ATTITUDES OF LATVIAN ADULTS TO THE CONSUMPTION OF PULSES

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Abstract
Pulses (*Fabaceae*) are an excellent source of nutrients with protein content equal to the protein of meats. Regularly choosing such meat alternatives as pulses can help minimize the amount of saturated fat and increase the amount of fibre in the diet. New pulse products could benefit vegetarians and people struggling with new diet changes. The aim of this study was to determine pulse consumption patterns of Latvian adults. An 11 question survey was developed on an online survey website www.visidati.lv to analyse consumer attitudes towards pulse consumption in Latvia. The questionnaire was completed by 780 respondents from September to December 2013. During the Baltics food industry fair 'Riga Food 2013' five question survey was carried out after vegetarian bean spread tasting. The questions were related to pulse consumption and preference; five question survey consisted of overall preference and quality determination of the product. The results show that the majority of Latvian omnivore adults consume pulses about once a week or less, while pulse intake in vegetarian adults is significantly higher ($p<0.05$). Latvian adults prefer green peas (*Pisum sativum* L.), navy and broad beans (*Phaseolus vulgaris* L.), lentils (*Lens culinaris* Medik.), chickpeas (*Cicer arietinum* L.) and maple peas (*Pisum sativum* L. var. *arvense*). Overall preference of vegetarian bean spread with sun-dried tomatoes (*Solanum lycopersicum* L.) is 'like very much' (4.5 – 4.6) and most of the respondents would purchase this product if it was available in a store.
Key words: pulse consumption, survey, overall preference.

Introduction

Legumes are plants in the family *Fabaceae*, or the fruits or seeds of such plants. Legumes are grown agriculturally, primarily for their food grain seed, for livestock forage and silage, and as soil-enhancing green manure. Pulses (grain legumes) are dry seeds of leguminous plants which are distinguished from leguminous oil seeds by their low fat content. Pulses yield from one to twelve seeds of variable size, shape, and colour within a pod and are mainly cultivated for human consumption (Codex Alimentarius Standart 171-1989, Rev. 1, 1995).

Pulses are staple foods for millions of poor people in developing countries, and have always been a part of Latvian diet. Traditional pulses in Latvian cuisine are maple peas (*Pisum sativum* L. var. *arvense*), garden peas (*Pisum sativum* L.), broad beans (*Vicia faba* L.), lima beans (*Phaseolus lunatus* L.), scarlet runner beans (*Phaseolus coccineus* L.), as well as navy (white), pinto and kidney beans (*Phaseolus vulgaris* L.). Lentil (*Lens culinaris* Medik.), chickpea (*Cicer arietinum* L.), mung bean (*Vigna radiata* (L.) R. Wilczek), urad bean (*Vigna mungo* (L.) Hepper), and adzuki bean (*Vigna angularis* (Willd.) Ohwi and Ohashi) are also widely used in the world. Pulses are available dried, canned, pre-cooked and also frozen. They are used in chilli con carne, burritos, stews, salads, side dishes, casseroles, soups, vegetarian versions of meat dishes and as baked or refried beans (Elliot, 2000).

Pulses are nutritionally important since they usually provide the bulk of the diet and are an excellent source of nutrients with a low glycaemic index. They are a relatively cheap source of energy, protein, slowly digestible carbohydrates and fibre, and important vitamins (niacin, folic acid, vitamin B_1, B_2, B_6) and minerals (iron, zinc, calcium, magnesium, phosphorus and copper) (McCrory et al., 2010).

Pulses constitute an important source of dietary protein for large segments of the world's population particularly in those countries in which the consumption of animal protein is limited by non-availability or is self-imposed because of religious or cultural habits (Boye et al., 2010). Protein content in pulses ranges from 17% to 40%, contrasting with 7–13% of cereals, and being equal to the protein content of meats (18–25%) (De Almeida Costa et al., 2006). It should be noted that pulse proteins are incomplete because of relatively low quantities of the essential amino acid methionine (McCarty et al., 2009). Nevertheless, most plant proteins are incomplete and by combining complementary foods from two or more incomplete protein sources, a complete protein can be created. Grains (which are deficient in lysine) are commonly consumed along with pulses to form a complete diet of protein. Pulses are among the best protein sources in the plant kingdom and unlike conventional animal food sources of protein such as beef or milk, pulses are packed with hormone-free, steroid-free and antibiotic-free plant protein (Papanikolaou and Fulgoni, 2008).

Pulses have shown numerous health benefits, e.g. lower glycaemic index for people with diabetes, increased satiation, cancer prevention, reduction in cholesterol levels, prevention or alleviation of constipation, and protection against cardiovascular diseases due to their dietary fibre content (Wang et al., 2010). Total dietary fibre content in pulses range from 11.8% to 23.3% (Khan et al., 2007), and insoluble dietary fibre constitutes 80 to 85% of total

dietary fibre in whole pulses. Besides these nutritional benefits, pulses are also gluten-free, so products made from pulse flours provide alternatives to wheat flour based products (Siddiq et al., 2013).

Among European countries, higher pulse consumption is observed around the Mediterranean, with per capita daily consumption between 8 and 23 g, while in Northern Europe, the daily consumption is less than 5 g per capita (Bouchenak and Lamri-Senhadji, 2013). In 2009 pulse (including soy and nuts) consumption represented only 0.7% of total regularly consumed foods in Latvian food basket, with daily consumption 32 ± 2 g per capita (Joffe et al., 2009). According to the Latvian Central Statistical Bureau data, the average pulse consumption was 9 g per capita per day and 63 g per capita per week in 2013 (Consumption of..., 2013). Pulses are included in two (out of the five) food groups that are the building blocks for a healthy diet. A serving of pulses as a part of meat/meat alternative or vegetable group is 75-80 g (½ cup) cooked beans, lentils, chickpeas, split peas or canned beans. The U.S. Dietary Guidelines (2005) recommend eating three cups (450 – 480 g) of pulses per week. Regularly choosing such meat alternatives as pulses can help minimize the amount of saturated fat in the diet but there are no guidelines for pulse consumption in Latvia. According to European Guidelines on cardiovascular disease prevention (Perk et al., 2012), recommended fibre intake is 30-45 g per day. One serving (½ cup) of pulses covers about 25% of daily fibre needs and contains more healthy fibre than any other food group (Agurs-Collins et al., 2006).

Pulses have always been an important source of protein for vegetarians and since vegetarianism is a growing trend in Latvia, pulse consumption among vegetarians could be higher compared to omnivores. However, one does not need to abandon their dietary practice in order to replace animal protein with plant protein on a weekly basis or choose a healthier dietary option. New pulse products, e.g. various pulse spreads, could benefit vegetarians and people struggling with new dietary changes but before beginning new product development it is necessary to evaluate the potential interest of consumers and the attitude towards this type of products (Lyly et al., 2007). Therefore, in order to ascertain the attitudes of Latvian adults to the consumption of pulses the aim of this study was to determine pulse consumption patterns of Latvian adults.

Materials and Methods

A questionnaire was developed to analyse consumer attitudes towards pulse consumption in Latvia. The questionnaire consisted of 11 questions; of which 7 questions were related to pulse consumption and preference (e.g., intake and preference of pulses, the most common method of preparation and serving), and the rest of the questions were aimed at obtaining basic information about respondents. The survey was developed with both multiple-choice and open-type questions; it was carried out during the Baltics food industry fair 'Riga Food 2013' (90 respondents; 67% women and 33% men) and posted on an online survey website 'www.visidati.lv' (690 respondents; 56% women and 44% men) from September to December 2013. Complete information about the respondents is given in Results and Discussion.

An additional 5 question survey was carried out during 'Riga Food 2013' after vegetarian bean spread tasting. Respondents (90 respondents; 67% women and 33% men) were asked to evaluate vegetarian bean spread with sun-dried tomatoes (*Solanum lycopersicum* L.) with 5-point hedonic scale (5 – like very much and 1 – dislike very much) in order to determine the overall preference of the sample (ISO 4121:2003). The rest of the questions were related to the quality of the product and the likeliness to buy it in a store. The vegetarian bean spread with sun-dried tomatoes was prepared at the laboratory of Faculty of Food Technology (Latvia University of Agriculture) according to the vegetarian spread preparation technology (Ķirse and Kārkliņa, 2014).

The obtained data processing was performed using mathematical and statistical methods with statistical software *R 3.0.2*; differences among results were considered significant if p-value < 0.05. One way analysis of variance (ANOVA), Tukey's test and independent samples *t*-test were used (Næs et al., 2011).

Results and Discussion

The questionnaire was completed by 780 respondents; of which 360 respondents followed vegetarian diet (46.2%) and 420 respondents were omnivores (53.8%). The mean distribution of respondents by gender was 64.5% women and 35.5% men. Respondents were from all regions of Latvia: Kurzeme (16.6%), Zemgale (26.3%), Vidzeme (14.8%), Latgale (13.3%) and Riga (29.0%). There were two noticeably larger respondent groups: one from age 35 to 44 and the other from age 25 to 34; while the smallest group of respondents was aged 65 and older (Fig. 1). During their late 20s to early 40s people use internet quite often compared to seniors who go online seldom. The level of education of the majority of respondents (62.3%) was higher education, followed by vocational (23.8%), secondary (11.7%) and basic (2.2%) education.

Vegetarians, by definition, abstain from the consumption of red meat, poultry, and seafood, therefore their main protein source is plant protein products (Fig. 2). According to the survey data, some

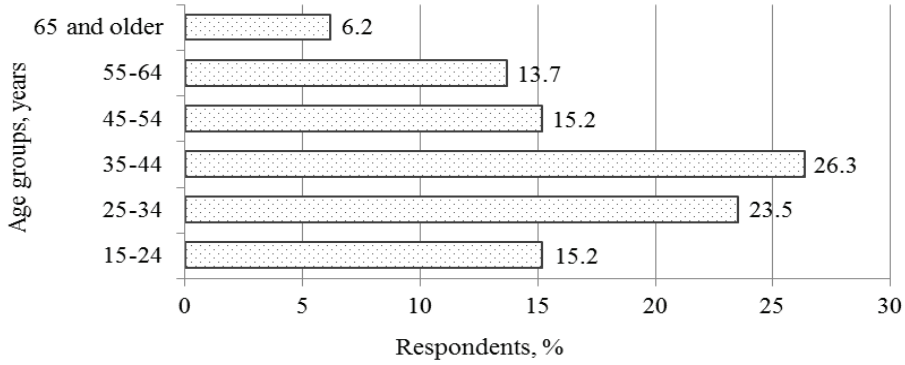

Figure 1. Distribution of respondents by age.

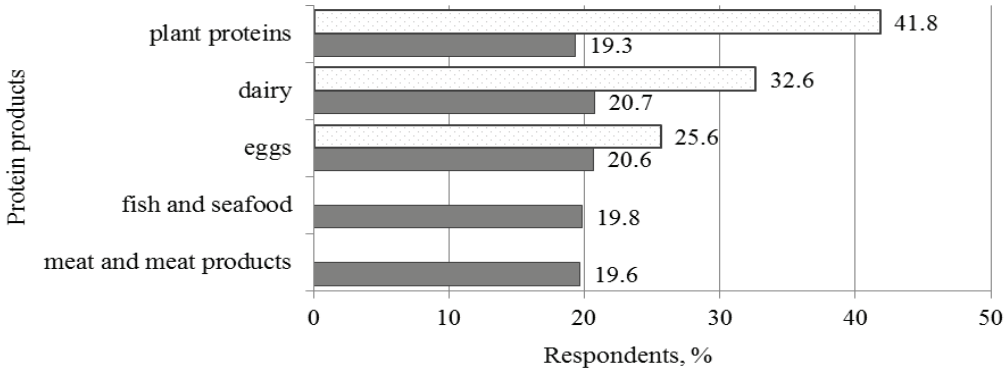

Figure 2. Preference of protein sources in the daily diet of the respondents:
□ vegetarian, ■ non-vegetarian.

of the vegetarian respondents (56 women and 24 men) replied that they only use plant protein products; they could therefore represent vegans. The data show that non-vegetarian respondents consume products from all five protein sources with no significant preferences to one or more protein sources in their daily diet ($p=0.072$). A little over 58% of the protein in Latvian vegetarian diet comes from animal products (dairy and eggs) and it corresponds to the data of other studies which state that about 40-60% of the protein in non-strict vegetarian diets is derived from animal products (Mangels et al., 2011).

The majority of respondents consume pulses about once a week, while only vegetarian respondents eat pulses every day (Fig. 3). Pulses are consumed 3 to 5 times a week by one fifth of non-vegetarian respondents and almost one third of vegetarian respondents. Pulse intake in Latvian vegetarian adults is significantly higher ($p<0.05$) comparing with Latvian omnivore adults. Belgian researchers found a trend towards a higher intake ($p<0.1$) of pulses when comparing vegetarian with omnivorous subjects, nevertheless reaching only borderline significance (Clarys et al., 2013). The differences between Latvian and Belgian dietary patterns could be the main reason for diverge in pulse intake as well as the product offer at grocery stores in Belgium. A variety of plant-derived protein products are available in Belgium such as vegetarian sausages, fillets, meat balls, burger patties and chops (Clarys et al., 2013) while in Latvia these products are not available or very expensive and not affordable on a daily basis. In Belgium vegetarian products in stores are equally available to both omnivores and vegetarians while the majority of Latvian omnivores are not aware of the small amount of vegetarian alternatives available. As pulses have always been a part of Latvian diet, it is possible to incorporate pulses in everyday meals for a reasonable price or prepare such meat substitutes as burger patties and meat balls from pulses at home.

More than one third of non-vegetarian respondents and a little over 20% of vegetarian respondents consume pulses less than once a week, and this less frequent consumption of pulses is the result of various reasons. The main reason for low pulse intake in both groups of respondents is meteorism (21.4%) (also known as flatulence). Pulses contain oligosaccharides (raffinose, stachyose, and verbascose) which are resistant to human enzymes but are digestible by gastrointestinal methane-producing microflora

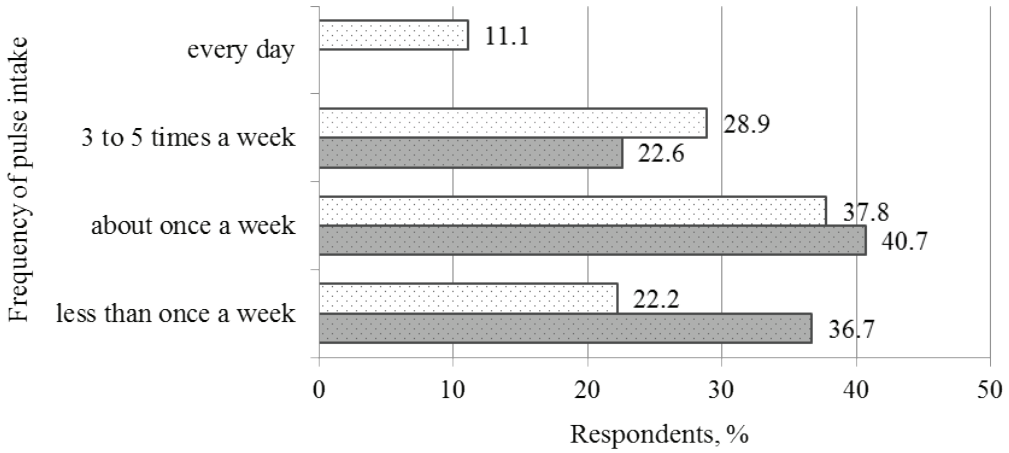

Figure 3. Frequency of pulse intake by their dietary practice:
□ vegetarian, ▩ non-vegetarian.

(*Methanobrevibacter smithii*) that causes flatulance (Ohge et al., 2005). Meteorism can be avoided by cooking pulses with anise, cumin, coriander, caraway or asafoetida which have the ability to prevent the formation of gas in the gastrointestinal tract (McGee, 1984). Other reasons for eating pulses less than one a week include long cooking time (20.4%), pulses not being in favour in respondents' families (15.3%) and problems with making delicious dishes (13.5%). Non-vegetarian respondents also find the taste or aroma unappealing and are not ready to plan ahead because dry pulses need soaking; 10.3% of non-vegetarian respondents follow blood type or paleo diet that excludes pulses. Vegetarian respondents often find pulses hard-to-cook and it prevents them from preparing home-cooked pulses more frequently. Seldom pulse consumption is also linked with limited pulse availability and living arrangements (e.g. easier to make other foods in dormitories).

Non-vegetarian respondents prefer traditional pulses (Fig. 4): green peas (18.1%), navy beans (15.6%), broad beans (13.4%), maple peas (12.6%), kidney beans (12.0%) and split peas (11.0%). Vegetarian respondents prefer lentils (14.4%) and chickpeas (12.8%) instead of split and maple peas. Pulses are the perfect meat alternative for vegetarians thus they are more open to trying different pulses. Mung beans which are fairly common in Indian cuisine are consumed three times less by non-vegetarians and soy is consumed twice as much by vegetarians. Soy (*Glycine max* (L.) Merr.), green peas (*Pisum sativum* L.) and snap beans (*Phaseolus vulgaris* L.) were included in this question because people consider them pulses, however they are, in fact, not grain

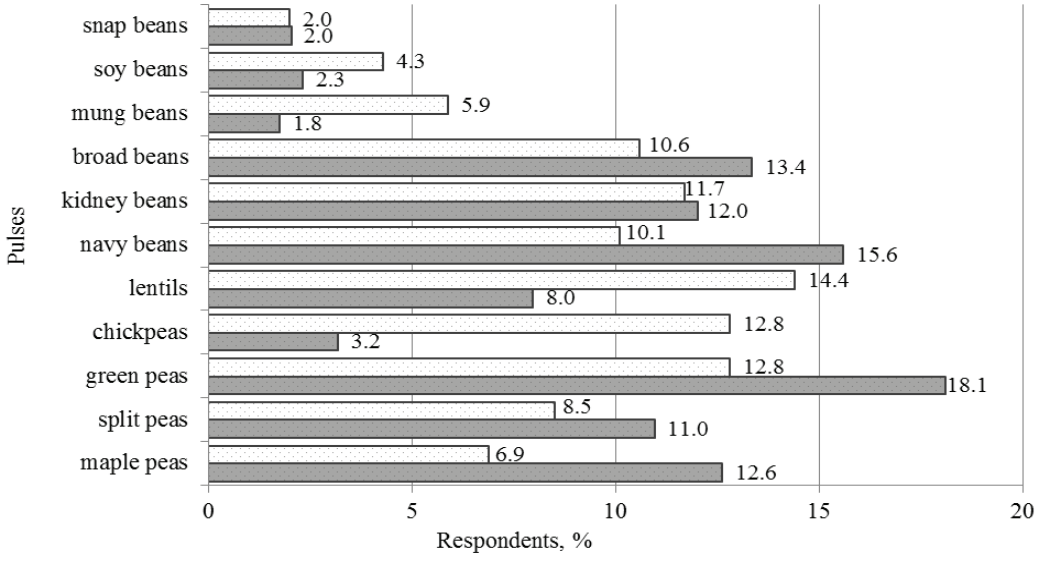

Figure 4. Preference of different pulses: □ vegetarian, ▩ non-vegetarian.

legumes and belong to oilseed crops and vegetable crops, respectively.

The majority of vegetarian respondents choose to buy dry pulses at a grocery store and cook them at home (Fig. 5) instead of buying pulse preserves which is the preferred use of pulses by non-vegetarian respondents. This could be the reason why some vegetarian respondents consume pulses less than once a week – they have experienced hard-to-cook phenomenon in home-cooked pulses. Although more expensive than dried pulses, canned pulses tend to be softer and sometimes more convenient or practical than soaking and boiling dried ones. Both groups of respondents use pulses grown in their gardens but hardly anyone consumes pre-cooked pulses. Non-vegetarian respondents also favour frozen pulses (mainly green peas) but consume little pulse spreads. Vegetarians consume store bought and home-made pulse spreads mainly from chickpeas (hummus) and beans.

The most common way of eating pulses is boiled pulses (with or without such additives as onions, bacon, lard) as a main dish and in stews or casseroles (Fig. 6). Non-vegetarian respondents also enjoy eating pulses in salads and soups as well as eating them raw (e.g. green peas). More than 10% of vegetarian respondents consume sprouted pulses which have a higher nutritional value than their unsprouted counterparts (Wang et al., 2005). Germination helps to reduce anti-nutritional factors that interfere with absorption of iron, zinc and calcium; sprouting increases the content of vitamin C and B vitamins (thiamine, niacin and riboflavin), also flatulence causing oligosaccharides are broken down thus making sprouted pulses more digestible (Limón et al., 2013). Vegetarian patties, which are only consumed by vegetarian respondents, are mostly made of beans, lentils and chickpeas for vegetarian burgers.

The majority of respondents would like various pulse spreads to be commercially available;

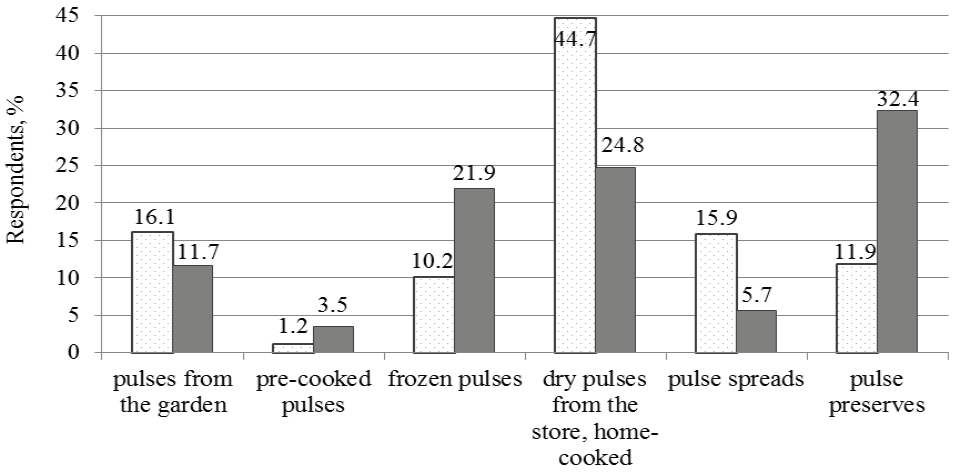

Figure 5. Most often chosen types of processed pulses: □ vegetarian, ■ non-vegetarian.

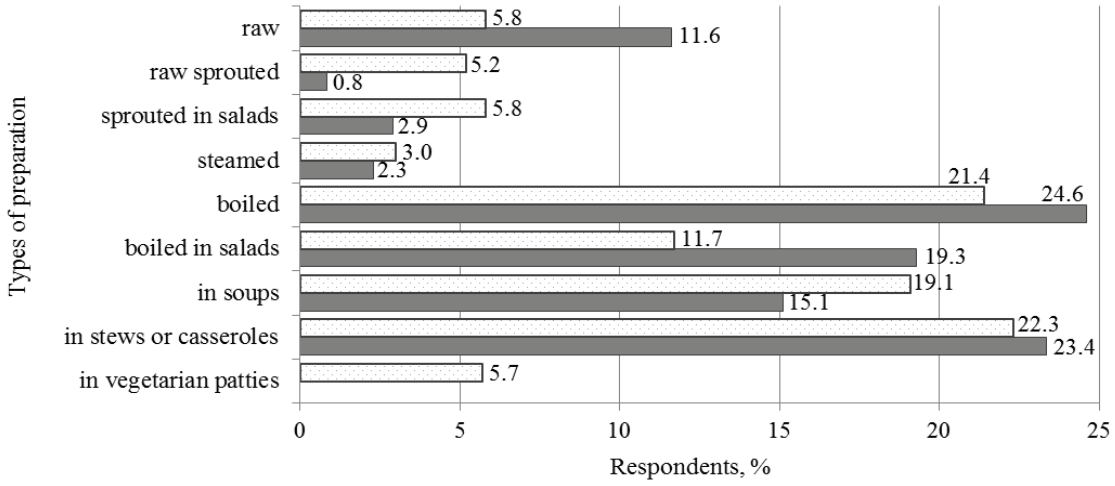

Figure 6. Consumption of prefered pulses: □ vegetarian, ■ non-vegetarian.

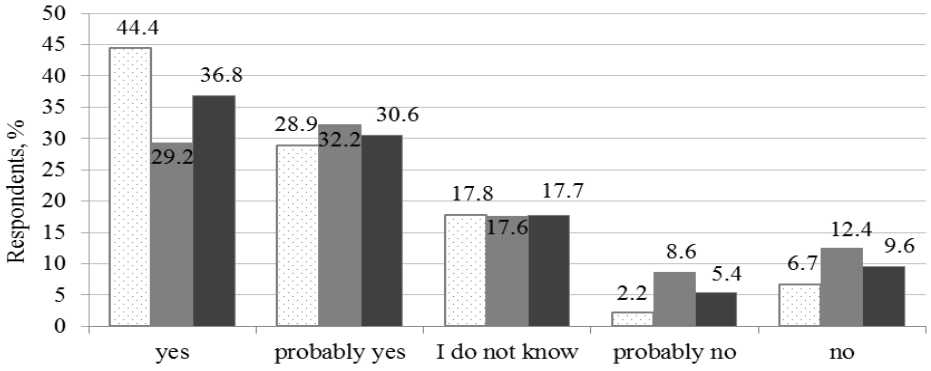

Figure 7. Would you like for more pulse products to be commercially available, e.g., various pulse spreads?
□ vegetarian, ■ non-vegetarian, ■ overall.

vegetarians are more interested in having pulse spreads commercially available than non-vegetarian respondents (Fig. 7). About ⅓ of respondents are not interested in more pulse spreads being available at grocery stores. A few of vegetarian respondents would like to have greater dry pulse selection at common grocery stores instead of new pulse products.

To better understand consumer demand on new bean products, visitors of the Baltics food industry fair 'Riga Food 2013' were offered to evaluate a new vegetarian bean spread with sun-dried tomatoes prepared at the Faculty of Food Technology. After tasting the product visitors were asked to complete a five question survey. They were requested to evaluate the product on a scale from 1 to 5 (5 – like very much and 1 – dislike very much) and the results show that the overall preference of vegetarian bean spread with sun-dried tomatoes is 'like very much' (4.5 – 4.6) with no significant differences between men and women ($p=0.168$).

Most of the respondents (60%) rated the quality of vegetarian bean spread with sun-dried tomatoes as 'good', followed by 'excellent' (35%) and 'average' (5%). Respondents were also questioned about the sensory attributes they liked and disliked about the product. Commonly the sensory attributes that influence acceptance of bean products are general visual appearance, texture and flavour (Ghasemlou et al., 2013). Sensory properties that male respondents liked most about the vegetarian bean spread with sun-dried tomatoes were flavour, freshness and similar taste to meat or hummus. Women, on the other hand, liked flavour and texture the best, followed by the ingredients used, as well as the bean flavour and aftertaste. Some of the male respondents disliked the texture, while female respondents noted the unappealing colour and wanted the product spicier. As consumer appetite for food is stimulated or dampened by its colour because the colour of food indicates the flavour of food, improving the colour should be taken into consideration. Respondents of both genders disliked the fact that the product was not on the market yet.

The last question on the additional survey was related to the likeliness to purchase vegetarian bean spread with sun-dried tomatoes at a grocery store. Majority of the respondents (75% men and 58% women) said they would buy this product as soon as it was available in a store, the rest of the respondents were undecided. Men were more likely to purchase vegetarian bean spread than women.

Conclusions

1. The majority of omnivore adults in Latvia consume pulses about once a week or less, while pulse intake in vegetarian adult group is significantly higher ($p<0.05$).
2. Latvian adults prefer green peas, navy and broad beans, lentils, chickpeas and maple peas, therefore they should be considered for vegetarian pulse spread preparation. These pulses are mainly purchased as preserves or dry, and then home-cooked and consumed boiled as a main dish and in stews or casseroles. The majority of the respondents would like for various pulse spreads to be commercially available.
3. Overall preference of vegetarian bean spread with sun-dried tomatoes is 'like very much' (4.5 – 4.6) and its quality is rated as 'good'.
4. Most of the respondents would purchase vegetarian bean spread with sun-dried tomatoes if it was available in a store.

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