

Exploring the Roasting Profiles of Cocoa Beans

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Driven to DiscoverSM

Accomplishments

- Recruited Taste Testers
- Wrote Surveys for taste testers
- Designed roasting parameters using Minitab
- Collected data using surveys

Recruiting method

The community surrounding the chocolate lab is very inclusive and close; recruiting taste testers was a breeze. I sent an email to chocolate lab affiliates and had plenty of volunteers willing to participate in the research.

Hello,

My name is Allen Belchak. I am doing research in the chocolate lab and I need your help! Starting on the fourth week of the semester, I will have recruited 10 willing individuals to taste test cocoa tea in the chocolate lab. Your involvement will be an hour per week for eight weeks. Each week I will hand out a survey with five responses on it, and a new batch of cocoa tea. You will rank each of the following on a scale from 1-10: Nuttiness, Creaminess, Earthiness, Fruitiness, and Overall Enjoyment. Those who participate will be rewarded with delicious, organic chocolate made by yours truly. The risks include the possibility that you do not enjoy the cocoa tea or to feel discomfort if you are hypersensitive to the stimulant theobromine that naturally resides in chocolate. I regret to inform you that those with food allergies such as peanuts, fruit, or dairy must refrain from participating in this study. For those interested in hearing more, I will hold a meeting in the chocolate lab on the second week of class. There I will explain more in depth what my research entails.

Thank you for your time and attention,

Allen

Design of Experiments

Four factors were in question for the cocoa bean roasting:

Ramp temperature: The set temperature until beans reach plateau temperature

Plateau Temperature: Temperature in which beans are roasted.

Time at plateau: Duration from when beans first hit plateau temperature to start of cool time.

Cool time: Set time that beans have to rotate in roaster after heat turned off (anticipated to have least effect on products of maillard reaction).

WORKSHEET 2

Full Factorial Design

Design Summary

Factors: 4 Base Design: 4, 16
Runs: 16 Replicates: 1
Blocks: 1 Center pts (total): 0

All terms are free from aliasing.

StdOrder	RunOrder	CenterPt	Blocks	Ramp T	Plateau T	Tp	Ct
13	4	1	1 -	-	+	+	
6	5	1	1 +	-	+	-	
3	6	1	1 -	+	-	-	
14	7	1	1 +	-	+	+	
12	8	1	1 +	+	-	+	
2	9	1	1 +	-	-	-	
11	10	1	1 -	+	-	+	
10	11	1	1 +	-	-	+	
15	12	1	1 -	+	+	+	
16	13	1	1 +	+	+	+	
1	14	1	1 -	-	-	-	
8	15	1	1 +	+	+	-	
7	16	1	1 -	+	+	-	

Survey One

The first survey could not support the focus of the project because it couldn't compare each roast directly to the next. It was realized that before comparing types of flavors between various roasts, it would be best to determine if there is a large difference in *strength* of flavor in the first place. It was then decided that the survey should include a separate part to directly compare the strength of aroma, and Strength of flavor of the two batches to later see if more flavor was related to a higher amount of polysaccharides.

Cocoa Tea Survey

Rank each of the following on a scale from 1-10. Give a rank of 1 if you experience no flavor. Give a rank of 10 if the flavor trumps others.

Fruitiness

Nuttiness

Creaminess

Earthiness

Overall Enjoyment

Survey Two

This survey was used to collect qualitative data from the roasts and then compare with the results from the extractions. The plan was to add a qualitative response to the quantitative data obtained from extracting the products of the Maillard reaction using the same batches of cocoa beans respectively.

Cocoa Tea Survey

For this survey taste both batches of tea subsequently. If Batch 1 has a stronger flavor, write "1" in the flavor box of Batch 1 and "2" in the flavor box of Batch 2. If Batch 2 has a stronger aroma, place a "1" in that box, etc. Repeat tasting until you can answer the question confidently.

Batch 1	Batch 2
Aroma:	Aroma:
Flavor:	Flavor:

Fruity	2	3	4	Nutty
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Astringent	2	3	4	Creamy
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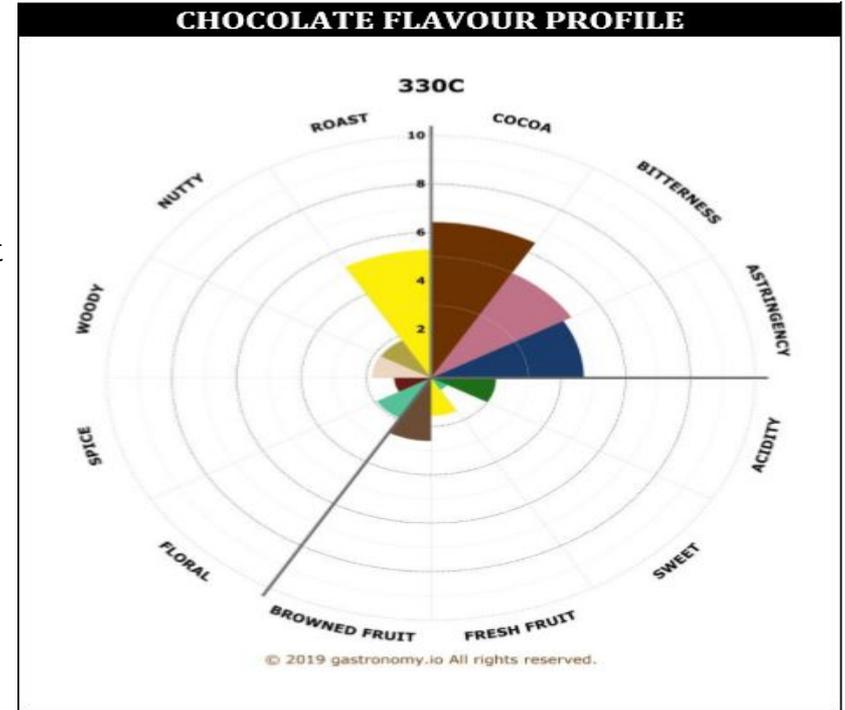
Bitter	2	3	4	5
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Chocolate	2	3	4	5
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Earthy	2	3	4	5
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Taste Testing Tactics

Here is the Bolivian chocolate flavour profile from the 2019 Cocoa of Excellence Programme. This is an example of how chocolate is professionally evaluated by judges. It shows a wheel of all the flavors present in the chocolate, along with the strength of said flavors. Each flavor wheel was accompanied by a chart of the characteristics of the bean inside the chocolate. Some of the things that were measured include: roast temperature, roast time, fat content, moisture content.



Future Recommendations

- Designing the surveys to obtain usable data proved to be the most challenging part of the project. After gathering the first bit of data from taste testers, I realized that I needed to write a new survey. Before gathering data from the new survey, the pandemic struck and did not allow for data collection.
- It is very important to communicate clearly with your faculty member in order to make sure you're headed in the right direction.

References

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