## WHITEPAPER



## A Heated Comparison: Ikawa vs Probat

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## INTRODUCTION

When it comes to sample roasting, coffee professionals have two main options in terms of equipment: a traditional drum roaster or a modern hot air roaster. The first involves three forms of heat transfer to roast coffee (convection, conduction, radiation) while the latter is solely dependent on the control of convective heat transfer. Some claim that one type of roaster is better than the other for quality assessment purposes, but little research has been performed to properly analyse these claims.

For almost 20 years, Caravela QA teams have relied upon traditional drum roasters at our origin labs and global import offices. However, with the growing improvements in air roaster technology and our proximity to Ikawa's manufacturers, the office in London has used both air and drum roasters to assess quality and roast samples for customers.

We have experienced notable differences in drum and air roasters, which centre around ease-of-use, consistency/replicability of roast profiles, and sensory results from cupping. For the purpose of this experiment, we will compare how these two different roasters affect the perception of flavour in the same coffee. We will analyse the sensory results to provide insights into the cupping experience of each roaster, which will allow buyers to make more informed purchasing decisions based on the type of roaster they use.

## METHOD

#### Experiment Analysis Protocol

A blind cupping was held at the Caravela London office on 7<sup>th</sup> June 2018, using a panel of seven highly-skilled coffee professionals. We chose five different coffees from one origin, for consistency purposes. The aim of this selection was to highlight the difference between roasting methods and equipment rather than the coffees themselves.

#### Equipment

#### - 4 Barrel Probat BRZ electric sample roaster

Drum roasters require an operator with sensory expertise; they must react to the audible, visual and aromatic changes that occur during the roast by manually adjusting heat and airflow settings. As each barrel requires different settings to achieve the same desired profile, only one barrel of the Probat sample roaster was used to rule out inconsistencies between barrels.

#### - Ikawa V2-PRO sample roaster

Roast profiles on the Ikawa are created with built-in software and a mobile app. All the changes in temperature/fan speed are set by the operator prior to roasting. We used the same profile for each sample to ensure the samples were subject to the same conditions.

### THE EXPERIMENT

The coffees in Table 1 follow strict quality guidelines in terms of moisture content, water activity, and UV testing. We work directly with producers through our PECA education program to ensure that these standards are met before assigning our coffees different quality grades: A, AA, and AAA (84+, 85+, and 86+, respectively).

For this experiment, we used 5 different AA-grade coffees from Nicaragua (an 85+ score). You can find out more about Caravela's unique grading system <u>here.</u>

Coffees Selected for the Experiment						
FARM	REGION	ALTITUDE	VARIETIES			
La Trampa	Jinotega	1100-1500 masl	Maracaturra, Caturra, Catuai, Bourbon			
Apollo 11	Jinotega	1100 masl	Caturra, Catuai			
La Roca	Dipilto, Nueva Segovia	1250-1500 masl	Bourbon, Caturra, Paca			
Los Pozitos	Jinotega	1200-1250 masl	Caturra, Catuai, Java			
Los Pirineos	Dipilto, Nueva Segovia	1350-1500 masl	Caturra			

TABLE 1 offees Selected for the Experiment

The coffees in Table 1 were all fresh crop from the 2018 harvest. 1kg samples of each were sent via airfreight to London from Caravela's office in Ocotal, Nicaragua.

Each coffee was divided into 2 sets of samples:

- 2 x 50 grams = 2 roasts on the Ikawa roaster
- 2 x 100 grams = 2 roasts on the Probat sample roaster

There were 4 roasted samples of each coffee, for a total of 20 samples to be cupped.

#### Sample Coding

As we could not display any information about the coffee or roasting, we used a coded system to identify samples after cupping. Each of the five coffees were allocated a sample number (Table 2).

SAMPLE #	COFFEE			
1	La Trampa			
2	Apollo 11			
3	La Roca			
4	Los Pozitos			
5	Los Pirineos			

### TABLE 2 Samples Coffee Code

The four samples of each coffee were assigned a letter, identifying the roast and roaster (Table 3).

Sample Roast Code Table							
	IKAWA		PROBAT				
SAMPLE #	ROAST #1	ROAST #2	ROAST #1	ROAST #2			
1	A	В	С	D			
2	А	В	С	D			
3	А	В	С	D			
4	А	В	С	D			
5	А	В	С	D			

TABLE 3 ample Roast Code Tabl

The following codes were then randomly assigned to different tables in order to create truly blind cupping conditions and minimize bias (Table 4):

## TABLE 4

#### Cupping Tables

TABLE 1		TABLE 2		
1A	1C	4B	4D	
2A	2C	2B	2D	
3A	3C	5B	5D	
4A	4C	1B	1D	
5A	5C	3B	3D	

#### ITEMS FOR CONSIDERATION AND CONSISTENCY PROTOCOL

We tried to reduce the effects of other variables that could have affected cup quality results:

- 1. The roasting of each sample was subject to the skill set of the person operating the roaster. Every effort was made to be as consistent as possible across roasts by using "equivalent" profiles on both machines. Drop temperatures and development time ratios were consistently 205c and 19%, respectively.
- 2. All 20 samples were roasted 24 hours prior to cupping.
- 3. We had a tasting panel of seven London-based professionals, some of whom were Q-Graded tasters, to provide their feedback as data. The cupping panel requirements were:
  - a. Extensive cupping experience of Speciality Coffee (2 Years +).
  - b. Professional position where cupping is practiced at least 3-5 days/ week.
- 4. Analysis of the data was limited to flavour descriptors appearing at least twice.
- 5. Results have been grouped as follows:
  - a. Per coffee (Primary)
  - b. Per machine (Secondary)

## QUALITATIVE RESULTS

We used tree map graphs to represent our results in a more visually comprehensive format and to demonstrate the following:

- 1. The flavour descriptors of each coffee.
- 2. The frequency of shared descriptors for each coffee.

In the brief before the cupping, the cuppers were instructed to write a maximum of 3 flavour descriptors per sample cupped. This would have yielded a total of 82 descriptors per coffee (7 cuppers x 2 machines x 2 samples x 3 descriptors).

We grouped similar descriptors into simplified lexical categories from the Coffee Taster's Flavour Wheel (Enzymatic, Sugar Browning, Dry Distillation), allowing us to better pinpoint any correlation of sensory observations from the participants. I.e. Descriptors such as "Brazilian nut", "hazelnut", "walnut" are grouped in the general category, "Nut".



GRAPHS - Tree Maps of flavour descriptors per coffee and roaster machine

Graph 1. Descriptors for La Trampa in both Ikawa and Probat sample roasts.

Cuppers detected a wider variety of characteristics in the Ikawa roasts, with "Cacao" being the most prominent flavour note of La Trampa. The Probat roasts had a narrower range of descriptors and the nutty characteristics of La Trampa were perceived more frequently.



Graph 2. Descriptors for Apollo 11 in both Ikawa and Probat sample roasts.

"Red stone fruit" was the second most frequent flavour descriptor for samples roasted on Probat, while it wasn't observed at all in the Ikawa roasts.



Graph 3. Descriptors for La Roca in both Ikawa and Probat sample roasts.

The flavour descriptor "Citrus" represented 30% of all flavour descriptors when it only represented 11% of them on the Ikawa roasts for the same coffee.



Graph 4. Descriptors for Los Pozitos in both Ikawa and Probat sample roasts.

The two main flavour descriptors for Los Pozitos (graph 4.) were "Citrus" and "Floral" in Probat roasts, while they were "Cocoa" and "Toasted nuts" in Ikawa roasts.



Graph 5. Descriptors for Los Pirineos in both Ikawa and Probat sample roasts.

The flavour descriptor "Savoury" (Graph 5.) was only used when describing Ikawa roasts.



Graph 6. The frequency of all descriptors used across entire sample set for both Ikawa and Probat.

In graph 6., the results show how cuppers identified 20 different flavour descriptors from Probat roasts and 22 descriptors for Ikawa roasts. The dry-distillation note of "Charcoal" often refers to coffee being improperly &/or over developed (vs over roasted), which has only been present in the Ikawa roasts. Whilst the term "Peasy" (aromas and flavours of garden peas due to defect) was only used to describe Probat roasts.

# FINAL THOUGHTS, CONCLUSIONS, AND NEXT STEPS

Whilst these results were based on coffees limited to one origin and the notes of a limited range of coffee professionals, we can assume that different roasting machines may impact the perceived flavour of a coffee.

As it is not always possible to detect three characteristics in coffee, our participants gave us a smaller set of descriptors than requested in the brief. This meant there was a smaller range of total descriptors (minimum = 64, maximum = 73) which does not affect the critical analysis of the results.

Looking at the graphs 1-5, Probat roasts had an average of 10 different flavour descriptors per coffee, whereas Ikawa roasts had an average of 11 different descriptors. We can assume that flavours were more pronounced in the Probat roasts, therefore easier to identify as such by all cuppers.

Additional observations:

- The flavour descriptor "Citrus" represented 53% of all flavour descriptors for 3 coffees (La Roca, Los Pozitos, Los Pirineos) when it only represented 16% of them on the Ikawa roasts for the same coffees.
- 2. We noticed that "Cocoa" or "Chocolate" represented an average of 58% of the flavour descriptors present in the Ikawa roasts.

It is interesting to note that "Chocolate", "Nuts", "Citrus" and "Apple" are flavour descriptors common to both roasters in graph 6, independent of coffee and roasting technique. These seem to be the "basic flavours", perhaps owing to the similar terroir, variety and quality of the five Nicaraguan coffees. Furthermore, the flavour descriptor "Citrus" was as frequently used as "Nuts" and "Chocolate" for the Probat roasts, while it was three times less frequent in the Ikawa roasts.

It seems that there are certain flavours that are highlighted more by one roaster than the other. This is the case for "Floral" and "Vanilla" which appear in Probat roasts (graphs 2-4) and not in Ikawa roasts. Conversely, the flavours "Straw" and "Soy sauce" are noted a few times in the Ikawa roasts, while they are absent from the descriptors of the Probat roasts (graph 6).

Whilst the most common flavour descriptors were relatively similar for both roasters, we have noticed that one machine tended to highlight specific characteristics of the same coffee when compared to the other machine. It could be assumed that there were fewer perceived flavours in the Probat roasts but that these flavours were more pronounced and perceived by a greater number of participants (graph 6), therefore easier to identify by all cuppers. Conversely, the lkawa roast highlighted a complex array of flavours but there was less correlation of cupping notes between participants.

This is something we would encourage coffee professionals keep in mind when making purchasing decisions based on a single type of sample roasting machine.

It would be interesting to extend this experiment to coffees from other origins and cuppers from other markets. We believe that this experiment could benefit from a much wider scope of data to really pinpoint how each roasting machine/method affects cup quality observations. Our experiment has shown that there are notable differences in the roast results from each roaster but hasn't determined which would be better for the task of sample roasting. We believe both roasters are equally valuable to the process of green buying and would encourage coffee professionals to explore the benefits of both. Looking ahead, we would like to explore other brands and models of sample roasters to further understand the limits of sample roasting technology. For example, would there be a difference in perceived flavour notes for gas powered Probat, Giessen or Diedrich sample roasters? How does altitude affect the roasts of Probat and Ikawa machines? We believe that addressing these questions will help professionals, from producers to green buyers, to better understand the equipment they use, and help them sell and purchase coffee more effectively.

We would like to take this opportunity to thank all the participants who contributed to this experiment.