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Raphaël Monod, Bérénice Houinsou-Houssou, Chantal Septier, Hervé This, Vo Kientza, Christian Salles, et al.. Influence of domestic salting practices on saltiness perception of cooked foods. Pangborn 2023, Aug 2023, Nantes, France. hal-04393313

**HAL Id: hal-04393313**

**<https://hal.inrae.fr/hal-04393313>**

Submitted on 5 Feb 2024

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# INFLUENCE OF DOMESTIC SALTING PRACTICES ON SALTINESS PERCEPTION OF COOKED FOODS

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Financial support:  
 ANR-19-CE21-0009  
 INRAE TRANSFORM

## Introduction

**Discretionary salt (DS)** contributes significantly to salt intake (Anderson *et al.*, 2010) and its use might increase in the future (Liem *et al.*, 2012). Finding domestic practices which can easily be adopted by consumers and that can enhance DS perception is important to lower salt intake. To determine whether domestic cooking practices can be adapted to maintain saltiness perception while reducing salt content, we set up a study on **carrots** and **pasta** cooked in water. **DS was added either during or after cooking. Three types of salt were used** (fine sea salt, flower of salt and micronized salt) at **two levels** (regular and reduced).

## Hypothesis:

Salting after cooking induces a higher saltiness perception due to a higher availability of salt crystals. Salt crystals structure and granulometry can modulate perception for DS added after cooking. According to the food matrix, the interaction between salt crystals and the food can be different, leading to a different salt release kinetic and thus likely to a more or less intense salt perception.

## Materials and methods

### Salting modalities:

• 2 [salt] levels:

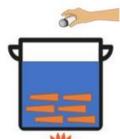
#### 'Regular' level

• 10 g of salt, 200 g of carrots,  
 1L of mineral water  
 • 7 g of salt, 100g of pasta  
 1L of mineral water

#### 'Reduced' level -50%

• 5 g of salt, 200 g of carrots  
 1L of mineral water  
 • 3,5 g of salt, 100 g of pasta  
 1L of mineral water

• 2 salting procedures:

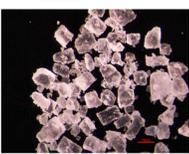


**At the beginning of cooking (in water)**



**After cooking (poured on the food)**

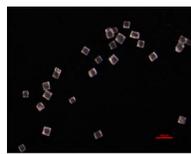
• 3 types of salt:



Fine sea salt



Flower of salt



Micronized salt

### Sensory analysis (either with boiled carrots or cooked pasta)

- Intensity ratings (sweetness, saltiness, sourness, bitterness and global flavour)
- Continuous Just About Right rating scale



70 naïve participants  
 57 % female  
 Mean age 40 yo



Cooked for 25 min into boiling water then cut in slices and stored in a water bath

**Samples for sensory evaluation**  
 3 slices (4,3 +/- 0,3 g)  
 Served at 39,5 +/- 2,7 °C  
 6 min to 45 min after pouring salt 'after cooking'



74 naïve participants  
 51 % female  
 Mean age 43 yo



Cooked for 7 min into boiling water and stored in water bath

**Samples for sensory evaluation**  
 3 pasta (6,11 +/- 0,3 g)  
 Served at 33 +/- 3 °C  
 6 min to 25 min after pouring salt 'after cooking'

## Results

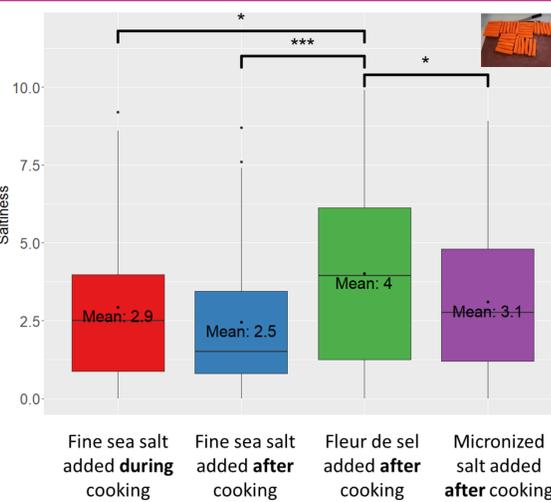


Fig.1: Saltiness intensity results ('Regular' level)

Carrots are considered **saltier** when **Fleur de Sel** is added after cooking at the 'Regular' level (fig.1)

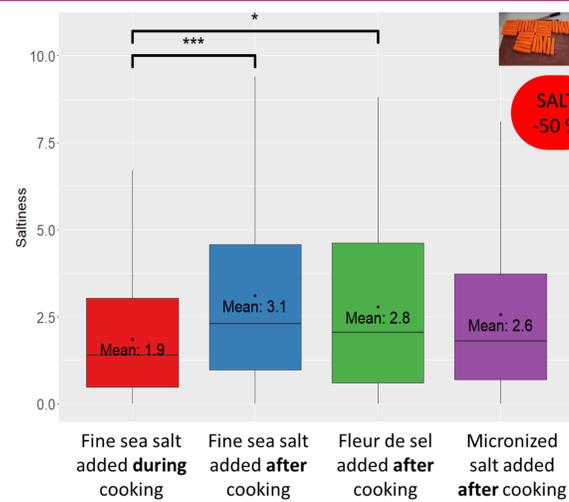


Fig.2: Saltiness intensity results ('Reduced' level)

Carrots are considered **saltier** when **Fine Salt and Fleur de Sel** are added after cooking at the 'Reduced' level compared to carrots salted during cooking (fig.2)

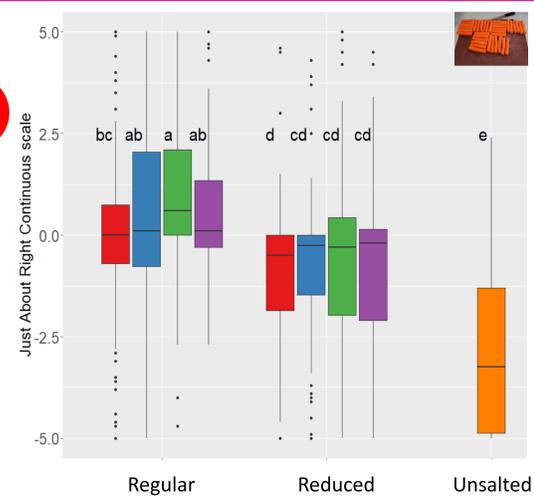


Fig.3: JAR results

Carrots salted at the - 50% 'Reduced' level after cooking are considered as salty enough as carrots salted during cooking at the 'Regular' level (fig.3)

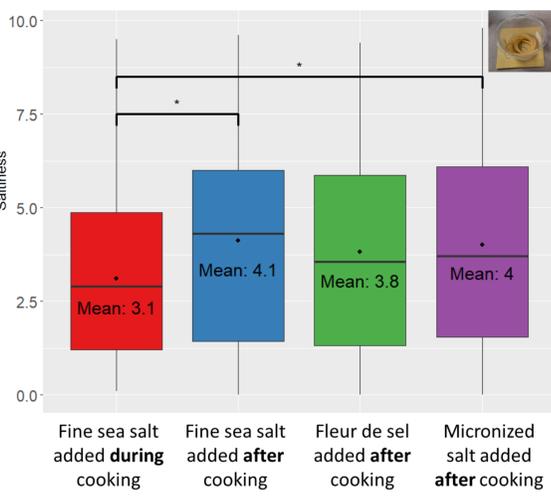


Fig.1 bis: Saltiness intensity results ('Regular' level)

Pasta are considered **saltier** when **Fine Salt and Micronized Salt** are added after cooking at the 'Regular' level (fig.1 bis)

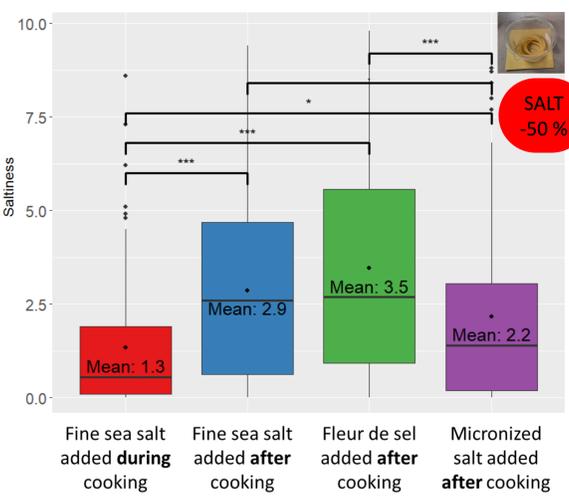


Fig.2 bis: Saltiness intensity results ('Reduced' level)

Pasta are considered **saltier** when **Fine Salt, Fleur de Sel and Micronized Salt** are added after cooking at the 'Reduced' level compared to pasta salted during cooking (fig.2 bis)

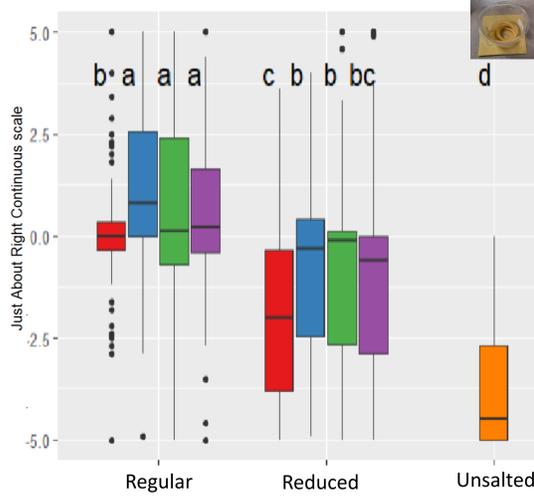


Fig.3 bis: JAR results

Pasta salted at the - 50% 'Reduced' level after cooking are considered as salty enough as pasta salted during cooking at the 'Regular' level (fig.3 bis)

### Salt type and salting procedure:



Unsalted

**Statistical treatments:**  
 Fig1/1bis/2/2bis  
 Linear Mixed Effects Model Anova (Type III)  
 Tukey HSD test

Significant effect when P value < 0,05

Fig 3/3bis  
 Median comparison test

Treatments with the same letter are not different

## Discussion

Salting after cooking (here pouring salt on cooked carrots or pasta) is an interesting way of maintaining saltiness perception while reducing the sodium content. A 50 % reduction in salt ingestion is achievable when salting is performed after cooking compared to adding salt in the water during cooking (total sodium content checked by HPLC). Perhaps, salting after cooking induces a heterogeneous distribution of salt crystals and maybe a weaker binding to the food matrix.

- Consequently, salt would be more released in saliva and Na<sup>+</sup> ions may be more available for taste receptors during Food Oral Processing
- A higher saltiness perception would result from this heterogeneity.
- NMR analysis and in vitro sodium release monitoring are under way to investigate such hypotheses.

Anderson, C. A. M., Appel, L. J., Okuda, N., Brown, I. J., Chan, Q., Zhao, L., Ueshima, H., Kesteloot, H., Miura, K., Curb, J. D., Yoshita, K., Elliott, P., Yamamoto, M. E., & Stamler, J. (2010). Dietary Sources of Sodium in China, Japan, the United Kingdom, and the United States, Women and Men Aged 40 to 59 Years: The INTERMAP Study. *Journal of the American Dietetic Association*, 110(5), 736-745. <https://doi.org/10.1016/j.jada.2010.02.007>

Liem, D. G., Miremadi, F., Zandstra, E. H., & Keast, R.S.J. Health labelling can influence taste perception and use of table salt for reduced sodium products. *Public Health Nutrition* 2012, 15: 2340.