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The significance of fresh fruit and vegetables in the daily diet of Warsaw universities students

Introduction

Vegetables and fruit, due to their great health benefits, make one of the basic elements of the proper human diet. They are rich source of vitamins, minerals, fibre as well as a wide range of antioxidants neutralizing free radicals activity. At the same time they are low in fat and calories, while vegetables in sugars [Wawrzyniak et al. 2011, Torba 2013, Gronowska-Senger 2015]. Regular consumption of fruit and vegetables lowers the risk of stroke, heart disease, type II diabetes or developing certain cancers. It boosts the immune system, improves bowel function, reduces the risk of overweight and obesity [Ostrowska et al. 2003, Kazimierczak 2004]. This positive effect of fruit and vegetables for human health is reflected in increasing their role in the dietary recommendations. According to experts, one should consume between 2 and 5 portions of fruit and between 2 to 8 servings of vegetables per day [Ołędzki 2012, Perzyńska 2014] in total, not less than 400 grams [*Konsumpcja...* 2012]. The immense role of fruit and vegetables is shown very clearly in the US Department of Agriculture dietary recommendations. In 2011 they replaced the so far My Pyramid with My Plate, 30% of which is composed of vegetables and 20% of fruit [Całyniuk et al. 2011, *The Food Guide...* 2014, My Plate 2014]. In the Polish recommendations the role of fruit and vegetables was also reinforced by moving them onto the first place in the pyramid [Piramida zdrowego żywienia...]. Poland in terms of the consumption of vegetables is unfortunately on the EU-average level, and as regards the fruit intake, it is almost at the end [Filipiak 2014, Zmarlicki et al. 2014]. Inadequate fruit and vegetable consumption among young people was shown by, among others, Czapska et al. [2000], Sznajder et al. [2005], Wyka and Żechałko-Czajkowska [2006], Gronowska-Senger [2007], Czaja et al. [2009], Bugaj et al.

[2013], Walentukiewicz et al. [2013a, b]. Therefore, the change of eating habits is necessary today, and dissemination of knowledge about health benefits of fruit and vegetables should make the way, as several studies have shown that knowledge determines their consumption [Cooke et al. 2004, Szczeńska et al. 2005, Ashfield 2006, Malara et al. 2006, Kwiatkowska 2010, Myszkowska-Rysiak et al. 2011, Seń et al. 2012]. The aim of this research was to examine the level of awareness of Warsaw universities students of this immense role of fruit and vegetables in the human diet and to examine the influence of knowledge obtained during their studies on this awareness as well as real consumption.

Materials and methods

The study examined the students' assessment of fruit and vegetables importance in their daily diet, frequency and intake capacity as well as the reasons for consuming these products and the importance of selected health benefits, which illustrate the awareness of students regarding fruit and vegetables value for human beings. These phenomena were investigated for the entire surveyed population, and in relation to the field and stage of the studies as well as gender.

The base for the analysis was delivered by the results of a survey conducted on a sample of 200 students of Warsaw universities, whose selection was intentionally random. The study involved students of the Warsaw University of Life Sciences – SGGW, who study horticulture and courses related to nutrition and dietetics (hereinafter referred to as "horticulture" and "nutrition"), suggesting their greater awareness of values and importance of fruit and vegetables in the diet. There were also students of other fields, recruited from Warsaw University of Technology, Warsaw School of Economics, Cardinal Stefan Wyszyński University in Warsaw. The students of "horticulture" and "nutrition" accounted for 25 and 25% respectively and those of other courses made 50% of all the respondents. The research included students of senior years – the final year of BA (I^o) and the first and second year of MA degree programme (II^o). Among them 66% were women and 34% men.

The analysis was made in percentages with grading of phenomena on a 1 to 5 scale, where 1 indicates "least important" and 5 "most important". Considering the scalable questions used in the questionnaire and non-equipotence of respondent groups, the non-parametric U-Mann-Whitney test (analysis on gender and level of study two grouping variables) and ANOVA Kruskal-Wallis test (analysis of the study field three grouping variables) have been used in the statistical analysis. The analysis assumed significance level of $p < 0.05$. The consumption of fruit and of vegetables was separately questioned, but when the analysis showed no difference between the two groups, the results were presented together.

Results

The role of fruit and vegetables in students' diet

The research shows that fruit and vegetables are, according to students' opinion, important in their everyday diet, and the importance of both of these product groups is virtually the same – 30.5 and 33.1% of respondents recognized fruit as very important and important, while vegetables 33.5 and 28.2% respectively (Table 1). Both groups of products were rated 3.83 on a 1 to 5 scale. Women find these products more significant than men and this is a statistically significant difference. As 39% of them considered these as very important and only 0.4% considered invalid, while in the case of men it was 16 and 2.2%.

Statistically significant differences were also noted between students of different fields and levels of studies. The students of "nutrition" give the greatest importance to the consumption of fruit and vegetables. These products are con-

Table 1

Fruit and vegetables significance in the diet of the surveyed students [percentage of answers]

Specification	Fruit and vegetables importance					
	very important	important	quite important	of little importance	not important	average rating
The sample group in total						
Fruit	30.5	33.1	26.9	8.5	1.0	3.8
Vegetables	33.5	28.2	26.8	10.5	1.0	3.8
According to gender – fruit and vegetables						
Women	39.0	25.9	26.6	8.1	0.4	3.9
Men	16.0	40.0	28.3	13.5	2.2	3.5
According to the course of the study						
Fruit						
Horticulture	18.3	43.7	28.0	10.0	–	3.7
Nutrition	45.9	34.0	20.1	–	–	4.3
Others	29.0	27.2	29.8	12.0	2.0	3.8
Vegetables						
Horticulture	18.3	43.7	26.0	12.0	–	3.7
Nutrition	57.7	16.3	20.1	5.9	–	4.3
Others	29.0	26.2	29.9	12.9	2.0	3.7
According to the stage of the study – fruit and vegetables						
I° level	22.3	27.0	32.7	18.0	–	3.5
II° level	36.1	31.9	24.3	6.3	1.4	4.6

Source: The own study.

sidered very important and important by respectively 79.9 and 74% of them. Hence the average rating in both cases reached a value of 4.26. For students of “horticulture” and “other courses” this assessment attains 3.7–3.8, yet a smaller percentage of these first ones than the latter, considers fruit and vegetables as very important (18.3 and 29%), and the bigger one as important (43.7 and 27.2%). Thus the hypothesis of greater awareness of beneficial role of fruit and vegetables in the case of “nutrition” students was confirmed, while it was not so in reference to the students of “horticulture”.

Regardless of the study field, the position of both groups of products was clearly increasing along with the years of the study programme. In the I^o, the average rating of the products importance equalled 3.5, while in II^o reached 4.6 with the share increasing from 22.3 to 36.1% of those recognizing them as very important and from 27 to 31.9 identifying as important. This difference was statistically significant. In the total sample group, there was not a single person who did not consume fruit or vegetables at least once a month.

The frequency and level of consumption

Considering the frequency of fresh fruit and vegetables consumption, it has been found that fruit are eaten slightly more often than vegetables, and the difference is statistically significant (*p*-value 0.132811). The first ones are mostly consumed once a day (36.8% of students), while vegetables 2–3 times a week (32.6%) – Table 2. The intake of 2–3 times a day in both cases was declared by 24.6% of the respondents. Yet, while the frequency of consumption of fruit is similar among men and women, vegetables are more likely to be consumed by women and this is a statistically significant difference. As many as 30.8% of them eat vegetables 2–3 times a day, while in the case of male students the percentage was only 9.1%. On the other hand, 23.9% of men consume vegetables only once a week, which in female group refers to 8.1%.

The frequency of fruit and vegetables intake varies according to the study field (Table 2), and the difference is statistically significant. It is most common among those who study human nutrition-related fields. Here, 30.1% and 51.7% of the respondents consume fruit and vegetables 2–3 times a day, and 45.9 and 15.8% once a day. Students of “horticulture” are less likely to eat these products. Fruit are taken 2–3 times a day by 26.3% of these respondents, and 27.7% of them eat fruit once a day, whereas vegetables 10.1 and 24% respectively. Most students of “horticulture” eat fruit and vegetables 2–3 times a week or less frequently. In the group of “other fields” students, the frequency of vegetables consumption is slightly higher than among “gardeners”, and of fruit intake – slightly

lower (very often and often 15.3 and 28.1%, and 19 and 37.1% respectively). Thus, one could ascertain that the picture of frequency of these products intake among students of "horticulture" and "other fields" is quite similar, but different to the picture of consumption frequency among students of "nutrition". However, there was no statistically significant difference ascertained in the frequency depending on the study level.

Table 2

Frequency of fresh fruit and vegetables consumption [%]

Specification	The frequency of consumption [number of times]																
	2–3		1		2–3		1		1–2								
	per day		per week		per month		per day		per week								
	% of the population concerned																
fresh fruit																	
Totally	24.2	36.8	25.1	10.9	6.0		24.2	24.2	32.6	13.1	5.9						
According to gender																	
Women	23.3	36.8	27.9	9.7	2.3	30.8	24.1	30.8	8.1	6.2							
Men	23.9	37.3	17.5	12.3	9.0	9.1	23.9	37.3	23.9	5.8							
According to the course of the study																	
Horticulture	26.3	27.7	34.4	9.6	2.0	10.1	24.5	43.8	12.0	9.6							
Nutrition	30.1	45.9	22.0	2.0	—	51.7	15.8	28.2	4.3	—							
Others	19.0	37.1	21.2	14.9	7.8	15.3	28.1	30.0	18.3	8.3							
According to the stage of the study																	
I° level	18.0	37.5	26.7	13.8	4.0	23.1	25.0	37.5	7.2	7.2							
II° level	25.7	36.8	23.6	9.0	4.9	23.6	23.6	31.3	15.3	6.2							

Source: The own study.

According to the survey, there is no reason why the students eat fruit or vegetables so rarely. Motives such as lack of time for shopping, high price of the products, large distance to the shop or lack of time for these products consumption, are of little importance for the majority of the respondents. The first two were mentioned as main reasons by approximately 10% of the respondents, and the two last by about 3%, while very little importance was indicated by approximately 48 and 55% of them. Low consumption of fruit and vegetables does not come from the fact that these products are disliked by students. Less than 4% of students gave it as a very important reason, and about 5% claimed this to be the important reason.

Fruit and vegetable consumption in the investigated population is at a similar level and there was no statistically significant difference between the two groups

of products (*p*-value 0.880138). Most students consume fruit and vegetables in quantities of 0.5–1 kg per week – 36.5 and 39.1% of the respondents respectively (Table 3). As many as 28 and 25.6% of respondents have 1.1–2 kg of these a week. Both fruit and vegetables are consumed in bigger quantities by women than by men, despite the difference not being statistically significant. Over 1 kg of fruit is consumed by 47% of female students and by 41% of male students, while exceeding 1 kg of vegetables is eaten by 48.8 and 34.3% respectively.

Table 3

Fresh fruit and vegetables intake during the week

Specification	Intake [kg]							
	<0.5	0.5–1	1.1–2	>2	<0.5	0.5–1	1.1–2	>2
	% the population concerned							
		fruit				vegetables		
Totally	18.5	36.5	28.0	17.0	17.2	39.1	25.6	18.1
According to gender								
Women	17.0	36.0	31.2	15.8	14.3	36.9	32.0	16.8
Men	20.8	38.2	22.1	18.9	23.5	42.2	15.2	19.1
According to the course of the study								
Horticulture	18.1	32.1	31.5	18.3	19.9	46.2	19.6	14.3
Nutrition	9.8	42.3	29.6	18.3	1.1	31.1	37.8	30.0
Others	22.2	33.3	30.4	14.1	22.4	39.2	24.3	14.1
According to the year of the study								
I° level	27.2	30.5	16.8	25.5	25.0	30.3	18.2	26.5
II° level	14.6	31.9	38.9	14.6	13.9	38.2	31.3	16.6

Source: The own study.

In the case of fruit consumption, a difference in weekly intake between students of various university courses is not statistically significant as well, though the relatively biggest consumption is recorded among students of “horticulture” (49.8% take more than 1 kg), slightly less – the “nutrition” students (47.9%) and the least group these are students of other fields (44.5%). Nevertheless, in the case of vegetables there is a clear predominance of “nutrition” students, and the difference between study fields is statistically significant. More than 1 kg of vegetables per week is eaten by up to 67.8% of this group of the respondents, while only 33.9% of “horticulture” students and 38.4% of other courses students. There is no statistically significant difference in the volume of both the intake of vegetables and fruit between students of I° and II° levels. The percentage of people consuming either more than 2 or 0.5 kg a week, was larger in the I° study level groups than in the II° one in both cases.

Reasons for consuming

Students eat fruit mainly because they like them. This reason has been rated 4.4 on a scale of 1–5 (Table 4). It's a bit more important for female students (rated 4.5) than male students (rated 4.3) and for students of the I° level (rated 4.5) than of the II° one (rated 4.4), although in both cases the differences were not statistically significant. Whereas, statistically significant differences were found between students of different fields. The reason "I like fruit" is most important for students of "horticulture" (rated 4.6), and then students of other courses (rated 4.4), while it is the least important for students of "nutrition" (rated 2.4). For students of human nutrition-related courses the most important reason for fruit consumption are health benefits of fruit, assessed at 4.4. These values are also appreciated by other faculties' students, but were ranked on the second place with the rating of 3.9. At the same time the value of health benefits are more important for women (4.1) than men (3.8). Both in the case of gender and the study field, the differences in the ratings are therefore statistically significant. In the whole sample group health benefits of fruit earned rating of 4.0. These values, however, are the main reason for eating vegetables, with the score of 4.1, yet

Table 4

The validity of the reasons of fruit and vegetables consumption (in a scale of 1 to 5)

Specification	Total	Gender		Study course			The study level	
		women	men	horticulture	nutrition	others	I°	II°
Fruit								
I like it	4.4	4.5	4.3	4.6	2.4	4.4	4.5	4.4
Health benefits	4.0	4.1	3.8	3.9	4.4	3.9	4.0	4.0
Nutritional benefits	3.3	3.4	2.9	3.1	3.6	3.2	3.3	3.3
Meals variety	3.2	2.5	3.1	2.9	3.4	3.2	3.2	3.2
Watching waistline	2.7	2.8	2.4	2.1	2.9	2.9	2.9	2.6
Routinely	2.5	2.5	2.5	2.5	2.7	2.4	2.6	2.5
Vegetables								
I like it	4.0	4.2	3.6	3.9	3.8	4.1	4.1	4.0
Health benefits	4.1	4.3	3.7	4.0	4.5	3.7	4.0	4.1
Nutritional benefits	3.3	3.6	2.9	3.1	3.8	3.2	3.2	3.5
Meals variety	3.4	3.5	3.3	3.4	3.5	3.4	3.6	3.4
Watching waistline	2.8	3.0	2.3	2.2	3.0	2.9	2.9	2.7
Routinely	2.5	2.6	2.5	2.4	2.8	2.5	2.6	2.6

Source: The own study.

this assessment was higher among women (4.3) than in men (3.7), and it was the statistically significant difference. The difference between students of different fields of the study was statistically significant as well. Health benefits of vegetables are most appreciated by students of "nutrition", as proved by the rating of 4.5. Rating reached 4.0 in the group of students of "horticulture", and among students of other courses it got only 3.7. The latter often eat vegetables, because they just like them (rated at 4.1), but in the assessment of this reason there were no statistically significant differences between the study fields. This is the second reason in terms of the importance for the consumption of vegetables.

Fruit and vegetables nutritional values (rated at 3.3) are a less important reason for their consumption, which are clearly better valued by women than men, and this difference is statistically significant. They are of utmost importance for students of "nutrition" – rating at 3.6 for fruit and vegetables at 3.8, with the rating of 3.2 in the opinion of students in the group of "other study field", and 3.1 in the group of students of "horticulture". However, while the difference in the importance of vegetable nutritional values for students of each field is statistically significant, in the case of fruit this difference is statistically insignificant. The least important reasons for eating fruit and vegetables are keeping fit (fruit rated with 2.7 and 2.8 for vegetables) as well as being accustomed (rating of 2.5 in both cases). "Keeping fit" is more important for women (2.8) than men (2.4) as well as for the students of "nutrition" rather than "other study fields" (2.8) and "horticulture" (2.1). In both cases, the differences were statistically significant. There were no differences statistically significant in assessing the reasons for fruit and vegetables intake in relation to the degree of the study.

The assessment of fruit and vegetables health benefits

According to the surveyed students, the most important fruit and vegetables health benefit is vitamin content. This value attained 4.5 in 1–5 rating in both cases (Table 5). Fibre content was placed as second most important reason in this respect with an average rating of 3.7, both in reference to fruit and vegetables. The above mentioned values are appreciated more by women than men, and by the students of "nutrition". And the difference in the assessment of their importance in relation to gender is statistically significant, both in reference to fruit and vegetables. As regards the study field, however, the statistically significant difference was recorded in the case of the assessment of vitamin content in fruit as well as fibre content in vegetables (Table 6).

In the case of fruit, 3.7 rating was given to the answer "Antioxidant content", where both the students of "nutrition" and "horticulture" recognized this value as more important than the content of dietary fibre (3.7 and 4.0 ratings).

Table 5

Fruit and vegetable health benefits assessment (in a scale of 1 to 5)

Specification	Total	Gender		Study course			The study level	
		women	men	horti-culture	nutri-tion	others	I°	II°
Fruit								
Vitamin content	4.5	4.6	4.3	4.5	4.8	4.4	4.5	4.6
Antioxidant content	3.7	3.7	3.6	3.7	4.0	3.5	3.5	3.8
Fiber content	3.7	3.9	3.3	3.5	3.9	3.7	3.9	3.9
Mineral salts content	3.3	3.3	3.2	3.2	3.6	3.1	3.2	3.3
Little sugar content	2.8	2.9	2.5	2.9	2.8	2.8	3.3	2.7
Vegetables								
Vitamin content	4.5	4.6	4.3	4.5	4.6	4.5	4.5	4.5
Antioxidant content	3.5	3.6	3.3	3.4	3.8	3.4	3.5	3.6
Fiber content	3.7	3.8	3.4	3.4	4.2	3.7	3.7	3.7
Mineral salts content	3.4	3.4	3.3	3.3	3.7	3.3	3.3	3.5
Little sugar content	3.3	3.5	2.9	3.3	3.4	3.2	3.4	3.2

Source: The own study.

Table 6

Fruit and vegetable health benefits assessment (in a scale of 1 to 5)

Specification	Gender		Study course		The study level	
	Z	p-value	H	p-value	Z	p-value
1	2	3	4	5	6	7
Significance in the diet						
Total	2.51143	0.01777*	11.74530	0.00282*	2.82654	0.00449*
Frequency of consumption						
Fruit	0.37367	0.70953	8.20259	0.01655*	1.17981	0.23878
Vegetable	3.59978	0.00028*	24.59873	0.00001*	0.39962	0.69045
Consumption						
Fruit	1.08117	0.28034	1.31778	0.51743	0.87011	0.38523
Vegetable	1.74720	0.08059	18.25285	0.00011*	0.36590	0.71542
Reasons for fruit consumption**						
A	1.72304	0.08488	7.68757	0.02141*	7.68757	0.02141*
B	2.04447	0.04091*	8.12723	0.01172*	8.12724	0.01172*
C	2.13275	0.03271*	3.28188	0.19380	3.28188	0.19380

Table 6 cont.

1	2	3	4	5	6	7
D	0.09570	0.92414	3.01312	0.02217*	3.01312	0.02217*
E	2.31069	0.02052*	13.51088	0.00117*	13.51089	0.00117*
F	0.06272	0.95025	1.623273	0.444131	1.62327	0.44413
Reasons for vegetables consumption**						
A	3.12679	0.00166*	2.90926	0.23349	0.81631	0.41535
B	3.28796	0.00093*	104.89071	0.00000*	0.66122	0.50952
C	3.28776	0.00100*	9.14653	0.01032*	1.15012	0.25085
D	1.12403	0.26168	0.58312	0.74710	1.47138	0.14151
E	3.12679	0.00106*	9.24785	0.00981*	1.00949	0.31365
F	0.24766	0.80514	4.13652	0.12641	0.54308	0.58816
Fruit health benefits***						
O	2.10433	0.03510*	9.04479	0.01086*	0.64583	0.51930
P	0.23351	0.81607	2.10308	0.34940	1.43164	0.15262
R	3.05903	0.00210*	1.60686	0.44779	1.73217	0.08325
S	0.90638	0.36560	5.18152	0.07496	0.33804	0.73629
T	1.66842	0.09530	0.18288	0.91262	3.08980	0.00187*
Vegetable health benefits***						
O	3.06718	0.02035*	1.56786	0.45661	1.05740	0.29105
P	1.28414	0.19960	2.14385	0.34235	0.15608	0.87658
R	2.68076	0.07127*	11.22002	0.00366*	0.26675	0.79049
S	0.03862	0.96936	2.01149	0.36577	0.71840	0.47360
T	2.59582	0.00920*	0.52214	0.77055	1.30058	0.19218

*The marked differences are statistically significant at $p < 0.05$, **Reasons for consumption: A – I like it, B – health benefits, C – nutritional benefits, D – meals variety, E – watching waistline, F – routinely; ***Health benefits: O – vitamin content, P – antioxidant content, R – fibre content, S – mineral salts content, T – little sugar content.

Source: The own study.

In respect to vegetables, “Antioxidant content” was estimated to 3.5. In both cases, that value was found most important for women, “nutrition” students and the II^o level students, although the differences between the gender, the field and degree of studies were not statistically significant. Women, “nutrition” students and those of the II^o course give more caution to the high content of minerals and low of sugar than other student, but the difference between women and men in the assessment of low sugar content as the vegetables pro-health value, was the only one statistically significant. Nevertheless, all the respondents pointed at the advantages of vegetables over fruit in this respect.

Conclusions

The research shows that fruit and vegetables are given a lot of attention in the students' daily diet. They are recognised as very important and important by 63.1 and 61.7% of the respondents respectively. The rating evaluation differed significantly in respect to the gender, the field and the level of the studies. The importance of both groups was assessed higher by women, students of nutrition-related fields and of the II^o level. However, only 24.2% of the respondents declared the actual consumption of 2–3 times a day, which is not satisfactory in the light of the recommendations. Both groups of products were most frequently consumed by students of nutrition, and the difference between the study fields was statistically significant. In the case of the vegetables consumption frequency there was also the statistically significant difference between men and women – women consume them much more often. Given the volume of consumption, no significant differences depending on gender, field and stage of the studies were found. The exception is the amount of consumed vegetables, which differed significantly according to the field of the studies. Vegetables are mostly consumed by students of nutrition.

Simultaneously, this group recognised health benefits as major cause for fruit and vegetables consumption, while for the others the most important was the fact they liked them, which at the same time made the least important reason for "nutrition" students. These differences are statistically significant. Regardless of the field of the study, fruit and vegetables vitamin content has been considered the most important health benefit, to be followed by antioxidants and fibre content, to end the list with the minerals and little sugar content. All of these were given the highest notes by the "nutrition" students as well as female students at general. There were, however, no significant differences found in the level of and the reasons for consumption as well as in the assessment of health benefits in relation to the study course stage.

Thus, the hypothesis of greater awareness of a positive role of fruit and vegetables in the human diet and a higher consumption among students of "nutrition", as the consequence of knowledge acquired during their tuition, has been confirmed. It hasn't been confirmed, however, for the "horticulture" students, which shows that too little attention is given to these issues in the curriculum, and which should be changed, as this knowledge could be used in their professional life to stimulate the demand for fruit and vegetables, contributing to the development of horticulture on one hand and on the other, to improve the state of health of the Polish society.

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Znaczenie świeżych owoców i warzyw w codziennej diecie studentów warszawskich uczelni

Abstrakt

Celem badań było poznanie poziomu świadomości studentów warszawskich uczelni znaczenia owoców i warzyw dla człowieka oraz wpływu na tę świadomość i realną konsumpcję wiedzy otrzymywanej w trakcie studiów. Analizo-

wano, jak studenci oceniają znaczenia owoców i warzyw w swojej codziennej diecie, częstotliwość i wielkość spożycia, powody konsumowania lub jego braku oraz znaczenie wybranych wartości prozdrowotnych. Z badań wynika, iż warzywa i owoce odgrywają ważną rolę w diecie studenta. Świeże owoce spożywane są najczęściej raz dziennie (36,8%), warzywa 2–3 razy w tygodniu (32,6%). Największa świadomość wartości prozdrowotnych owoców i warzyw oraz największa ich konsumpcja cechuje studentów kierunków związanych z żywieniem człowieka.

Słowa kluczowe: owoce, warzywa, spożycie, studenci