Research Question: To What Extent does Zinc affect the growth of *Arabidopsis thaliana?*

Days	Wildtype	Wildtype Zinc.	*nca1-1*	*nca1-1 zinc*	*zip-2*	*zip-2 zinc*
Day 1 10/7/19	All seeds have been planted today	All seeds have been planted today	All seeds have been planted today	All seeds have been planted today	All seeds have been planted today	All seeds have been planted today
Day 2 10/8/19	10 visible germinated seeds	6 visible germinated seeds	no visible germinated seeds	no visible germinated seeds	no visible germinated seeds	no visible germinated seeds
Day 3 10/9/19	20 visible germinated seeds	22 visible germinated seeds	11 visible germinated seeds	20 visible germinated seeds	no visible germinated seeds	1 visible germinated seed
Day 4 10/10/19	21 visible germinated seeds Visible condensation	23 visible germinated seeds Visible condensation	13 visible germinated seeds Visible condensation	21 visible germinated seeds Visible condensation	1 visible germinated seed Visible condensation	1 visible germinated seed Visible condensation
Day 5 10/11/19	- 21 visible germinated seeds Visible condensation - Watered	23 visible germinated seeds - Watered	17 visible germinated seeds Visible condensation - Watered	22 visible germinated seeds - Watered	8 visible germinated seeds Visible condensation - Watered	2 visible germinated seeds - Watered
Day 9 10/15/19	23 visible germinated seeds	23 visible germinated seeds	18 visible germinated seeds	25 visible germinated seeds	11 visible germinated seeds	11 visible germinated seeds
Day 10 10/16/19	23 visible germinated seeds	23 visible germinated seeds	19 visible germinated seeds	25 visible germinated seeds	11 visible germinated seeds	11 visible germinated seeds
Day 11 10/17/19	23 visible germinated seeds	23 visible germinated seeds	19 visible germinated seeds	25 visible germinated seeds	11 visible germinated seeds	13 visible germinated seeds
Day 12 10/18/19	Pod 1: Diameter:3 .25 cm (0.96 cm	Pod1: height:1.75 Diameter: 3.5cm	n/a	n/a	n/a	n/a

	biggest leaf) Height: 0.35 ———— D:2.85 cm (0.62) H:0.99 cm ———— D:3.19 cm (0.68 cm) H:0.89 cm ———— D:1.55 cm (0.4 cm) H:0.45 cm cm ———— D:3.66cm (0.78 cm) H:1.0 cm ———— D:1.64cm (0.63 cm) H:0.4 cm Pod 2: D:2.42cm (0.51 cm) H:0.6 cm ———— D:1.51 cm (0.49 cm) H:1.0 cm ———— D:1.42 cm (0.41 cm) H: 0.5 cm ———— D:1.98 cm (0.30 cm) H: 0.4 cm ———— D:0.92 cm (0.25 cm) H:0.1 cm	———— H:2cm D:3.25cm ———— H:1.25 D:1.6cm ———— H:2cm D:3.9cm ———— H:1cm D1.9cm Pod 2 H: .75cm D:1 cm ———— H:1.4cm D:2.4cm ———— H1.6cm D:2.9cm ———— H2.1cm D:3.5cm Pod 3 H:1 cm D:1.5cm ———— H:1.2cm D:1.3cm ———— H:2.2cm D:3.1cm ———— Pod4 H:2.75cm D:4cm ———— H:.75cm D:1.25cm ———— H:1.98 D3.2cm ————				

	Pod 3: D: 2.88 (0.6 cm) H: 0.5 cm ————- D:1.0 cm (0.39 cm) H:0.45 cm ————- D:0.3 cm (0.1 cm) H: 0.2 cm Pod 4: D: 3.1 cm (0.6 cm) H: 1.4 cm ———— D: 1.5 cm (0.6 cm) H: 1.9 cm 2.4 0.6 1.5 Pod 5 H:1.35 D:2.3 ———— H:1.39 D:2.78 ———— H:1.78 D:2.6cm	H:2.29 D2.51cm Pod 5 H:.75cm D:3cm ———— H:2cm D:2.5cm ———— H-1.1cm D:2.5cm ———— H:2cm D:2.5cm ————				
Day 15 10/21/19	n/a	1.1.5 cm tall 15 leaves 2. 1.3 cm tall 18 leaves 3. 1.4 cm 16 leaves 4. 0.8 cm tall 16 leaves	n/a	1.5 cm tall 1.9 c, tall .65 cm tall 1.3 1.65 .9 1.7 .85cm .95cm 15 l	n/a	0.7 cm 10 leaves 0.5 cm 10 leaves 0.8 cm 12 leaves 0.2 cm 7 leaves 1 cm 11 leaves

		5. 1.0 cm tall 18 leaves about 66.7 ml Zinc water added (200 ml added to all 3 zinc plant types)		13 l 12 l 11 leaves 15l about 66.7 ml Zinc water added (200 ml added to all 3 zinc plant types)		about 66.7 ml Zinc water added (200 ml added to all 3 zinc plant types)
Day 16 10/22/19 Today we thinner out our plants by removing extra plant whom had been struggling leaving about 2 per pod. Also we noticed a fungus infestation and it was due to a simple flaw in our experiment al design and we removed most of it	Overall health: Good; no defects. All plants continue to develop as predicted (without defect).	Overall health: Fair. Plants develop similar to Wildtype control however but all pods show discoloratio n (yellow) in their leaves.	Overall health: Good. Continue to grow slower than Wildtype however they are still healthy.	Overall health: good. There is no sign of zinc deficiency yet and they compare well to the controlled NCA1.	Overall health: fair. The plants continue to develop in a variety of ways. One pod has one plant that has barely developed and some have grown large.	Overall health: Poor-Mode rate. This is because the plants have not grown very talk so it cannot be determined yet whether this occurred because of its genetics as a mutant or zinc increase.
Day 17 10/23/19 Some of	They are doing pretty good	plant #1: 11 leaves 3.41 cm tall	plant #1: 8 leaves 1.8 cm	plant 1-15 L Plant 2-15L	Plant 1: 4 leaves 0.3 cm	Plant 1: 10 leaves 1.31cm

the plants had fungus still and we are in the process of removing it. In response to this problem the only viable solution is to take the tops off of our containers	but one of the pods are broken and dried out. So we are moving it into a new pod. We noticed slight chlorosis. P1 3.2 cm H 9 leaves P2 2.6 cm H 10 leaves P3 2.5 cm H 9 leaves P4 3.3cm 6 leaves P5 1.1 cm H 8 leaves P6 1.4 cm H 9 leaves P7 2.6cm H 8 leaves P8 2.8 cm H 8 L P9 3.1 cm H 9 leaves P10 1.9cm H 10 leaves **Average Height: 2.45 cm**	Plant #2: 11 leaves 2.84 cm tall Plant #3: 10 leaves 2.2 cm tall Plant #4: 13 leaves 2.7 cm Plant #5: 13 leaves 3.28 cm tall Plant #6: 12 leaves 2.01 cm tall Plant #7: 9 leaves 3.50 cm tall Plant #8: 13 leaves 3.1 cm tall Plant #9: 11 leaves 1.9 cm tall Plant #10: 8 leaves 2.90 cm tall All plants show some sign of discoloration in the form of yellow spots on their leaves **Average height: 2.784**	Plant #2: 9 leaves 2.1 cm Plant #3: 9 leaves 2.25 cm Plant #4: 7 leaves 2.51 cm tall Plant #5 9 leaves 2.8 cm Plant #6: 11 leaves 2.42 cm tall Plant #7: 9 leaves 3.0 cm tall Plant #8: 8 leaves 3.56 cm tall Plant #9: 7 leaves 3.0 cm tall **Average height:1.32444**	Pod3-15 L 1.6 cm tall 2.01c, tall 0.71cm tall 1.39 1.72 .99 1.81 .99 1.1 **Average height: 1.258**	Plant 2: 10 leaves 1.9 cm Plant 3: 22 leaves 2 cm Plant 4: 15 leaves 1.5 cm Plant 5: 18 leaves 1.9 cm P6 2 cm H 8 leaves P7 .7 cm H 8 leaves P8 2.8 cm H 7 leaves P9 2.1 cm H 7 leaves P10 .8 Cm H **Average height: 1.6 cm** Green Slight fungus growth	Plant 2: 2 leaves 0.3 cm Plant 3: 2 leaves 0.2 cm tall Plant 4: 8 leaves 1.9 cm Plant 5: 8 leaves 1.2 cm Plant 6: 6 leaves 1.4 cm tall Plant 7: 6 leaves 1.1 cm tall Plant 8: 4 leaves 0.7 cm tall Plants 9: 4 leaves 0.6 cm **Average height: 0.97 cm**
Day 20		Wildtype		nca1-1 with		

10/26/19 Mrs. Beardsley watered on Saturday as they all looked dry		with zinc believed to have flowered sometime from day 19-20 (during the weekend). Possibly a response to zinc stress		zinc believed to have flowered sometime from day 19-20 (during the weekend). Possibly a response to zinc stress		
Day 22 10/28/19 We have removed a great deal of fungus from the sides of our pods today. It has been unanimously decided that the loss of soil from fungus cannot be endured any longer so the removing of fungus has come to an end	the Wildtype without zinc has been developing without many defects. Their stems are growing taller and the leaves are getting better. However, there are some spots on leaves that are white. We believe this is due to the outbreak of fungus on our plants. Despite this challenge, many continue to	the Wildtype with the zinc treatment also show signs of the growth of a stem. However, these plants have smaller leaves that are curling in and have a much paler color compared to the Wildtype. While there may be fungus present in these pods, the difference between these two plants is a clear	By a general look I can easily see a huge difference in the height and color, and the zinc plantings are starting to show signs of chlorosis. The mutant alone is doing ok and in specific, there are fuzzy little hairs , it's a good shade of green , lots of leaves	chlorosis occurred, also there are 2 pods in which they are super dry and the rest (3) , also they are smaller and have chlorosis acting upon it.	All the plants are a very healthy green color. They have grown much taller than the zip-2 with added zinc. Also, many more leaves are visible in the plants without added zinc. Fuzzy hairs are visible on all the leaves. However, no chlorosis is visible.	the plants are very small compared to the zip-2 without zinc. The plants are incredibly underdeveloped and it is now clear that this is due to zinc to city due to the successful growth of the zip-2 not enduring the treatment. Not only are the plants extremely small compared to the other plants, but the small

	grow taller and stronger.	example of zinc toxicity.				leaves have already begun to curl.
Day 24 10/30/19 Today we have discovered that the plants looked severely dehydrated. We watered them today with an extra 400mL of zinc solution and water to the controlled. We plan to make more solution and check tomorrow if they need to be watered again. We believe this occurred because we had to take the tops off our plants because of fungus growth but that	the plants today displayed strong signs of being deprived of water. Some of the plants looked on the verge of death as their leaves curled in and they lost their color. The soil looked and felt very dry and seemed to be in a critical condition. The plants however seemed to look better after watering them more than usual.	More of the zinc here started to flower and we noticed that those who had flowered had smaller leaves. Only 2 of them were dried out and obviously dried out but the three of the ones that did flower we ok. This could be a response to their environment as the plants sensed the water being cut off and started to begin the flowering process to keep their genes going on.	nca-1 without zinc seemed to experience the same conditions as the Wild Type control in a less extreme way. We believe that this is because this plant grows at a slower rate in general due to its genetics and we believe this plant may be easily brought back to its previous condition and be able to continue in this experiment.	nca-1 with zinc displayed signs of stronger growth than the control. We believe this could be because of the stress experienced by the zinc toxicity in the water it was given. We also believe that it did not take in as much water as the control because of the amount of zinc that it was already given.	zip-2 was small, but performed better than the zip-2 with the treatment. We believe this is because the zip-2 plants with treatment were already experiencing struggle from the stress of zinc toxicity while the control was not facing this. This allowed more growth to be experienced in the control.	Zip-2 w/ zinc didn't grow very well and is struggling way more then the zip 2 and furthermore none flowered and were small and dried up. Also the struggle w/ the zinc is obvious as many of the leaves are dried up and having chlorosis

caused the plants to take in more water and therefore become dehydrated .						
11/1/19 Day 26	Pod 1: 6.83 cm 12 leaves Wildtype are beginning to flower	plant 1: 11.3 cm Plant 2: 12.7 cm	plant 1-7.7cm Plant 2 3.1 cm tall Plant 3 1.2cm high Plant 4 2.74cm tall Plant 5 2.1			
11/2/19 day 27	Plant 1 (f) 10.4 cm & 16 L Plant 2 (f)4.5cm &11 L Plant 3 (f) 4.9cm & 11 L Plant 4 7.6cm (f) & 13 leaves Plant 5 8.4cm &12 L	All have flowered P1 13.4cm & 16L P2 7.7cm and 14L P3 15.1cm and 18L P4 12.5cm and 12 L P5 11.3cm and 12L	P1 10.5cm and 16L P2 2.9cm and 11 leaves P3 4.7cm and 15 leaves P5 3.7 cm and 9 leaves P6 3.4cm and 10 leaves P7 2.0cm and 14 leaves P8 3.3 cm in height and 11 leaves and this is the single plant that has not	P1 9.5cm and 13 leaves P2 1.9cm and 8 leaves(also the only one who has not flowered in this groupe and the rest have flowered) P3 4.6cm and 10 leaves P4 3.5cm and8 leaves P5 3.9 cm and 8 leaves P6	All except plant one have flowered P1 .5 cm in height and 7 leaves P2 7.25cm and 12 leaves P3 4.2 cm and 12 leaves P4 3.8 cm 10 leaves	P1 2.4cm H and 13 leaves P2 Only one flowering 5.4cm and 5 leaves P3 .5cm and 10 leaves P4 .6 and 6 leaves P5 1.1cm and 9 leaves P6 .4cm in H and 4 leaves

			flowered in this group	3.8 cm in height and 12 leaves		