IT'S A-DROUGHT TIME FOR SOYBEANS

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ABSTRACT

In this project, five different types of soybeans were tested in three sequentially staged droughts and had one control group. My hypothesis was that soybean P24T05R would do best in drought, and soybean R2C2450 would do the worst. The materials used for this were Pro Mix potting soil, four inch circular pots, pot holders, a fourth-cup measuring cup, and a soup ladle (about one and a half Tablespoons). The process used to determine the best and worst soybeans was determined by the number of alive soybeans out of the total soybeans that sprouted, the number of plants that sprouted out of the total amount of soybeans per each type, and the number of green triplets, sets of green leaves, per each soybean type out of the total amount of green triplets. Then, those percents for each soybean type were averaged. Then each soybean was ranked; the higher the percent, the better the rank. The reader should know that my calculation on how much to water each plant was off and so they were watered too heavily for a period of time. The first part of my hypothesis proved true; the soybean with the overall best results was P24T05R. The second part of my hypothesis proved false; the worst was AG25X6. This then can be interpreted to mean that out of soybean types P28T08R, P22T69R, P24T05R, R2C2450, and AG25X6, a farmer looking for good drought resistance in his soybeans should try to find soybean P24T05R.

background knowledge

When my family is driving down the roads around where we live, we always drive past acres and acres of soybean fields. They seem to dry out at certain points in the season so they could be used for feed for livestock. Still I wondered, “What would happen to them if they dried out too early?” So came my science fair idea: to test different soybeans in drought to see which would withstand the effects of drought the best. Found in research was that signs of drought were leaves being smaller, clamping, flipping (casteel, 2012), and the plant turning yellow, brown, and white. Also, soybeans should emerge between one and two days, but will sprout between four and seven days (Bonnie Grant, 2016). Another fact I learned was that the closer the moisture is to 18 percent the more profit a farmer makes (Gary Zoubek, Chuck Burr, 2016). The amount of water to use on each pot was calculated by taking the average rainfall from spring and summer in Ashtabula County (GRAPHIQ, 2016) and the two were averaged and then divided by 90 (the approximate amount of days in a season) to get the daily average of rainfall in Northeast Ohio (0.1106 inches). Then the area of my four inch pots was found to be 12.56 in^2, and was multiplied by the daily average rainfall. These calculations ended up at 1.389 inches^3, which was converted to approximately 1.4 inches^3 or about 1 ½ Tablespoons. I checked my work with a tabele I found in someone’s pdf (unknown, 2016).These calculations would have been accurate for plants in a field, but because the drainage difference for a field and pots wasn't taken into account, it was incorrect for my purpose. Although the over watering was not intentional, it did add a variable that increased strain on the soybeans, and therefore produced more drastic results. This experiment will be conducted on five different types of soybeans to

find out which has the best resistance to the effects of drought. I believe soybean P24T05R will do the best and soybean R3C2450 will do the worst. The way the testing will be conducted are as follows: at week number four group one will undergo drought, at week five, group two will undergo drought, and at week six, group three will begin its drought. The experiment will last for a total of seven weeks. Then the information on the number of green triplets in a soybean group, number of alive soybeans out of the number that sprouted, and the number of soybeans that sprouted out of those planted will be counted and analyzed to determine the soybean with the best results during a drought. Also, this project is a continuation of last years project where it was determined that the best soil type was Pro Mix.

Soybean AG25X6 has a level three relative maturity, level two maturity group, level two emergence, level three standability, and level one no till adaptability. It also has a level five iron chlorosis tolerance, level four white mold tolerance , level two brown stem rot tolerance, and level four Sudden Death Syndrome tolerance.

Soybean R2C2450 has the trait GENRR2Y, the seed trait WARDEN, a harvest weight of 1650, and a harvest moisture of 13.7 percent.

Soybean P28T08R has good white mold tolerance, moderate stature, and built in Phytophthora resistance. It also is suitable for early planting and or cold soils, highly suitable for moderate to heavy SCN soils, suitable for delayed harvest, and suitable for reduced tillage.

Soybean P24T05R has built in SCN resistance, very good field emergence, above average white mold tolerance, and built in Phytophthora resistance. It also is suitable for early planting and or cold soils, highly suitable for moderate to heavy SCN soils, highly suitable for delayed harvest, and suitable for reduced tillage.

problem and hypothesis

The problem was the lack of information on which of these five soybeans would do the best and the worst in a drought situation. My hypothesis was that soybean P24T05R would do the best in drought because it has the highest resistance to many soybean diseases and is suitable for different time-lines of planting and harvesting, making it seem a heartier plant; soybean R2C2450 would do the worst in drought because it has the least information on resistance to diseases, making one think it's a weaker plant.

methods and materials

The materials used were Pro Mix potting soil, eighty circular four inch pots, eight pot holders, a fourth-cup measuring cup, and a soup ladle (about one and a half Tablespoons).

The methods for determining which soybean had the best overall results were finding the number of alive soybeans out of the total soybeans that sprouted, the number of plants that sprouted out of the total amount of soybeans planted per each type, and the number of green triplets per each soybean type out of the total amount of green triplets. Then, they were changed into percents and averaged for each soybean type, then each soybean was ranked; the higher the percent, the better the rank.

results

The results of this experiment were that in the category of green triplets, P24T05R was first; in the category of alive plants out of the total that sprouted, P24T05R was also first; in the category of how many sprouted out of the total amount planted P22T69R and AG25X6 tied for first. But overall, the mean of the percents showed that P24T05R had the best score out of them all, and AG25X6 had the worst score. This disproves my hypothesis that R2C2450 would do worst, but proved the first half of the hypothesis correct since P24T05R did do the best.

	Alive Out of Sprouted (rank)	Sprouted Out of Total Planted (rank)	Amount of Green Triplets Out of Total Green Triplets (rank)	Averaged Score
AG25X6 (soybean 1)	44% (5)	100% (1)	7% (5)	50% (5)
R2C2450 (soybean 2)	64% (3)	88% (4)	20% (3)	57% (3)
P28T078R (soybean 3)	50% (4)	94% (3)	20% (3)	55% (4)
P22T69R (soybean 4)	88% (2)	100% (1)	23% (2)	70% (2)
P24T05R (soybean 5)	100% (1)	88% (4)	31% (1)	73% (1)

SOYBEAN 1	11/07/16	11/10/16	11/1316	11/19116
Dead	5	6	6	9
Alive	11	10	10	7
Duds	0	0	0	0

SOYBEAN 2	11/07/16	11/10/16	11/13/16	11/19/16
Dead	2	2	2	5
Alive	12	12	12	9
Duds	2	2	2	2

SOYBEAN 3	11/07/16	11/10/16	11/13/16	11/19/16
Dead	4	6	7	7
Alive	11	9	8	8
Duds	1	1	1	1

SOYBEAN 4	11/07/16	11/10/16	11/13/16	11/19/16
Dead	1	1	1	2
Alive	15	15	15	14
Duds	0	0	0	0

SOYBEAN 5	11/07/16	11/10/16	11/13/16	11/19/16
Dead	0	0	0	0
Alive	14	14	14	14
Duds	2	2	2	2

conclusions

The conclusion that can be drawn from this experiment is that out of soybean types P28T08R, P22T69R, P24T05R, R2C2450, and AG25X6, a farmer looking for good drought resistance in his soybeans should try to find soybean P24T05R. I reject the second half of my hypothesis that soybean R2C2450 would do the worst; AG25X6 had the worst results. I conclude that the first half of my hypothesis is correct and soybean P24T05R had the best overall results. For more information on the scores, see the above chart.

further implications

One thing that went wrong in my experiment was that drainage in open soil versus pots wasn't taken into account and therefore was a miscalculated amount of water necessary to water the soybeans. Also, no beans had time to develop before the six week experiment ended; next year if I were to do this again, I'd start the experiment earlier. Something else I could do next year with this basic project idea is put soybeans under a flooding environment instead of that of drought.

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