

About Flavour release from food and beverage

Culinary precisions **experimentally tested during recent** **Seminars of Molecular Gastronomy** **Herve This vo Kientza**



In this discussion

1. Cooking **lentils** in water with salt (March 2026)
2. Blanching **herbs** in salter water (January 2026)
3. Fish **fumets** (April 2024)
4. The flavour of the **roux** : where does it come from ? (May 2024)
5. The **names** of recipes come from their flavour (September 2025)

1. Cooking lentils



The question studied

Regarding lentils: with considerable skepticism :

*"Rule 3. Never salt the cooking water." You've probably heard it before: **if you add salt at the beginning of cooking**, your lentils will **take a long time** to cook and they probably **won't be very appealing at the end**.*

Do you know why you shouldn't salt the water? It's a matter of osmosis. For a dried legume to cook, it needs to be hydrated. If you cook it in unsalted water, the less concentrated salt (the water in this case) will move towards the more concentrated salt (the lentils), thus allowing them to cook by hydration."

Methods and materials

Experiment 1, with lentils that were not soaked first

Two identical pans :

Pan 1 : 200 g tap water, 25 g of lentils

Pan 2 : 200 g tap water, 25 g of lentils, 10 g of salt (5 x more than used)

Same heating : 20 min

Then draining, and soaking in 5 L of tap water (2 min)

1. the scum in pan 1 is white ; the scum in pan 2 is black.

Les deux casseroles sont mises simultanément à bouillir (16 h 20).

2. More lentils in pan 1 are burst than in pan 2.

3. Triangular test showed a slight difference in firmness; the lentils from pan 2 have a better flavour.





A confirmation

Experiment 2.

Same as experiment 1, but with lentils that were soaked for 1 h 38 min. 300 g of water instead of 200 g.

1. At 13 min, lentils of pan 1 are almost cooked, but lentils from pan 2 remain firm.
2. Less differences in the scum than for experiment 1.
3. After 20 min cooking, draining, soaking twice with tap water (5 L), draining and addition of 10 g of salt to each batch to counterfight the differences in flavour (salty). **A difference in firmness remains.**

2. Blanching herbs



The question studied

Marie Antoine Carême, *L'Art de la cuisine française au XIX^e siècle*, 3^e tome, 4^e partie « Traité des petites sauces », p. 134) :

« Sauce mayonnaise à la ravigotte [sic] printanière. Après avoir épluché et lavé une poignée de cerfeuil, un peu d'estragon, de ciboulette et de pimprenelle, **vous les blanchissez à l'eau bouillante dans un poêlon d'office avec un peu de sel** » .



Methods, materials, results

Pan 1 : 426 g tap water

Pan 2 : 426 g tap water, and 20 g of sea salt.

The two pans are heated in the same way. Put to the boil.

At the same time, the same mass of a mixture of herbs (tarragon, chives, chervil) are added.

Blanching for 5 min is much longer than what is done today.

After 300 s, the two batches are taken out simultaneously, and put in a large quantity (5 L) of tap water.

1. The herbs cooked in non salted water have a clearer colour .
2. The herbs cooked with salt (top picture, next slide) are more tender than in pure water, stems are shrunk. Chives are softer.
3. Triangle test: even after soaking post cooking the salt taste appears.
4. Experiment repeated, with 30 s blanching, more rinsing (3 times) : same colour change, still flavour difference (herbs from pan 1 are more bland).



3. Fish fumets



The question studied

Currently, most cooks prepare their recipe as follows:

- they sweat the fish bones and trimmings (sole, turbot, pike, etc.) in butter with chopped shallots or onions and carrot slices;
- then they add a bouquet garni, mushroom trimmings, peppercorns, white wine, and water.
- cooking time: 20-25 minutes.

Some reference recipes:

1. Culinary Guide: 10 kg of fish bones, 550 g of chopped onions, 250 g of mushroom trimmings, 15 g of peppercorns moistened with 10 liters of water and one liter of white wine. Cooking time: 20-25 minutes. Just before straining the stock, add lemon juice.

It is said (and written) that bitterness would appear if the cooking time is more than 20 min

Experiment #1 : any bitterness?

In a pan:

- bones from cod (ratio 1 kg / 1 L of liquid)
- 75 g butter
- 1 leek
- 10 g of mushrooms
- salt
- cooking for 10 min
- white wine (half)
- water (half)
- cooking for 1 h

Stock is kept at 16 min, and compared with stock made after 40 min (same temperature).

Result: the fumet cooked for 40 min is not bitter. It is even more appreciated than the fumet at 16 min (more flavour).

Exp # 2: Are whiting fumets better than trout fumets?

Two identical pans, with:

- same ingredients: head (without eyes or gills), bones, from whiting (pan 1) or trout (pan 2)
- same quantity of water (to cover),
- same cooking time (gentle simmer, uncovered, 20 minutes),
- skimming of both stocks.

For this experiment, we use only water and fish (no aromatic garnish), and we do not sweat the fish before adding the liquid.



Results

1. A triangle test is organized to know if we can distinguish any **differences in smell**. A classic phenomenon emerges: while we perceive a difference in smell when we see the two pans, the triangle test shows that we cannot distinguish between them. And the only juror who performs better than the others is still significantly mistaken.

We conclude that we cannot recognize any significant difference in smell.

2. A triangle test is organized for the flavour of the two fish fumets: the **difference is very slight**, in that, again, those who sometimes recognize the difference are also often mistaken. And **none of them can say which fish stock comes from which fish**.

Exp #3 :

various ingredients

The goal, using only trout, is to compare:

- 1. a fumet made from the head (without the gills or eyes),**
- 2. a fumet made from the bones,**
- 3. a fumet made from the skin.**

Again, we are cooking for 20 minutes, with the ingredients covered in water and the cooking process uncovered.



Results

Visually, the broths are quite different:

- The broth made with the heads is white, milky, and cloudy, with a little fat floating on top.
- The broth made with the bones is clearer, less colored, with less fat floating on top.
- The broth made with the skins is yellow, clear, and has the most fat.

A sensory test of **smell shows no difference**, but a sensory test of flavour seems to show a **slight difference between the head broth and the bone broth**.



Exp # 4: is it useful to blend the bones?

Goal : In this experiment, we compared a whiting fumet with or without the head and bones crushed (after cooking).

Both fumets were strained, but, moreover, the fumet with crushed bones was filtered twice (it remained milky white, while the other was clear).

The sensory test for odor showed no difference, but the flavor was more pronounced when the fish had been blended.

Exp #5: is it useful to purge?

Same protocol as before:

- same pans
- same quantity of water
- same mass of bones
- same cooking intensity
- same cooking time (simmer gently, uncovered, for 20 minutes)
- scumming of the stock
- we use only water and bones, no salt, no aromatic garnish
- no sweating



Experiment preparation. From left to right: trout trimmings, purged or not; whiting trimmings, purged, with or without eyes and gills; complete trimmings of sole (top) and trout (bottom).

The purged flesh (adhering to the central bone) is whiter than the unpurged flesh.

The two pots are heated together. They both reach a boil 4 minutes later. During the 20-minute cooking time, starting at a simmer, the fat that rises to the surface is skimmed off. It is observed that:

- the liquid from the unpurged trout trimmings is more yellow.
- there is more foam in the pot containing these unpurged trimmings (but it is noted that the blood can be used to clarify broths).

At the end of cooking, as a **difference in odor** is noticeable, we conduct a triangle taste test: the fumet made from purged trimmings has less odor than the fumet made from unpurged trimmings. For flavor, triangle test showed that the fumet made from unpurged trimmings had more flavor, and it is not unpleasant, on the contrary. It had no bitterness.

We conclude that disgorging is unnecessary.

Note that these trout stocks have a pleasant trout odor and flavor.



Exp #6: Any effect of eyes and gills?

Using whiting, comparison of two fumets: made with whiting trimmings. The eyes and gills were removed before purging (1 hour 15 minutes) for one, and they were left in during purging for the other. Simmering for 20 min, with scumming.

The fumet without eyes and gills was clearer, with less foam.

A triangle test for odor showed no perceived difference.

A triangle test for flavour showed more flavor if the gills and eyes are left in.

Again, the flavour is pleasant, And the whiting flavor is quite pronounced.



Exp #7: Trout vs Sole

Comparison of two fumets with higher concentrations: one of purged trout (with eyes and gills) and the other of purged sole (with eyes and gills). The purging process took 2 hours and 20 minutes.

This time, during cooking, we observed a significant amount of fat floating on the surface of the sole stock, and very little on the trout stock. We skimmed off this floating fat with a ladle.

The triangle test showed a clear difference, but we also observed that:

- the sole stock had little flavor, with a neutral one,
- the trout stock had more flavor, and it was good.



General conclusions

- we were able to make fish stocks with at least sole, trout, and whiting,
- the one with the most flavor was the trout stock,
- we never experienced any bitterness,
- the higher the proportion of fish, the less bland the stock,
- purging is unnecessary,
- purging produces less foam,
- removing the eyes and gills is unnecessary,
- it is much better to cook for longer than the 20 minutes sometimes indicated,
- blending the trimmings before cooking adds more flavor,
- oily fish release fat that floats to the surface (and which can be removed like skimming beef stock).

4. About roux



Exp #1: comparison of the same roux, cooked slowly or rapidly

Guide culinaire :

*“Le temps de cuisson, étant subordonné à l'intensité du calorique employé, ne peut être fixé mathématiquement, mais **il est toujours préférable d'en conduire la cuisson plutôt trop lentement que trop vite**, parce que : sous l'influence d'une chaleur trop vive, les cellules contenant les principes actifs de la farine se racornissent et emprisonnent étroitement leur contenu, s'opposant dès lors à son mélange ultérieur avec l'élément de mouillement et, de ce fait, détruisant l'équilibre de liaison de la sauce.*

In a pan, 125 g butter.
Heated until melted.
100 g of flour are added.
Cooked (low heat) for 15
min.
Cooking halted when a
brown roux is made.

Process repeated with the
same pan and ingredients,
but heated faster until the
same color is reached (6
min).

A sensory test (triangle)
shows that **the roux
cooked slowly and the
roux cooked quickly** are
clearly distinguishable,
with a more "fatty"
flavour for the roux
cooked quickly.



Exp #2: Synthetic roux

Comparison of an ordinary roux to a "system" made from browned butter and toasted flour.

We observe that this is not strictly speaking a "roux," but a new culinary creation, which, for convenience, we will call a "synthetic roux."

1. We begin by making browned butter over medium heat, stirring constantly. The butter melts in 2 minutes, and we stop cooking it when it begins to turn a golden/blond/orange color.
2. Separately, we toast 3 ladles of flour in a slowly heated saucepan, stirring well to prevent the flour from sticking to the pan. We aim for even toasting.

As mentioned earlier, it is the color of the "mixed roux" that determines the color of the third roux from the first experiment.

A sensory test reveals a difference between a quickly cooked roux and a "prepared roux": the quickly cooked roux, while the same color, has a stronger odor. **The "synthetic roux" also has a distinct flavour, perhaps due to the presence of lumps. It is preferred by the tasters.**

The most striking difference is a considerable firming of the "prepared roux" upon cooling: this remains to be explained.



5. Naming recipes: a question of flavour



Different recipes

1. beurre maître d'hôtel:

knead butter with chopped parsley, salt, pepper, and lemon juice.

2. garlic butter :

butter and garlic, salt, pepper

3. snail butter:

butter with garlic, lemon juice, tarragon, salt, pepper

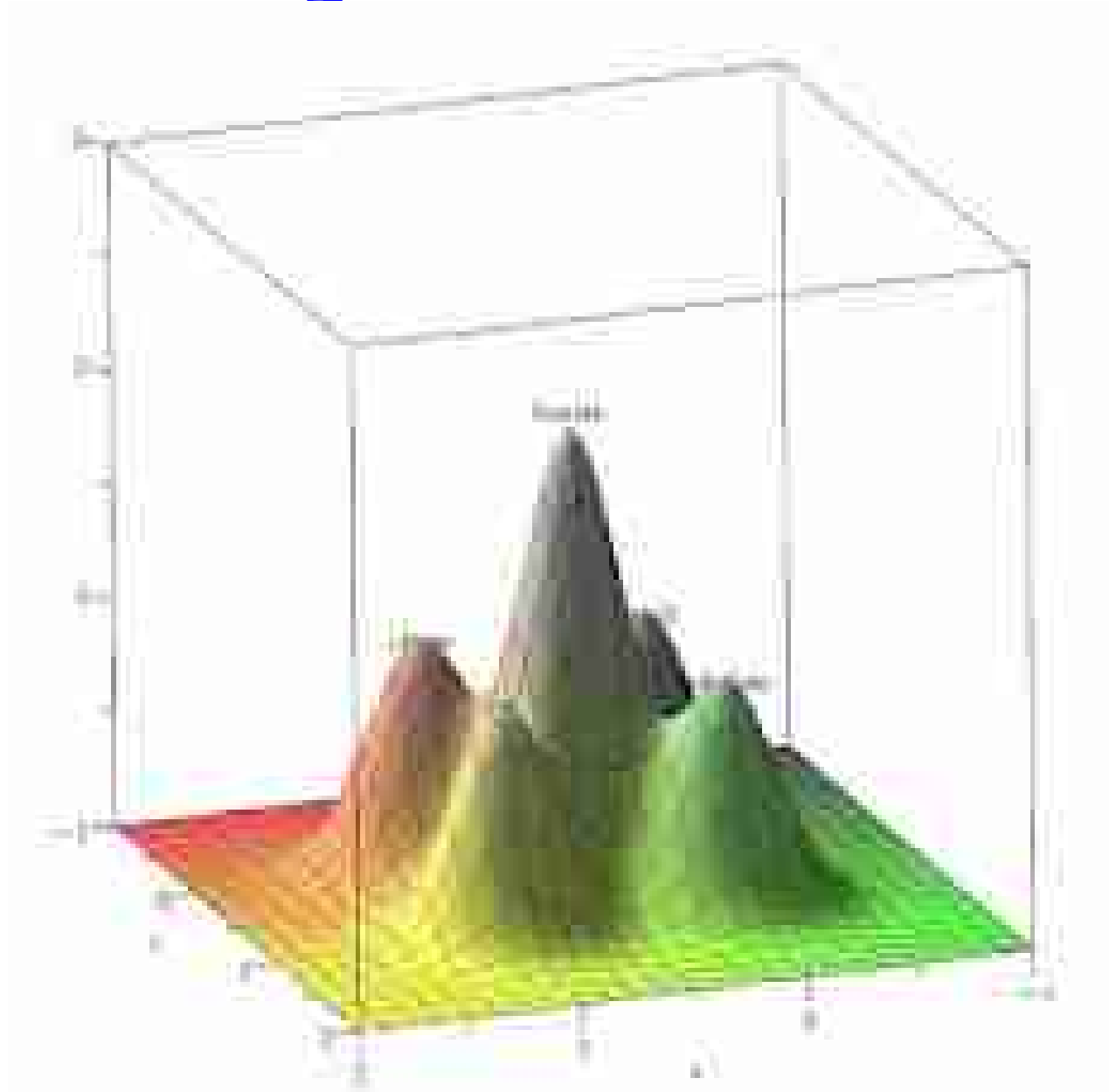
4. beurre Colbert :

butter, parsley, meat glaze,

5. beurre Chateaubriand :

Meat glaze, tarragon, parsley, butter

**For intermediates :
“façon xxx”**



References

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