Creation of recipes centered on aroma components using gas chromatograph

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Introduction

All materials such as beverages and ingredients used in cocktails and cooking are made up of hundreds of aroma components. As it is said that up to 90% of our overall flavor experience is related to our sense of smell[1], the aroma of an ingredient is made up of the balance of its numerous aroma components (conclusively, the flavor is determined and the taste has a three-dimensional effect by combining them). GC-MS (Gas Chromatography Mass Spectrometer) is one of the measuring equipments capable of analyzing this aroma component. Originally, it was used to analyze substances such as metals, investigations of water quality, rat cell tests, and various other research studies, but in fact, it has been used for alcohol and food analysis for more than 40 years. However, even after many years have passed since then, there are still few recipes that utilize this fragrant ingredient. Using the data left by our predecessors and the data I independently analyzed by GC-MS, I explored the possibility of creating recipes centered on this aroma component by making various cocktails. As a result, I ended up with three methods: Balance, Framing, and Enhancement.

How to build a recipe

1. Balance

By using GC-MS, each aroma component that is likely to be contained in the material is quantified and written out as a graph. The scent of the material is determined by various scent molecules, but when you run the same genre of liquors on a gas chromatograph, you can see a certain shape. In particular, when comparing gin, which is a distilled liquor that contains a large amount of volatile aroma components, the aroma components that account for the majority are almost similar, and it can be said that there is not much difference when looking only at the structural diagram of the aroma molecule. However, when comparing gin with a particularly floral scent and some sharp dry gins, there were some that contained relatively large amounts in the former, and some that contained almost none in the latter, but could be measured slightly in the former. I speculated that there might be something here that makes the floral stand out. Based on this, I created a twist cocktail (a unique arrange on the original) of Sidecar. With a large amount of Limonene as a base, I added Linalool and a small amount of Cymene to explore the possibility of recreating the floral Sidecar (one of the classic brandy-based cocktails). As a result, the scent of brandy, which is the base spirit, is dominant, so although it requires some ingenuity to make the florals like a bouquet stand out, it is a very well-balanced and gorgeous flavored Sidecar. As a consideration, we did not distill a large amount of highly fragrant flowers like gin and incorporate them as materials, so it is difficult to reproduce the scent of flowers only by the balance of aroma molecules, I came to the assumption that the taste itself could be balanced by building a recipe based on a certain balance of certain molecules.

2. Framing

As mentioned in the introduction, the aroma of the ingredients used for cooking is made up of a balance of numerous aroma components. Among them, it should be noted that the major aromatic component, which accounts for the

majority of the total amount of aromatic components (shows a large peak in measurement), and the special fragrance component, which has a presence that stands out a material even in a small amount (Vanillin and Cinnamaldehyde). Focusing on these two elements, the author explored how the final taste of the cocktail would be affected by combining ingredients that share the same major aroma components, such as the Vanillin mentioned above. As a result of producing various cocktails from this point of view, I was able to surmise that even recipes with seemingly eccentric combinations tend to have a tendency to bring the flavors together within the same frame. For example, Umeshu (plum wine), cranberry, and paprika(red bell pepper) contain a large amount of Benzaldehyde, which smells like apricot, as a main aromatic component. There was concern that the fruity and vegetal notes would be mixed, and the balance of the taste would be lost, but in the end, no off-flavours appeared, and it came together beautifully. One of the signature cocktails of the author's bar “Strange Coco” contains asparagus and ground sesame, a fragrant molecule called 2-methylpyrazine, which has a nutty and cocoa-like scent. From there, as I set the landing point in coconut flavor, the recipe is built by combining it with jasmine and almonds, which are ingredients that share the same aromatic components as coconut. As a result, even here, although it has a mysterious taste with various flavor vectors, it is finished in a cocktail that fits within the frame of coconut flavor. Focusing on γ-decalactone, another signature cocktail "On Her Palm", which combines wagyu bacon soaked in vodka and peach, has also been well received.

3.Enhance

As we apply gas chromatographic analysis to products that have already been completed as products, such as distilled spirits, or materials that we want to use as the main ingredient, I assumed it would work easily enhance the flavor of a liquor by creating a blended bitters(A bitter liquor made from various herbs and botanicals used in small amounts as a seasoning in cocktails). In the case of "Light It Dark", the signature cocktail of the author's bar, I collect each of the three possible main aroma components by applying a gas chromatography uniquly to the herb liqueur called Unicum and bitters were created (here, Camphene bitters, Linalool bitters, and α-curcumene bitters). By adding these, the strong bitter flavor of Unicum was further enhanced, sublimating it into a cocktail with even more kick. If you apply this, for example, when you have decided on the liquor you want to use as a base, you can easily enhance the taste by analyzing it with gas chromatography and using bitters that match the main aroma components derived from it. This can also be used when improvising customer's requests at a bar without a menu. It is also expected to be able to adapt to occasions where base spirits are specified, such as cocktail competitions.

Summary

By making full use of the methods described so far, it becomes possible to logically explain and assemble the recipe construction, which has been entrusted to the sensibility of the creator until now, through chemical connections. Humans tend to appreciate the value of things when they are explained and convinced, and it can be predicted that this will further refine the perfection of cocktails. In addition, this idea can also be applied to cooking. I brought the ingredients used in the above-mentioned cocktail "Strange Coco" directly to a French bistro with which I have a close relationship and asked to make a dish, then he made the one which flavor is balanced beautifully. From this point of view as well, the author believes that it is a method full of possibilities that can be incorporated into the entire restaurant industry. However, the gas chromatograph does not provide 100% data, but rather presents possible results. There are many shortcomings that need to be solved such as the fact that there are rare cases where the data remains when analyzed continuously, the results changed by the analysis conditions, and, in addition, restrictions on import volume of

helium gas due to the recent world situation make the upper limit of use at some facilities. Although it is still an obscure method because there are many aspects of the mechanism of human taste that have not been elucidated, I hope that it will become a technique that will play a role in the development of the food and beverage industry in the future.

References

1) Bernard Lahousse, Peter Coucquyt, Jphan Langenbic : The Art & Science of Foodpairing. p.18 (2021)

About the author

Toru Kiriyama In July 2017, he opened BAR "KIRIP TRUMAN" in Kitahama, Osaka, Japan. Two years later, in September 2019, he opened Japan's first mocktail bar "The Mocktail Bar MORI (currently TMBM)" in Honmachi, Osaka, offering the possibility of non-alcoholic drinks. It is characterized by an unparalleled avant-garde style that focuses on the aromatic components of ingredients and builds recipes from there. He also works as a video grapher, and has produced promotional videos for his own bar, as well as making videos for cocktails and dishes at other bars and restaurants. 2021 “World Class” Japan TOP50.

KIRIP TRUMAN INSTAGRAM

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