TASTING THE 8 MARKS COLLECTION AGED 1 YEAR IN EX-BOURBON CASKS

The first release of The 8 Marks Collection contained an invitation to deeply explore the world of Hampden Estate through each specific mark with a focus on production method and identity of spirits. This second release contains the same 8 Marks of the distillery, with an added layer: one year of maturation in ex-Bourbon cask. The figures and infographics included in this document explain and analyze the differentiation of compounds extracted from the barrels, but the tasting experience is still strongly rooted in the aromatic identity and profile of the original marks which are defined by the raw materials used, fermentation and distillation techniques. New conclusions and understandings of Hampden Estate may be drawn from the opportunity to experience the two releases side by side. The future of Hampden Estate is profound and exciting – new experimentation is ongoing and upcoming releases will surely aim to deepen a collective understanding of how combination, creation and concentration of flavors evolve over time.

HOW TO READ AND USE THE DIAGRAMS

The diagrams found in The 8 Marks Collection Aged 1 Year in ex-Bourbon casks detail the aromatic components derived from the aging in wood in each individual mark. The first diagram represents the share in percentage of non-volatile components detected: it can be assessed while tasting the spirit. The second diagram represents the volatile components and is linked to the olfactive and the gustative perception.
Only the major components are shown, while less significant ones are regrouped as "others". Data shown inside the circles denotes the concentration in esters at distillation, as a reference point.

A LROK cask

THE RESPECTIVE SIZE OF MOLECULES AND THEIR PERCEPTION

The 8 Marks presented in this set are released at 52% ABV, meaning ethanol accounts for 52% of the total quantity of the liquid. The remaining 48% is mostly water, but also contains a minuscule percentage of all aromatic components combined. This percentage ranges from 0.5% for OWH (with 0.04% being esters) to 3.5% for the extremely heavy DOK (with 1% being esters).
Taking a mark with a medium concentration in esters – like HLCF as a reference point – all the non-ethanol and non-water components collectively represent 1.72% of the total volume, with only 0.26% of esters.
The aromatic components extracted from the wood, when combined, contribute only a tiny fraction of 0.0215%, where 0.0214% are non-volatiles and a mere 0.0001% are volatile components. These quantities are exceedingly small compared to the flavors they impart. Each mark's profile actually reflects the summation and interaction of these components.

OWH

OWH, the lightest mark in terms of esters, was created in the early 2010's and is exclusively made from molasses. With its low level of congeners, the influence of the wood may be more notable, but it retains fresh fruity notes, reminiscent of pear and apple, with a hint of caramelization. Despite being only one-year old, OWH boasts a diverse bouquet, enriched by a few volatile notes.

OWH
40-80
gr/HLPA

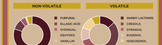
LFCH

LFCH is a modern mark made from molasses which offers a bit more complexity than OWH. This sample distinctly shows notes of wood, possibly attributed to a higher presence of ellagic acid and whisky lactones among the volatile compounds. It exhibits a dark color, likely influenced by a higher concentration of gallic acid from the specific casks used in maturation.

LFCH
80-120
gr/HLPA

LROK

LROK is a historical mark crafted from various raw materials which boasts a medium to high level of esters. In this one-year-aged version, distinctive woody notes emerge due to a high concentration of furfurals which impart a mellow caramel undertone. Notably, coal flavors have begun to replace the typical floral and fruity aromas of unaged LROK distillate.



LROK
200-400
gr/HLPA

HLCF

HLCF is a mark created in the early 19th century and holds significant historical value for Hampden Estate. It is famous for being commercialized unaged as "RUM FIRE." In this sample of HLCF, the influence of wood components is evident, complementing its characteristic notes of ripe banana and pineapple.

HLCF
400-600
gr/HLPA

<>H

<>H, pronounced "Diamond" H, is a heavier mark, due to increasingly high levels of fruity esters, particularly ethyl butyrate. The different wood components start to have less impact on the final balance.
This sample maintains a captivatingly elegant and powerful bouquet, reaching a remarkable youthful balance.

<>H
900-1000
gr/HLPA

HGML

The HGML mark is an unmistakably heavy rum, created with the specific intent of blending. In this one-year-old version, there has been a noticeable evolution in the superior alcohols present in the unaged spirit, and their oxidation transforms the bouquet significantly. This young spirit holds tightly onto its original character.

HGML
1000-1100
gr/HLPA

C<>H

C<>H, a twin mark of HGML, boasts an even higher concentration of esters. Despite similarities with HGML after one year, this sample has evolved in a gentler manner, featuring a more complex bouquet. It still retains its inherently powerful character, showcasing a robust and intense rum.

C<>H
1300-1400
gr/HLPA

DOK

DOK stands as the pinnacle of high-ester rums in Jamaica, offering a truly unique experience when enjoyed neat. It's remarkable to witness how even minute quantities of wood components contribute to its captivating bouquet, complementing its dominant notes of ripe banana and acetate. Truly, it offers an unforgettable experience.

DOK
1500-1600
gr/HLPA

THE 8 MARKS COLLECTION AGED 1 YEAR IN EX-BOURBON CASKS

This release of Hampden Estate's The 8 Marks Collection Aged 1 Year in ex-Bourbon casks gives rum enthusiasts the opportunity to discover the impact that one year of maturation in ex-Bourbon casks has had on each spirit. The aging was done in the distillery's official warehouse and under the intense tropical and humid climate of Jamaica where maturation is accelerated. While the first release of The 8 Marks Collection focused on the ester contents of the unaged marks, this 8 Marks Collection highlights the effects of maturation and of all the variables involved in this complex process. It can be assessed as such – or perhaps in comparison with the original unaged versions – to provide tasters with the opportunity to explore the different aspects of traditional Jamaican aromatic profiles after a short period of aging. This document deeply explains the relationship between empirical organoleptic tasting and the scientific chemical analysis conducted on each of these aged 8 marks.

A SHORT INTRODUCTION TO THE HISTORY OF JAMAICAN RUM

In the early 19th century, Jamaica was the largest rum producer in the world, with more than 100 sugar estates and just as many distilleries. In the past, Jamaica was a supplier of rum for European blenders and distilleries did not release official bottlings. British blenders used to buy different rums from many distilleries and bring the unaged liquid to Europe for blending and aging. Different provenances provided different styles and formulas, resulting in endless combinations for the blenders to create brands for the European market. Most of the distilleries, including Hampden Estate, started aging their rums only in early 2000's, and this new reality gave consumers the opportunity to discover the profile of authentic, tropically aged Jamaican pure single rums.

WHAT IS A MARK?

Historically, distilleries had a portfolio of multiple formulas of rum, called "marks" that were sold in bulk. Each distillery created specific recipes by combining different raw materials, managing the length of fermentation, and their own variations on the distillation process. Specific formulas are characterized by their flavor profile, defined by aromatic compounds called "congeners". The combination of these congeners contributes to the identity of the spirit and is expressed in grams of esters per hectoliter of pure alcohol (gr/HLPA). Jamaican rums are historically famous for their high level of esters. Using ancestral natural techniques, the formula for each recipe was categorized by its intensity in esters and given a unique acronym, actually known as a "mark". Distillery managers would chalk these acronyms onto casks to identify the rum inside. Many marks have been lost over time, though they were usually distiller's initials or abbreviations for the characteristics of the distillate.

HAMPDEN ESTATE'S MARKS

Mark	Ester Level	Full name of the mark
OWH	40-80 gr/HLPA	Outram Wormald Hussey
LFCH	80-120 gr/HLPA	Lawrence Francis Close Hussey
LROK	200-400 gr/HLPA	Light Rum Owen Kelly
HLCF	400-600 gr/HLPA	Hampden Light Continental Flavoured
<>H	900-1000 gr/HLPA	Diamond H
HGML	1000-1100 gr/HLPA	Hampden George MacFarquhar Lawson
C<>H	1300-1400 gr/HLPA	C Diamond H
DOK	1500-1600 gr/HLPA	Dermot Owen Kelly-Lawson

Ethyl Acetate, the most common ester in Jamaican rum

THE AGING OF JAMAICAN RUM MARKS

The figures in the chart above classify the different marks produced at Hampden Estate based on their respective concentration in esters measured at distillation, as Jamaican rums were historically unaged. In aged rums, the aromatic profile is still very much characterized by esters, but additional components (and the corresponding aromas and flavors) are also found, especially thanks to new elements being extracted from the oak casks used for aging and to time passing by, allowing for congeners to bound together. This maturation process is relentless and involves many different variables interacting.

HAMPDEN
ESTATE
PURE SINGLE JAMAICAN RUM

THE 8 MARKS COLLECTION
AGED 1 YEAR IN EX-BOURBON CASKS

Hampden Estate, Trelawny, Jamaica

Ex-Bourbon cask, used for maturation at Hampden Estate

THE DIFFERENT VARIABLES AT PLAY DURING THE MATURATION OF RUM

Maturation is a complex process, influenced by the interaction of numerous variables, collectively defining the profile of any given spirit. The wooden cask hosting the spirit obviously plays a central role in this process. Apart from specific maturations where multiple cask types are used (which is not the case at Hampden Estate), the nature of the cask is a static factor that doesn't change. Nonetheless, a specific cask's characteristics will surely influence the maturation process: its shape, size, oak species, char level, previous contents, specific location within the warehouse all have an impact on the maturing spirit.

The other key variable is age, a linear factor that is often considered to be the most important since it is easily comprehensible, being universally quantifiable and comparable. Although these two factors may seem straightforward, they are deeply intertwined in a continuous, never ending interaction. The cask is a porous container, acting as a sort of medium between its internal content and the environment where the maturation takes place. This specific environment is itself a dynamic combination of different variables: the climate, temperature, humidity, altitude, atmospheric pressure, wind, aeration, exposition are continuously changing and impacting the maturation process. The conditions at Hampden Estate, defined by the tropical climate of Jamaica, are heavily influenced by the ever-changing nature of these variables.

Time flows through all these factors, so the seemingly simple linear concept of aging must be seen as a truly dynamic process, with virtually infinite combinations of possibilities, meaning that each cask remains unique and should be traced and monitored individually.
In this complex dynamic process of maturation, the human factor also plays a role, and the ability of a gifted and experienced cellar master to assess and monitor the status of any given cask is highly valuable for the distillery.

A DEEP DIVE ON HAMPDEN ESTATE'S AGING PROCESS

In the following pages, many maturation variables are analyzed, detailing how this process takes place at Hampden Estate: a deep dive on the extraction of wood components and an introduction on the process of evolution of the rum; due to the combination, creation and concentration of flavors.
This analytic approach aims to be as detailed as possible, but these notions should nonetheless be seen as a point of reference only, keeping in mind that tastings are always subjective, empirical and emotional, based on every taster's experience.

THE SCIENTIFIC EQUIPMENT AT USE

The first release of The 8 Marks Collection featured unaged rums and used gas chromatography to detect congeners present in the different unaged expressions. With this new release, since the maturation under wood implies the presence of both volatile and non-volatile aromatic components, a more advanced technology was used, called HPLC (High Performance Liquid Chromatography).
The analysis and research work was conducted in partnership with Hampden Estate in Jamaica and Laboratoire Cognac Oenologie in France.

THE EXTRACTION OF WOOD COMPONENTS DURING MATURATION

THE STRUCTURE OF WHITE AMERICAN OAK

The casks used for aging the rums of this set were crafted from American white oak (Quercus alba) sourced from mature trees aged between 70 and 100 years. This oak variety is primarily composed of cellulose, hemicellulose and lignin, three key polymers each contributing distinct characteristics to the rum during the maturation process.
Cellulose (making up about 50% of the Quercus alba's composition) and hemicellulose (constituting about 35%) are polymers made of polysaccharides, respectively glucose and diverse sugars. Cellulose consists of long molecular chains that are too sturdy to play a significant role in the extraction process. Hemicellulose, on the other hand, introduces several varieties of sugars that contribute sweet and toasty flavors to the rum. These components also enhance the smoothness of the mouthfeel and impart color to the spirit.
Lignin (about 25% of the wood's structure) is an aromatic polymer with a complex structure of phenol derivatives. During maturation, alcohol acts as a solvent, breaking down lignin's chemical bonds and extracting various key phenolic compounds that have a major impact of the profile of the spirit.

The complex polymer structure of lignin

An example of oligomer of phenol with typical ring structure

THE DYNAMICS OF FLAVOR EXTRACTION

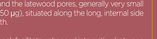
Extraction primarily occurs through the ethanol and water content present in rum. Ethanol serves as an effective solvent, initiating the breakdown of macromolecules into molecules. While water possesses a lower extractive strength, it also plays a role in the process. Other families of congeners, such as esters, aldehydes, and superior alcohols, which are typically present in unaged spirits, can contribute to extraction but significantly less compared to ethanol.
The extraction of compounds from the wood is front-loaded, meaning that the most significant aromatic compounds begin to be extracted at the early stages of maturation, but this process continues gradually over time. These extracted components will infuse into the unaged rum, imparting their flavors and aromas, and slightly increasing volatile acidity.
Many characteristics linked directly to the barrel such as the ones detailed below, will influence the way spirit and wood interact with each other.

WOOD POROSITY

White oak is a ring-porous wood, characterized by varying pore sizes: the early wood pores, typically medium to very large (30-200 µm), forming distinct rings or bands on the cross-cut side of the stave, and the latewood pores, generally very small to medium (25 to 50 µq), situated along the long, internal side of the stave's length.

The pores in white oak facilitate enhanced interaction between alcohol, water, and the barrel, resulting in a more rapid extraction of flavor components from the wood into the spirit.

In the tropical climate of Jamaica, high average temperatures speed up the process by opening up the pores more, leading to increased breakdown of lignin and release of aromatic compounds.



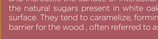
Early/wood pores: cross-cut of a stave (left); the pores x10 (right)

TOASTING AND CHARRING

The oak is cut into staves, seasoned, and then toasted or charred, a prerequisite for aging Bourbon.

The charring process plays a crucial role in determining the level of interaction and extraction: it breaks down the wood's structure, leading to the degradation of polysaccharides and polyphenols, thereby making aromatic components available for extraction and imparting unique flavors. Additionally, it facilitates the filtration of components.

Hampden Estate utilizes ex-Bourbon barrels with medium to heavy char levels, ranging from #2 to #4.



Level #3 char on a barrel stave

THE RED LINE AND EXTRACTION OF SUGARS

While heavy charring accelerates the color extraction and increases the surface of interaction, it also draws the natural sugars present in white oak closer to the surface. They tend to caramelize, forming a protection barrier for the wood , often referred to as the "red line".

In tropical climates, high temperatures facilitate the expansion of liquids and rum can more easily reach that red line and start extracting other components. The analysis of the 8 Marks after only one year of maturation shows that no significant amounts of sugars has been extracted yet.

Detail of the top layer of a stave known as the Red line

SHAPE AND SIZE OF EX-BOURBON BARRELS

The size of the casks used also plays a key role: Bourbon barrels are relatively smaller than other types of vessels and result in a higher surface of interaction between wood and spirit. This leads to faster extraction and oxidation.

Bourbon barrels are hand-made and can vary slightly in size and shape, but generally have the following features:

- Volume: 200 liters
- Height: 86 cm
- Head diameter: 53 cm / Bilge diameter: 66 cm
- Weight: 45 kgs when empty (225 kgs when full)
- Staves: 32, held together only by steel hoops and rivets

TWO MAIN TYPES OF WOOD COMPONENTS

During the first year of aging, the wood components that are extracted by the rum carry the most impact on the profile of the spirit. For this reason, they are the main focus of the research conducted for The 8 Marks Collection Aged 1 Year in ex-Bourbon casks.

Although more than 140 types of molecules have been found in the oak wood extract, only about 20 can be considered typical, as shown on the right side. These molecules are divided into volatile and non-volatile components.

Volatile components evaporate spontaneously at room temperature (20°C) due to their lighter molecular weight and vapor pressure, leading to their propensity to release from the liquid. Conversely, non-volatile components do not evaporate under normal conditions and predominantly remain in the liquid.

Consequently, this difference is crucial when considering perception during tasting: volatile components are perceived by the nose, while non-volatile ones are perceived both on the nose and on the palate. Their presence and quantities influence the coherence between smell and taste, explaining why many aged rums exhibit differences in aroma and flavor.

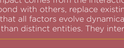
DIFFERENT SIZES, DIFFERENT UNITS OF MEASUREMENT

The size and molecular weight of wood components can vary drastically, justifying the use of different units of measurement to quantify them: heavier compounds, such as esters, are typically counted in grams per hectoliter of pure alcohol (gr/HLPA), equivalent to 1 part per 100,000. Non-volatile wood components, which are generally lighter, are measured in milligrams per liter (mg/L), corresponding to 1 part per million. Volatile compounds extracted from the wood, being even lighter, are measured in micrograms per liter (µg/L), equivalent to 1 part per billion.

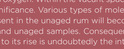
This document does not aim to provide specific, precise quantities of each component found in the 8 marks, but rather percentages within their respective categories. This approach deliberately favors the empirical detection of flavor influences on the nose and palate over analyzing numbers.

For our purposes, it would be organoleptically impossible to find precise correspondences between figures and flavors, as flavors should be seen as complex combinations of many molecules. Moreover, different molecules have different aromatic strengths, meaning that figures alone can be misleading. For instance, a molecule present in low quantity can exert a significant influence due to its high aromatic strength.

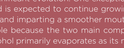
Furfural



Vanillin



Ellagic acid



Eugenol

P-cresol

Cis-whisky lactone

EXTRACTING NON-VOLATILE COMPONENTS OF THE WOOD

These components are so deeply linked to the wood that their values are dependent on the nature of the specific single barrel in which the rum is aging, sometimes even more than the general type of wood and origin.

- **Furfural** ($C_5H_4O_2$) and **5-methyl furfural** ($C_6H_6O_2$) are among the lightest non-volatile components detected in the analysis. Their extraction brings flavors of peanut butter, roasted hazelnut, and caramel. Furfurals are consistently present in high quantities in all aged 8 Marks, averaging 55% of all non-volatile components identified.
- **Vanillin** ($C_8H_8O_3$) is a phenolic aldehyde developed by the degradation of lignin, with a very characteristic flavor. It has a high aromatic strength but surprisingly, a very tiny physical presence, accounting for less than 1% of the non-volatile components detected.
- **Syringaldehyde** ($C_9H_{10}O_4$), like vanillin, is an aldehyde resulting from the degradation of lignin. Also detected in fairly low quantities, summing up to around 5% of non-volatiles. It brings spicy, smoky, warm notes from the wood.
- **Sinapaldehyde** ($C_{11}H_{12}O_4$) and **Coniferylaldehyde** ($C_{10}H_{10}O_3$) are similar molecules to syringaldehyde, detected in smaller quantities.
- **5-Hydroxymethylfurfural**, also known as "HMF" ($C_6H_6O_3$), detected in significant quantities, is responsible for caramelized notes of roasted honey. It accounts for about 11% of all non-volatiles.

Other non-volatile compounds include phenolic acids, still present in small quantities :

- **Gallic acid** ($C_7H_6O_5$), widely present in wood species, brings vegetal flavors of olive or raspberry and also releases color.
- **Vanillic acid** ($C_8H_8O_4$), is present as an oxidated form of vanillin.
- **Syringic acid** ($C_9H_{10}O_5$), an oxidated form of syringaldehyde, brings notes of honey and ripe dates.
- **Ellagic acid** ($C_{14}H_6O_8$), is a polyphenol with multiple hexagonal structures, detected in significant quantities, totaling an average 14% of measured non-volatiles. Typical of American oak, it brings structure, bitterness and a tannic mouthfeel.

EXTRACTING VOLATILE COMPONENTS OF THE WOOD

The most important volatile molecules are phenols, responsible for woody, ashy and smoky notes. Phenols have a hexagonal shape, making them a stable and long-lasting component. Another key family of volatile compounds is lactones, very typical of oak aging, especially from American oak. Due to their minuscule molecular weight, volatile components are measured by µg/L.

- **Gualacol** ($C_7H_8O_2$) is commonly found in oak-aged wines as well. It brings notes of smoked straw and smoked cheese, often found to be slightly pharmaceutical in profile. It is present in very tiny quantities in these samples.
- **Eugenol** ($C_{10}H_{12}O_2$) is a light volatile phenol, known for its typical flavor of clove. Averaging 8% of all volatile components found, but overall inconsistent among the 8 samples (ranging from 1% to 20%), due to the rather young age of the rums and to small differences among casks.
- **Isoeugenol** has the same chemical formula and the same inconsistency among the marks analyzed, is also found, bringing a floral note reminiscent of ylang-ylang.
- **Cresols**, a group of phenols, are found in three structures with identical chemical formulas (C_7H_8O): ortho-cresol (o-cresol), meta-cresol (m-cresol), and para-cresol (p-cresol). They are responsible for flavors of coal tar, extracted from the charred wood, growing significantly as the period of maturation gets longer. M- and p- structures taken together total around 22% of all volatile components.
- **Whisky lactones**, or quercus lactones ($C_{10}H_{18}O_2$), are another important category of aromatic components, present here under 2 structures: cis-whisky lactones and trans-whisky lactones. The cis- form is responsible for earthy, herbaceous, light coconut aromas, while the trans- form gives spicy, vegetal and more prominent coconut notes. As expected with aging in American oak, the cis- form is 10 times more present than trans- form, accounting for 32% of all volatile components and highlighting the origin of the wood and its charring level. The cis- form also has a very high aromatic strength since it's perceptible at the very tiny quantity of 1 µg/L, while the trans- form is not noticeable at less than 20 µg/L.
- **Syringol** ($C_8H_{10}O_2$) and **4-allyl syringol** are other phenols bringing wet wood notes, detected in significant quantities, totalling an average 24% of all volatile components.

COMBINATION, CREATION AND CONCENTRATION OF FLAVORS

THE DYNAMICS OF FLAVOR EVOLUTION DURING MATURATION

Maturation is a complex process: within the cask, molecular interactions occur, resulting in the combination, creation, and concentration of flavors. These processes unfold over time, making them slower and longer than extracting aromatic components from wood. After just one year of aging, these interactions are starting to shape the identity of the rums, making their fundamental role in aging worth our attention.
Delving into these details, particularly at the microscopic level, is both fascinating and fraught with challenges. While it is true that each detected molecule may contribute to a specific flavor, their true impact comes from the interaction with other elements and environmental conditions. These interactions can cause molecules to evolve, change structure, bond with others, replace existing compounds, and sometimes revert to previous states. In chemistry, where balance is constantly sought, a key learning is that all factors evolve dynamically. Therefore, the combination, creation, and concentration of flavors should be viewed as interconnected processes rather than distinct entities. They interact dynamically, constantly impacting the profile of the final product.

THE ROLE OF OXYGEN IN RUM MATURATION

The primary catalyst in this evolution process is oxygen. Within the vacant space of the barrel, oxygen takes up an important place. This impacts all the wood variables as mentioned and amplifies their significance. Various types of molecules undergo oxidation and structural changes: for instance, lighter volatile aldehydes and alcohols which are sparingly present in the unaged rum will become more significant as they evolve. The analysis reveals a substantial increase in these two categories when comparing aged and unaged samples. Consequently, observed levels of volatile acidity have surged significantly (by 180% in average). Another external factor contributing to its rise is undoubtedly the introduction of aldehydes extracted from the wood, such as vanillin, which also begin to oxidize.
Esters, on the other hand, have shown no growth after this first year of maturation, suggesting that transesterification may not have occurred, possibly due to the ethanol-saturated solution impeding significant evolution. One exception are whisky lactones, classified as an ester, whose newfound presence very slightly increases the overall ester content and is expected to continue growing with extended aging. Additionally, during aging, some phenols extracted from the wood polymerize, becoming heavier and imparting a smoother mouthfeel.
Oxygen continues to play an ever-growing role because the two main components of rum, ethanol and water, non-aromatic, evaporate, increasing the concentration of all aromatic compounds. Alcohol primarily evaporates as its molecules interact with the surrounding air at the surface level, breaking their hydrogen bonds in response to vapor pressure. Water evaporates as a result of temperature changes. The loss of liquid, known as the angel's share and quantified as an annual percentage, explains why the longer the spirit has matured in cask, the less of it will be available to bottle.

COMPARISON OF THE ANNUAL EVAPORATION BETWEEN TROPICAL AND CONTINENTAL AGING

TROPICAL CONDITIONS AT HAMPDEN ESTATE'S WAREHOUSE

With the tropical climate conditions in which Hampden Estate's warehouse sits, the angel's share rate is exceptionally high, averaging around 7-8% per year, compared to approximately 2% in the European aging environments prevalent for Scotch whisky or Cognac. As a result, after the same number of years, significantly less rum remains in each cask.
Consequently, tropically aged rums are often considered to "age faster", featuring an inherently more mature profile, as all aging processes occur at a rate three to four times faster than in Europe. With reduced levels of ethanol and water, aromatic compounds proliferate, leading to an intensified flavor concentration during the maturation process.