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Effect of the campaign against food waste in a food and nutrition unit in Juína-MT

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Abstract

Background: According to the Food and Agriculture Organization of the United Nations, 1.3 billion tons of food are wasted annually, this volume represents 30% of all food produced annually in the whole world. Food and nutrition units are spaces dedicated to the elaboration and distribution of healthy meals. Inappropriate food service, food rejection or other factors can lead to waste. In order to evaluate the waste and quality of service of the food and nutrition units, it is possible to use numerous tools, one of them is the rest-ingestion index, which is the ratio between the rest returned in the trays by the costumer and the quantity of food and food preparations offered, expressed as a percentage. Objective: The present work intends to verify the occurrence of wastage in the form of rest-ingestion index, in the food and nutrition unit of the Federal Institute of Mato Grosso, and to evaluate the influence of an awareness campaign against food waste. Results: There was no statistical difference in per capita consumption, per capita rest ingestion and percentage of rest ingestion before and after the campaign against food waste. However, a reduction in per capita rest ingestion (12.1%) and percentage of rest ingestion (15.6%) after the campaign can be observed. Conclusion: It is concluded that the campaign to raise awareness of food waste has produced positive results for Federal Institute of Mato Grosso, Campus Juína, as there was a reduction in the amount of food wasted in the cafeteria, although it was not a statistically significant reduction. In this way, the need to carry out campaigns with a greater frequency is verified, as well as to implement other ways of working on the subject of food waste with the students, in order to obtain more satisfactory results. For this, it is also necessary that every school community is involved in making students aware of all the losses that food waste brings.

words: allelochemical compounds; vegetable extracts; silvopastoral; pinus; brachiaria.

INTRODUCTION

The Brazil is considered one of the ten countries that most wasted food in the world. About 30% of the production is practically thrown away in the post-harvest phase (Carvalho, 2009).The waste is incorporated into the Brazilian culture and the production system, causing irrecoverable losses in the economy, contributing to the imbalance of supply, reducing the availability of resources for the population and impacting on their current food insecurity situation (Negreiros et al., 2009).

According to the Food and Agriculture Organization of the United Nations (FAO, 2017), 1.3 billion tons of food are wasted annually, this volume represents 30% of all food produced annually in the whole world. Food and Nutrition Units (FNUs) are also responsible for a portion of this food waste, since when the customer serves a portion and does not consume all that food, it contributes to the increase of that number (Silvério and Otramari, 2014; Abreu et al., 2003).

This food waste, known as rest-ingestion index, is the ratio between the rest returned in the trays by the costumer and the amount of food and food preparation offered, expressed as a percentage. Rates below 10% are acceptable as a percentage of rest ingestion (Teixeira et al., 2000). There are services that achieve rates lower than those recommended in the literature, ranging from 4% to 7%. When the result is greater than 10% in healthy groups and 20% in diseased groups, it is assumed that the menus are inadequate because they are poorly planned or poorly performed (Castro et al., 2003).

According to Abreu et al. (2003), the restaurant should measure food leftovers over time and establish a proper parameter for the unit. Thus, it is clear the importance of FNUs to implement a control of rest ingestion in order to evaluate the portion size in the distribution and acceptance of the menu (Ricarte et al., 2008; Maistro, 2000). In addition, this is an instrument for controlling costs and quality indicator in the service provided, contributing to the improvement of the entire production process and acceptance of the menu offered (Amorim et al., 2005). Studies show that restaurants that use the type of self-service, that is, those where there is no restriction of the quantities served by costumers, tend to a greater waste of food (Amorim et al., 2005; Silva, 2008). The loss by rest ingestion is very considerable within of a FNU and its occurrence is explained by the lack of a greater commitment of the costumer relative to the value of the served food, that is despised by him. By virtue of a series of cultural economic factors, the human being tends to waste everything that does not add financial value (Ribeiro, 2002).

Due to the importance of food waste in Brazil and considering the contribution of FNUs to the problem, the present work intends to verify the occurrence of wastage in the form of rest ingestion, in the FNU of the Federal Institute of Mato Grosso (FIMT), and to evaluate the influence of an awareness campaign against food waste on some variables, such as: per capita consumption, rest ingestion total, rest ingestion per capita, percentage of rest ingestion and number of people that could be fed with the rest accumulated.

MATERIAL AND METHODS

This research was developed at the FNU of the FIMT- Campus Juína, which has a medium level menu consisting of rice, beans, two garnishes, a protein option, three types of salad, dessert and juice. Meals are served in distribution desks with the use of flat trays and plates, the partial self-service system is adopted, with a portioning of the protein option and the dessert.

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Data collection of the rest ingestion was performed during 15 working days during the lunch period, which is the most active shift and was divided into two stages: before the awareness campaign and after the awareness campaign with the costumers.
During the data collection, the number of meals distributed, the amount of food produced, the amount of food not distributed, the amount of food distributed, the per capita consumption, the rest ingestion total, the rest ingestion per capita and the rest percentage were quantified.

To obtain the weight of the distributed meal, an electronic scale with a capacity of 100 kg was used. All the prepared foods that were for distribution were weighed, discounting the weight of the containers. The weight of the rest was obtained by weighing the waste container that was collected in the area of return of plates, trays and utensils, discounting the weight of the container.
All calculations were performed according to the formula recommended by Vaz (2006).
For the calculation of the amount of food consumed, the following formula was used:
Distributed meal weight (Kg) = total produced - leftovers after serving meals. Disposable materials, bones and fruit peels were discarded in containers separate from food so as not to influence rest ingestion calculations. For the correct separation of the edible part, a person was guiding the costumers at the time of discarding the rejected foods. The following formula was used to calculate the rest-ingestion index:**% Rest ingestion =** remainder weight x 100 / distributed meal weight. In order to calculate the rest-ingestion per capita, the equation was used:**Per capita of the rest ingestion (Kg) =** weight of the rest / number of meals served And finally, by knowing the per capita consumption per meal, the number of people that could be fed with the rest accumulated during the period of data collection was calculated, using the equation:
People fed with the accumulated rest = accumulated rest / consumption per capita per meal.
Then, the awareness campaign was carried out through the establishment of educational banners in the refectory and in the courtyard of FIMT - Campus Juína. In this banner, there was information about the first collection of data and educational messages. In addition, results of the first collection and quantitative of people who could be fed with food that was wasted during the collection period were presented to the students. This information was passed on to students through classroom visits. After the awareness campaign the second data collection of the ingestion rest was carried out, using the same methodology adopted for the first collection. Subsequently, a descriptive analysis was carried out, verifying the measures of central tendency and variability, after which the normality test was performed. The consistency of the data was also based on the detection of outliers through the construction of the boxplot. Once the normality assumptions were taken, the analysis of variance of the variable of interest (percentage rest ingestion) was performed, having as a source of variation the before and after the campaign against food waste.

RESULTS AND DISCUSSION

Table 1 shows the minimum, average, median, maximum and quartile values of the distribution and the respective standard deviations and coefficients of variation of the rest ingestion before and after the campaign, where all data follow normal distribution by the Kolmogorv-Smirnov test. Although the rest ingestion presents a high amplitude, with 6.40 and 9.42 before and after the campaign, respectively, it has a low interquartile amplitude (4.01 and 3.3), and has a symmetrical distribution (Figure 1). From the third quartile, it is possible to infer that 75% of the data are below 11.98 before the campaign, whereas, after the execution of the campaign against waste, this value becomes 9.90. No discrepant values were observed in the data series (Figure 1), both before and after the campaign.

Table 1: Descriptive analysis of the rest ingestion before and after the campaign.

Treatments	Min	Q1	Average	Median	Q3	Max	Std. Dev.	CV%
Before the campaign	6.41	7.97	9.73	9.99	11.98	12.82	2.17	22.36
After the campaign	4.17	6.58	8.22	8.16	9.9	13.6	2.64	32.15

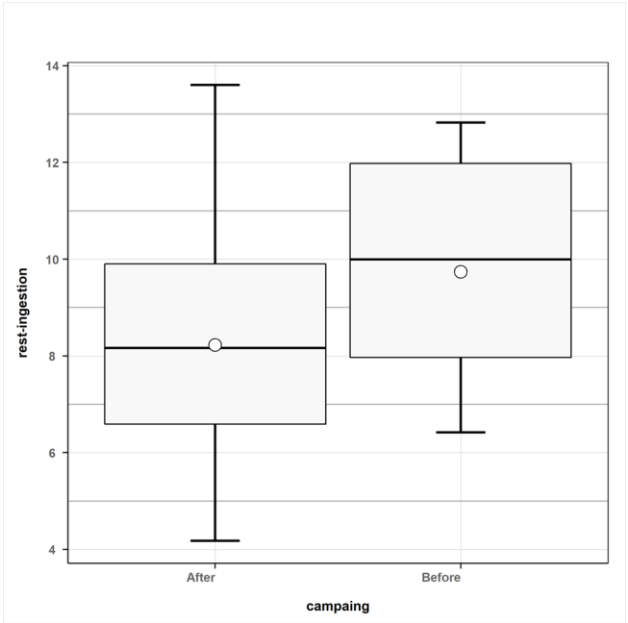

Fig. 1: Boxplot of the rest ingestion variable.

The results of Table 3 show that there was almost no difference between the average number of costumers before (300) and after (298) the awareness campaign, and thus, the FNU of FIMT Campus Juína maintains a pattern of number of costumers in the lunch period.

When analyzing the average amount of food produced and quantity distributed, we noticed that after the campaign there was an increase of 2.49% and 3.92%, respectively. On the other hand, there was a reduction of 8.18% in the average amount of clean and dirty leftovers and 10.72% in the mean of the total rest weight after the awareness campaign (Table 3).

The average percentage of the rest ingestion was 9.74% before the campaign and 8.22% after the campaign, that is, there was a 15.61% reduction after the awareness campaign (Table 3). According to Teixeira *et al*. (2000) and Castro *et al*. (2003), values below 10% are considered acceptable for healthy groups. Thus, the values were adequate at the two sampling moments when the index below 10% was considered acceptable, although they were close to the maximum limit. Mezomo (2002) points out that when a food service presents a percentage of rest ingestion higher than 10% in a healthy group and 20% in a sick group, it is assumed that the menus are inadequate due to poor planning and/or poor execution. Scotton *et al*. (2010) consider high the 10% index and suggest that the FNUs set lower values taking into account the specificities of the offered service and the type of client.

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In a study carried out at the Federal Institute of Piauí, which evaluated the rest ingestion produced during the lunch period, a percentage of 9.14% was found, a result close to that found in the FNU of FIMT Campus Juína before the campaign awareness. The authors of this study believe that, because FNUs users, for the most part, are adolescents and due to the financial resources coming from the federal government, may be the aggravating factor for the waste practiced in this unit (Moura *et al*., 2012). The target audience of the FNU of FIMT Campus Juína are high school students, meaning most of the unit clients are also teenagers. Therefore, there is a lack of awareness among adolescents about food waste in both studies, so this topic should be constantly addressed with this audience in order to reduce food waste in these institutions.

In a study carried out at the FNU of the Federal Institute of the North of Minas Gerais Campus Salinas, which verified the influence of the campaign against food waste, inadequacies were found in the percentage of rest ingestion before the campaign (10.67 %) and after the campaign (11%), considering as acceptable values lower than 10% (Bicalho and Lima, 2013). The results of this study show that the waste in the FNU surveyed was higher in relation to the FNU of FIMT Campus Juína. The partial self-service distribution system adopted by FNU of FIMT Campus Juína may have contributed to the least waste. According to Kinasz and Werle (2004), it is expected that the self-service system will result in less food waste, since the diner may choose to use the food options in quantities he deems necessary.

Based on the analysis of variance performed for the rest ingestion variable (Table 2) considering two treatments (before and after the campaign), in order to evaluate the effect of the campaign on the reduction of waste, from the comparison between the variances of treatments, it was verified that there was no significant difference between the treatments by the Fischer test. It is important to emphasize that despite the non-significant analysis generated by the test performed, it does not represent that the campaign did not generate effects, a proof of this is the reduction of the third quartile after the campaign around 20%, demonstrating that 75% of the clients reduced the waste.

Table 2: Analysis of variance for the rest ingestion before and after the campaign.

SV	df	SS	MS	F	P
Treatments	1	17.20	17.20	2.93	0.09
Residues	28	164.23	5.86		

In the FNU of the FIMT Campus Juína, a 12.10% reduction was observed (Table 3) in the per capita mean value of the rest ingestion after the awareness campaign. In a small FNU study, more satisfactory results were obtained, the mean per capita of the rest ingestion decreased by 58.81% during the campaign when compared to the days before the campaign (Falci *et al*., 2007).

The mean per capita consumption was 4.37% higher after the awareness campaign (Table 3). Bicalho and Lima (2013), found different results of this study, since they observed that after the awareness campaign against food waste there was a significant reduction ($p < 5\%$) in per capita consumption (from 618.81 g to 444.98 g food). The food distribution system may have influenced the achievement of different results, since in the FNU evaluated by Bicalho and Lima (2013), the clients were served by employees, on the other hand in the FIMT Campus Juína clients could serve the food options as much as they wanted and only the protein dish and the dessert were portioned. In Table 3, we can observe that the mean of the rest ingestion per capita reduced (from 52.56 g to 46.20 g) after the awareness campaign, that is, a reduction of 6.36 g. In a study carried out in a large FNU of the city of Anápolis - GO, a reduction of 5.6 g (from 60.9 g to 55.3 g) in the rest ingestion per capita was obtained after an educational intervention with the clients (Machado *et al*., 2014). Thus, it is evident that the intervention carried out in the FNU of FIMT Campus Juína brought better results when compared to the data obtained by Machado *et al*. (2014). However, the rest ingestion per capita of the FNU of FIMT Campus Juína was superior in both moments of the collection, the value defined by Vaz (2006), which is 15 g to 45 g. Moura *et al*. (2009) evaluated the rest ingestion in a FNU of the agricultural college of Guarapuava - PR, which distributes an average of 280 meals at lunch, and found an average of 58.44 g of rest ingestion per capita. The FNU of this study has a number of clients similar to that of the FNU of the FIMT Campus Juína (300 clients), however, when we evaluate the food waste considering the average per capita rest ingestion (Table 3), it is perceived that the waste in the FNU of FIMT Campus Juína is lower in relation to FNU of the agricultural college of Guarapuava - PR, even before the realization of the awareness campaign.

Table 3: Comparison of the variables collected before and after the awareness campaign.

Variables	Before the Campaign (n = 15)	After the campaign (n = 15)
Number of clients	300 ± 19.67	298 ± 18.07
Quantity produced (kg)	185.27 ± 9,28	189.90 ± 6.60
Clean and dirty leftovers (kg)	21.77 ± 2.16	19.99 ± 2.37
Amount distributed (Kg)	163.51 ± 8.53	169.92 ± 8.55
Weight of rest (kg)	15.77 ± 1.45	14.08 ± 1.81
Rest ingestion (%)	9.74 ± 0.76	8.22 ± 0.96
Per capita of rest ingestion (g)	52.56 ± 2,60	46.20 ± 4.35
Per capita consumption (g)	554.23 ± 37.84	578.46 ± 32.79
Number of people who could be fed with the accumulated rest	30 ± 3.65	25 ± 3.79

Data are expressed as mean ± standard error; n = number of days of collection.

When we evaluated the number of people that could be fed with the rest accumulated before and after the campaign, a total of 444 and 380 people were obtained, respectively (Figure 2). When we counted the total number of people who could feed on wasted food during the 30 days of collection (before and after the campaign), we obtained a total of 824 people. In a study carried out by Viana and Ferreira (2017), it was considered that the FNU waste is relevant, since with the rest of the food accumulated in five days of collection it would be possible to feed approximately 266 people.

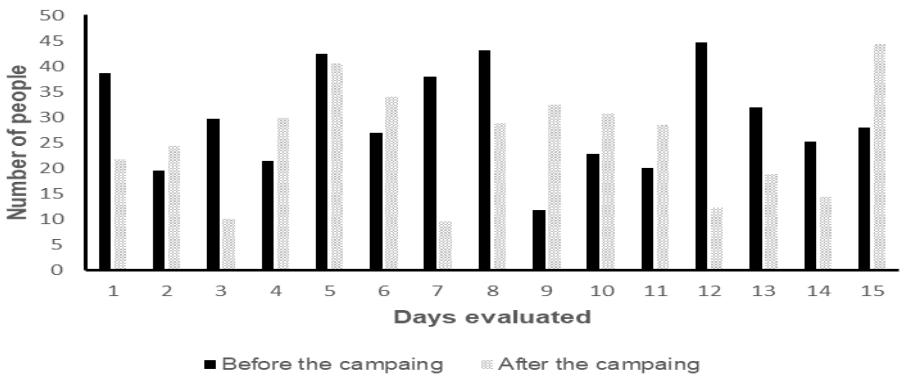

Fig. 2: Number of people who could be fed before and after the campaign.

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However, after the campaign the average number of people that could be fed with the accumulated rest ingestion reduced from 30 to 25 (16.67%) (Table 3), when we analyzed the total number of people (824) who could to be fed during the 30 days of collection (before and after the campaign), we realized that these foods would be enough to supply around three lunch days at the FNU of the FIMT Campus Juína, since the unit distributes an average of 300 during this period.

Therefore, through the results obtained in this study, it is noticed that there was a behavioral change on the part of the clients after the campaign of awareness against the waste. However, the ideal would be no waste at all by clients, since any situation of food waste is unacceptable, since in Brazil there are numerous families that do not have access to adequate food (Viana and Ferreira, 2017). According to Abreu *et al.* (2003), when food is well prepared, the rest should be very close to zero, since in restaurants where meals are paid by weight there are no leftovers. According to Gazzinelli *et al*. (2001), education is an essential tool to stimulate the creation of a new culture of garbage, however, it is necessary that each one reflects on the production of garbage at home and the waste that is so common in the our culture.

Conclusion:

It is concluded that the campaign to raise awareness of food waste has produced positive results for FIMT Campus Juína, as there was a reduction in the amount of food wasted in the cafeteria, although it was not a statistically significant reduction.

In this way, the need to carry out campaigns with a greater frequency is verified, as well as to implement other ways of working on the subject of food waste with the students, in order to obtain more satisfactory results. For this, it is also necessary that every school community is involved in making students aware of all the losses that food waste brings.

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