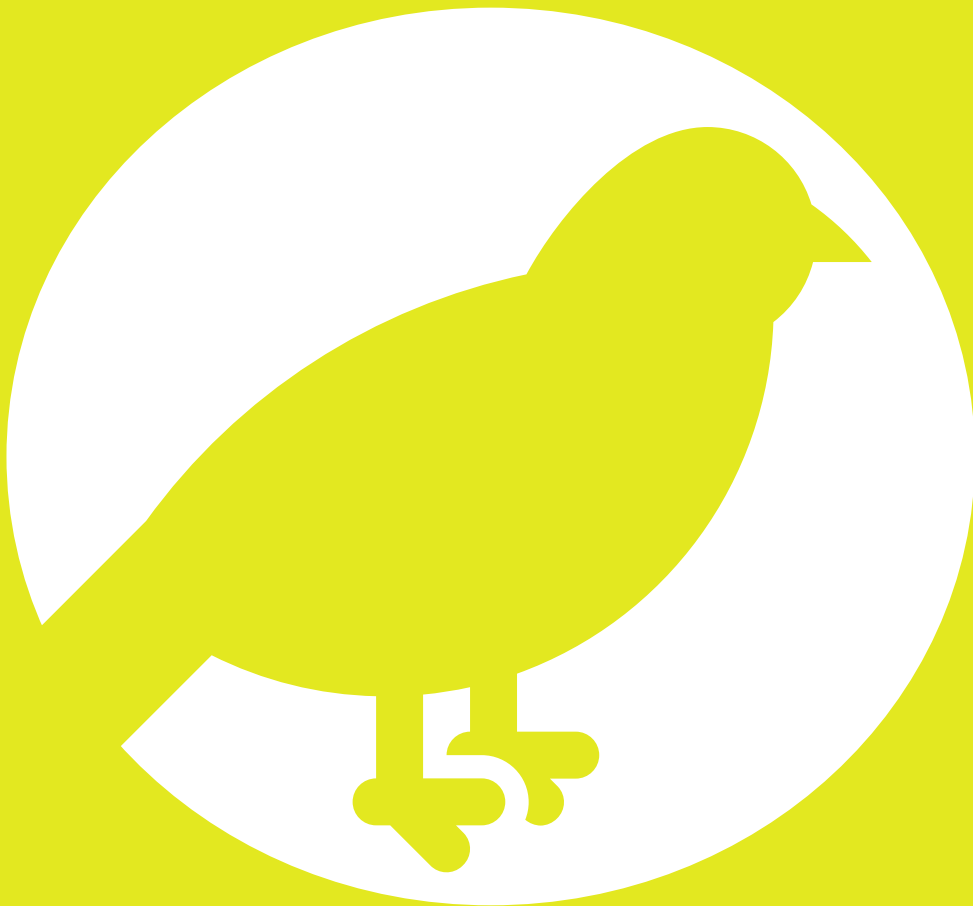


Coloured Bird feeders

The affect of colour on bird feeder selection
by sparrows



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Projektbeskrivelsen

Introduction: Last year, I bought a book on climate change. The book put me on a mission to create a bird feeder that would attract as many sparrows as possible, because I learnt that many bird species were in decline and one of the main reasons for bird deaths is starvation. To fulfill this mission, I harnessed the power of colour. If I could find the colour that would attract the most sparrows to my bird feeder, I could provide a stable food source for sparrows and they wouldn't die of starvation.

My hypothesis was that the sparrows would eat more bird food from the yellow bird feeder than the grey/green bird feeder. I thought this because the colour yellow is a colour which represents "food" – and so survival - for sparrows, as they eat sunflower seeds from sunflowers, which are yellow.

Materials: I used four identical bird feeders (from Jem and Fix), yellow Luxi spray paint (acrylic based), brown Dupli-color, green Dupli-color, 3200g shell-less sunflower seeds from Biltema, scale, funnel, spoon, small tub, Coolife wildlife camera PH700A, scissors and tape.

Method: I performed in total four experiments. I spray painted one of the bird feeders yellow, brown or green and left one grey/green. I filled both bird feeders up with 200g of shell-less sunflower seeds for every attempt. In all experiments I left the bird feeders outside for around 24 or 48 hours. I also swapped the positions of the bird feeders for every attempt. For all the experiments, except for experiment 1, I hung both bird feeders at the same height.

After every attempt, I weighed how much bird food that was left in each bird feeder. I had also set up a wildlife camera for experiment 2-4, which took photos of the sparrows who came to eat at the bird feeders. I looked at the photos after every attempt and wrote down what bird feeder the sparrows visited.

Results; Experiment 1: In experiment 1, I saw that there were not only sparrows eating at the bird feeders, but also other small birds. The birds ate more from the bird feeder that was higher up for both attempts that I did.

The results from experiment 1 show that the height at which the bird feeder hangs from seems to play a role in how much the birds eat from it. This led me to hang the bird feeders at the same height for experiment 2.

Results; Experiment 2-4: In the following text, I will be referring to one of the positions of the bird feeder as position A. Position A is the position where the bird feeder was on the left of the camera.

Great tits consistently favoured the bird feeder at position A. It might be the same for greenfinches, but the data was not clear enough about the greenfinches for me to make a solid conclusion.

However, the sparrows consistently favoured the grey/green bird feeder for every experiment, no matter its position.

A few other small birds, such as robins, blue tits, chaffinches also came to eat at the bird feeders, but there weren't enough of them for me to make any conclusions about them.

Conclusion: Sparrows prefer to eat from the grey/green bird feeder over yellow, brown and green bird feeders. In order to attract more sparrows to your bird feeder and prevent sparrows from dying of starvation, choose a grey/green birdfeeder over yellow, brown and green bird feeders. The reason for putting out a bird feeder for sparrows is because they are very important to the health of the environment and humans.

1. Introduction

At the beginning of 2022, I bought a book¹ on climate change at a book fair at my school. In one chapter, there is an activity about making a bird feeder out of recycled plastic bottles.

I learnt from the book that almost all bird species are on a steep decline. Forests are carelessly flattened to make way for urbanization, which destroys vital homes for all types of biodiversity, including birds. Birds are forced to live in cities that are different from what they are used to. They choose to nest in dangerous places² and the constant lights disturb their circadian rhythm³.

After reading the chapter on birds and bird feeders, I began testing several designs of bird feeders to see which design the birds in my garden would like best. I tested several designs and afterwards I concluded that they liked the simplest design best.

I decided to take my project further and focus on what colour would attract the most birds to my bird feeders. I researched about sparrows, as there were a lot of sparrows in my garden at the time.

Sparrows are largely dying of starvation in huge numbers, which is a problem because they are very important for the environment.

Sparrows use colour to find food and so if I could find the colour that they were most attracted to, I would be able to provide food to many more sparrows and they wouldn't die of starvation.

2. Background

Starvation is one of the most common reasons for sparrow deaths⁴, so it is important for them to have a reliable food source. I learnt that there are 247 million fewer sparrows than in 1980 and other bird species are also dying a lot in Europe⁵.

“House sparrows have also vanished from many cities for reasons that have not yet been established but are likely to include shortages of food,” says Patrick Barkham in The Guardian.

I wanted to make sure that I could provide more food sources for sparrows because they are very important for the environment.

¹ How You Can Save the Planet by Hendrikus van Hensbergen, Puffin Books, 2021, ISBN: 978-0-241-45304-9

² Rise for the Sparrows | WWF (wwfpak.org)

³ Light Pollution Poses Threat to Migrating Birds - International Dark-Sky Association (darksky.org)

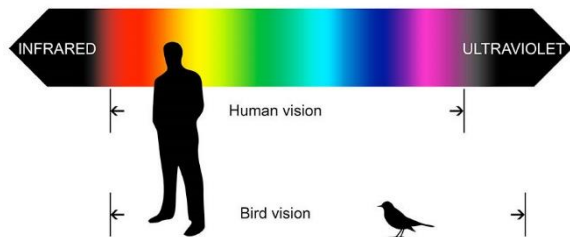
⁴ <https://www.theguardian.com/environment/2021/nov/16/house-sparrow-population-in-europe-drops-by-247m>

⁵ <https://www.theguardian.com/environment/2021/nov/16/house-sparrow-population-in-europe-drops-by-247m>

Without them, there would be an upsurge in locust populations in certain countries, as was seen in China in 1958. This became a problem because the locusts ate so much of China's grain, that there was a huge famine and millions of people died⁶.

This proves that it is vitally important for the stability of the environment and human populations, to keep birds alive.

Birds use the colours in nature to help guide them to food.



I found that birds eat more from the bird feeders that are the same colour as the birds' plumage and hummingbirds tend to eat more from red bird feeders, as the flowers where they get their nectar from are also red⁷.

I decided to spray paint one of the two identical grey/green bird feeders yellow in my first two experiments, as sunflowers are yellow and sparrows eat sunflower seeds. For experiment 3, I spray painted one of the bird feeders brown and for experiment 4, I spray painted one of the bird feeders green.

3. Problem formulation

Sparrow numbers are on a worryingly steep decline and a bird feeder which could not only provide food for them, but also attract as many sparrows as possible, would help solve this problem.

Does a grey/green, yellow, brown or green bird feeder attract the most amount of sparrows?

⁶ Four Pests campaign - Wikipedia

⁷ What Colors Are Birds Attracted To? - Color Meanings (color-meanings.com)

4. Hypothesis

Experiment 1 and 2:

I hypothesize that the sparrows will eat more bird food from the yellow bird feeder than the grey/green bird feeder (for experiment 1 and 2). I think this because the colour yellow is a colour which represents “food” – and so survival - for sparrows, as they eat sunflower seeds from sunflowers, which are yellow.

Experiment 3:

My hypothesis for experiment 3 was that the sparrows would eat more bird food from the brown bird feeder than the grey/green one. This is because birds are attracted to the colours of their own plumage and sparrows are brown

Experiment 4:

My hypothesis for experiment 4 was that the sparrows would not have a preference between my grey/green and green bird feeders.

5. Materials and Method (experiment/attempt)

Materials

These were the materials that I used:

1. Four identical bird feeders (from Jem and Fix)
2. Luxi Yellow Spray Paint (acrylic based)
3. 3200g shell-less sunflower seeds from Biltema
4. Scale
5. Funnel
6. Spoon
7. Small tub
8. Coolife wildlife camera PH700A
9. Scissors
10. Tape



Method

I performed in total four experiments and I did several attempts for both experiments. In all of my experiments, I used four identical, grey/green bird feeders and spray-painted three of them yellow, brown or green⁸. I then filled both bird feeders up with 200g of shell-less sunflower seeds and hung them under an apple tree in my garden.

I also hung the wildlife camera on the apple tree for experiment 2. Throughout all my attempts in experiment 2, it took pictures of the birds as they were eating at the bird feeders. I was able to look back at what species of birds were going to what bird feeder.

I performed a third and fourth experiment leading up to the finals where I used a similar method as I did in experiment 2, but instead of spray painting one of the two identical bird feeders yellow, I spray painted it with brown Dupli-colour spray paint (from Bauhaus) for experiment 3 and leaf green Dupli-colour spray paint (from Bauhaus) for experiment 4.



Picture of both birdfeeders in experiment 1 and 2

After the picture (above) was taken, I applied tape to the lid to make sure that the bird feeders would not fall down from the apple tree during the experiments.

Experiment 1

In my first attempt, I hung the grey/green bird feeder slightly higher than the yellow bird feeder. This was because I was unsure if the branches that would let me hang both bird feeders at the same height would be able to hold the weight of the bird feeders without breaking. I wasn't able to look at what species of birds were eating from the bird feeders using the wildlife camera.

After around 48 hours, I weighed the amount of bird food that was left in each of the bird feeders.

In my second attempt, I switched the positions of the bird feeders and hung the yellow bird feeder slightly higher than the grey/green bird feeder. This was to check if the position of the bird feeder affected how much the birds would eat from it. If the position did matter, I knew that my results from my first experiment would be inaccurate.

After around another 48 hours, I weighed the amount of bird food that was left in each of the bird feeders.

⁸ I made sure that the paint was safe for the birds.



Picture of experiment 1, attempt two with great tit eating (above).



Picture of experiment 1, attempt one (above)

Experiment 2

I performed four attempts for experiment 2. In experiment 2, I also managed to look at the photos of the different bird species that were eating at the different bird feeders, using the wildlife camera.



Picture of experiment 2, attempt one (left)



Picture of experiment 2, attempt two (right)

In the following text, I will be referring to the two possible positions of the bird feeders as position A and position B. The bird feeder in position A is the bird feeder to the left in the photo. In the first image above, this would be the yellow bird feeder. The bird feeder in position B is the bird feeder to the right. In the first image above, this would be the green bird feeder.

In my first attempt, I was now confident that the branches were strong enough to let me hang both bird feeders at the same height. I decided to keep the bird feeders outside for around 24 hours now, as more birds had discovered the bird feeders and I didn't want them to eat all the bird food so that I wouldn't have any results. From experiment 1, I knew that the position of the bird feeder mattered to how much food the birds ate from the bird feeder.

After around 24 hours, I weighed the amount of bird food that was left in each of the bird feeders.

In my second attempt, I swapped the positions of the two bird feeders again.

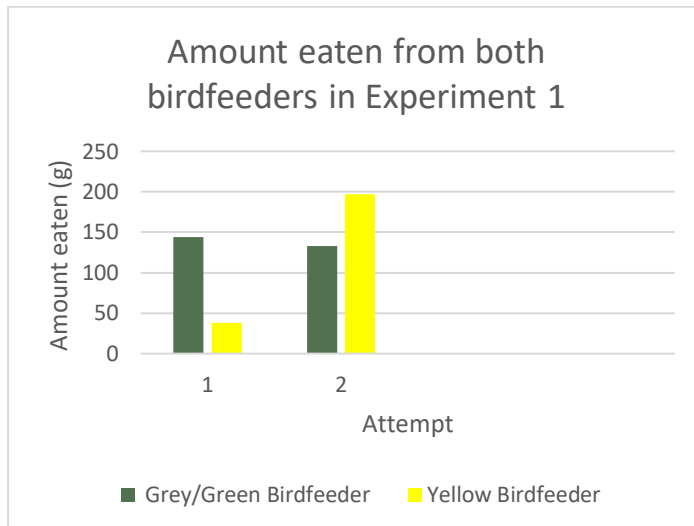
After around another 24 hours, I weighed the amount of bird food that was left in each of the bird feeders.

I continued to swap the positions of the two bird feeders for another two attempts, weighing the amount of bird food left in each of the bird feeders after around 24 hours, before looking at my final results.

6. Results and discussion

Experiment 1

This is a graph of my results for experiment 1:



The results from experiment 1 show that the height at which the bird feeder hangs from, seems to play a role in how much the birds eat from it. When I hung the grey/green bird feeder higher up than the yellow bird feeder, the birds ate more from the grey/green one. When I switched the positions so that the yellow bird feeder was higher up than the grey/green bird feeder, the birds ate more from the yellow one.

This led me to hang the bird feeders at the same level for experiment 2 and I changed the amount of time that I kept the bird feeders outside for to 24 hours. I realized that 48 hours was too long to keep the bird feeders outside for, because the birds would eat all the bird food from one bird feeder and then move onto the other bird feeder, even if that was not their initial instinct. This would not give me the answer to the question that I was trying to answer.

It was also in experiment 1 that I saw that there were not only sparrows visiting the bird feeders, but also great tits and greenfinches.

Experiment 2

This is a table of my results for experiment 2:

Bird species spotted	Attempt 1		Attempt 2		Attempt 3		Attempt 4	
	Yellow (position a)	Grey/Green (position b)	Yellow (position b)	Grey/Green (position a)	Yellow (position a)	Grey/Green (position b)	Yellow (position b)	Grey/Green (position a)
Great tit	33	20	17	52	58	13	10	53
Sparrow	4	28	2	21	4	11	0	18
Greenfinch	23	19	1	9	20	18	15	32
Blue tit	3	1	0	0	12	9	5	25
Robin	0	0	0	0	0	2	2	1
Unknown	1	2	0	3	0	0	0	0
Total number of birds	64	70	20	85	94	53	32	118
Amount of food eaten (g)	120	103	25	94	75	56	32	93
Amount of food eaten per bird (g/bird)	1.9	1.5	1.3	1.1	0.8	1.1	1	0.8

In experiment 2, I was able to identify what specific bird species were visiting the bird feeders, using the photos that the wildlife camera had taken.

Great tits consistently favoured the bird feeder at position A, no matter its colour. It might be the same for greenfinches, but the data was not clear enough about the greenfinches for me to make a solid conclusion.

However, the sparrows consistently favoured the grey/green bird feeder, no matter its position.

I don't have clear answers for the blue tits and robins, as there weren't so many and/or they didn't visit the bird feeders as often as the great tits and sparrows.

I included the unknown category because there were times when I couldn't identify the bird species, but I did get better throughout the attempts.

I also calculated the total number of birds that ate at each bird feeder for every attempt and the amount of food eaten per bird (g/bird). I included the total number of birds that ate at each bird feeder so that I had a general idea of how many birds were eating from each bird feeder for every attempt. I also included the amount of food eaten per bird (g/bird) so that I knew how hungry the birds were for every attempt, as this could affect the results.

Experiment 3

On the following page is a table of my results for experiment 3:

	Attempt 1		Attempt 2		Attempt 3		Attempt 4		Attempt 5		Attempt 6	
	Grey/ green bird feeder (Position a)	Brown bird feeder (Position b)	Grey/ green bird feeder (Position b)	Brown bird feeder (Position a)	Grey/ green bird feeder (Position a)	Brown bird feeder (Position b)	Grey/ green bird feeder (Position b)	Brown bird feeder (Position a)	Grey/ green bird feeder (Position a)	Brown bird feeder (Position b)	Grey/ green bird feeder (Position b)	Brown bird feeder (Position a)
Sparrow	2	0	5	0	15	3	7	1	0	3	10	1
Great tit	43	2	13	14	39	7	10	11	9	2	3	6
Blue tit	11	1	5	8	15	1	2	8	3	1	0	3
Greenfinch	58	22	55	46	109	77	48	59	47	53	12	91
Robin	7	0	1	0	7	1	1	3	2	1	1	0
Blackbird	0	0	1	0	2	0	0	1	1	2	1	0
Chaffinch	0	0	0	0	14	4	22	21	17	23	7	38
Total number of birds	121	25	80	68	201	92	90	104	79	85	34	138
Amount of food eaten (g)	59	29	74	72	108	74	75	84	56	70	19	163
Amount of food eaten per bird (g/bird)	0.5	1.2	0.9	1	0.5	0.8	0.8	0.8	0.7	0.8	0.6	1.2

My hypothesis for experiment 3 was that the sparrows would eat more bird food from the brown bird feeder than the grey/green one. This is because birds are attracted to the colours of their own plumage and sparrows are brown.

In experiment 3, the sparrows clearly preferred the grey/green bird feeder, even if there weren't as many sparrows visiting in total as there were in experiment 2.

There weren't any clear trends for the great tits, blue tits, robins, blackbirds, greenfinches and chaffinches. The greenfinches preferred the grey/green bird feeder for attempts 1, 2 and 3, but for attempts 4,5 and 6 they preferred the brown bird feeder.

Experiment 4

After experiment 3, I found an article⁹ where a person had done similar experiments to my experiments and they had discovered that some of the colours that house sparrows are attracted to are silver and green bird feeders. The sparrows were attracted to the colours relatively equally. This led to my hypothesis being that the sparrows would not have a preference between my grey/green and green bird feeders.

This is a table of my results for experiment 4:

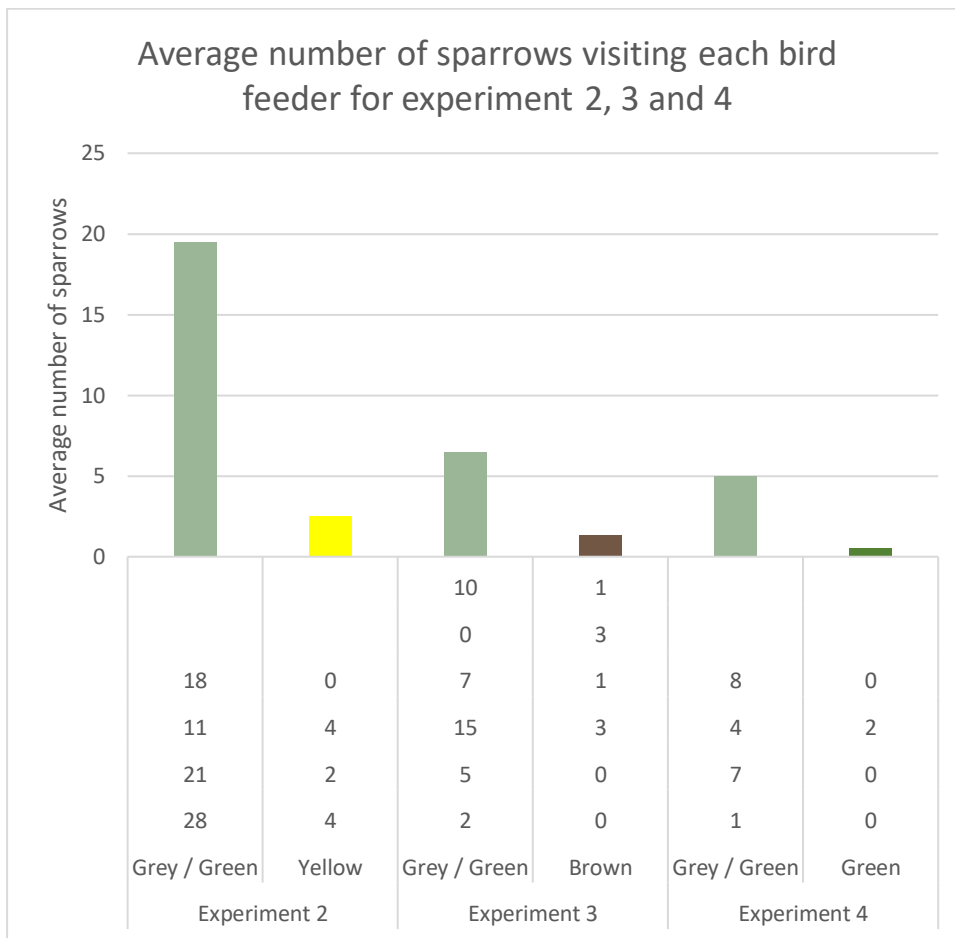
	Attempt 1		Attempt 2		Attempt 3		Attempt 4	
Bird species spotted	Green (position a)	Grey/Green (position b)	Green (position b)	Grey/Green (position a)	Green (position a)	Grey/Green (position b)	Green (position b)	Grey/Green (position a)
Great tit	9	2	2	5	9	2	2	13
Sparrow	0	1	0	7	2	4	0	8
Greenfinch	78	46	39	79	82	64	81	120
Blue tit	2	2	0	4	1	1	0	4
Robin	5	0	0	4	0	0	0	4
Chaffins	26	36	3	20	12	25	10	20
Blackbird	0	0	0	0	2	0	0	0
Unknown	0	0	0	0	0	0	0	1
Total number of birds	120	87	44	119	108	96	93	170
Amount of food eaten (g)	92	94	57	113	85	75	77	115
Amount of food eaten per bird (g/bird)	0.8	1.1	1.3	0.9	0.8	0.8	0.8	0.7

In experiment 4, the sparrows clearly preferred the grey/green bird feeder.

⁹ Rothery, L. et al. Colour preferences of UK garden birds at supplementary seed feeders, PLOS ONE, 2017

The greenfinches appear to prefer the bird feeder in position a. Similar to experiment 3, there weren't any clear trends for the great tits, blue tits, robins, blackbirds and chaffinches.

Here is a graph which summarizes experiment 2, 3 and 4:



7. Perspective

The birds in experiment 1 preferred the birdfeeder that was higher up. This may be because of predators, such as cats.

However, the results from experiment 2 showed that the sparrows consistently ate from the grey/green bird feeder. This means that they prefer to eat from the grey/green bird feeder over the yellow bird feeder. Out of the grey/green and yellow bird feeders, it would be smartest to use the grey/green bird feeder to attract sparrows, as they eat more from the grey/green one. More sparrows in the world will result in a healthier environment.

The results for the other bird species that came to eat at the bird feeders were mixed.

More experiments focused on them would give me more concrete results.

Nature is often uncontrollable and it is very hard to predict exactly what will happen in experiments dealing with nature. I encountered many factors that may have affected the results and conclusion.

As I mentioned above, the varying hunger of the birds might have affected how much the birds ate in each attempt.

My control bird feeder might have been the wrong colour, since I only kept it the same colour as the original; a grey/green. Though white may have been a relatively neutral colour choice for humans, white is a colour meaning “danger” for birds, which is why I did not make the control bird feeder white¹⁰.

The varying weather outside might have affected how many times the birds were willing to fly to the bird feeders. If it was too windy outside, it might have been harder for the birds to fly to the bird feeders. The small birds that I saw when doing my experiments also weren't nocturnal, so may have preferred sunnier conditions to be out in. This is my own hypothesis, but I did not record the weather for each attempt.

Another thing that may have changed how much and/or often the small birds ate from the bird feeders, was the presence of larger birds. The smaller birds seemed to fear larger birds like pigeons, magpies and kestrels. They would sometimes stop eating from the bird feeders and hide in the bushes when they saw these larger birds.

The fact that the small birds spilled some of the bird food onto the ground when they were eating may also have affected the end result.

Throughout both experiments, I did spill small amounts of bird food every now and then too, but the spilling of bird food would not have affected how much the food weighed at the end of every attempt by more than two to three grams. This is only an estimation.

Using all of the knowledge that I have gained from my two experiments, I would like to continue researching and finding what colour would attract the most birds to my bird feeder.

I read that birds are attracted to bird feeders that are the same colour as their own plumage¹¹. Based off of this information, I could choose to colour the bird feeder brown instead of yellow for future experiments.

That is what I decided to do for experiment 3.

In both experiments 3 and 4, there were fewer smaller birds at the bird feeders compared to the amount of smaller birds in experiment 2. The wild life camera captured photos of the green finches and chaffinches fighting over the food and this might have scared the smaller birds from visiting the bird feeders more often.

In experiment 4, I tested grey/green and green. I hypothesized based on an article¹² that I had found after experiment 3, that the sparrows would have around equal preference between the two bird feeders, but that was not the case. The sparrows preferred the grey/green bird feeder. The article had several different coloured bird feeders outside at the same time, while I only compared two different coloured bird feeders at the same time. In that way my experimental setup made perhaps the sparrows actively choose the bird feeder that they were the most attracted to.

Other reasons for the different results between my experiments and the experiments in the article, could be that the person who did the experiments in the article also used a silver bird feeder, not a grey/green bird feeder like I did. The sparrows may also have recognized my grey/green bird feeder since I have used the same grey/green bird feeder in all three previous experiments.

¹⁰ <https://www.color-meanings.com/what-colors-are-birds-attracted-to/>

¹¹ <https://www.color-meanings.com/what-colors-are-birds-attracted-to/>

¹² Rothery, L. et al. Colour preferences of UK garden birds at supplementary seed feeders, PLOS ONE, 2017

I performed my first two experiments in early January, but I performed my third and fourth experiment in late March. The availability of other food, such as insects, in March might have affected how much the birds ate from the bird feeder compared to how much they ate in January. Another reason for why the birds ate more from the bird feeders is the colder weather in January.

Not only would I like to experiment further with the colours that humans see, but I also hope to apply something that reflects UV light and see how that affects birds, as a lot of birds actively use UV light to find food¹³.

After I had conducted my experiments, I found a website saying that yellow would attract birds for the same reasons that I had thought of¹⁴. However, they seemed to have come to the opposite conclusion that I had (it did not say sparrows specifically). Perhaps more attempts and experiments would reveal a different conclusion than the one that I had made. I may also have conducted my experiments in different conditions from their setup. For example, they might have used a different shade of yellow.

I hope to eventually create the optimal bird feeder for attracting not only common small birds, but also more rare or endangered species of birds.

7. Conclusion

Sparrows prefer to eat from the grey/green bird feeder over yellow, brown and green bird feeders. In order to attract more sparrows to your bird feeder and prevent sparrows from dying of starvation, choose a grey/green birdfeeder over yellow, brown and green bird feeders. The reason for putting out a bird feeder for sparrows is because they are very important to the health of the environment and humans.

¹³ [Ultraviolet vision in birds: What is its function? - ScienceDirect](#)

[True Colors: How Birds See the World \(nwf.org\)](#)

¹⁴ [What Colors Are Birds Attracted to? - 4 Bird's Favorite Color \(thayerbirding.com\)](#)

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