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THE ORGANOLEPTIC QUALITIES OF SOME VARIETIES OF FRENCH BEANS

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Abstract

French beans are one of the most consumed vegetables in Romania, especially during fasting periods, but also worldwide, knowing that it has an important nutritional value. Due to its high protein content, many people who want to adopt an animal protein-free diet resort to eating bean-based foods. In the present study, four french bean genotypes were analyzed that showed differences in color, seed size and weight, but most importantly in taste.
From these, a control variety was chosen that presented white seeds, more precisely the 'Doina' variety, a variety approved by VRDS Buzau in 2020. Tastings were carried out followed by the completion of opinion polls, which found that the genotype preferred by consumers was the L3 genotype, a genotype that presents seed of red color. The purpose of this article was to find out if consumers are open to eating beans of a different color than the classic white.

Key words*: beans, genotype, 'Doina', VRDS Buzau.*

INTRODUCTION

Common bean (*Phaseolus vulgaris* L.) is one of the most important vegetable which is consumed worldwide for its edible seeds and pods because are a good source of protein (de Almeida Costa, da Silva Queiroz-Monici, Reis, & de Oliveira, 2006; Siddiq, Butt, & Sultan, 2011), has dietary fibre, starch (Osorio-Díaz et al., 2003), minerals, vitamins (Kutos et al., 2003), and beneficial nutraceuticals such as polyphenols (Wu et al., 2004), while containing little or no total fat, trans-fat, sodium and cholesterol (Drewnowski A, 2010; Raw P., 2012). Several studies have shown that regular consumption of beans can help lower total and LDL cholesterol and other risk factors for heart disease (Anderson et al., 1990; Bazzaro et al., 2011; Finley et al., 2007; Kabagambe et al., 2005). Bean intake has been associated with a decreased risk of breast, stomach, colorectal, kidney and prostate cancers in human and animal studies (Bobe et al., 2008; Dahm et al., 2010; Lanza et al., 2006; Thompson et al., 2012). Beans are high in natural antioxidants (Vinson et al., 1998). The color of the bean coat appears to affect the antioxidant capacity because this correlates with total phenolic content of the bean. Colored beans (red, brown or black) possess greater antioxidant activity than white beans (Madhujith et al., 2004). Furthermore, some of these antioxidant compounds are lost during typical preparation and cooking methods, although significant amounts of antioxidants still remain (XU BJ et al., 2008).

Dry beans are the second most cultivated species after soybean, from Fabaceae family (Gherase et al., 2020).

The popularity of the crop originates from the fact that it is relatively easy to produce, it is flavorful and versatile, and it is a good source of nutrition. Dry beans are one of the most consumed vegetables in Romania, especially during fasting periods, but also worldwide, knowing that it has an important nutritional value. Dry beans are usually prepared by soaking in water to imbibe the seed followed by cooking in a water-based broth either boiling or using a pressure cooker to shorten preparation time. With increasing urbanization, consumer preferences are shifting in favor of convenience foods and commodities, which require reduced food preparation time (Siddiq & Uebersax, 2012). The methodology of sensory profiling constitutes the basis of a

descriptive quantitative analysis, defining a product with the minimum number of words and with maximum efficiency, using a precise tasting sheet, which can be reproduced and is understood by all.
The objective is to define the sensory quality of the beans, establishing a protocol for the preparation of samples and a tasting sheet for the texture profile. The first methodological aspect is the formation of a tasting panel, the organization of sessions, the preselection of descriptive factors and the final list. It ends with a tasting sheet with the descriptive factors, in order of perception, and with a structured scale (Bourne, 1972; Blair, 1978; Meilgaard et al., 1987). The second methodological aspect is the training of the judges, with an evaluation of agreed criteria and the consistency and the ability of the team to reproduce results as well as their sensory evaluation of the varieties, by explaining the differences that exist between them (Drake, 1989; Mioche and Touraille, 1990).
Evaluating its individual traits it is possible for the breeders to get both total and detailed idea for the organoleptic properties of new lines and varieties. Sensory analysis is a significant element of the complex evaluation of bean quality in many investigations (Brewer et al., 1994; Mnkeni et al., 1995; Pevicharova and Poryazov, 2002). The aim of the present study was to assess the relationship between the total sensory evaluation and some characters of sensory and chemical analyses in for types of dwarf french bean and to estimate which of them have priority in the quality breeding of this vegetable crop.

MATERIALS AND METHODS

The Laboratory of Genetics, Breeding and Biodiversity from VRDS Buzau has a valuable germplasm collection of *Phaseolus* sp. grouped by type of plant growth and direction of use (Tănase et al., 2021).
The present study began in the first decade of May 2021, in the experimental field of VRDS Buzău, where the entire bean germplasm collection was cultivated.
The applied culture technology was specific to the field bean crop (Tanase et al., 2020).
Phenological, biometric and laboratory measurements were carried out during the vegetation period. The descriptors used were the one from UPOV guidelines.
Following this evaluation, four genotypes of beans were chosen to be analyzed from an organoleptic point of view, including the 'Doina' variety, a variety recently approved by VRDS Buzau, which was chosen in the current study as a control variety.
The choice of the four genotypes of beans was made based on criteria related to the size, but especially the color of the seeds. The genotypes were noted G1-white beans, G2-black beans, G3- red beans, G4- variegated beans (Figure 1).

Figure 1. Seeds detail

The aim of this study was to show that these four genotypes differ not only visually, through the criteria mentioned above, but also sensory (taste and texture). In this, regard tasting panel was made.
Our survey included 18 questions, in the first part was described the demographic profile of the respondents, followed by the main characteristics of the seeds and a comparison between them.
The tasting panel was formed by 16 respondents with ages from 18 to over 50 years old, both males and females, from rural and urban area. The resulted data were analysed with descriptive statistic methods.

The cooking and preparation conditions of the samples will be selected, recreating the conditions of consumption (Rousset-Akrim et al., 1995).
For the tasting, the four types of beans were prepared in the same way. 350 g of beans were used for each genotype, which was first soaked in water for 24 hours. After this time, the beans were boiled in four separate pots, but identical in material (stainless steel) and capacity (5 l), in two liters of water which was added a teaspoon of sodium bicarbonate, for thus avoiding packaging after consumption.
After the water boiled, the beans were left to boil for a period of 8 minutes, during which time the foam formed on top is removed, for the same reason that sodium bicarbonate was added. After 8 minutes the water was changed to a clean and cold one. Sodium bicarbonate was not added this time. The final cooking took 2 hours and 8 minutes, resulting in a total cooking time of 2 hours and 16 minutes.
Before to the tasting, the respondents were informed about the health benefits of beans.

RESULTS AND DISCUSSIONS

The seeds of the four genotypes of dwarf french beans, G1, G2, G3 and G4 were harvested at technological maturity, boiled and were share within our respondents.
The seeds were measured and weighed 3 times: at technical maturity, after soaking for 24 hours and after boiling.
After the boiling period, it was found that all genotypes kept the color of the seeds, except for the G4 genotype, whose seeds turned completely brown (Figure 2).
For a better understanding of respondents opinion and preferences on the Table 1 is presented their socio-demographic profile. The interviewed respondents were from 18 to more than 45 years old. From our study, 69.8% were women and 31.2% men. In 69.8% of the cases people were from the urban area and 31.2% of them from the rural area. Mainly are people with postgratuade studies (38.6%) and college (35.1%) studies.

Figure 2. Seeds detail of G4

Table 1. The socio-demographic profile of respondents

Variable	Consumers	
	No.	%
Sex		
- Men	5	31,2
- Women	11	69,8
Area		
- Urban	11	69,8
- Rural	5	31.2
Age		
- 18-24	2	12.5
- 25-35	8	50.0
- 35-45	4	25.0
- Over 45	2	12.5
Studies		
- High school	4	25.0
- College	5	31.2
- Postgratuade studies	7	43.8

Sensorial analyses were organized in October 2021 for the four genotypes and the results are presented in the Table 2 for each criterion: seed taste and texture.
In terms of seed size 50% of respondents preferred G2 (Figure 3), a genotype that has the smallest seeds from this study. Specifically, before boiling the seed had an average length of 1 cm and a width of 0.65, and after the boiling it reached a length of 1.37 cm and a width of 0.67 cm.
The initial weight was 0.47 g and after boiling it increased to 1.54 g. On the other hand, G3 is the genotype of beans that had the largest dimensions, more precisely before boiling the seeds had an average length of 1.64 cm and a width of 0.78, and after boiling the length was 2.43 cm and the width 1.19 cm. The initial weight was 0.48 g and after boiling it increased to 1.48 g.

Table 2. Sensorial analyses of the seeds

Variable	Consumers	
	No.	%
What genotype attracts you in terms of seed size?		
- G1	7	43.7
- G2	8	50.0
- G3	0	0.0
- G4	1	6.3
Are you reserved to try different colored been seeds?		
- Yes	4	25.0
- No	12	75.0
You would be willing to replace the classic bean with white seeds with beens that have different colored seeds?		
- Yes	12	75.0
- No	4	25.0
How often do you normally eat beans?		
- Rarely	5	31.2
- Fasting period	5	31.2
- Monthly	4	25.0
- Weekly	2	12.6
Given the amount of protein the beans contains, would you be willing to replace meat with bean in some cases?		
- Yes	12	75.0
- No	4	25.0

Figure 3. Seeds detail G2

Consumers were open to tasting all the bean genotypes, even though they normally ate only white beans. Only 25 % of them were a little reluctant to try them when they first saw the seeds.

75% of respondents would be willing to replace the classic white beans (Figure 4) with the genotypes of beans tasted in the current study (Table 3). There were also respondents who woud not give up the consumption of beans with white seeds, but rather would consume all the genotypes tried because they consider that the four genotypes tasted have different tastes.

Table 3. Respondents` preferences before tasting

Variable	Consumers	
	No.	%
Which bean genotype do you like best in terms of seed taste?		
- G1	4	25.0
- G2	0	0.0
- G3	6	37.5
- G4	6	37.5
Which bean genotype do you like best in terms of seed texture?		
- G1	4	25.0
- G2	0	0.0
- G3	7	43.8
- G4	5	31.2
Taking into account all the analysed aspects, do you have a favorite bean genotype? If so, what is it?		
- G1	3	28.8
- G2	0	0.0
- G3	8	50.0
- G4	5	31.2
Which bean genotypes satisfied your tastes the last?		
G1	0	0.0
- G2	16	100.0
- G3	0	0.0
- G4	0	0.0
Will you recommend to other people to try beans with different colored seeds?		
- Yes	16	100.0
- No	0	0.0

Figure 4. Seeds detail of G1

At the same time, taking into account all the health benefits it has and the amount of protein found in beans, these people would in some cases replace meat with beans. Both in terms of texture and taste, G3 (Figure 5), beans with red seeds were preferred by consumers (43.8%), who said that its seeds are creamier and have a sweeter taste.

Figure 5. Seeds detail of G3

So, if in the first part of the questionnaire, being asked which genotypes of beans attracts them the most from a visual point of view, most respondents chose G2, things changed considerably when they tasted the four genotypes. Consumers were least satisfied with G2, while G3 was the most popular bean genotype, after analysing it from all points of view.

CONCLUSIONS

The respondents were delighted with the organization of the tasting they took part in, they were interested in finding out as about the health benefits of eating beans and also tasting other types of beans than those frequently consumed by them.

At the same time, the respondents had a positive feedback regarding the taste of the 'Doina' variety, comparing it with the beans frequently consumed by them.

In the future, we want to carry out more complex and larger tastings and why not to registration the genotype that was most liked by consumers, G3 for patenting and approval. They were pleasantly surprised by the different taste of the geotypes tasted in this study and showed a great openness to consume beans with seeds of different colors.

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