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CONSUMER ATTITUDES TOWARDS NOVEL TECHNOLOGIES IMPLEMENTED IN FOOD PRODUCTION ACROSS SELECTED REGIONS OF POLAND®

Postawy konsumentów wobec nowych technologii wykorzystywanych w produkcji żywności w wybranych regionach Polski®

The objective of the research was to determine the degree of and conditions for food technology neophobia among consumers in selected regions of Poland. The research was conducted in 2019 in Podkarpackie (150 people), Mazowieckie (161) and Zachodniopomorskie (149) voivodeships, using a survey method. The results obtained show a difference in the respondents' attitudes towards novel technologies depending on the region. The highest level of neophobia was observed among the residents of Podkarpackie voivodeship, with moderate levels displayed in Zachodniopomorskie voivodeship and the people of Mazowieckie voivodeship being the most accepting of novel food technologies. Different conditions for consumer attitudes towards novel food technologies have been observed in the analysed regions as well.

Key words: food technology neophobia, Polish consumers.

Celem przeprowadzonych badań było określenie poziomu i uwarunkowań food technology neophobia wśród konsumentów z wybranych regionów Polski. Badania przeprowadzono w roku 2019 na terenie województw Podkarpackiego (150 osób), Mazowieckiego (161) i Zachodniopomorskiego (149) metodą ankietową. Uzyskane w efekcie badań wyniki świadczą o zróżnicowaniu postaw respondentów w stosunku do nowych technologii produkcji żywności w zależności od regionu. Najbardziej neofobiczni okazali się być mieszkańcy województwa Podkarpackiego, umiarkowanie wysoki poziom food technology neophobia stwierdzono w grupie badanych z województwa Zachodniopomorskiego, a najwyższy poziom akceptacji dla nowych technologii wyrazili mieszkańcy województwa Mazowieckiego. W analizowanych regionach stwierdzono także odmienną uwarunkowaną postaw respondentów w odniesieniu do nowych technologii.

Słowa kluczowe: neofobia technologiczna, polscy konsumenci.

INTRODUCTION

Novel technologies used in food production spark different reactions from consumers [2, 13]. Consumer attitudes towards products manufactured with novel technologies can be illustrated with two extremes. The first one is approval of novel products, while the other consists in denial of the new and exhibiting preference for conventional products [6, 11]. A majority of consumers lack sufficient knowledge regarding the technologies used in food production, which in turn significantly hinders the acceptance of said technologies [3, 10]. A positive consumer attitude towards novel technologies depends on the perceived risks and benefits attached to it [1]. Some technologies, such as genetic engineering, cause consumer backlash due to being perceived as a source of unknown and dangerous risk [12], which corresponds in a negative manner to the approval and willingness to consume the product [15].

Food Neophobia Scale (FNS) was used to assess consumer attitudes towards novel food products [9, 14]. However, it is not designed to measure the degree of approval for novel food production technologies [7]. That is why, under the Food Futures National Research Flagship Project, Cox and Evans [5] have developed the Food Technology Neophobia Scale (FTNS) - a psychometric tool for measuring the level of technology neophobia. The final 13 item scale was developed from studies on almost one thousand Australian consumers. It was later tested [10] and found to be stable over time. The scale comprises 13 items with which participants are asked to agree or disagree using a seven-point bi-polar scale anchored 'totally disagree' to 'totally agree', with a labelled mid-point of 'neither agree nor disagree'. Higher scores indicate greater neophobia. Items 10, 11, 12, and 13 need to be reverse-scored.

The body of research into measuring food technology neophobia and, consequently, knowledge on its conditioning

factors are not very extensive. The research conducted thus far has shown that food technology neophobia levels are higher among women and people living in small towns and rural areas [4], that technology neophobia increases with age and is inversely correlated to income and education level [16], and that people living in large households are more inclined towards food technology neophobia [8].

So far, there have been no attempts to measure the relationship between the region of residence and the approval for new food production technologies. Determining this link could be significant empirically, as well as in the area of practical application, e.g. for developing marketing strategies for innovative products. For this reason, research has been undertaken to determine the differences in levels of and conditions for food technology neophobia in selected regions of Poland.

MATERIALS AND METHODOLOGY

The survey was conducted in 2019 on a sample of 460 adults from the following voivodeships: Mazowieckie – in central Poland (161 respondents), Podkarpackie – in the south of Poland (150) and Zachodniopomorskie – in the north-west of the country (149). The voivodeships have been selected arbitrarily, due to their diverse geographic, economic and social characteristics. Quota sampling method was employed – the respondents were selected so that the sample structure was analogous to the respective region's in terms of gender, age and area of residence (urban/rural). Characteristics of the studied population are presented in Table 1.

Survey method was used for the research. The questionnaire consisted of 13 statements constituting a scale for measuring food technology neophobia and a set of questions to determine the demographic (gender, age, area of residence), economic (income) and socio-professional (education) characteristics of the studied population. Diverse methods for questionnaire

distribution were employed (on-line survey, group administered questionnaire, household drop-off survey).

As per the premise of food technology neophobia measurement, the degree of compliance with each statement was expressed by the respondents on a 7-tier scale, 1 signifying they 'totally disagree' with the statement and 7 meaning they 'totally agree' with it. Based on the assessment of compliance with each statement, individual levels of food technology neophobia were calculated; then, mean value of the sums (X) and standard deviation (Sd) were determined. On such basis, three intervals of food technology neophobia were determined for each region:

- low (neophilic attitude): $13 \text{ pts} < X - Sd$,
- moderate (neutral attitude): $X - Sd < X + Sd$,
- high (neophobic attitude) $\geq X + Sd \leq 91$.

The following statistical analyses included calculating mean values and frequencies, as well as cross tabulation. Statistical significance of differences between variables was determined with the Chi² test ($p < 0,05$). Correlation strength between variables was determined by using Pearson correlation coefficient ($p < 0,05$). The statistical analysis was performed with the SPSS 2014 program.

RESEARCH RESULTS

Analysing the agreement of the respondents from each voivodeship with the statements included in the food technology neophobia scale has shown, that respondents from Podkarpackie voivodeship exhibit the highest level of agreement across all statements. Respondents from Zachodniopomorskie voivodeship have declared moderate agreement, and those from Mazowieckie voivodeship agreed with the statements to the least degree. As a result of the recorded differences in evaluating agreement with the statements, the level of technology neophobia, too, was

Table 1. Characteristics of the studied population

Tabela 1. Charakterystyka badanej populacji

Specification		Podkarpackie voivodeship	Mazowieckie voivodeship	Zachodniopomorskie voivodeship
Number of respondents		150	161	149
Gender (%)	Women	50.1	52	50.9
	Men	49.9	48	49.1
Age (%)	18 – 35 years old	26.4	32.8	31.6
	36 – 55 years old	32.4	33.7	33.8
	>55 years old	41.2	33.5	34.6
Education (%)	Primary and vocational	56.3	35.4	36.7
	Secondary	26.3	37.2	38.7
	Higher	17.4	27.4	24.6
Area of residence (%)	Rural	58.3	36	31.4
	Urban	41.7	64	68.6
Income (%)	<2000 zł	55.4	32.1	51.2
	2000 zł – 3500zł	25.3	39.3	30.5
	>3500 zł	19.3	28.6	18.3

Source: Own research

Źródło: Badania własne

Table 2. Mean* rating of agreement with the statements included in technology neophobia scale and level of neophobia in the studied voivodeships

Tabela 2. Średnia* ocena zgodności ze stwierdzeniami zawartymi w skali neofobii technologicznej i poziom neofobii w badanych województwach

No.	Statements	Podkarpackie voivodeship	Mazowieckie voivodeship	Zachodniopomorskie voivodeship
1.	There are plenty of tasty foods around so we don't need to use food technology to produce more	4.5	3.2	3.3
2.	The benefits of new technologies are often grossly overstated	4.8	3.5	3.8
3.	New food technologies decrease the natural quality of food	4.7	3.2	3.5
4.	There is no sense in trying out high-tech food products because the ones I eat are already good enough	4.3	4.1	4.1
5.	New foods are not healthier than traditional foods	4.2	3.9	4.1
6.	New food technologies are something I am uncertain about	4.9	4.4	4.6
7.	Society should not depend heavily on technologies to solve its food problems	3.9	3.8	3.8
8.	New food technologies may have long term negative environmental effects	4.9	3.8	3.9
9.	It can be risky to switch to new technologies too quickly	4.3	4.2	4.2
10.	New food technologies are unlikely to have long term negative health effects (R**)	4.9***	4.2***	4.6***
11.	New products produced using new food technologies can help people have a balanced diet (R)	4.8***	3.9***	4.1***
12.	New food technologies give people more control over their food choice (R)	4.3***	3.4***	3.7***
13.	The media usually provides a balanced and unbiased view of new food technologies (R)	5.1***	4.5***	4.7***
Sum (novel food technology neophobia score)		59.7 (Sd 14.2)	49.9 (Sd 11.9)	52.5 (Sd 12.5)

* the scale from 1 – I strongly disagree to 7 – I strongly agree

** (R) the assessment of compliance with the statement was re-coded

*** value after reverse scored

* w skali od 1 – zdecydowanie się nie zgadzam do 7 zdecydowanie się zgadzam

** (R) ocena zgodności ze stwierdzeniem została zrekodowana

***wartość po zrekodowaniu

Source: Own research

Źródło: Badania własne

the highest in Podkarpackie voivodeship (59,7), and lower in Zachodniopomorskie (52,5) and Mazowieckie (49,9) voivodeships (Table 2).

Upon determining limit values of neophobia level intervals for each voivodeship, percentages of respondents within each interval were calculated. The highest percentage of respondents exhibiting neophilic attitude (approving of novel food production technologies) was recorded in Mazowieckie and Zachodniopomorskie voivodeships (nearly ¼ of the respondents), while the lowest percentage was recorded in

Podkarpackie voivodeship (14,3%). This is the region where the highest percentage of people with neutral attitudes was recorded as well (71,3%), whereas the percentage of people with such attitude in the other two voivodeships was ca. 60%. As for the percentage of respondents reporting high levels of neophobia, it was the highest in Zachodniopomorskie voivodeship (18,6%); in other regions, people disapproving of novel technologies constituted around 14% of the respondents (Table 3).

Table 3. Share of respondents showing low, moderate and high approval for new food production technologies in the surveyed voivodeships

Tabela 3. Udział respondentów wykazujących niskie, umiarkowane i wysokie aprobaty dla nowych technologii produkcji żywności w badanych województwach

Novel food technology neophobia interval	Podkarpackie voivodeship (%)	Mazowieckie voivodeship (%)	Zachodniopomorskie voivodeship (%)
Low	14.3	23.6	23.2
Medium	71.3	62.1	58.2
High	14.3	14.4	18.6

Source: Own research

Źródło: Badania własne

Analysing conditions for food technology neophobia has shown that only in the case of Podkarpackie voivodeship gender played a differentiating role in respondents' attitudes towards novel technologies – women were significantly more inclined to approve of employing novel technologies in food production compared to men (food technology neophobia levels of 55,7 and 62,9 respectively). Across all the analysed regions, age was found to affect food technology neophobia levels, with the strongest correlation between the two variables recorded in Podkarpackie voivodeship (0,437), and the weakest in Zachodniopomorskie voivodeship (0,324). It should also be noted, that in all the voivodeships food technology neophobia level among the oldest age groups was significantly higher than the levels recorded in the remaining groups. Correlation between education level and attitude towards novel food production technologies was only recorded in Podkarpackie and Mazowieckie voivodeships – neophobia was inversely correlated to the education level (correlation strength of -0,378 and -0,311 respectively) Area of residence (urban/rural) had statistically significant influence over neophobia levels among the respondents from Podkarpackie and Zachodniopomorskie voivodeships - in both cases, rural area residents exhibited more neophobic attitudes. These two voivodeships are also where income was found to affect neophobia levels – respondents with the lowest income exhibited more neophobic attitudes than those who declared medium and high income (correlation strength of -0,479 and -0,321 respectively) (Table 4).

SUMMARY AND CONCLUSIONS

The conducted research has shown diverse attitudes towards novel food production technologies among the respondents depending on the region. Residents of Podkarpackie voivodeship have been found to exhibit the highest levels of neophobia, with moderate levels of food technology neophobia among the respondents from Zachodniopomorskie voivodeship, and the highest level of approval for novel food production technologies in Mazowieckie voivodeship.

Analysing the structure of neophobia level intervals has shown, that in Podkarpackie voivodeship, the largest percentage of respondents (compared to other regions) exhibited a moderate level of neophobia, with the smallest percentages representing low and high levels. In turn, Zachodniopomorskie voivodeship has the largest percentage of respondents in the high level interval, and the smallest percentage within moderate level interval. Mazowieckie voivodeship stood out with the largest percentage of respondents representing low neophobia level interval.

The recorded differences could be partially explained by distinct structure of the examined voivodeships in regard to gender, age, area of residence, education and income levels; however, the analyses conducted have shown that the influence of these factors on food technology neophobia in each voivodeship varies. Gender was a statistically significant factor differentiating neophobia levels only in Podkarpackie voivodeship; age – across all the analysed regions (positive correlation); education level – in Podkarpackie and Mazowieckie voivodeships (negative correlation); area of residence and income (negative correlation) – in Podkarpackie and Zachodniopomorskie voivodeships. Therefore, it can

Table 4. Conditions for technology neophobia level in the surveyed voivodeships

Tabela 4. Uwarunkowania poziomu neofobii technologicznej w badanych województwach

Specification		Podkarpackie Voivodeship		Mazowieckie voivodeship		Zachodniopomorskie voivodeship	
		Neophobia level	r*	Neophobia level	r*	Neophobia level	r*
Gender	Women	55.7a**		49.8a		52.7a	
	Men	62.9a		50.1b		52.3b	
Age	18 – 35 years old	56.3a	0.437	47.3a	0.401	49.9ab	0.324
	36 – 55 years old	57.5b		48.5b		51.4b	
	>55 years old	62.8ab		53.7ab		54.8a	
Education	Primary and vocational	62.4ab	-0.378	52.6ab	-0.311	52.1a	
	Secondary	56.5b		48.7b		52.9b	
	Higher	54.2a		47.9a		52.4c	
Area of residence	Rural	63.5a		50.9a		56.3a	
	Urban	54.2a		49.2b		50.7a	
Income	>2000 zł	62.3ab	-0.379	50.5a		54.1ab	-0.321
	2000zł – 3500zł	57.1b		49.9b		51.2b	
	< 3500 zł	56.3a		49.3c		51.1a	

* Pearson correlation coefficient ($p < 0,05$)

** values in the cell marked with the same letter differ with statistical significance, Chi² test, $p < 0,05$

* współczynnik korelacji Pearsona ($p < 0,05$)

** wartości w komórce oznaczone tą samą literą różnią się istotnie statystycznie, test Chi², $p < 0,05$

Source: Own research

Źródło: Badania własne

be inferred that the differences in perception of novel food production technologies in the examined voivodeships are to a significant degree caused by worldview and psychological factors.

Due to its sample not being representative, the research may be considered a poll; however, its results might inspire further exploration of the problem it tackles, particularly conducting research on larger, representative populations, accounting for psychographic aspects of consumer behaviors and referencing specific types of technological innovations.

PODSUMOWANIE I WNIOSKI

Przeprowadzone badania wykazały zróżnicowanie postaw respondentów w stosunku do nowych technologii produkcji żywności w zależności od regionu. Najbardziej neofobiczni okazali się być mieszkańcy województwa Podkarpackiego, umiarkowanie wysoki poziom food technology neophobia stwierdzono w grupie badanych z województwa Zachodniopomorskiego, a najwyższy poziom akceptacji dla nowych technologii w produkcji żywności wyrazili mieszkańcy województwa Mazowieckiego.

Analiza struktury przedziałów neofobii wykazała, że na Podkarpaciu największy odsetek respondentów (w stosunku do pozostałych regionów) charakteryzował się średnim poziomem neofobii, zaś najniższe odsetki reprezentowały przedziały niski i wysoki. Z kolei w województwie Zachodniopomorskim największy odsetek badanych zaliczony został do

przedziału wysokiego, a najniższy do średniego. Województwo Mazowieckie wyróżniał najwyższy odsetek badanych reprezentujących niski przedział neofobii.

Stwierdzone różnice można byłoby częściowo wyjaśnić odmienną strukturą badanych województw ze względu na płeć, wiek, miejsce zamieszkania, poziom wykształcenia i dochodu, jednakże przeprowadzone analizy wykazały, że oddziaływanie tych determinant na poziom food technology naophobia w poszczególnych województwach jest zróżnicowane. Płeć istotnie statystycznie różnicowała poziom neofobii jedynie w województwie podkarpackim, wiek we wszystkich analizowanych regionach (korelacja pozytywna), poziom wykształcenia w województwach podkarpackim i mazowieckim (korelacja negatywna), zaś miejsce zamieszkania i dochód (korelacja negatywna) województwach podkarpackim i zachodniopomorskim. Można więc wnioskować, że przyczyną różnic w postrzeganiu nowych technologii wytwarzania żywności w badanych województwach są w istotnym stopniu względy o charakterze psychologicznym i światopoglądowym.

Przeprowadzone badanie ze względu na brak reprezentatywności próby można uznać za sondażowe, jednakże jego wyniki mogą stanowić inspirację do dalszej eksploracji podjętej problematyki, w tym szczególnie realizacji badań na większych, reprezentatywnych populacjach, uwzględniających aspekty psychograficzne zachowań konsumentów oraz odnoszących się do specyficznych rodzajów innowacji technologicznych.

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