Organised by
Ege University Engineering Faculty
Food Engineering Department

INTERNATIONAL FOOD CONGRESS

Novel Approaches in Food Industry

NAFI 2011

26 - 29 MAY 2011

ALTIN YUNUS RESORT HOTEL

CESME IZMIR TURKEY

www.nafi2011.com

PROCEEDINGS OF THE
INTERNATIONAL FOOD CONGRESS
NOVEL APPROACHES IN FOOD INDUSTRY

Volume 2

MAY 26 – 29, 2011

ÇEŞME - İZMİR, TURKEY

Edited by

Şebnem TAVMAN
Semih ÖTLEŞ
Taner BAYSAL
Yekta GÖKSUNGUR
Duygu KIŞLA
Nur DİRİM
Nurcan KOCA

ORGANIZATION

Scientific Advisory Committee

Ahmed E. YOUSEF, *The Ohio State University, Columbus, USA*
Akif KUNDAKÇI, *Celal Bayar University, Manisa, Turkey*
Ali ÜREN, *Ege University, İzmir, Turkey*
Alev BAYINDIRLI, *Middle East Technical University, Ankara, Turkey*
Artemis KARAALI, *Yeditepe University, İstanbul, Turkey*
Aytaç SAYGIN GÜMÜŞKESEN, *Ege University, İzmir, Turkey*
Dilek BOYACIOĞLU, *İstanbul Technical University, İstanbul, Turkey*
Fahrettin GÖĞÜŞ, *Gaziantep University, Gaziantep, Turkey*
Ferruh ERDOĞDU, *Mersin University, Mersin, Turkey*
Figen ERTEKİN, *Ege University, İzmir, Turkey*
Hamit KÖKSEL, *Hacettepe University, Ankara, Turkey*
Heike P. SCHUCHMANN, *Institute of Technology Karlsruhe, Germany*
Hikmet BOYACIOĞLU, *Doruk Gorup, İstanbul, Turkey*
Jozef L. KOKINI, *Illinois University, USA*
Mahir TURHAN, *Mersin University, Mersin, Turkey*
Mahmut DOĞAN, *Erciyes University, Erciyes, Turkey*
Mehmet PALA, *Yıldız Teknik University, İstanbul, Turkey*
Meltem SERDAROĞLU, *Ege University, İzmir, Turkey*
Mustafa ÜÇÜNCÜ, *Ege University, İzmir, Turkey*
Mustafa ÖZİLGEN, *Yeditepe University, İstanbul, Turkey*
R. Paul SINGH, *University of California, Davis, USA*
Osman ERKMEN, *Gaziantep University, Gaziantep, Turkey*
Sibel KARAKAYA, *Ege University, İzmir, Turkey*
Şebnem HARSA, *İzmir Institute of Technology, İzmir, Turkey*
Tomris ONOĞUR, *Ege University, İzmir, Turkey*

Organizing Committee

Chair

Şebnem TAVMAN

Ege University, Faculty of Engineering
Department of Food Engineering
35100 Bornova, Izmir, Turkey
Phone: +90 232 311 30 16
Fax: +90 232 342 75 92
E-mail: sebnem.tavman@ege.edu.tr

General Secretary

Nur DİRİM

Ege University, Faculty of Engineering
Department of Food Engineering
35100 Bornova, Izmir, Turkey
Phone: +90 232 311 30 32
Fax: +90 232 342 75 92
E-mail: nur.dirim@ege.edu.tr

Nurcan KOCA

Ege University, Faculty of Engineering
Department of Food Engineering
35100 Bornova, Izmir, Turkey
Phone: +90 232 311 30 29
Fax: +90 232 342 75 92
E-mail: nurcan.koca@ege.edu.tr

Members

Semih ÖTLEŞ

Ege University, Faculty of Engineering
Department of Food Engineering
35100 Bornova, Izmir, Turkey
Phone: +90 232 311 30 24
Fax: +90 232 342 75 92
E-mail: semih.otles@ege.edu.tr

Taner BAYSAL

Ege University, Faculty of Engineering
Department of Food Engineering
35100 Bornova, Izmir, Turkey
Phone: +90 232 311 30 43
Fax: +90 232 342 75 92
E-mail: taner.baysal@ege.edu.tr

Yekta GÖKSUNGUR

Ege University, Faculty of Engineering
Department of Food Engineering
35100 Bornova, Izmir, Turkey
Phone: +90 232 311 30 27
Fax: +90 232 342 75 92
E-mail: yekta.goksungur@ege.edu.tr

Duygu KIŞLA

Ege University, Faculty of Engineering
Department of Food Engineering
35100 Bornova, Izmir, Turkey
Phone: +90 232 311 30 13
Fax: +90 232 3427592
E-mail: duygu.kisla@ege.edu.tr

PREFACE

It is our pleasure to introduce you **The International Food Congress** entitled **"Novel Approaches in Food Industry"** which will be held in Çeşme, Izmir, TURKEY. The congress will take place on 26-29 May, 2011 and include a variety of hot topics such as novel food products and technologies, thermal and non-thermal food processing technologies, applications of nanotechnology in food processing, innovations in food science and technology. This congress will highlight the most important areas of recent Research & Development in Food Science and Technology as well as explore relevant and interesting topics for the future. The congress will also provide accurate and updated scientific information and trends for the discipline of food science and technology. 400 leading scientists from all over 40 countries will contribute to the congress as oral or poster presentations.

This congress will provide a forum for the exchange of ideas and authoritative views by leading scientists, as well as business leaders and investors in the food industry. **More than 32 leading food industry companies became sponsor or supporting organization to our congress**. Outstanding keynote speakers and well-known leading scientists and experts from around the world will be sharing their knowledge with us. Company executives, as well as speakers from universities, research centers and governmental institutions will discuss scientific and technical developments in detail.

We would like to thank all contributors including authors of oral and poster presentations and our sponsors for contributing to the success of this congress.

On Behalf of the Executive Committee

Prof. Dr. Sebnem TAVMAN

AFTERNOON SESSION (14.00-18:30)
FOOD CHEMISTRY AND QUALITY

Evaluation of the practices applied in the preparation of vegetable salads in a catering unit

A. Rodrigues[1], E. L. Pereira[1,2], E. Ramalhosa[*1,2]

[1*] School of Agriculture, Polytechnic Institute of Bragança, Campus Sta. Apolónia, Apartado 1172, 5301-855 Bragança, Portugal; [2*]Mountain Research Center (CIMO), Polytechnic Institute of Bragança, School of Agriculture, Campus Sta. Apolónia, Apartado 1172, 5301-855 Bragança, Portugal
elsa@ipb.pt

Abstract

Food safety is nowadays an important issue for the consumers, being a point of great concern to catering units. These must prepare an equilibrated meal in terms of nutritional value and safety. The consumption of fruits and vegetables has assumed great importance. Nevertheless, in the processing of vegetables it is crucial to follow the basic rules of personal hygiene and production, as many times these products are served raw, without being subjected to any thermal processing.

Even these catering units must follow European regulations and have implemented an HACCP plan, incorrect practices are sometimes observed. Thus, in the present work it was intended to evaluate the activities related with the preparation of vegetable salads in a catering unit. To achieve this goal, 21 periodic visits were performed and the survey of the activities linked to salad preparation was done by check-list previously elaborated.

In general terms, the practices followed in the reception, storage and preparation of the vegetables were quite satisfactory. However, some incorrect points were stated, such as the use of unrefrigerated vehicles by the vegetable supplier, the maintenance of the vegetables at room temperature during long periods of time and the incorrect application of the implemented Washing and Disinfection Plan, in addition to other points. Moreover, variability on the disinfection method used in the vegetables salad preparation was also stated. In relation to personal hygiene of food operators, some points also need correction.

Introduction

Nowadays, a diet rich in fruits and vegetables is highly recommended. These are an important source of compounds, such as antioxidants, that decrease the risk of incidence of some diseases. However, processing fresh produce into fresh-cut products increases the risk of bacterial growth and contamination by breaking the natural exterior barrier of the produce. So, the practices applied in their preparation are of great importance.

The incidence of foodborne illness is increasing worldwide. This may in part be attributed to a change in commercial food production, as well as in changes in consumer demands for ready-to-eat meals. In addition, consumers use more often catering units. In these establishments, salads must be prepared with some care. Such products are often eaten raw or with minimal processing and if contaminated with pathogenic microbes, may represent a health hazard to the consumers. In the past decade the frequency of documented outbreaks of human enteric infections associated with the consumption of raw fruits and vegetables has increased (Beuchat, 2004).

In Europe great efforts have been made to produce legislation that improves food hygiene and render the Hazard Analysis and Critical Control Points (HACCP) system mandatory (EC Regulation n.° 852/2004, EC Regulation n.° 853/2004). Nevertheless, even if sometimes this system is implemented, several lacks on the practices might be found.

Some studies involving food services hospital staff in Turkey (Tokuç *et al.*, 2009) and nursing homes and long-term care facilities in Italy (Buccheri *et al.*, 2010) have been performed in order to evaluate the knowledge, attitudes and practices in food hygiene and to prevent foodborne illnesses. To our knowledge, few works have been made among food services in catering units. Thus, the aim of this study was to investigate the attitudes and practices of the food handlers who are routinely involved in salad preparation in a catering unit although in this organization an HACCP plan is implemented.

Materials and Methods

This survey was conducted in a catering unit located in the Northeast of Portugal, that labor 10 months per year and serves up around 970 meals daily. It has already an HACCP plan implemented.

In relations to the vegetable salads, they are prepared twice a day (lunch and dinner). In order to verify *in loco* the practices followed in their preparation, a check-list was applied, concerning the following topics:

Vegetables reception;
Vegetables storage;
Salads preparation;
Salads distribution;
Fulfillment of the Washing and Disinfection Plan;
Check of the execution of the Good Practices on Personal Hygiene.

From May to November 2009, twenty one periodic visits were performed. In all visits, the temperatures of the refrigeration chamber of vegetables and of the salads display cabinet (where vegetables are placed for distribution) were measured.

Results and Discussion

In general terms, the present study allowed us to verify that the practices followed in the reception, storage and preparation of the vegetables were quite satisfactory, whereas some points needed correction. In the following sections, some points are discussed.

Vegetables reception

It was stated that the vegetables proceed from only one supplier and are frequently received on Mondays. In some situations, they are also delivered on Thursdays. The reception hour varied between 9h:10 to 11h:13. Generally, onions, lettuce, tomatoes and carrots are received. In all situations, waiting time didn't exist. In terms of transportation, the vehicle varied between a station wagon with opening box covered with a tilt (27% of the times), a closed unrefrigerated vehicle (64%) and a refrigerated car (9%). However, in all situations the transport vehicle was at room temperature. This is a point that needs to be corrected in the future.

The store keeper always recorded the quality of the raw-materials, verifying the supplier's identification, the compliance with the order-note and the appearance of the vegetables. The vegetable supplier was not certified and therefore there was no certificate of quality. In 36.4% of the visits, the absence of labeling was observed, and the supplier was always informed about this fact.

Vegetables storage

The vegetables storage occurred after 1 to 16 minutes, depending on the products and the place where they were stored. During the survey, onions, for example, were received individually in two situations and as they are stored in a place with easy access at room temperature, their deliver time was very short. Nevertheless, the reception/storage time was quite satisfactory, showing that the vegetables do not remain at high temperatures during long periods of time. The other vegetables were stored in a refrigeration chamber, specified to these products. It was stated that the chamber temperature varied between 6 and 7°C, with an average of 6.2±0.5°C. However, after the placing of vegetables in the chamber, its temperature increased to 9 to 18°C (average equal to 11.4±2.9°C). This fact was due to

the door remained open during the placement of the vegetables. This is a practice that needs to be corrected by the store keeper, as it is very important that the door must be closed as soon as possible.

In all visits it was stated that the vegetables refrigeration chamber was clean, in good maintenance state and tidy up. Moreover, the store keepers made the manual register of temperatures twice a day and to their regular cleanliness and disinfection. In relation to plagues, near the entrance of the storehouse some traps were installed in order to prevent the entrance of rats, as well as an insect-trap.

Salads preparation
Salads preparation was always performed in a particular zone in the kitchen, named "Preparation Zone of Legumes and Salads". As vegetable salads are prepared twice a day, the attitudes of the food handlers were observed in those periods. The turns were always formed by the same persons.

During the morning period, vegetables were delivered from the storehouse to the kitchen from 9h:00 to 10h:00. The waiting period (time between vegetables entrance in the kitchen and the start of their preparation) was unsatisfactory because they remained in the kitchen at room temperature and were exposed to the critical zone of temperatures for high periods of time. The exposition time of vegetables determined for the two turns during the two periods of the day – morning and afternoon – are represented in Table 1.

Table 1 – Exposition time (min) of the vegetables since their entrance in the kitchen until the beginning of their preparation.

	Turn A		**Turn B**	
	Morning	**Afternoon**	**Morning**	**Afternoon**
Average ±Standard Deviation	46±19	49±18	34±18	46±28
Minimum	20	20	2	15
Maximum	68	68	53	100

After comparing both turns, the average values were identical, with the exception of turn B in the morning. In relation to salads preparation, the food handlers finished this task in a variable time (Table 2).

Table 2 – Total time (min) spent during salads preparation.

	Turn A		**Turn B**	
	Morning	**Afternoon**	**Morning**	**Afternoon**
Average ±Standard Deviation	48±36	36±10	50±13	39±8
Minimum	30	21	32	21
Maximum	66	51	67	54

No differences were observed between turns. However, the highest were determined in morning for both turns. This might be due to the high salads quantity that food handlers must prepared.

The operations sequence was identical in both turns. The first step was always the disinfection of the tomatoes and lettuce, followed by their immersion in water. At last the vegetables were put in proper containers to be served up by the public. In relation to carrots and onions, no disinfection step was applied, being only chopped.

The disinfection methods varied within turns. In Turn A two disinfectants were used, namely, chlorine-tablet and vinegar. In tomatoes disinfection the food handlers used different quantities of chlorine-tablets, varying from one (80% of the situations) to two tablets (20%) in less than 20 dm^3 of water. In lettuce disinfection, one (14.3%) and two (19.1%) tablets for 60 dm^3 of water, in addition to vinegar, had been used. In Turn B only chlorine-tablets had been used. In relation to tomatoes, the number of chlorine-tablets varied between one (70%), two (20%) and three (10%) for 20 dm^3. In

lettuce disinfection, it varied from one (45%), two (45%) or three (10%) tablets. It must be referred that the dose recommended by the producer is one chlorine-tablet for 20 dm^3 of water, indicating that for 60 dm^3 three chlorine-tablets should be used. Due to this, only in Turn B and in 10% of the situations, the correct procedure had been followed. In contrast, in tomatoes disinfection in Turns A and B the procedure was correctly performed in 80 and 70% of the situations analyzed, respectively.

In terms of disinfection time, these varied slightly within turns. For tomatoes, they varied between 1 and 16 minutes for Turn A and between 1 and 14 minutes for Turn B. For lettuce, higher disinfection times were observed, varying between 5 to 23 minutes and 5 to 30 minutes for Turns A and B, respectively.

These results may be the consequence of a lack of specific training and empiric adoption of safe attitudes and behaviors based on skill in working and domestic settings, as suggested by Tokuç *et al.* (2009) when analyzing the practices of food service staff working on hospitals in Edirne, Turkey.

Salads distribution
After being prepared the salads were put in the meal-room, where they stayed in an unrefrigerated display cabinet. The exposition time varied between 1h30 to 3h30. During this period, the salads might be subjected to the critical zone of temperatures, 5 to 65°C. In fact, during lunch or dinner, the room temperature varied from 12.4 to 22.2°C and 15.0 to 24.6°C, respectively, which are temperatures that favors growth of microorganisms. Furthermore, it must be referred that this high exposition time was due to the food handlers generally prepared the salads in great advance and transferred them to the meal-room instead of maintaining under refrigeration.

Fulfillment of the Washing and Disinfection Plan
Regarding the washing and disinfection of surfaces and tools, two products had been used by the food handlers, namely the disinfectant/bactericide Carvidet® and Mistolin DLB-B® (bio-alcohol), both of them prepared often without rule. Besides, in several situations the surfaces were only cleaned with water. In more detail, in Turn A the chemical products referred before were used 81.8% of the times, water being used in the remaining situations. In Turn B water was the most used (63.2%) followed by the chemical products (36.8%).

It must be referred that a Washing and Disinfection Plan was already implemented in the catering unit, as well as the associated registers. However, this plan had not been executed most of the time (91% and 95% of the situations in Turn A and B, respectively) and the records had not been done. This is a situation that needs to be corrected without delay.

Check of the execution of the Good Practices on Personal Hygiene.
In relation to the Good Practices on Personal Hygiene followed by food handlers, for the two turns the results were identical. As positive points, it must be referred that: (i) The uniform was always tidy and clean; (ii) It existed a waste bin adequate for salad preparation, with cover and pedal, and coated with a plastic bag; and (iii) The food handlers did not go to WC during the task. Only in one situation, the cap of one food handler was incorrectly dressed.

In contrast, other points need correction, as can be observed on Figure 1. Sometimes the food handlers used jewelry (1A) which is a practice unwise. Jewelry might be a physical and/or biological risk because they can be accumulation zones of residues and favor microorganism's development. Other point that must be corrected is the fact that food handlers did not start the task by washing their hands (almost 50% of the situations) (1B). Nevertheless, more than 50% of the times, the food handlers used gloves (1C). They said that it was a question of hygiene. Nevertheless, some caution must be taken because if gloves are not correctly used, they will be a source of contamination.

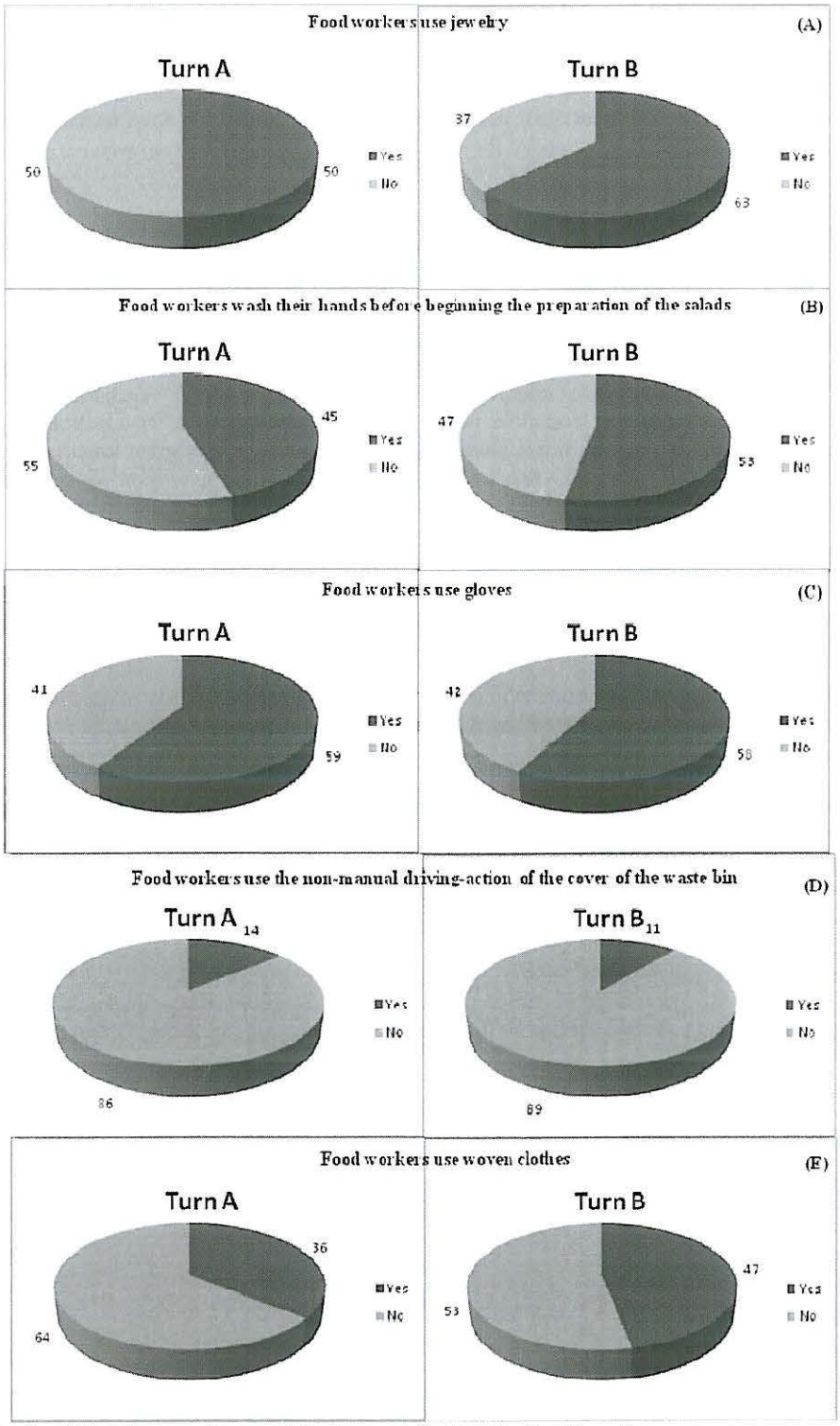

Figure 1 - Good Practices on Personal Hygiene applied by the food handlers.

In more than 85% of the situations the food handlers did not used the non-manual driving-action of the waste bin (1D). Nevertheless, it was stated that during salads preparation the waste bin remained unclosed, not being opened by hand. However, it is advisable that waste bin must remain closed in order to avoid contamination and shall not be open by hand. Sometimes food handlers used woven clothes (1E) which are not recommended for being a possible contamination source.

Conclusions/Recommendations

In general terms, the present survey allowed verifying that the practices followed in vegetable salads preparation in a catering unit were quite satisfactory. However, even an HACCP plan is implemented some aspects need to be improved.

In relations to the reception of the vegetables, it is important that some of these products, such as lettuce, should be transported in a refrigerated vehicle in order to reduce the time spent in the critical zone of, 5 to 65°C, which can favor microbial growth. During the storage of vegetables, it is important to maintain the door open the least time possible and the installation of an electronic system for temperature recording is recommended. During salad preparation, it is of great importance to reduce the time that vegetables remain at room temperature and the correct execution of the Washing and Disinfection Plan, as well as required registration. Salads must also not be prepared much in advance.

Even all food handlers had attended training courses on food hygiene the results of the present study indicate that knowledge alone is probably insufficient to promote positive attitudes and safe behaviors. It is important that food handlers do not use jewelry, use correctly the waste bin, wash their hands before beginning the task and do it regularly, and do not use woven clothes.

As final recommendation, this study points out there is a need of finding alternative educational strategies that must be better understood by the food handlers.

References

Beuchat L.R. (2004). Difficulties in Eliminating Human Pathogenic Microorganisms on Raw Fruits and Vegetables, *Acta Hort.*, 642, 151-160.

Buccheri C., Mammina C., Giammanco S., Giammanco M., La Guardia M. and Casuccio A. (2010). Knowledge, attitudes and self-reported practices of food service staff in nursing homes and long-term care facilities, *Food Control*, 21, 1367-1373.

EC Regulation n.° 852/2004 of 29th April.

EC Regulation n.° 853/2004 of 29th April.

Tokuç B., Ekuklu G., Berberoglu U., Bilge E. and Dedeler H. (2009). Knowledge, attitudes and self-reported practices of food service staff regarding food hygiene in Edirne, Turkey, *Food Control*, 20, 565-568.

ISBN 978-975-483-902-9

META Basım Matbaacılık Hizmetleri
Tel: 0.232 343 64 54 Bornova-İZMİR