Health Assessment of Foods Prepared with Infrared Cooking in Terms of Acrylamide and pH Determination

TANATAR KALIP & ANATEK R&D AND CONSULTANCY SERVİCE REPORT

ANADOLU ÜNİVERSİTESİ

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SUMMARY

Following preliminary meetings with representatives from Tanatar Kalıp and the R&D team, it was agreed to conduct a small-scale pilot project. Two IR-Grill devices provided by the company were used to cook foods prioritized by experts in the kitchens of Anadolu University, Eskişehir Vocational School, Culinary Program. Subsequently, acrylamide and pH analyses were conducted in the food laboratory of Yunus Emre Vocational School of Health Services, Medical Laboratory Techniques Program.

Not only foods cooked with the IR-Grill, but also samples cooked on a charcoal grill, in a conventional oven, and raw samples were analyzed and evaluated.

The report includes recommended cooking durations for kitchen use, general observations, and practical advice. In addition, the results obtained from laboratory analyses are also discussed.

As a result, it was concluded that the IR-Grill, developed by Tanatar using the infrared cooking principle, provides similar cooking quality in approximately 50% less time compared to the oven and charcoal grill. From the perspective of acrylamide content and pH levels, foods cooked with the IR-Grill showed similar characteristics to those cooked using the other two methods. No issues were identified regarding the use of the IR-Grill in either amateur or professional kitchens.

> ***"The IR-Grill is a practical and safe rapid-cooking device suitable for use in both home and professional kitchens."***

1. COOKING – Process, Method, Description and Evaluations

First, the IR-Grill, developed by Tanatar with an infrared-based cooking feature, was received and used in preliminary applications in the kitchens of the Culinary Program. During this phase, various food types were used for the planned tests, and it was decided to set the power to 100 and the height to 8.5 cm in order to obtain standard results and ensure reasonable comparisons. Similarly, to minimize variations in the charcoal grill, it was determined that the oak charcoal should reach embers, be slightly ashed, and maintain a distance of approximately 7 cm from the grill surface.

For the oven, it was found appropriate to use the UNOX BakerTop model at 220 °C, preheated, with a cast iron grill, and with the fan set to level 4.

Next, food items commonly found in the Eskişehir market and regularly used in the food and beverage sector were listed in Tables 1 to 6. These items were freshly obtained on the days of the experiments, and except for some specific test samples noted in the tables, they were prepared plain—without spices, additives, or any processing—using lean, salt-free, sugar-free, and unseasoned forms. Naturally small items like asparagus and whole items like chestnuts, which are considered desirable in their final form, were only cleaned and not cut or reshaped. Other food items were cut to approximately 2x4 cm in size and 3–7 mm in thickness, considering their texture for compatibility with IR-Grill, charcoal grill, and oven cooking.

After this preliminary preparation, the cooking process was carried out immediately and swiftly. The cooked samples were photographed with label information, cooled to room temperature, placed in food sampling bags labeled accordingly, and then stored in stainless steel gastronorm containers at +4 °C.

The cooked and cooled samples were then transported to the food laboratory under cold chain conditions, where they were analyzed and evaluated as detailed in the following section.

Table 1. *Beef and Beef Products*

Product	Code/Description	Comments and Summary Feedback
Beef meatball (minced)	DKÇ/Raw DKPK/Charcoal Grill DKPK/Oven DKPİ/IR-Grill	IR-Grill is quite successful.

Beef cubes (skewer)	DKŞÇ/Raw DKPK/Charcoal Grill DKŞPF/Oven DKŞPİ/ IR-Grill	IR-Grill is quite successful.
Beef sausage	DSÇ/Raw DSPK/Charcoal Grill DSPF/Oven DSPİ/ IR-Grill	IR-Grill is quite successful.
Beef striploin	DKOÇ/Raw DKOPK/Charcoal Grill DKOPF/Oven DKOPİ/ IR-Grill	IR-Grill is quite successful.
Beef ribeye	DAÇ/Raw DAPK/Charcoal Grill DAPF/Oven DAPİ/ IR-Grill	IR-Grill is quite successful.
Homemade- sytle meatball	DEKÇ/Raw DEKPK/Charcoal Grill DEKPF/Oven DEKPİ/ IR-Grill	IR-Grill is quite successful.
Beef chop	DPÇ/Raw DPPK/Charcoal Grill DPPF/Oven DPPİ/ IR-Grill	IR-Grill is quite successful.
Beef T-bone steak	DTSÇ/Raw DTSPK/Charcoal Grill DTSPF/Oven DTSPİ/ IR-Grill	IR-Grill is successful, but as the thickness of the meat increases, the internal cooking may not meet Turkish expectations. After searing, cooking a little longer on low setting is benefical.

Table 2. *Lamb and Lamb Product*

Product	**Code/Description**	**Comments and Summary Feedback**
Lamb meatball (minced)	KKÇ/Raw KKPK/Charcoal Grill KKPF/Oven KKPİ/ IR-Grill	IR-Grill is quite successful.
Lamb cubes (skewer)	KKŞÇ/Raw KKŞPK/Charcoal Grill KKŞPF/Oven KKŞPİ/ IR-Grill	IR-Grill is quite successful.
Lamb Beyti	KBÇ/Raw KBPK/Charcoal Grill KBPF/Oven KBPİ/ IR-Grill	IR-Grill is quite successful.

Lamb külbastı(grilled)	KKÜÇ/Raw KKÜPK/Kömür Izg. KKÜPF/Fırın KKÜPİ/ IR-Grill	IR-Grill is quite successful.
Lamb delight (loin)	KLÇ/Raw KLPK/Kömür Izg. KLPF/Fırın KLPİ/ IR-Grill	IR-Grill is quite successful.

Table 3. *Poultry Meat and Product*

Product	**Code/Description**	**Comments and Summary Feedback**
Chicken wing	PKÇ/Raw PKİ/ IR-Grill	IR-Grill is quite successful.
Chicken schnitzel	ŞÇ/Raw ŞPK/Charcoal Grill ŞPF/Oven ŞPİ/ IR-Grill	IR-Grill is successful. However, for thick schnitzels, starting with high heat and finishing at the lowest heat yields better results.
Chicken nugget	NGÇ/Raw NGPK/Charcoal Grill NGPF/Oven NGPİ/ IR-Grill	When cooking with IR-Grill, starting with high heat and finishing at the lowest heat gives better results.
Chicken breast	PGÇ/Raw PGPK/Charcoal Grill PGPF/Oven PGPİ/ IR-Grill	IR-Grill is quite successful.
Chicken leg (thigh)	PBUÇ/Raw PBUPK/Charcoal Grill PBUPF/Oven PBUPİ/ IR-Grill	IR-Grill is successful. However, better results are achieved by starting at high heat, then finishing at low heat with flipping.
Chicken chop	PPÇ/Raw PPPK/Charcoal Grill PPPF/Oven PPPİ/ IR-Grill	IR-Grill is quite successful.
Chicken drumstick	PBÇ/Raw PBPK/Charcoal Grill PBPF/Oven PBPİ/ IR-Grill	IR-Grill is successful. However, better results are obtained by starting with high heat, then cooking with turning at low heat.
Turkey sausage	HİNÇ/Raw HİNPK/Charcoal Grill HİNPF/Oven HİNPİ/ IR-Grill	IR-Grill is successful. However, better results are achieved by briefly applying high heat, then cooking at low heat with turning.

Table 4. *Fishes*

Product	Code/Description	Comments and Summary Feedback
Horse mackerel	İÇ/Raw İPK/Charcoal Grill İPF/Oven İPİ/ IR-Grill	IR-Grill is quite successful.
Salmon	SÇ/Raw SPK/Charcoal Grill SPF/Oven SPİ/ IR-Grill	IR-Grill is quite successful. However, for thick salmon slices, starting with high heat and finishing at the lowest heat gives better results.
Mullet	KÇ/Raw KPK/Charcoal Grill KPF/Oven KPİ/ IR-Grill	IR-Grill is successful. Better results are obtained by starting with high heat and then cooking at low heat with flipping.
Sea bream	ÇÇ/Raw ÇPK/Charcoal Grill ÇPF/Oven ÇPİ/ IR-Grill	IR-Grill is successful. Starting with high heat and finishing at low heat with flipping yields better results. Cooking as fillets is more effective.
Sea bass	LÇ/Raw LPK/Charcoal Grill LPF/Oven LPİ/ IR-Grill	IR-Grill is successful. Better results are achieved by starting with high heat and finishing at low heat with flipping. Cooking as fillets is more effective.

Table 5. *Vegetables*

Product	Code / Description	Comments and Summary Feedback
Potato	PÇ/Raw PPFY/Oiled Oven PPİY/Oiled IR-Grill PPF/Oil-free Oven PPİ/ Oil-free IR-Grill	IR-Grill is quite successful.
Eggplant	PCÇ/Raw PCPF/Oven PCPİ/ IR-Grill	IR-Grill is quite successful.
Tomato	DÇ/Raw DPF/Oven DPİ/ IR-Grill	IR-Grill ois quite successful.
Red pepper	KBÇ/Raw KBPF/Oven KBPİ/ IR-Grill	IR-Grill is quite successful.
Green pepper	YBÇ/Raw YBPF/Oven YBPİ/ IR-Grill	IR-Grill is quite successful.
Courgette	KBÇ/Raw KBPF/Oven KBPİ/ IR-Grill	IR-Grill is quite successful.
Artichoke	EÇ/Raw Eİ/ IR-Grill	IR-Grill is successful.

Asparagus	KÇ/Raw Kİ/ IR-Grill	IR-Grill is quite successful.
Cultivated mushroom	MNTÇ/Raw MNTİ/ IR-Grill	IR-Grill is quite successful. Placing it salted in a cup-like shape and cooking without turning results in better juice retention for serving.
Celery	KRVÇ/Raw KRVİ/ IR-Grill	IR-Grill is quite successful.
Brussels sprouts	BLÇ/Çiğ BLİ/ IR-Grill	IR-Grill is successful.
Broccoli	BRÇ/Raw BRİ/IR-Grill	IR-Grill is successful. However, due to its shape, some protruding parts may burn early. Frequent turning is recommended.
Carrot	HÇ/Raw HPF/Fırın HPİ/IR-Grill	IR-Grill is quite successful. However, it is better to shape all pieces equally and not too thick.
Leek	PRSÇ/Raw KSİ/ IR-Grill	IR-Grill is successful.

Table 6. *Fruits and Others*

Product	**Code / Description**	**Comments and Summary Feedback**
Banana	MÇ/Raw MPF/Oven MPİ/ IR-Grill	IR-Grill is quite successful. Cutting it in half horizontally and placing chocolate pieces before grilling gives a good result.
Quince	AYÇ/Raw AYPF/Oven AYPİ/ IR-Grill	IR-Grill is quite successful.
Avocado	AVÇ/Raw AVİ/ IR-Grill	IR-Grill is quite successful.
Apple	EÇ/Raw APK/Charcoal Grill EPF/Oven EPİ/ IR-Grill	IR-Grill is quite successful.
Pear	AÇ/Raw APF/Oven APİ/ IR-Grill	IR-Grill is quite successful.
Pumpkin	BKÇ/Raw BKİ/ IR-Grill	IR-Grill is suitable for cooking and presentation.
Chestnut	KSÇ/Raw KSİ/ IR-Grill	Further studies are needed for appropriate preparation and cooking with IR-Grill.
Bread	EKÇ/Normal EKPK/Charcoal Grill EKPF/Oven EKPİ/ IR-Grill	IR-Grill is quite successful. It is very suitable and practical for grilling bread.

Halloumi Cheese	HELÇ/Raw HELPF/Oven HELPİ/ IR-Grill	IR-Grill is very suitable for frying/grilling.

When the cooking durations of selected foods listed in Table 7 and visually represented in Graphic 1 are evaluated for charcoal grill, IR-Grill, and oven methods, it has been determined that IR-Grill provides faster cooking for all foods. In some cases, the IR-Grill cooked with similar quality in approximately 50% less time compared to the oven and charcoal grill.

Table 7. *Cooking Times of Some Foods on Charcoal Grill, IR-Grill, and in Oven*

Product Name	Charcoal Grill Cooking Time (min)	IR-Grill Cooking Time (min)	Oven Cooking Time (min)
Beef meatball (minced)	10	5	10
Beef cubes (skewer)	11	7	8
Beef sausage	3	2	6
Beef striploin	11	5	8
Beef ribeye	10	4	8
Homemade beef meatball	11	10	14
Beef chop	9	5	10
Beef T-bone steak	11	5	10
Lamb meatball (minced)	8	5	8
Lamb cubes (skewer)	9	7	10
Lamb Beyti	10	7	12
Lamb Külbastı	11	6	12
Lamb Lokum (loin)	11	6	10
Chicken wings		11	
Chicken schnitzel	7	10	15
Chicken nugget	5	9	13
Chicken breast	9	6	9
Chicken thigh	11	7	10
Chicken chop	8	6	8
Chicken drumstick	11	7	10
Turkey sausage	4	8	10
Horse mackerel	6	4	8
Salmon	6	5	8
Mullet	6	4	8
Sea bream	6	4	8
Sea bass	6	4	8
Potato (with oil)		10	17
Potato (oil-free)		10	17

Eggplant		7	10
Tomato		6	10

Table 7 Contune *Cooking Times of Some Foods on Charcoal Grill, IR-Grill, and in Oven*

Produkt Name	**Charcoal Grill Cooking Time (min)**	**IR-Grill Cooking Time (min)**	**Oven Cooking Time (min)**
Red pepper		8	5
Green pepper		8	5
Zucchini		9	10
Artichoke		8	
Asparagus		4	
Cultivated mushroom		7	
Celery		7	
Brussels sprouts		7	
Broccoli		5	
Carrot		8	10
Leek		3	
Banana		4	10
Quince		7	10
Avocado		2	
Apple	6	3	5
Pear		8	5
Pumpkin		7	
Chestnut		8	
Bread	3	2	5
Halloumi cheese		3	10

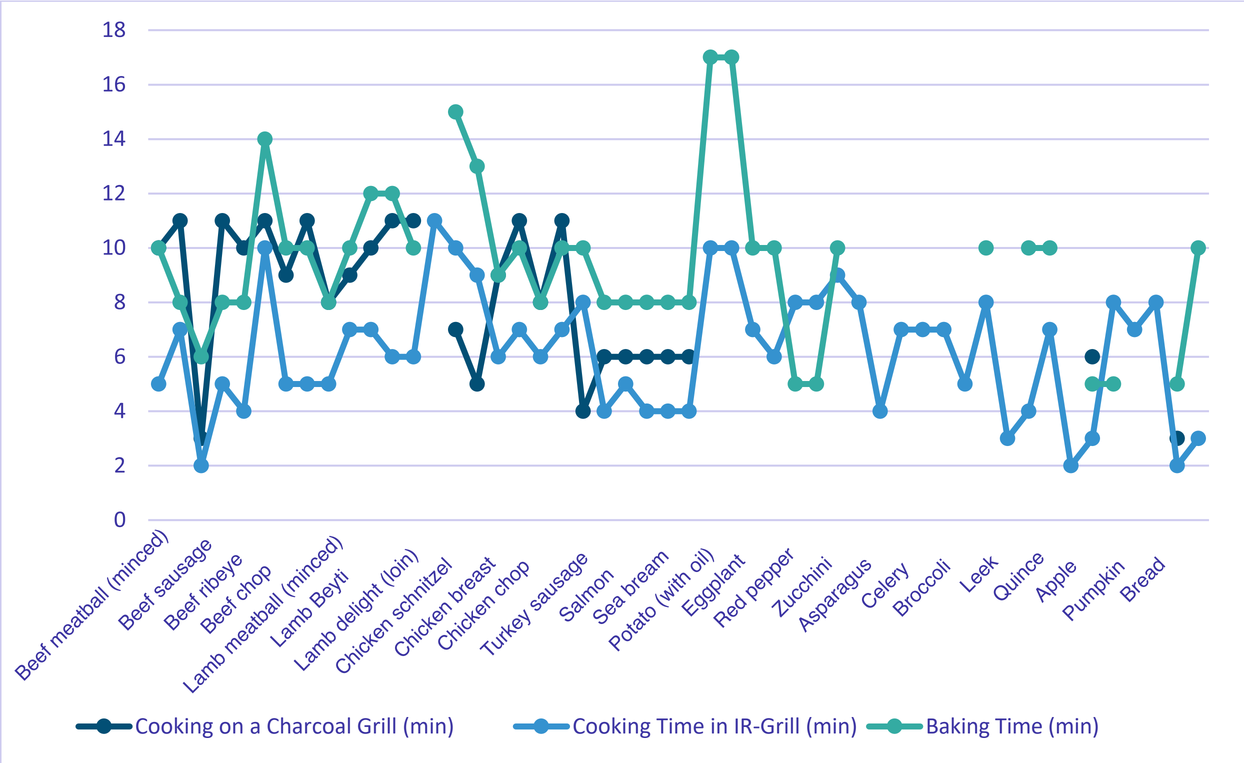


Figure 1. *Cooking Times of Selected Foods on Charcoal Grill, IR-Grill, and in Oven*

It is considered that the IR-Grill cooking device offers a significant advantage over other cooking equipment and methods, especially in terms of time savings. Its ability to reach high temperatures rapidly and cook food quickly contributes to this perception. The concept of time is particularly important in home use and, especially, in industrial settings. In this respect, the product can be considered advantageous.

Another benefit is its ability to emit significantly less smoke, odor, and soot during cooking compared to a charcoal grill. Taking all these aspects into account, it can also be stated that the product may be preferable in terms of energy cost. Given the high energy expenses in kitchens and the increasing importance of sustainability, the product is expected to stand out and be favored.

Furthermore, the practicality and functionality of the device are additional advantages. The fact that cleaning and maintenance can be carried out easily further proves its user-friendliness. The current prototype is considered sufficient in terms of capacity for home use. For industrial kitchens, modifying the product's size would be beneficial. Despite reaching high temperatures rapidly, the product's ability to cook food quickly without burning it is considered a major advantage.

Additionally, the ease of adjusting heat and height levels is seen as a favorable feature for cooking different types and sizes of food.

It is concluded that the IR-Grill cooking device is suitable for both home and industrial kitchens. The aforementioned advantages will help the product stand out compared to other cooking devices and methods. Especially with changes in social life and global events reducing the time spent in the kitchen, the growing importance of time and the product's advantage in this area will play a key role in its market success.

2. ACRYLAMIDE AND pH DETERMINATION – Process, Method, Description, and Evaluations

First, various raw meat, poultry, fish, and fruit samples were cooked using a charcoal grill, an oven, and the IR-Grill. After cooking, their pH values were measured. The pH evaluations were, conducted using an OHAUS-brand pH meter.

Prior to pH determination, calibration was performed using standard solutions provided by the company. The pH meter electrode was rinsed with analytically pure water before each measurement. The pH meter probe was stored in a KCl solution. The pH values obtained after the samples were cooked using the specified methods are presented in Table 8.

Table 8. *Çiğ, kömür ızgarası, fırın ve IR-Grill numunelerden elde edilen pH değerleri*

Sample Name	pH value			
	Raw	Charcoal Grill	Oven	IR-Grill
Beef mince	5.92	6.11	6.14	6.12
Beef sausage	5.34	5.39	5.11	5.02
Beef striploin	6.66	6.13	5.88	5.87
Chicken chop	5.64	6.07	5.89	5.97
Apple	4.10	4.14	4.22	4.03
Beef chop	5.64	6.07	5.89	5.97
Beef cubes	6.10	6.13	6.44	6.65
Beef T-bone steak	5.57	6.06	5.80	5.82

Beef ribeye	5.91	6.00	6.17	6.04
Lamb mince	5.75	6.11	5.98	6.01
Lamb cubes	5.65	5.90	5.91	6.00
Lamb Beyti	5.57	5.96	5.99	5.90
Lamb Külbastı (grilled)	6.45	6.72	6.09	5.96

Tablo 8 (Continued) *pH Values Obtained from Raw, Charcoal Grill, Oven, and IR-Grill Samples*

Sample Name	**pH value**			
	Raw	**Charcoal Grill**	**Oven**	**IR-Grill**
Salmon	6.20	6.37	6.27	6.33
Horse mackerel	6.66	6.78	6.90	6.71
Sea bream	6.54	6.59	6.48	6.31
Chicken thigh	6.86	6.59	6.82	6.51
Mullet	6.69	6.83	6.81	6.71
Chicken breast	5.82	6.04	6.37	6.27
Chicken drumstick	6.70	6.90	7.00	6.43
Lamb delight (loin)	5.76	6.08	6.06	5.99
Sea bass	6.70	6.70	6.53	6.61
Potato	7.20	7.23	7.28	7.20

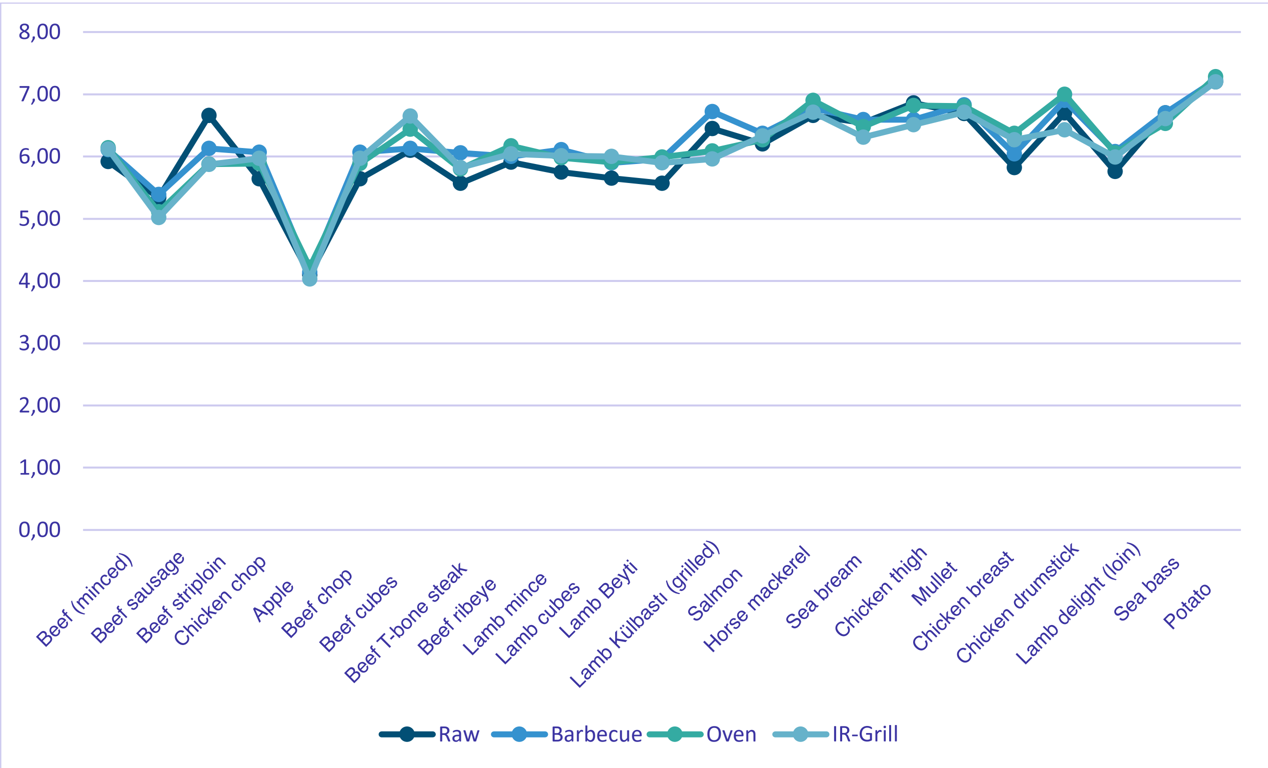


Figure 2. *pH Values Obtained from Raw, Charcoal Grill, Oven, and IR-Grill Samples*

An analysis of the values presented in Table 8 and shown in Figure 2 indicates that the raw products purchased were fresh and their pH values were consistent with those found in the literature. Differences between the measured pH values and those reported in the literature may be attributed to the time elapsed after the animal was slaughtered.

When the results of cooking using charcoal grill, oven, and IR-Grill are examined, an increase in pH values is observed. The pH values obtained from IR-Grill cooking were found to be comparable to those from charcoal grill and oven methods. Considering cooking speed, duration, and preparation steps, IR-based cooking can be considered advantageous.

Furthermore, acrylamide formation is dependent on pH, as in the Maillard reaction. pH affects the reactivity of both sugars and amino groups. A high pH promotes the reactive open-chain form of sugars and the deprotonated form of amino groups. The optimum pH range for acrylamide formation is approximately between 7 and 8.

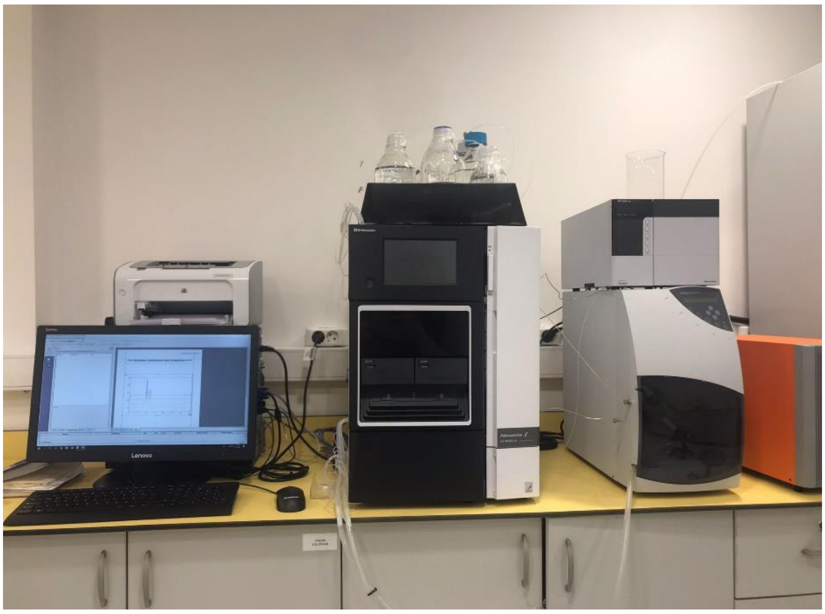
Acrylamide Determination in Various Foods Cooked with Infrared Cooker

Acrylamide is a chemical compound that forms during the cooking of foods at high temperatures (usually above 120 °C). It is formed as a byproduct of the reaction between sugars and the amino acid asparagine, and is particularly found in carbohydrate- and protein-containing foods cooked at high temperatures such as potato chips, fried potatoes, and fried chicken. Acrylamide forms as a result of the Maillard reaction, especially due to the binding between amino acids like asparagine and reducing sugars such as glucose and fructose.

In 1994, the International Agency for Research on Cancer (IARC) classified acrylamide as a probable human carcinogen based on carcinogenic effects observed in rodents. It is also recognized as a known neurotoxin.

Within the scope of this project, it was aimed to develop a method for determining the amount of acrylamide formed in various foods cooked using an infrared cooker via HPLC-DAD. For this purpose, an acrylamide standard of analytical purity was first prepared in various concentrations.

Literature reviews and preliminary trials were conducted to determine acrylamide by the HPLC-DAD method (Photographs 1–3). Based on the results of these preliminary tests, it was decided to apply the HPLC-DAD conditions specified in Table 9.

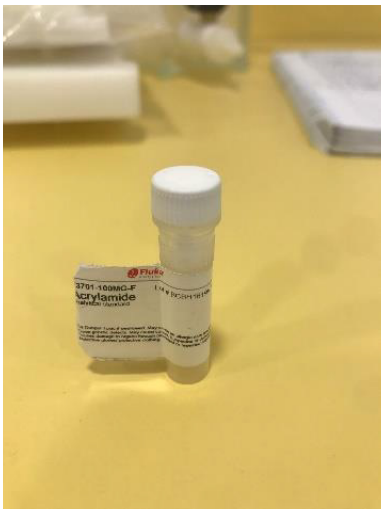


Photograph 1. *HPLC–DAD instruments*

Table 9. *Applied HPLC-DAD Conditions*

Parameter	**Value**
Mobile phase	(Water:Acetonitrile) (98:2, v/v)
Flow rate	0.5 mL mn^{-1}
Column	C_{18} (5 µm, 250 mm x 4,6 mm)
Injection volume	10 µL
Column temperature	40 °C
Wavelength	200 nm

A precise weighing was performed using the acrylamide standard (Sigma–Aldrich) of analytical grade to prepare a stock solution with a concentration of 1 mg mL^{-1}, and it was dissolved in HPLC-grade water.



Photograph 2. *Acrylamide standard*

Photograph 3. *Precision balance*

The prepared solution was mixed using a vortex mixer for 5 minutes and then kept in a sonicator for 20 minutes. The stock solution was stored in a refrigerator at 4 °C. Subsequently, working standard solutions in the concentration range of 0.1–5 ppm were prepared by diluting the stock solution with HPLC-grade water. For the extraction of acrylamide from the samples prepared using the aforementioned infrared cooker, a 0.1% acetic acid solution, Carrez 1, and Carrez 2 solutions were prepared.Carrez 1 solution was prepared by dissolving 15 g of $K_4[Fe(CN)_6]$ in 100 mL of HPLC-grade water.Carrez 2 solution was prepared by dissolving 30 g of $ZnSO_4$ in 100 mL of HPLC-grade water. All prepared solutions were kept in the sonicator for 20 minutes. The chromatograms shown in Figure 1 were obtained.

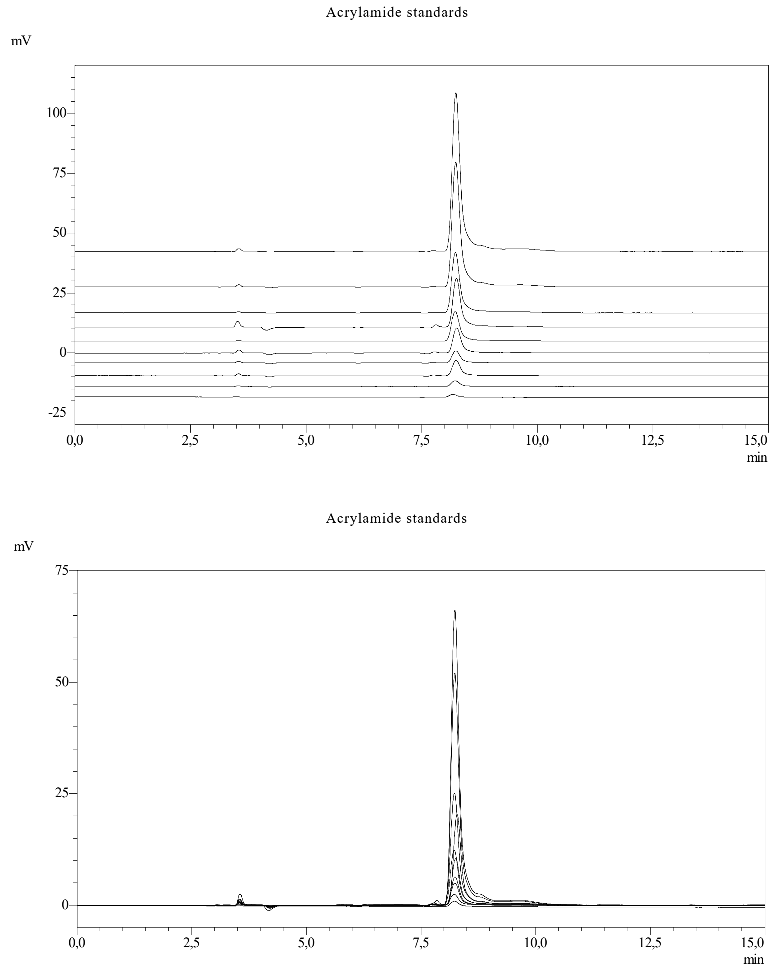
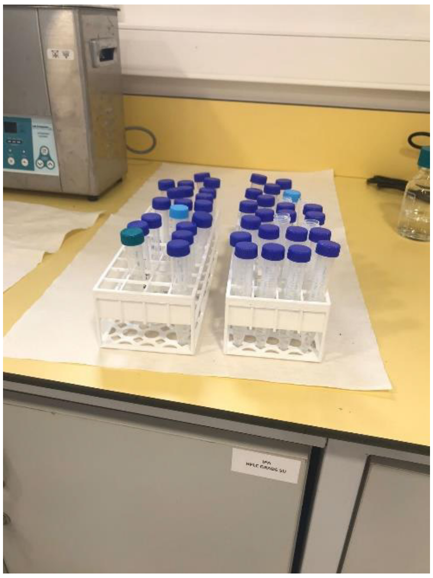


Figure 3. *Acrylamide Standard Chromatograms Obtained by HPLC-DAD*

After homogenization, exactly 3 grams of each sample were carefully weighed for analysis. Then, 29.4 mL of 0.1% acetic acid solution, 0.3 mL of Carrez 1, and 0.3 mL of Carrez 2 solutions were added to each sample (equivalent to 1 g per 10 mL). The resulting mixture was vortexed for 20 minutes and then kept in a sonicator for 1 hour. Following this, the samples were centrifuged at 5000 rpm for 15 minutes. The supernatant was then filtered through a 0.22 µm PVDF filter and transferred into vials (Photographs 4–5). After preliminary trials, it was decided to carry out analysis on the following samples cooked using the infrared cooker (it was assumed that the type of meat—poultry or red meat—would not significantly affect the acrylamide content).



Photograph 4. *Samples in vials*

Photograph 5. *Samples in HPLC-DAD*

Table 10. *Sample List*

Sample No	Sample Name
1	Beef mince
2	Grilled lamb (Külbastı)
3	Diced meat (Kuşbaşı)
4	Schnitzel
5	Chicken thigh
6	Chicken breast
7	Nugget
8	Sausage
9	Bread
10	Salmon
11	Sea bass
12	Fermented sausage)
13	Halloumi
14	Zucchini
15	Pear
16	Potato
17	Apple

The samples listed in Table 10 were analyzed using HPLC-DAD, and the chromatograms shown below were obtained.

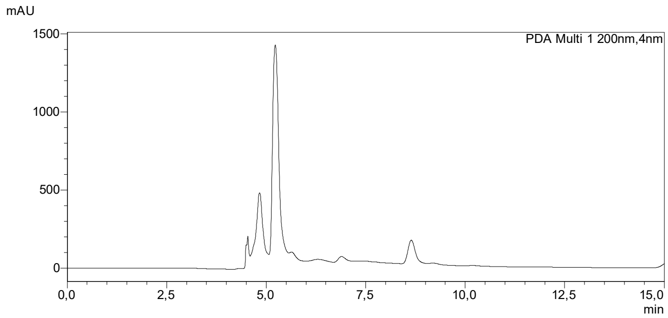


Figure 4. *Sample No. 1*

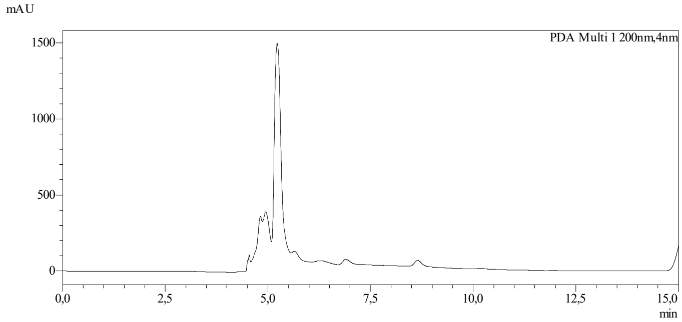


Figure 5. *Sample No. 2*

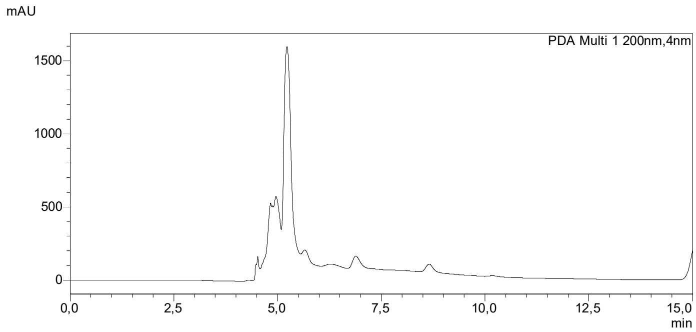
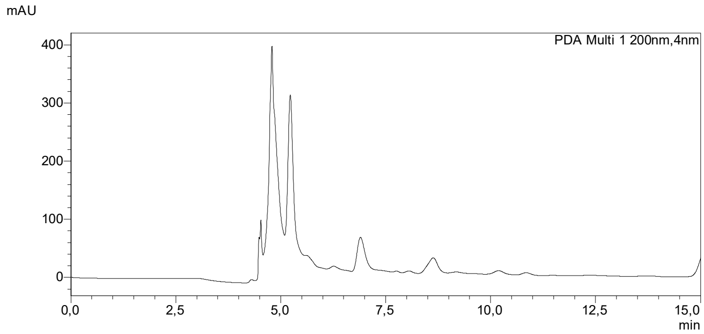


Figure 6. *Sample No. 3*



Grafik 7. *Sample No. 4*

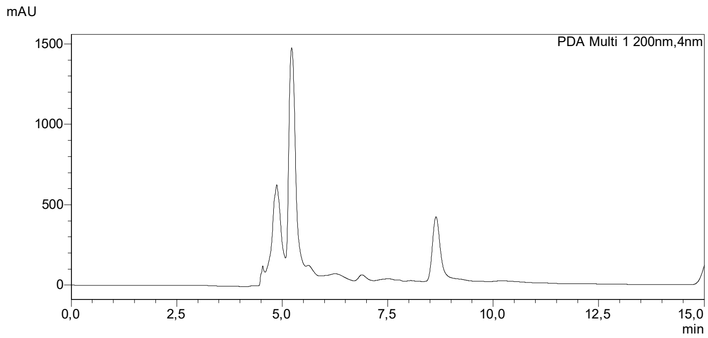


Figure 8. *Sample No. 5*

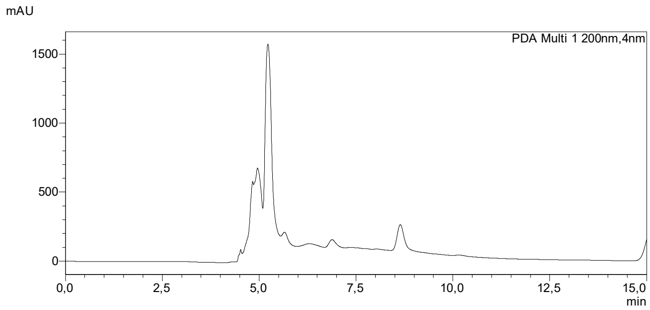


Figure 9. *Sample No. 6*

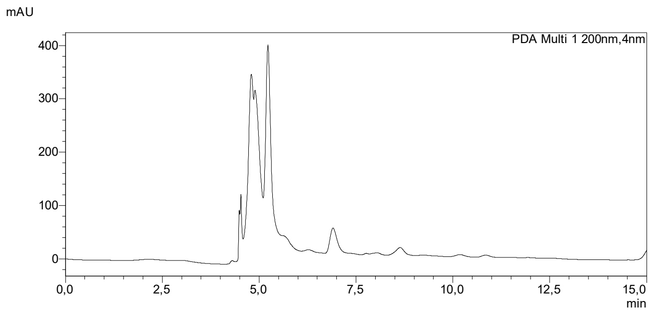


Figure 10. *Sample No. 7*

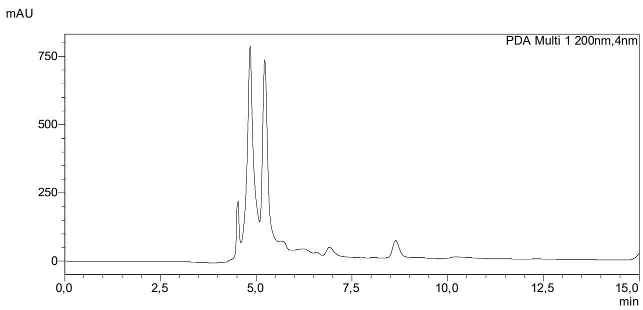


Figure 11. *Sample No. 8*

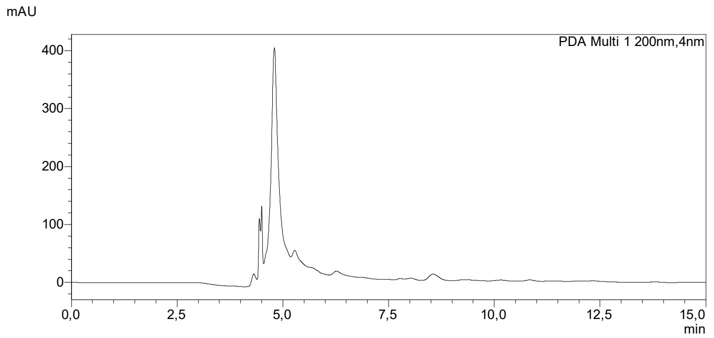


Figure 12. *Sample No. 9*

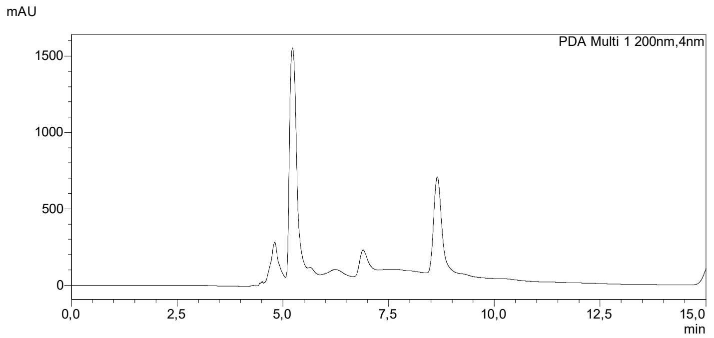


Figure 13. *Sample No. 10*

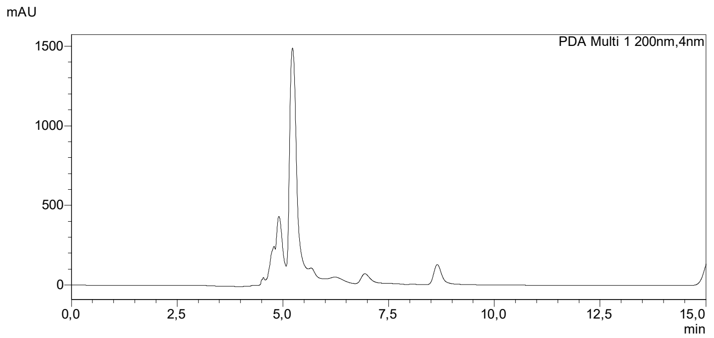


Figure 14. *Sample No. 11*

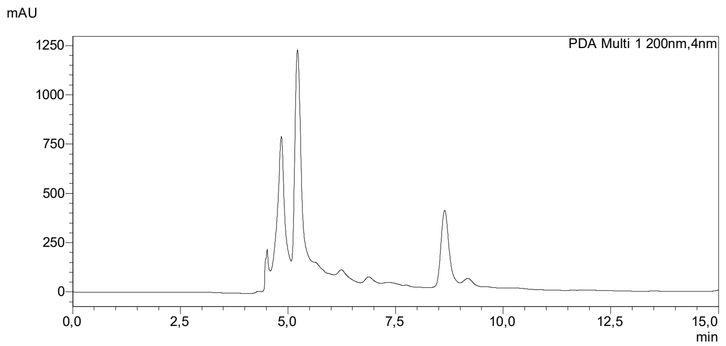


Figure 15. *Sample No. 12*

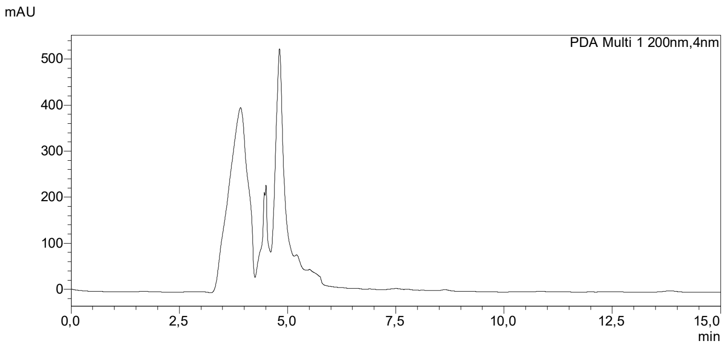


Figure 16. *Sample No. 13*

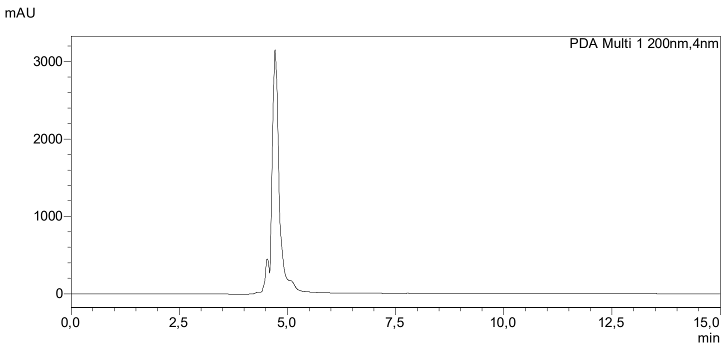


Figure 17. *Sample No. 14*

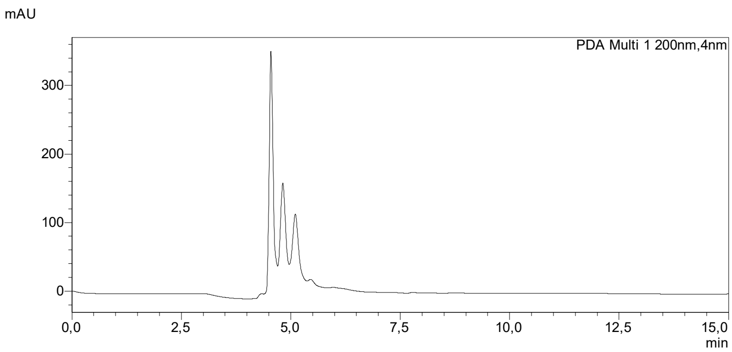


Figure 18. *Sample No. 15*

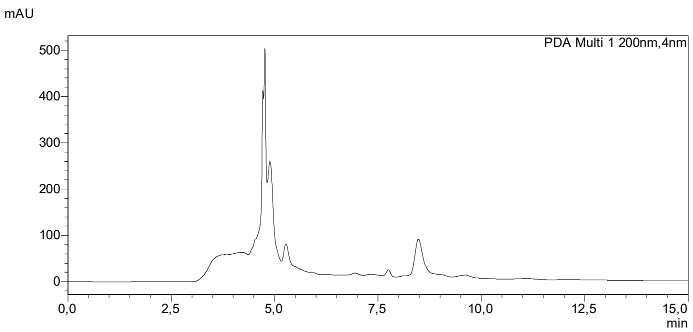


Figure 19. *Sample No. 16*

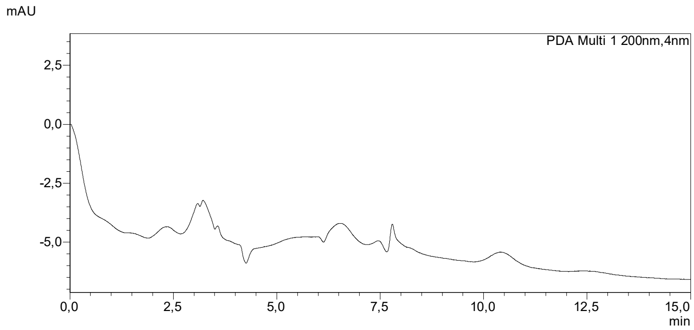


Figure 20. *Sample No. 17*

Upon examining the results, it was concluded that in products cooked under standard kitchen conditions using the IR-Grill, acrylamide levels remained below the detection limit — in other words, no acrylamide formation was observed. To ensure that no interference occurred in the applied HPLC-DAD method, acrylamide was intentionally added to some of the samples and reanalyzed. The resulting chromatograms are shown below.

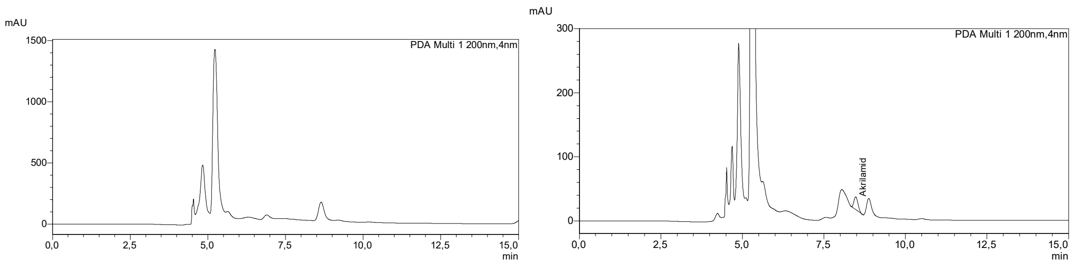


Figure 21. *Chromatogram obtained from Sample No. 1 after acrylamide spiking*

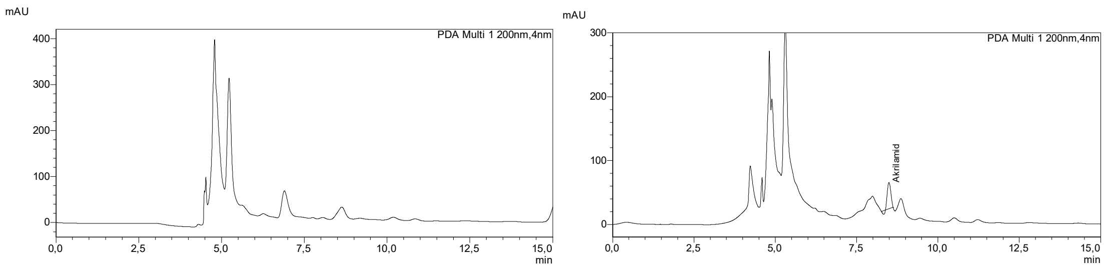


Figure 22. *Chromatogram obtained from Sample No. 4 after acrylamide spiking*

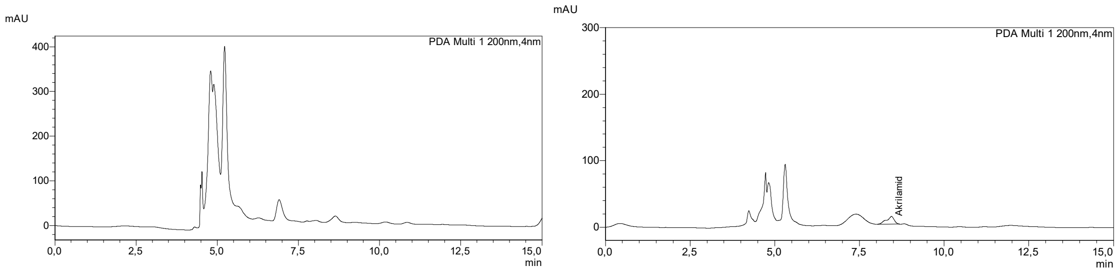


Figure 23. *Chromatogram obtained from Sample No. 7 after acrylamide spiking*

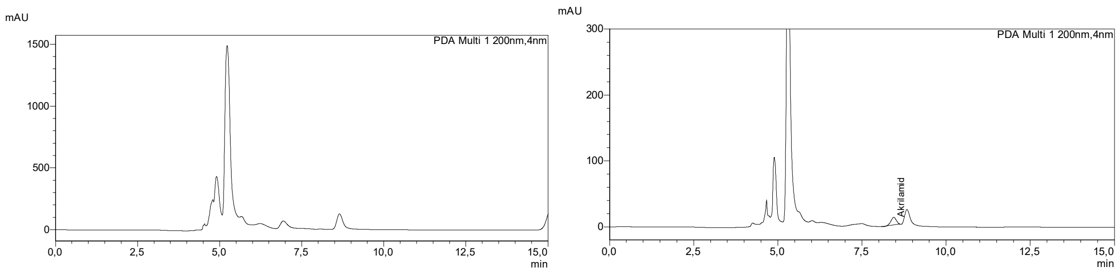


Figure 24. *Chromatogram obtained from Sample No. 11 after acrylamide spiking*

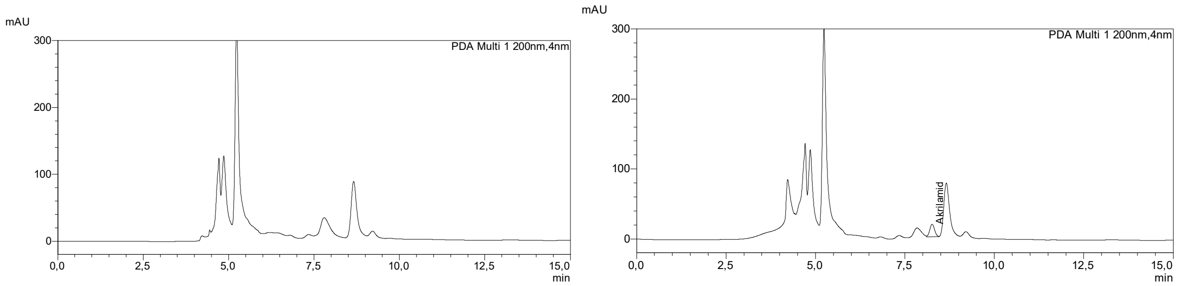


Figure 25. *Chromatogram obtained from Sample No. 12 after acrylamide spiking*

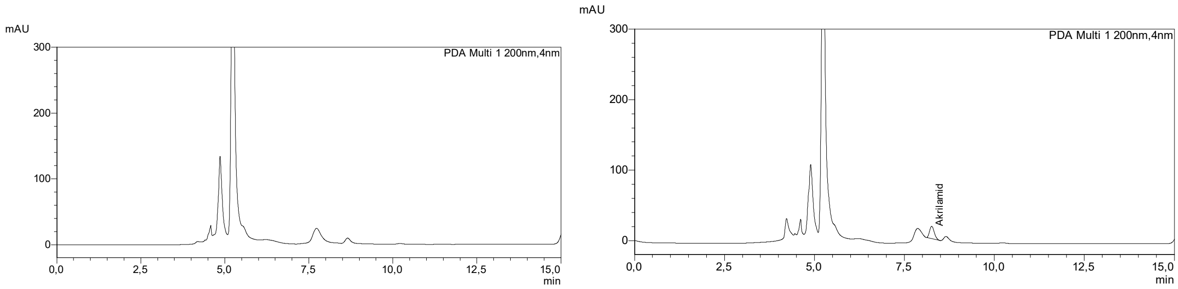


Figure 26. *Chromatogram obtained from Sample No. 2 after acrylamide spiking*

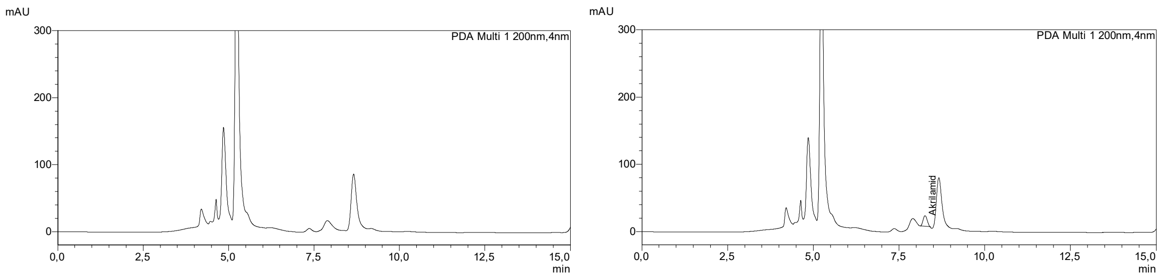


Figure 27. *Chromatogram obtained from Sample No. 5 after acrylamide spiking*

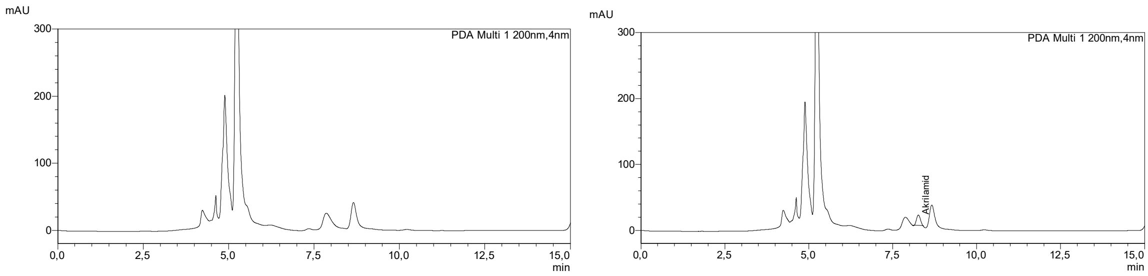


Figure 28. *Chromatogram obtained from Sample No. 6 after acrylamide spiking*

The signals observed following the addition of acrylamide standard at specific concentrations are shown in the figures above. These results confirm that acrylamide either did not form or remained below the detection limits in products cooked using the IR-Grill, and they validate the suitability of the applied method. However, the amount of acrylamide formation may vary depending on the type of product, cooking duration, and temperature.

In conclusion, it was found that the IR-Grill, developed by Tanatar, provides comparable cooking quality in approximately 50% less time compared to oven and charcoal grill cooking. Additionally, the foods cooked using the IR-Grill displayed similar properties in terms of acrylamide and pH levels to those cooked with the other two methods.

No drawbacks were identified regarding the use of the IR-Grill in either amateur or professional kitchens.

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Türkiye Atom Enerjisi Kurumu Teknik Rapor Işınlamanın Akrilamid Miktarı Üzerine Etkisi

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CONGRATULATİONS AND BEST WİSHES

As the project team, we sincerely congratulate all officials of Tanatar Company, especially the R&D manager and staff. We hope that the IR-Grill will soon be well accepted in the market and become a preferred cooking device in households as well as food and beverage businesses.

Best regards and continued success.

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