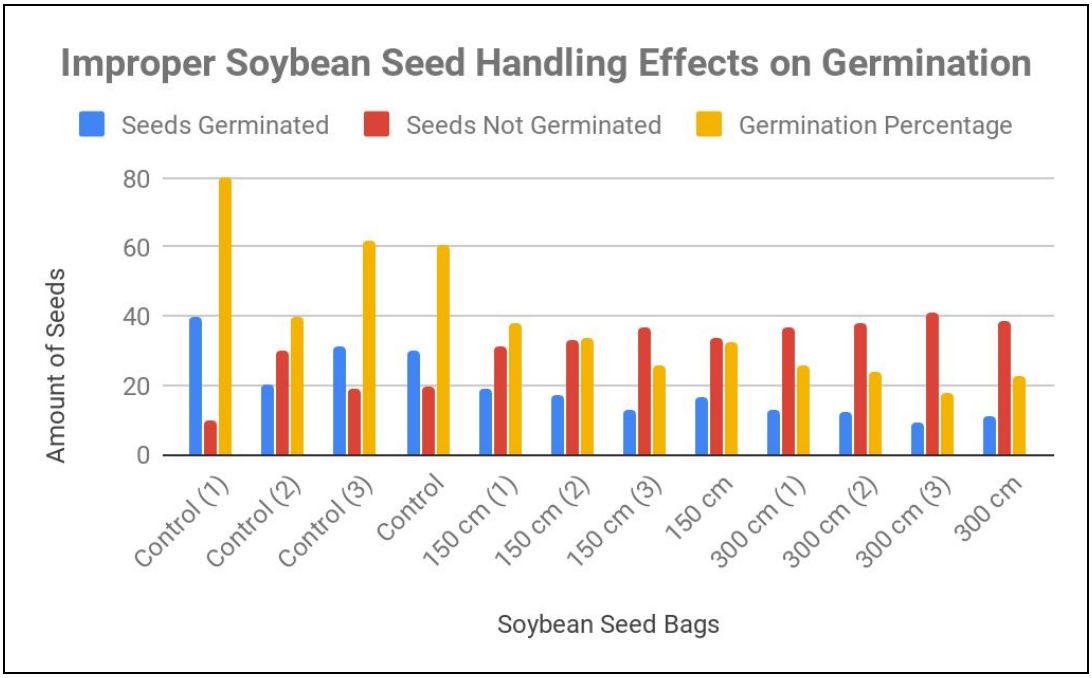
Methods

1. Place 450 soybean seeds into 9 plastic bags of 50
2. Label 3 bags each, constant, 150 centimeter, and 300 centimeter
3. Drop the 3 bags labeled 150 centimeter from 150 centimeters or 1.5 meters, drop 3 times
4. Drop the 3 bags labeled 300 centimeters from 300 centimeters or 3 meters, drop 3 times
5. Do not drop remaining 3 bags, (constant)
6. Wet 4 foot long paper towel with 40 milliliters of water
7. Open bag of seeds
8. Place seeds in 5 rows of 10
9. Fold ends and roll paper towel to form seed mat
10. Place seed mat back into bag
11. Repeat steps 6-10 for the remaining bags, constant, and dropped from heights
12. Keep bags in room temperature (70° Fahrenheit)
13. Check mats for moisture daily, give water to all mats 5 milliliter per bag if needed
14. Open bags and unroll seed mats to check for germination 2.5 days later
15. Record data

Data Collection/Summary of Data

Improper Soybean Seed Handling Effects on Germination

Bag	Germinated Seeds	Ungerminated Seeds	% Germination
Control (1)	40	10	80%
Control (2)	20	30	40%
Control (3)	31	19	62%
Control (Average)	30.33	19.66	60.66%
150 cm (1)	19	31	38%
150 cm (2)	17	33	34%
150 cm (3)	13	37	26%
150 cm (Average)	16.33	33.66	32%
300 cm (1)	13	37	26%
300 cm (2)	12	38	24%
300 cm (3)	9	41	18%
300 cm (Average)	11.33	38.66	22.66%



Data Analysis

There are multiple trends in the data. As the seeds are dropped from higher heights, the seeds germinated, represented by the blue bars on the graph, decrease. Also, as seeds are dropped from higher heights the seeds that did not germinate, represented by the red bar on the graph, increased. The average germination rate also decreased. These trends show constant change in data.

Discussion

The results of the study prove the hypothesis was correct in that the more dropped the soybean package was the lower the germination rate. This provided similar results to the Others Work Section in that improper handling has a negative effect on soybean germination, causing it to not germinate.

Conclusion

As of the result of this project the conclusion can be drawn because that improper soybean handling has a negative effect on the germination of soybean seeds. This conclusion can be drawn based on the data, The seed bags dropped from 150 centimeters had a 14 percent lower germination rate than the control. Also the bag dropped from 300 centimeters had a 5% lower germination rate then the bag dropped from 150 centimeters. The results fit the hypothesis and also had similar results to the Others Work section. There were some possible errors in the project which are stated below.

Errors	Solutions
The soybeans tested could have been dropped or damaged before they were received for this test.	Get soybeans from a trusted source making sure they are undamaged
The moisture content of the seeds could have been different when dropped	Test the seeds for moisture level after being left together in an identical area.
Floor dropped onto was similar density and similarly hard, yet different materials.	Drop all seeds onto the same floor.

The next step to complete this project are going through with further variables and a further extension of the project. I would like to look at moisture content of soybeans and other variables to determine the best way to germinate and grow a soybean.

Summary

This project was chosen to be conducted because knowledge was wanted to know about soybeans and their germination process and to conduct an experiment that is useful and important. This project is important to agriculture. Every time a farmer plants soybeans they need to know that they are not wasting money. They also need to know that they could be the reason not as many of there seeds are germinating. If soybeans are negatively affected by improper handling then a farmer cannot risk the damage.

The study was conducted by taking 9 bags of 50 soybeans and dropping 3 from 150 centimeters, 3 from 300 centimeters, and 3 handled properly. The seeds were then germinated in a seed mat and 3 days later they were recorded for germination percentage. The data was recorded and the conclusion was drawn that improper handling of soybean seeds has a negative effect on germination.

Acknowledgements

Mrs. Sanders:

Assisted with the testing and provided materials with Global Impact STEM Academy.

Ms. Ahmed:

Helped with data and data table.

Mrs. Keriazes:

Helped with the format of the report and printing of the trifold board.