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Evaluation of waste of vegetables and fruits in a Meal Production Unit

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Abstract

This study evaluated the waste of vegetables and fruits in pre-preparation in commercial and hospital Meal Production Units in the city of Belo Horizonte-MG. The samples were collected during three weeks in each unit by Nutrition students. Twenty kinds of vegetables and fruits (4 fruits and 16 vegetables) were chosen, weighed before and after cleaning and selection, process performed three times for each type of food. The waste in pre-preparation was assessed by calculating the correction factor. Data were tabulated in Microsoft Excel 2010® program and statistical analyses performed using the Statistical Package for Social Sciences version 17.0. It was found that among the foods analyzed, ten did not differ statistically, showing statistical relevance of these factors. The commercial production unit has lower correction factors or similar to literature, compared with hospital production. In general, the waste presented by some food types analyzed was mostly higher than determined by literature as acceptable. Thus, investments are necessary in personal training, equipment calibration, exchange of utensils, and selection of better suppliers.

Keywords: Fruits. Vegetables. Food waste.

Introduction

Elevated indices of food waste in Brazil have been observed in all spheres. The inadequate planning of food processing, from post-harvesting to consumption, affects the economy and exacerbates social problems.[1]

A study carried out by the National Council of Food and Nutritional Safety (NCFNS) (Conselho Nacional de Segurança Alimentar e Nutricional (CONSEA)), showed evidence that food waste is related to various factors that range from harvest to preparation, such as the inadequate handling of food, storage and inappropriate transport, cultural habits, inadequate forms of preparation, and even the each food's matrix has an influence. Data points out that, of the country's total waste, 10% occurs during harvest, 50% in the handling and transport of food, 30% in the storage centers, and 10% is divided among supermarkets and consumers.[1]

According to Vanin *et al*.,[2] the inclusion of vegetables and fruits on the menu of a Meal Production Unit (MPU) (Unidade Produtora de Refeição (UPR)) encompasses the functional physical planning that involves the sizing of the reception area, storage, and pre-preparation, articulated to supply management and human resources in order to minimize the waste of various resources, such as: energy, manual labor, and the food itself. For the utilization of vegetables in nourishment, it is necessary that these raw materials undergo cleaning processes, subdivision, and cooking, generating cuttings and peels. The adoption of less careful habits and customs or of inappropriate production procedures can result in an exaggerated waste-picture.[3]

It is known that, in the managing of an MPU, waste is a relevant question, synonym of lack of quality service; therefore, appropriate planning should be taken into consideration so that waste can be minimized during processing.[2,4-7] Paying attention to the fact that a large part of food waste in the country is from the handling stage, it is considered that the MPUs are a potential action field.

This way, the objective of the present study is to evaluate the waste of vegetables and fruits in pre-preparation, using the correction factor (CF) indicator, in two MPUs in Belo Horizonte--MG, and comparing the constant values in the literature.

Methods

It deals with a study carried out in two MPUs of Belo Horizonte-MG, one commercial and the other in a hospital. The sample collection was achieved in a period of three weeks in each unit, from the month of September to October, by academics from a Nutrition course, during the fulfillment of a supervised internship in food and nutrition services.

Due to the occurrence of employee rotation in the areas of washing and pre-preparation, the collection of data on different days was prioritized, with specific handlers, and no additional orientation was offered on food waste in pre-preparation.

20 produce types were evaluated, 16 of which were vegetables (curly lettuce, eggplant, beet, onion, chive, carrot, kale, mint, yucca, cucumber, bell pepper, okra, cabbage, parsley, tomato, and string bean) and four fruits (pineapple, papaya, mango, and watermelon).

The pre-preparation waste was evaluated through the calculation of the CF. The data were collected in triplicate, according to Degiovanni *et al*.,[8] before pre-preparation, to obtain the gross weight (GW), and what would be discarded in order to obtain the CF was weighed after pre-preparation; afterwards, the average values of CF for each type of vegetable were conjectured.

In order to determine the CF, the formula developed by Araújo *et al.* was utilized,[9] consisting of the calculation of the relation between food weight as acquired (GW); by the decrease in GW from the parts that would be discarded, the weight of the food after cleaning was reached (liquid weight - LW) (CF=GW/LW). The cleaning of the food types was done based on the type of food, taking into account old and damaged leaves, hardened stalks, deteriorated pieces, skins, roots, central stalks, and rotten parts of the foods.

After the sample collection, the data was inserted into Microsoft Excel® and the statistical analysis was carried out using *Statistical Package for the Social Sciences* (SPSS) versão 17.0. For the univariate analysis, the Anova and Tukey tests were carried out, to confirm whether or not there was a significant difference between the samples and the data in the literature. A level of significance of 5% ($p<0.05$) was fixed for all the tests.

Results

During the study, 20 produce types were evaluated, four being fruits and 16 being vegetables. In the hospital MPU, it was observed that pineapple, onion, chive, carrot, watermelon, bell pepper, tomato, and string bean, obtained an FC established by the literature. Whereas in the commercial MPU, beet, onion, mint, watermelon, bell pepper, parsley, and string bean, presented a CF in accordance with that cited in the literature (table 1).

Table 1. Correction factors of vegetables and fruits observed in a hospital Meal Production Unit and other commerce in Belo Horizonte - Minas Gerais and correction factors recommended by Silva et al., 2013.

Grocer	UPR Hospital	UPR Commercial	SILVA et al., 2001	Value p
Pineapple	1.79ª	2.32ª	1.93ª	0,42
Curly lettuce	1.47ª	1.67ª	1.31ª	0,18
Eggplant	1.19ª	1.26ª	1.08ª	0,31
Beet	2.06ª	1.33^{b}	1.53^{b}	< 0,001
Onion	1.06ª	1.27ª	1.53ª	0,08
Chive	1.00^{a}	1.50^{b}	1.18^{a,b}	0,04
Carrots	1.16ª	1.30ª	1.16ª	0,26
Kale	2.95ª	1.69^{b}	1.50^{b}	0,005
Mint	1.65^{a}	1.01^{b}	1.36^{c}	< 0.001
Papaya	1.61ª	1.69ª	1.50ª	0,66
Mango	2.64ª	1.94^{b}	1.36^{b}	0,04
Watermelon	1.39ª	1.62ª	1.90ª	0,20
Yucca	1.58ª	1.38^{b}	1.31^{b}	0,001
Cucumber	1.24ª	1.21ª	1.17ª	0,44
Bell Pepper	1.31ª	1.45ª	1.57ª	0,38
Okra	1.32^{b}	2.11^{a}	1.31^{b}	0,002
Red Cabbage	3.09ª	1.45^{b}	1.35^{b}	0,04
Parsley	1.84^{a}	1.18^{b}	1.44^{a,b}	0,04
Tomato	1.10ª	2.25ª	1.25ª	0,06
String Bean	1.10ª	1.14ª	1.26^{b}	< 0.001

Note: The different letters on the line determine significant difference among the samples at the level of 5% significance.

Silva et al – practical guide for preparation. São Paulo:Atheneu, 2001.

The CFs found in pineapple, curly lettuce, eggplant, onion, carrot, papaya, watermelon, cucumber, bell pepper, and tomato, do not statistically differ between the hospital and commercial MPUs, nor from the literature, demonstrating adequate statistics of these factors.

The value of CF found for beets was statistically different among the MPUs. However, the hospital MPU obtained a value high above and statistically significant of that recommended in the literature ($p<0.001$). The same happened with kale ($p = 0.005$), mango ($p = 0.04$), and yucca ($p = 0.001$). Contrary to this, the CF found for okra was much higher and statistically significant than that determined by the literature, in the commercial MPU ($p = 0.002$), such that the hospital MPU showed itself to be equal to that in the literature.

With the measurements made with chive, the CF between the units statistically differed ($p = 0.04$), such that the commercial MPU found the higher value; however, not one of the two were found to be different than that found in the literature. The same happened with parsley, where the hospital MPU was much higher than the other unit ($p = 0.04$), but without statistical differences found within the literature. The CF of mint differed as much between the MPUs as within the literature, such that the value found in the hospital unit was above the literature and in the commercial unit, below ($p < 0.001$).

Lastly, the string bean resulted in CF lower and statistically significant in the two units compared with the literature. In general, the commercial MPU had lower CFs or more similar to the literature than the hospital MPU.

Discussion

It was observed that, among the 20 foods analyzed, ten did not statistically differ, demonstrating a statistical adequacy of these factors. However, it is known that in Brazil hunger still is one of the main problems to be combated and that the waste of food is very present in the lives of Brazilians, causing losses of approximately 1.4% of the national internal gross product (IGB), such that the loss of vegetables alone is around 35 to 45%.[5,10] This way, the importance of the constant control of procedures carried out in food units is reaffirmed, ranging from the choice of suppliers and their raw materials to the capabilities of their personnel, seen that inefficient control can culminate in the reduction of profit and point out inefficiencies in their process.[11]

The value of CF found in hospital MPU for beet, kale, mango, and yucca are high above other works. The CF of okra was higher in the commercial MPU and statistically significant, when compared to that confirmed in the literature. Such values may have been determined by the precarious quality of the raw-materials, for losses suffered in storage and mainly in the process of choosing and peeling the same, on the part of the staff.[2,5,7] For the mint, in which the commercial restaurant obtained a CF less than in the literature, this fact can be justified, for in the commercial MPU the stalk of this vegetable was considered eatable, being used in juices, which did not happen in the hospital MPU.

Brazil has a program today called "Brazil Kitchen",[12] an initiative of the Social Service of Industry (SESI) (Serviço Social da Indústria) and of the Ministry of Social Development and the Federal Government's Combat of Hunger (Ministério do Desenvolvimento Social e Combate à Fome do Governo Federal), with support from the Federations of Industries (Federações das Indústrias) and the Regional Departments of SESIs throughout the country. The target is to empower people to use all parts of food, and avoid waste. A modification in the conception of what is eatable may affect in the social impact of the MPU in society, in addition to increasing a companies profit.[8,12] Currently, it is hoped that the professional responsible for menu planning uses forethought in terms of the process of reuse. Lemos et al.[5] suggest recipes with the use of stalks of watercress and/or kale for the production of flour or juices, gathering nutritional value in preparation and preventing losses from transforming themselves into costs for the processing unit.

In the present study, low coefficients of variation were found among the measures of CF of produce in the commercial MPU and greater variation in the hospital UAN(?) when compared to the literature. A possible raw materials standardization process and more efficient cuts present in the first unit, is credited for such a result. Therefore, all of the individuals that are part of the chain of vegetable processing must be sensitized in relation to the adoption of efficient production methods. It is about an individual process within each company, very influenced by the unit manager.

Moreover, give attention to the existence of processes of evaluation and measurement of the occurred losses, as well as techniques that permit one to diagnose, evaluate, and define the relevance of the process; the direct and indirect losses should be developed in a particular way in each unit, as well.[5,8]

Conclusion

From the given results, it is possible to conclude that the majority of evaluated food presents waste higher to that determined by the literature as acceptable. And knowing that waste is one of the serious problems faced daily in an MPU, it is necessary that the nutritionist be aware of the diverse factors that permeate in the occurrence of these losses.

For this, the investment in personnel training, calibration of equipment, exchange of tools, and right choice of suppliers, is deemed necessary.

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