

Ham cooking

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1 Introduction

I was going to cook a ham for the first time ever so I decided to document the process.

2 Ham and equipment

- 2.58 kg ham (Tamminen – Porsaan pikkukinkku, Luomu)
- Coline meat thermometer model TPW306
- Rosenlew stove model RKK5100
- Huawei Honor 7 default alarm clock app
- Pirkka oven bag
- Fredman aluminium foil

3 Measurements

According to various online sources (e.g. [1, 2, 3]), there seems to be several ways to prepare a ham which result to different levels of juiciness and tenderness. For a juicy result, one should utilise an oven bag and aim for ham temperature¹ of 73 – 75 °C. For a tender ham, on the other hand, one should aim for a temperature of at least 80 °C without using a bag.

Additionally, one should let the ham to warm up to about 10 – 15 °C in the room temperature before cooking. Depending on the source, the appropriate cooking temperature is around 100 – 120 °C and it should take roughly 1 – 1.5 hours per kilo to reach the desired ham temperature. Furthermore, some sources suggests cooking with 200 °C during the first half an hour before lowering the temperature.

As I prefer juicy ham, I decided to cook with the following plan:

1. Let the ham warm up to 10 °C in the room temperature (22.5 °C)
2. Use an oven bag, start with 200 °C

3. After half an hour, drop to 100 °C

4. Cook until ham temperature is 73 °C

5. After being taken out of the oven, wrap the ham in foil and let it ripen for about an hour in room temperature

The ham temperature was continuously measured throughout and the value marked down every five minutes, approximately.

Raw data, notes, codes etc. are available online at github.com/harmanen/ham-2020

4 Results and discussion

Temperature curve of the ham is shown in Fig. 1. Additionally, linear fits to three phases are shown as well. These phases are: warming up in the room temperature, cooking in 100°C and cooling in the room temperature after the ham temperature starts to decline. Results of these fits are listed in Table 1.

Table 1: Results of the fits ($f(x) = ax + b$) made to different phases of the temperature curve.

Phase	a [°C / min]	b [°C]
I (warming)	0.0473 ± 0.000988	1.29 ± 0.106
III (cooking)	0.497 ± 0.00941	-92.5 ± 2.67
IV (cooling)	-0.188 ± 0.0166	148 ± 6.52

4.1 Phase I: warming up in room temperature

Although the precision of the meat thermometer ($\Delta T = 1$ °C) is not good enough for the time resolution during the first phase, a fit can be made. It took roughly 3 hours for the ham to warm up from 2 °C to 10 °C at a rate of approximately 2.8 °C per hour.

¹Temperature is always measured in the centre of the ham.

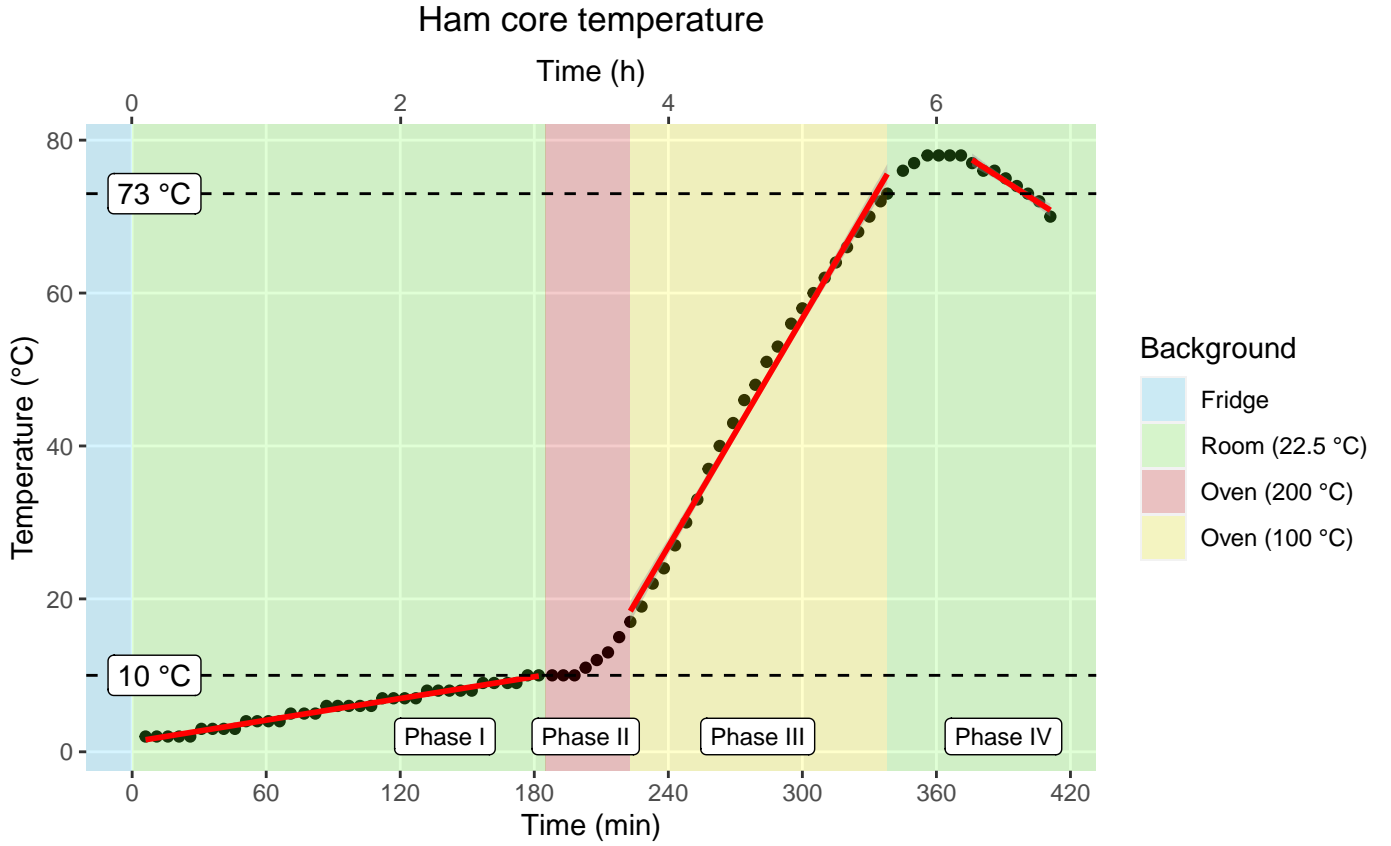


Figure 1: The core temperature of the ham as a function of time (black points). Background colour indicates the ambient temperature as shown in the legend. Critical temperatures of 10 °C (ham into oven) and 73 °C (ham out of the oven) are indicated with horizontal dashed lines. Linear fits to different phases (as discussed in the text) are shown in red lines.

4.2 Phase II: cooking with higher temperature

about 11 °C per hour.

No fits are made during this phase as this is the initial kick-start for the cooking process. It is nicely clear (and expected) from the plot that the heat transport is not instant but it takes about 15 minutes for the centre to start heating up.

4.3 Phase III: cooking with lower temperature

At this phase the ham warmed up approximately 30 °C per hour. The slope is roughly constant although one could argue that there might be initially faster period of warming up that slows down towards the end.

4.4 Phase IV: cooling in foil in room temperature

After being removed from the oven, the ham temperature still rose up to approximately 78 °C . Cooling rate after this was

5 Conclusions

Juicy and delicious (see Fig. 2).

References

- [1] atria.fi/reseptit/ruokateemat/teemat/joulukinkku/kinkun-paisto/
- [2] hk.fi/joulu/nain-paistat-taydellisen-joulukinkun/
- [3] snellman.fi/fi/kinkkuvinkit/joulukinkun-paistaminen/

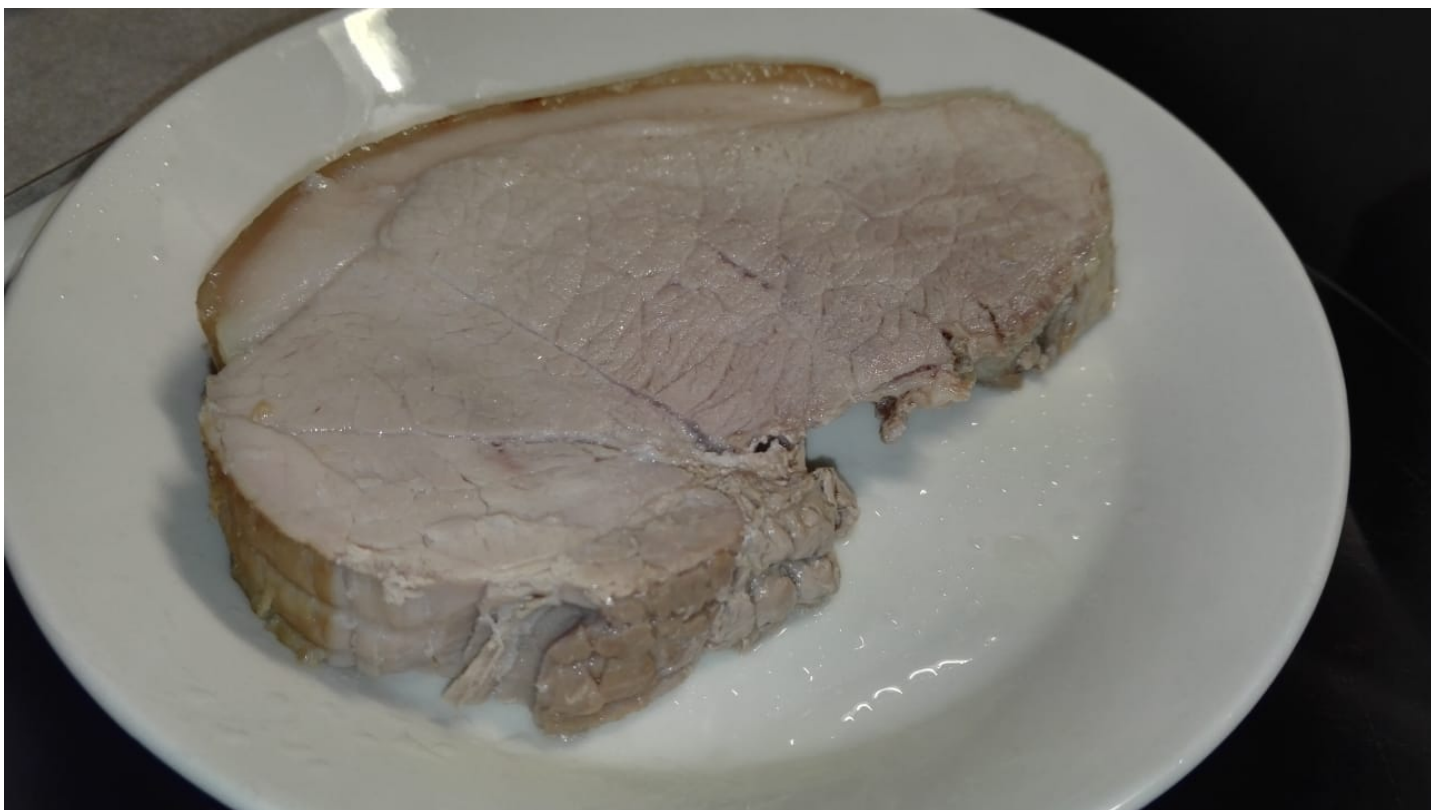


Figure 2: Ready to be enjoyed.