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Pick Your Packaging



A Comparison of Green Coffees Shipped in Different Packing Materials

By Rachel Northrop

Photos courtesy of Ally Coffee

There are many plastic-based materials available for packing green coffee that offer high barriers against moisture, air, light, dust and other contaminants that might negatively affect coffee quality. These materials are designed to maintain coffee quality over time. Most of the research around the effectiveness of these materials measures coffee stored in a stable environment, such as a warehouse or roaster's facility. Knowing how packing materials preserve coffee for long periods of time is important, of course, but how do different packing materials stabilize coffee during the shipping process and the first few months after it lands?

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Coffee trees in Aponte, Nariño, Colombia.

THE QUESTION

Many microlots are released from the warehouse and delivered to roasters as soon as they land to offer customers the freshest crop coffee. Do packing materials designed to ensure quality for more than a year also have a positive impact on coffees that never see long-term storage?

The transition from the dry mill in the origin country to the warehouse in the destination country is the period of time—between two and four months, depending on time afloat—when green coffee undergoes the most dramatic changes in environment. Air pressure, humidity, temperature and many other factors fluctuate as coffee progresses from mill to port to ocean and back to land.

Does the way coffee is packed help preserve the product during this process? Our quality control team decided to begin investigating this question by conducting a comparison of green coffee packing materials. While the information gathered could be a good basis for further research into the topic, it's important to note that this comparison was designed to explore how packing materials might affect coffee our company imports regularly, and in no way intends to represent comprehensive research or generate formal recommendations for packing green coffee.

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THE COMPARISON

The same coffee was shipped in four different kinds of packaging inside a full container of that same coffee, with the remainder packed as usual in fique (natural fiber) bags with GrainPro-brand bag liners. This allowed us to observe the same coffee under the same transport conditions, changing only the packing materials.

This preliminary comparison would alert us if we were asking producers to add steps and costs, and adding work for the warehouse in handling bags with liners that did not positively impact quality.

We chose to conduct this experiment using a full container of a community lot of coffee. Coffee pulled from a large number of producers and milled, sorted and packed at the dry mill provided a homogenized coffee with which to conduct the comparison. Also, because this is a coffee our quality control (QC) team has worked with for several years, we are familiar with how it roasts and cups across offer, pre-shipment and arrival samples.

- Origin: Aponte, Nariño, Colombia
- Supplier: Cooperativa de Cafes Especiales de Nariño
- Coffee: Fully washed caturra grown by producers on the indigenous Inga reserve in Aponte
- Port of Export: Buenaventura

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Cooperativa de Cafes Especiales de Nariño.

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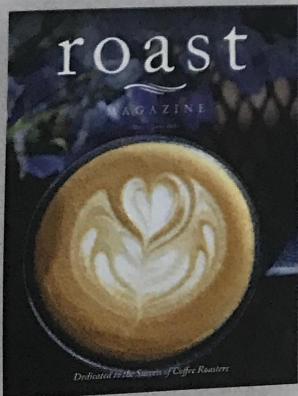
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MATERIALS

Jose Gomez, the manager of the cooperative, oversaw the packing of the experimental bags, packing Aponte coffee in the following four combinations of materials:

- Fique only
- Fique, paper and GrainPro
- Fique and GrainPro
- Fique, Qualipak and GrainPro

Originally, we envisioned shipping the paper and the Qualipak bags without any additional materials, to match the way coffee is exported from Brazil. However, the Colombian Coffee Growers' Federation (FNC, by its Spanish acronym) requires that all coffee be exported in fique, and that all coffee in a container match the packing description indicated on customs documents, which included both fique and GrainPro. Therefore, coffee packed in paper and Qualipak were triple-packed with three materials, which is atypical.

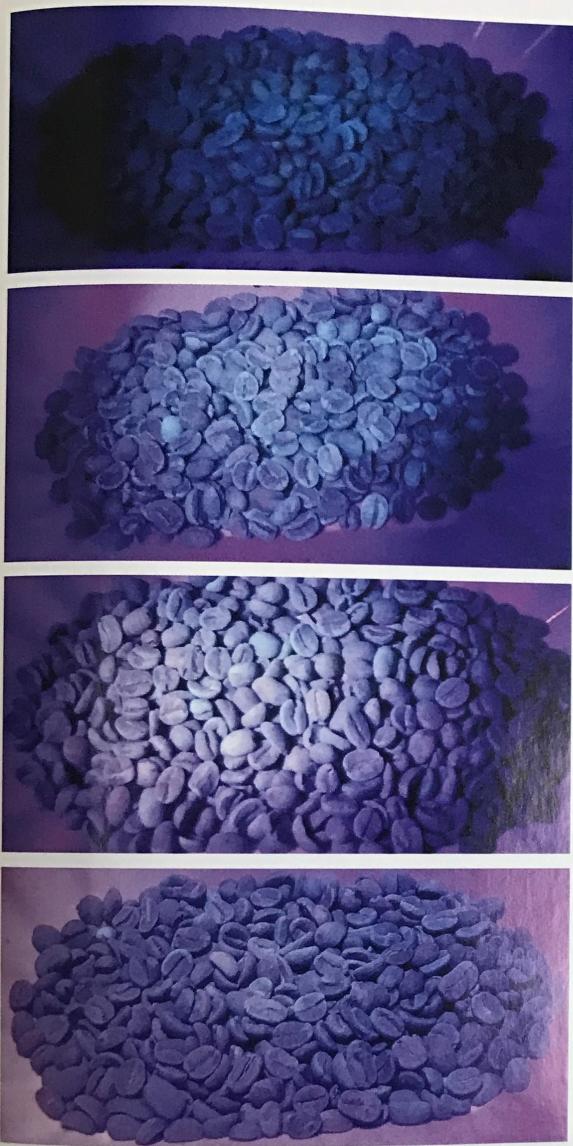
"Whatever the liner is, all coffee has to be packed in fique with the required federation markings," explains Gomez. The co-op purchases its fique bags from Empaques del Cauca in Popayan. (The FNC is a shareholder in Empaques del Cauca.)



LEFT Fique and paper packing. MIDDLE Fique GrainPro packing. RIGHT Fique only packing.



The four packing methods used for comparison.



FROM TOP TO BOTTOM GrainPro bioluminescence | Jute bioluminescence. | Paper and GrainPro bioluminescence. | Qualipak and GrainPro bioluminescence.

"There is a general lack of the material for making bags, fique, and so it's sort of monopolized," Gomez notes. "There's a three-month turnaround when ordering, so we keep a stash."

The co-op orders GrainPro liners directly from the Philippines, which adds a cost of about \$2.60 to each bag, in addition to the \$2.70 that fique bags cost. Plastic liners add an additional cost at the port as well.

"It's more expensive to sample because they can't stick the bags to draw out beans," says Gomez. "They open maybe 10 bags in a lot and charge us to sample each one."

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METHODS

The co-op packed coffee according to each of the four methods in 25-kilogram bags. They shipped a total of eight bags, of which three were packed in GrainPro, three in Qualipak, and one each of paper and fique.

Coffee was hulled, weighed and sewn into the bags at the same time as the rest of the coffee in the container. The external fique was clearly marked to avoid confusion at the warehouse.

Gomez prepared a document to clarify the meaning of the additional bag marks, stating, "For export and logistic purposes, each bag of 25 kilograms is distinctly marked to reference the type of packing. Each bag is packed in an additional GrainPro liner, with



Aponte, Colombia.

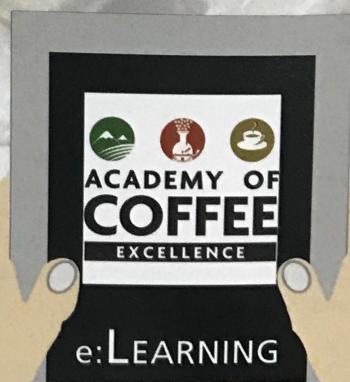
the exception of the one fique-only bag, to comply with export requirements."

The container shipped from Buenaventura on Nov. 27, 2017, and landed in Continental Terminals International warehouse in New Jersey on Dec. 21, 2017. As soon as the coffee was available for release, the experimental bags were shipped to Ally Coffee headquarters in Greenville, South Carolina. Ally's QC manager, Q grader Anderson Stockdale, completed a full physical analysis of the coffees, and she and members of the Ally team completed a sensory analysis on Jan. 18, 2018.

"We received eight total bags, of which three were packed in GrainPro, three packed in Qualipak-plus-GrainPro, and one each of paper-plus-GrainPro and fique only," explains Stockdale. "Of the GrainPro and Qualipak-plus-GrainPro, I pulled a sample from each and then built a blended sample of the three to create a representative sample." At that point, the coffee had been in its packing materials for three months.

Water activity was measured with a Rotronic HygroPalm 8303 and coffees were evaluated according to Specialty Coffee Association/Coffee Quality Institute protocol. Stockdale also observed the bioluminescence of the green beans, an indicator used in other food industries to detect the presence of bacterial activity.

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Packing Method	Moisture %	Water Activity	Cup Score	Descriptors
Fique Only	13.5	0.646	85.25	sweet, citrus fruit, malt, maple syrup, Meyer lemon, orange, red apple, tangy
Fique + Paper + GrainPro	12.1	0.566	86	milk chocolate, apple, caramel, cherry, clean, grape, malic acid, red fruit, roasted nuts, walnut
Fique + GrainPro	12.2	0.583	86	berries, brown sugar, caramel, citrus, creamy, dark chocolate, fruity, lemon, orange, pithy
Fique + Qualipak + GrainPro	12.1	0.591	84.75	brown sugar, acidy, astringent, cherry, citric acid, grape, grapefruit, lemon, orange, roasted nuts

RESULTS

Keeping in mind that the purpose of the experiment was to perform a comparative test and not a conclusive study, Stockdale observes, "The first notable result is that the coffee packed using Qualipak

displayed the most bioluminescent beans, and those coffees presented as the most astringent in the cup." The microbial activity indicated by bioluminescence is associated with decreased shelf life. While this is most relevant for keeping fresh produce safe

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for consumption, it is an attribute worth observing in green coffee to predict cup quality.

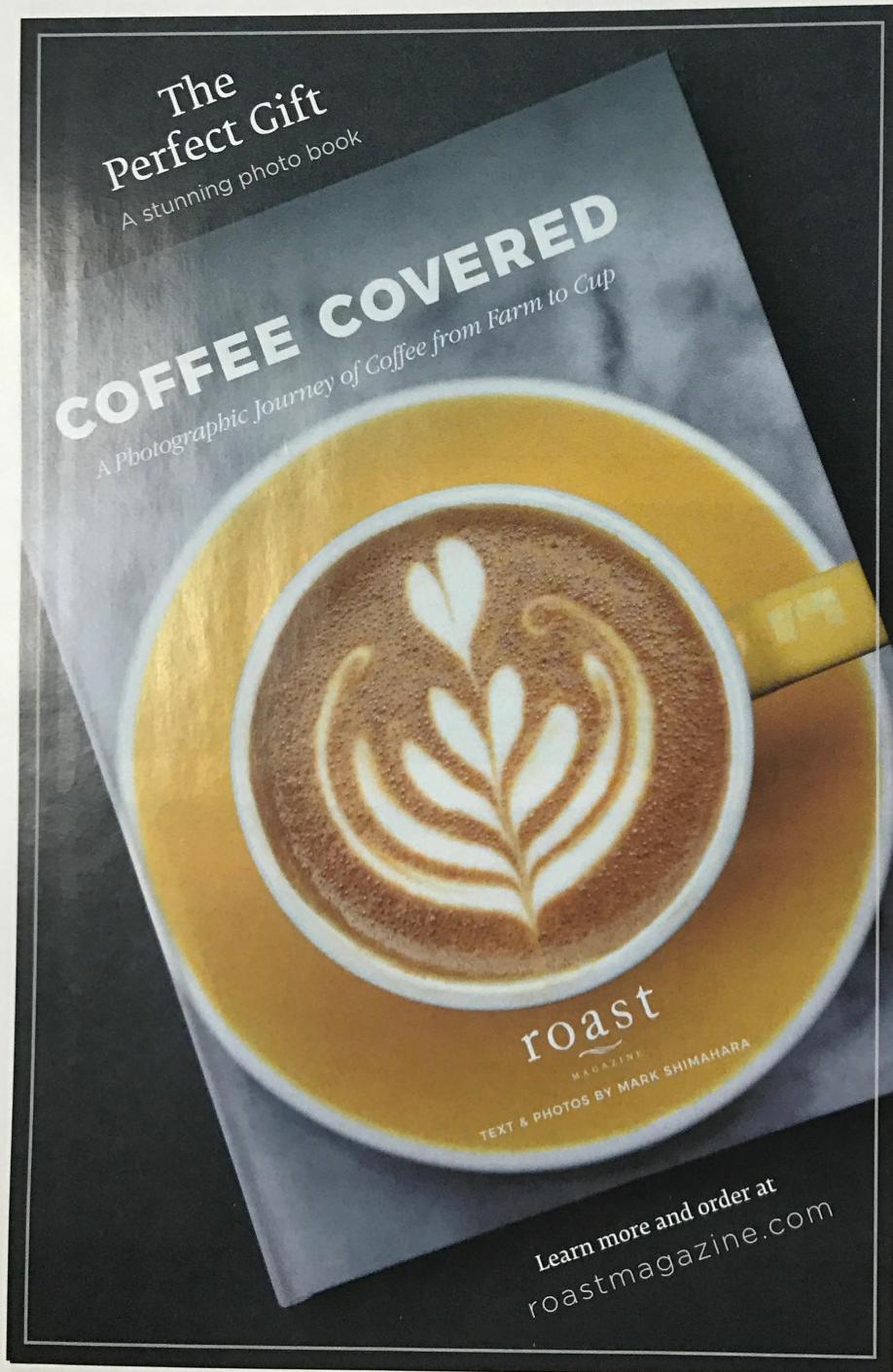
The other most notable result relates to the moisture level and water activity of the coffee packed in fique-only versus all other materials. Coffee in GrainPro, GrainPro-plus-paper and GrainPro-plus-Qualipak all registered consistent moisture

content compared to each other, with the coffee packed only in fique coming in more than a full percentage point higher. This is significant because moisture is one of the factors that most directly impacts immediate and long-term quality.

In 2016, Flávio Borém, a researcher with the Universidade Federal de Lavras in Minas Gerais, Brazil, conducted a study of green

coffee storage coordinated by the Brazil Specialty Coffee Association to develop improved packing materials. While his comprehensive research measured natural and pulped natural coffees from Brazil stored in eight packing methods across more than eight variables for close to two years—three months in Brazil, three months in transport, and 18 months landed in store—Borém's findings also recognized the importance of moisture content.

According to Borém's study, "The storage conditions and type of packaging in which the coffee beans are kept can allow change in the moisture content, and may accelerate respiration and promote a reduction in product quality during storage ... Regardless of the manner of coffee processing, the beans kept in packages without a barrier (paper and fique) and with a low [plastic] barrier showed an increase in moisture content over 18 months of storage. For the other packages, the moisture content remained stable, indicating the effectiveness of barriers



It is also noteworthy that moisture percentage and water activity alone do not account for differences in cup score, which makes the correlation between bioluminescence in green beans, astringency and projected shelf life, for both green and roasted coffee, an interesting line of inquiry to continue pursuing.

to water vapor present in the packages studied."

The data generated by the comparison conducted by Cooperativa de Cafes Especiales de Nariño and Ally Coffee agrees with Borém's conclusions. Borém also states that elevated moisture content "promotes an increase in the respiratory rate of the coffee beans, decomposition and consumption of coffee chemical compounds."

While the test measured arrival quality rather than long-term storage, based on the cupping notes and scores of the evaluated coffees, the coffees packed in fique-plus-GrainPro and fique-plus-paper-plus-GrainPro—packing methods with a moisture barrier—present the highest quality cup profile. (It is clear, however, that more testing is necessary to explain the lower cupping score for the coffee shipped in fique-plus-Qualipak-plus-GrainPro.)

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NEXT STEPS

The evaluation process further piqued our curiosity rather than satiating it, but the side-by-side comparison of the same coffee shipped in the same container packed in different materials confirms the commonly held hypothesis that shipping coffee with a plastic liner preserves quality better than fique alone, even during the initial three months of transit.

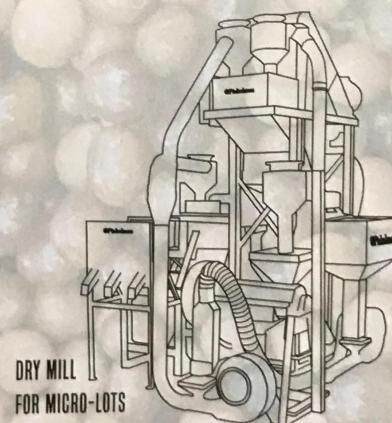
While bag liners add cost and labor along the supply chain, if coffee sensory quality is the most important goal, then specialty coffee should indeed be shipped with some sort of moisture barrier in addition to fique, jute or other fibers, even if coffee is released and roasted as soon as it lands.

This information should be helpful to producers and exporters as much as

roasters and importers. We hope others will continue to conduct side-by-side comparisons of the coffees they ship and explore options for preserving green coffee quality during both the transit process and longer-term storage.

RACHEL NORTHROP manages communications and origin traceability for Ally Coffee. Her coffee journey began researching production in the mountains of Latin America. Today, she writes about the nuances of supply chains for several trade publications.

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