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Also bought trays with a light bulb heater to keep the seeds at their optimum temperature when the garage is cold.  12/29/00 Set up the seeds. Used dirt just bought, so it is guaranteed weed and pest free. Cut the trays into 8 slot squares, so each tested group will have 64 slots with multiple seeds and one control group. Put the dirt in up to the top and then used a handful of seeds and spread them evenly over the tray. Slight cover of dirt over seeds. Watered each tray with ½ cup water with a spray bottle, averaging about 4 sprays per slot. Set the three heating units under the growing lights. Bought thermometers to regulate the heat inside each unit.  1/1/01 Modified the heat/light set up. At the present, the two lights and three bulbs are plugged into a surge protector and then plugged into a socket in the garage wall. However, when the garage lights are turned off, so are the growing lights and heating units. Modified into another plug that keeps it on all night. Wondering if I need to have the growing lights off at night, though.  1/2/01 Watered with a spray bottle- ½ cup per tray = 5 sprays per slot. The inside portions of the trays were drier than the rest, most likely because they were right over the heating light. (heating light is 15 watts)  2 4 6  1 3 5  Tray #1 was 60'F when first opened, and 55'F when finished and recovered. Tray #2 was 66'F when first opened, and 62'F when finished and recovered. Tray #3 was 64'F when first opened, and 60'F when finished and recovered. Tray #4 was 68'F when first opened, and 56'F when finished and recovered. Tray #5 was 68'F when first opened, and 62'F when finished and recovered. Tray #6 was 62'F when first opened, and 62'F when finished and recovered. It was 60'F outside, and it was about 2:30pm.  1/4/01 Watered with an eye dropper instead. Each slot got approximately 1/8 oz. Again, the inside portions were drier than the rest of the tray. The first sprouts came up today! In the middle of each small tray were the highest seedlings, about 1 inch. Tray #1 was 68'F when first opened, and 58'F when finished and recovered. Tray #2 was 68'F when first opened, and 58'F when finished and recovered. These two trays were open for 6 minutes and 47 seconds. Tray #3 was 70'F when first opened, and 62'F when finished and recovered. Tray #4 was 70'F when first opened, and 64'F when finished and recovered. These two trays were open for 6 minutes and 30 seconds. Tray #5 was 68'F when first opened, and 60'F when finished and recovered. Tray #6 was 67'F when first opened, and 60'F when finished and recovered. They were open for 6 minutes and thirty seconds. It was 58'F outside, and it was about 4:30pm. Took pictures of the set up and each double tray.  1/6/01 Watered again with the baster. The grass is now touching the top of the globes now in some areas. The middle didn't seem dry this time. Tray #1 was 66'F when first opened, and 62'F when finished and recovered. Tray #2 was 68'F when first opened, and 62'F when finished and recovered. These two trays were open for 7 minutes. Tray #3 was 68'F when first opened, and 64'F when finished and recovered. Tray #4 was 66'F when first opened, and 64'F when finished and recovered. These two trays were open for 4 minutes. Tray #5 was 68'F when first opened, and 63'F when finished and recovered. Tray #6 was 68'F when first opened, and 60'F when finished and recovered. They were open for 3 minutes and thirty seconds. It was 56'F outside, and it was about 4:30pm. Took pictures of the set up and each double tray.  1/8/01 Watered again with the baster. The grass was pushing the top of the double trays off since it had grown so high. Some of the grass is significantly shorter than the average, and it is always on the even side edge, so I think it is because that part isn't directly under the growing lights. Also, the grass over the heating light is shorter than the average. Tray #1 was 62'F when first opened, and 60'F when finished and recovered. The grass in it ranged from 2" to 4" with the average being 3½". Tray #2 was 60'F when first opened, and 60'F when finished and recovered. The grass in it ranged from 3" to 3½" with the average being 3½". These two trays were open for 8 minutes. Tray #3 was 70'F when first opened, and 68'F when finished and recovered. The grass in it ranged from 1" to 4" with the average being between 2" and 4". The 1" grass was on the outside. Tray #4 was 68'F when first opened, and 64'F when finished and recovered. The grass in it ranged from 2" to 4" with the average being 3½". Again, the outside edge was 1" and the 2" stalks were over the heat source. These two trays were open for 5 minutes. Tray #5 was 68'F when first opened, and 63'F when finished and recovered. The grass in it ranged from 3" to 4" with the average being 3½". Tray #6 was 62'F when first opened, and 62'F when finished and recovered. The grass in it ranged from 3" to 4" with the average being 3½". The outside corner was only ½", though. They were open for 5 minutes. It was 57'F outside, and it was about 3:30pm. Took pictures of them pushing the top off, each double tray and the ½" corner.  1/10/01 Switched to watering out of bottom tray. The slots can soak up the water from the two holes in their bottoms. Each double tray has 1cm of water in it that the slots are sitting in. I had to level each one with boards underneath and support the tray holding the water with a board in where the heating lamp is. Hopefully this will work better. I noticed that the grass at the edge of the even trays were shorter, not because they were farther out from the growing light, but because the lamp tilted, casting a shadow on the even grass edges and lighting the odd tray edges more. This is probably why the evens were so short and the odds so tall. Fixed by putting a board on top of the side of the growing light that was raised. I also decided to leave the tops off of the grass since they seemed fine on their own. Tray #1 was 62'F when first opened. The grass in it ranged from 5.5cm to 20cm with the average being between 10cm and 14cm. Tray #2 was 62'F when first opened. The grass in it ranged from 4cm to 16cm with the average being between 10cm and 14cm. Tray #3 was 56'F when first opened. The grass in it ranged from 6cm to 17cm with the average being between 10cm and 14cm. Tray #4 was 54'F when first opened. The grass in it ranged from 4cm to 14cm with the average being between 10cm and 14cm. Tray #5 was 62'F when first opened. The grass in it ranged from 7cm to 19cm with the average being between 12cm and 16cm. Tray #6 was 58'F when first opened. The grass in it ranged from 4cm to 14cm with the average being between 10cm and 14cm. It was 59'F outside, and it was about 8:30pm. Took pictures of them pushing the top off, the shadow effect and each single tray.  1/12/01 All the plants are about the same height now. There was no water left in any of the trays. Noticed the roots of the grass coming out from the holes in the slots. Wondering if the water in the tray will be even or if one will take more than another. The temperature was 60'F. Tray #1 and Tray #2 had an average height of 12cm to 16cm. Trays 3 and 5 had an average height of 12cm to 17cm with a low height of 8cm. Trays # 4 and 6 had an average height of 12 to 16cm with a low of 7cm. Took pictures of each individual tray from above to show density and one set up of the grass height in relation to the growing light.  1/14/01 Temperature 55'F. Time: 9:00pm. Filled trays again with a centimeter of water. The average height for all of them was between 12cm and 18cm. Hoping they won't stop growing once I start the music soon.  1/16/01 8:00pm; 54'F. Again filled the bottom trays with 1cm of water. Tray #1 had a range of heights from 12cm to 20cm. Tray #2 had a range of heights from 12cm to 21cm. Tray #3 had a range of heights from 12cm to 20cm. Tray #4 had a range of heights from 12cm to 18cm. Tray #5 had a range of heights from 12cm to 19cm and Tray #6 also had a range of heights from 12cm to 19cm. Working this week in Mr. Thiel's room to get the music ready. He suggested to pick the music based on observations about the different beat and wave patterns, "assuming that sound energy impacts metabolic activity of living tissue than the higher frequencies will have a greater impact (more energy) than the lower frequency sound types." He also said that it would be better to have three very different sound types with a larger sample size than the 5+ one control I was going to have. Although he thought it would be better to have all the music going at one time, the best thing he could come up with would be to do each music on a totally different day for a longer period of time. Of course making sure all the variables are controlled as much as possible  1/18/01 4:45; 52'F outside. Tray #1 had a range of heights from 16cm to 22cm. Tray #2 had a range of heights from 14cm to 23cm. Tray #3 had a range of heights from 12cm to 20cm. Tray #4 had a range of heights from 12cm to 19cm. Tray #5 had a range of heights from 12cm to 25cm and Tray #6 had a range of heights from 12cm to 23cm. Still in Mr. Thiel's room analyzing the music to pick the five to test the plants with. Talked with Mr. Thiel and agreed on taking each tray to the outside room, putting it in a box so the light, etc., wouldn't have be a factor in the outcome and playing music all night long. The trays would be on different days, but it is the only way to keep the hours long and not intermingle music. Also decided to get better data, to measure every single strand of grass in a randomly picked 1in square. Going to talk to Ms. Nash to see how many squares I would need for an accurate representation of the population.  1/20/01 6:45pm; 55'F. Had to modify the setup. The grass blades were getting so tall the tips were being burnt. Raised the growing light up 10cm. (see picture "setupJan20"). Tray #1 had a range of heights from 16cm to 25cm. Tray #2 had a range of heights from 16cm to 26cm. Tray #3 had a range of heights from 15cm to 24cm. Tray #4 had a range of heights from 16cm to 23cm. Tray #5 had a range of heights from 16cm to 26cm and Tray #6 had a range of heights from 16cm to 24cm. The roots are forming a lacework on the bottom of the trays. Can be seen in the "tray(1-6)Jan20" pictures.  1/22/01 There was water left in the bottom trays shared by trays 3 and 4 and trays 5 and 6. Tray #1 had a range of heights from 16cm to 26cm. Tray #2 had a range of heights from 16cm to 26cm. Tray #3 had a range of heights from 16cm to 25cm. Tray #4 had a range of heights from 16cm to 24cm. Tray #5 had a range of heights from 16cm to 29cm and Tray #6 had a range of heights from 16cm to 25cm.  1/24/01 no data  1/26/01 no data  1/28/01 4:00pm; 58'F. Unable to collect data on the 24th and 26th. The soil was dry since they hadn't been watered since the 22nd. The blades are either 16cm or between 28cm and 31cm. Took pictures of growth (see tray"x"Jan28.jpg). Tray #1 had a range of heights from 16cm to 30cm. Tray #2 had a range of heights from 16cm to 29cm. Tray #3 had a range of heights from 16cm to 30cm. Tray #4 had a range of heights from 16cm to 28cm. Tray #5 had a range of heights from 16cm to 29cm and Tray #6 had a range of heights from 16cm to 30cm.  1/30/01 Had to raise the growing lamp another 12cm. The tips of the grass blades were singed again. 3:30pm; 60'F outside. Tray #1 had a range of heights from 16cm to 30cm. Tray #2 had a range of heights from 16cm to 31cm. Tray #3 had a range of heights from 16cm to 30cm. Tray #4 had a range of heights from 16cm to 31cm. Tray #5 had a range of heights from 16cm to 31cm and Tray #6 had a range of heights from 16cm to 32cm.  2/1/01 Mrs. Nash, the statistics teacher, said thirty blades of grass would be an accurate representation of the population. Picked out the music: Hard Rock, Jazz, Classical, Rap, Hawaiian and the control without any music. The music was picked on the different wave patterns produced and the different frequency spectrums produced.  2/9/01 Mr. Thiel is burning the CD this weekend. Have 20 seconds of each song and will play over and over for the selected time.  2/11/01 Mowing the grass today. Either because of the lack of turgor pressure or their height, they have fallen over. See picture "February 11/ longgrass.jpg". Going to water well and then cut. Will do a mass cut now and then trim each one to the same height before the first exposure. Gave each double tray 2L of water  2/12/01 Gave another 2L of water this morning-going to cut this afternoon. Cut to a rough height of about 2inches. Will trim before testing to 2inches.  2/18/01 Trimmed Tray 1 (Hard Rock) this morning and put it outside for the first run. See pictures in folder "February 18" The tray will be placed in a 27 ¾ in x 30 ½ in x 28 ¾ in heavy cardboard box. The stereo will be placed inside of the box and turned to the track number for each tray. The track is 20 seconds long and will repeat itself for 12 hours. Each track has been tested with the stereo to check its decibel reading and the volume has been marked so that each track will be playing at 80 decibels. Took out and placed back in the double tray after the 12 hours.  2/19/01 Trimmed Tray 2 (Hawaiian) and put out to be subjected. See pictures under folder "February 19."  2/20/01 Trimmed Tray 3 (Classical) and put it outside. The trays are being tested in a box so that there is no change between days in the sunlight reaching the plants. This way, the only energy reaching the plants that could affect each one differently would be the energy in the sound waves. See pictures under folder "February 20."  2/21/01 Trimmed tray 5 (Rap) to 2 inches and left with the music for 12 hours. See picture under folder "February 21."  2/22/01 Trimmed Tray 4 (Jazz) to 2 inches and left with the music for 12 hours. See picture under folder "February 22."  2/23/01 Trimmed Tray 6 (No Music) to 2 inches and left in for 12 hours. See pictures under folder "February 23." There are also pictures of me cutting the grass and the grass pile under that folder.  2/24/01 Giving the grass one day rest in between testing runs.  2/25/01 Tested tray 1 for 12 hours. See pictures under folder "February 25." Also began setting up a second box to be able to test two trays per day. The first set up was in a room in the backyard. This one will be in my college sister's empty room. The temperature should be the same since her room is blocked off from the heater and we only have it on for an hour or two each night anyway. There shouldn't be a big difference in the extraneous noise coming to the box in the house since we won't be home for most of the 12 hours. I've also informed my family to be quite and not to play any of their music until after the grass is done testing. Vacuum cleaners and any other loud noise making machine is included in the "don't play until after the grass is out" category. The cardboard box is roughly the same size as the first, although not perfect, and is made out of the same heavy cardboard. This box is 28 ¼ inches x 31 ½ inches x 44 ½ inches instead of 27 ¾ inches x 30 ½ inches x 28 ¾ inches. See pictures under folder "February 25" labeled "cuttingboxFeb25.jpg," "cuttingbox2Feb25.jpg," and "outstaplesFeb25.jpg." The boxes are far enough away that they should not be able to hear the other.  2/26/01 Tested tray 2 for 12 hours. See pictures under folder "February 26." Copied the Grass Music CD to have one for the new room. Tested the decibels for the new stereo and marked where the volume should be for each track. The only problem is to figure out how to switch from one a day to two a day without having one being tested a day sooner than the others in terms of days from the last testing.  2/27/01 Tested tray 3 for 12 hours. See pictures under folder "February 27." Starting from the 26th, there is 3 pictures for each tray: one from a top view, one from a side view, and one from an angled view.  2/28/01 Tested tray 5 for 12 hours. See pictures under folder "February 28."  3/1/01 Tested tray 4 for 12 hours. See pictures under folder "March 1."  3/2/01 Tested tray 6 for 12 hours. See pictures under folder "March 2."  3/3/01 Day of rest for the grass. I've been keeping the double bottom trays full with 2L of water every other day or so. If there is still 2L of water in all of the tray, I just leave it.  3/5/01 Tested tray 1 for 12 hours. See pictures under folder "March 5."  3/6/01 Tested tray 2 for 12 hours. See pictures under folder "March 6."  3/7/01 Tested tray 3 for 12 hours. See pictures under folder "March 7."  3/8/01 Tested tray 5 for 12 hours. See pictures under folder "March 8."  3/9/01 Tested tray 4 for 12 hours. See pictures under folder "March 9." Decided that there is no way to have the grass be the same number of days from the last testing to switch to testing two per day. But since they are all receiving the same amount of light with the rotating system (when tray 1 is in, tray 2 is under; when tray 2 is in, tray 1 is under the light) it shouldn't matter that much. Switching to testing two trays per day at the end of this round.  3/10/01 Tested tray 6 for 12 hours. See pictures under folder "March 10."  3/11/01 Going to give the grass a day of rest before starting another round of testing. This time going to use the second room.  3/12/01 Tested tray 1 outside and tray 2 inside, each for 12 hours, from 6:30am to 6:30pm. See pictures in folder "March 12"  3/13/01 Tested tray 3 inside and tray 5 outside from 6:40am to 6:40pm. See pictures in folder "March 13."  3/14/01 Tested tray 4 outside and tray 6 inside from 5:55am to 5:55pm. See pictures in folder "March 14."  3/18/01 Tested tray 1outside and tray 2 inside. They were exposed from 7:40am to 7:40pm. Will measure them on the 19th. See pictures under folder "March 18."  3/19/01 Tested tray 3 inside and tray 5outside. They were exposed from 6:30am to 6:30pm when they were put back in the double tray for tomorrow. See pictures under the folder "March 19." Took tray 1 and tray 2 out for measuring. Decided to measure every green blade of grass in the middle four cells of each tray so there would be no biased results. It took about two hours to measure both trays. Tray 2 looked better with higher and more grass. Filled up the double tray with 2L of water when I put them back. See the picture under folder "March 19" labeled "measuring1Mar19.jpg."  3/20/01 Tested tray 4 outside and tray 6 inside from 6:00am to 6:00pm. See pictures under the folder "March 20." Measured tray 3 and tray 5. Tray 3 had considerably less blades, but they were just as high as tray 5. The tips of the grass blades in tray 3 easily broke off, suggesting lack of cellulose and the unhealthiness of the blades. Most of tray 3 was filled with the brown, old, dead grass. Tray 5 had considerably more blades of grass. There were many blades on the outer cells that had heights of 15-16 cm, but there were none in the middle four cells. Filled up the double trays with 2L water.  3/21/01 Measured trays 4 and 6. The grass in tray 4 was a light green color while the grass in tray 6 was very dark. Tray 6 also had thicker blades than the other trays, and the small blades (4-6cm) were thinner than the taller blades, suggesting new shoots. Tray 6 was denser than any of the other trays, but there wasn't as many blades in the center four cells, giving the impression in the data that tray 2 was denser.  3/22/01 Took in the grass to analyze in Mr. Thiel's lab. We decided not to do the starch test since it would most likely turn the whole blade black and we would not be able to tell any difference between the different trays. We did continue to do the spectrophotometer test. I cut off 2 grams of each grass tray at random locations throughout the tray. We massed them to exactly 2.00g. They were then added to a 100mL mixture of 30% acetone and 70% distilled water. The mixture was blended at high speed for 15 seconds. The solution was then poured through a paper towel filter one sheet thick to filter the grass not blended up and any foam in the solution out. The flacks were labeled and put in the refrigerator overnight. Worked from 4:00 to 6:00. See pictures under the folder "March 22" for pictures of the workbench, the tubes, the six trays after cutting, and working the blender.  3/23/01 Worked from 3:00 to 6:00. Used the spectrophotometer to analyze the chloroplast's absorbency for each tray at wavelengths from 400 to 720 at intervals at 20. The chlorophyll mixture was put in tubes that fit into the spectrophotometer. The chlorophyll had settled in 5 out of the 6 tubes, the 6th being the example Mr. Thiel showed me where he blended it longer than 15 seconds. The spec was loaded with a plain acetone tube to calibrate the spec. The tubes were wiped clean so fingerprints would not interfere with the reading, and inverted several times until the chlorophyll was completely suspended in the acetone. See pictures under folder "" labeled "spec." and "tubes2." |