Research Article

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Quantitative descriptive analysis of Italian polenta produced with different corn cultivars

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Abstract

BACKGROUND: Polenta is a porridge-like dish, generally made by mixing cornmeal with salt water and stirring constantly while cooking over a low heat. It can be eaten plain, straight from the pan, or topped with various foods (cheeses, meat, sausages, fish, etc.). It is most popular in northern Italy but can also be found in Switzerland, Austria, Croatia, Argentina and other countries in Eastern Europe and South America. Despite this diffusion, there are no data concerning the sensory characteristics of this product. A research study was therefore carried out to define the lexicon for a sensory profile of polenta and relationships with corn cultivars.

RESULTS: A lexicon with 13 sensory parameters was defined and validated before references were determined. After panel training, the sensory profiles of 12 autochthonous maize cultivars were defined.

CONCLUSION: The results of this research highlighted that quantitative descriptive analysis can also be used for the sensory description of polenta, and that the defined lexicon can be used to describe the sensory qualities of polenta for both basic research, such as maize selection, and product development.

Keywords: corn; polenta; sensory analysis; quantitative descriptive analysis; principal component analysis

INTRODUCTION

Maize (*Zea mays* L. ssp. *mays*), known as corn in some countries, is a cereal grain widely cultivated throughout the world. Worldwide production was over 826 Mt in 2008 – more than rice (678 Mt) and wheat (681 Mt), with the USA producing almost half of the world's harvest.[1] The primary uses of corn are as feed for livestock, forage, silage and grain, but it can also be used for maize creations (corn mazes, sculptures, etc.) or as biofuel. This grain is very important, with many industrial uses including transformation into plastics, syrups and alcohol for biofuels, but it is also widely used for human nutrition in the form of popcorn, sweetcorn and, above all, cornmeal with which various dishes such as polenta in Italy, angu in Brazil, mush in the USA or tortillas can be produced.

Among these dishes, the most popular in northern Italy (but also in Switzerland, Austria, Croatia, Argentina and other countries in Eastern Europe and South America) is certainly polenta, a porridge-like dish, generally made by mixing cornmeal with salt water and constantly stirring while cooking.[2,3] In these countries, polenta is made with either coarsely or finely ground dried yellow, white or red cornmeal, depending both on the region in question and the texture desired.

The name 'polenta' derives from earlier forms of grain mush (known as *puls* or *pulentum* in Latin) commonly eaten in Roman times and later. The early forms of polenta were made with starches extracted from *Triticum spelta* L. or chestnut flours, both of which are still used (although in relatively small quantities) today. Polenta is often cooked in a huge copper pot known in Italian as a 'paiolo' and can be mixed (generally at the end of cooking or at moment of serving) with various foods such as cheeses, butter, fish, porcini mushrooms, rapini (broccoli rabe) or other vegetables, sausages or meat, as in the Venetian *polenta e osei* with small game birds.

Generally, the yellow maize cornmeal is used for polenta production, but buckwheat, white maize or a mixture of the two can also be used.

Polenta is traditionally a slowly cooked dish, sometimes taking an hour or longer to cook, with constant stirring necessary. However, a variety of cooking shortcuts such as instant and precooked polenta have recently become popular, both in Italy and elsewhere.

Although corn composition has been well defined and the chemical/sensory characteristics of some derived products such as tortillas or popcorn have also been outlined,[4–11] the scientific literature concerning studies on polenta is poor and only concerns chemical parameters.[12]

The aim of this work was thus to use a quantitative descriptive analysis (QDA) to define a lexicon for the sensory profile of traditional polenta obtained from fresh corn maize and use this lexicon to compare different corn cultivars regarding odour, aroma and, above all, the structure of the final product.

QDA has been successfully used to obtain detailed descriptions of the aroma, flavour and oral texture of food and beverages.[13–21]

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Table 1. Corn cultivars used to define the sensory profile of traditional polenta during the 2 years of testing. The underlined cultivars were used to develop the list of attributes for odour, aroma, taste and structure of polenta

	Year	
Cultivar	2008	2009
Pignoletto Giallo		X
Pignoletto Rosso	X	X
Nostrano dell'Isola		X
Ottofile giallo	X	X
Ostenga	X	X
Scagliolo Marne	X	X
Locale Elbano	X	
Ottofile Maceratese	X	
Cinquantino bianco	X	
Maranello Verneveil	X	
Culaccione	X	
Marano		X

Sensory characteristics are identified by professionally trained and experienced experts and samples are evaluated for a selected number of attributes by a trained panel. This provides an objective measure of the sensory quality of food products and the resulting sensory profiles can then be used in product development and manufacturing, quality control and in helping to explain the results of consumer tests.

MATERIALS AND METHODS

Sample preparation

Flour produced by 12 autochthonous corn cultivars was examined over a 2-year period (Table 1). Nine cultivars were examined by the same tasters in the first year, and seven in the second year. Four of these cultivars (Pignoletto Rosso, Ottofile Giallo, Ostenga and Scagliolo Marne) were examined for 2 years. All maize was produced in a field in the province of Turin (Piedmont, northwest Italy). Polenta was made by cooking 300 g cornflour in 1 kg natural unsalted water. This recipe was used to highlight the maize characteristics; it is largely used in the Alpine area of Italy, where the final product can be mixed afterwards with cheeses, fats, meat, sausage, fish and other foods. To avoid any unwanted effects on sensory reception and thus highlight only polenta descriptors, salt was not used. Cooking time was 45 min and during this time the polenta was constantly stirred. To guarantee the same cooking conditions, an automatic cooking-mixer (Bimby TM-31, Vorwerk, Milan, Italy) was used.

Samples of approximately 80 g polenta were served in plastic dishes to panellists.

Sensory analysis

A QDA was performed.[22,23] The panel was made up of 10 tasters (six male and four female, between 30 and 42 years old, recruited according to ISO regulations),[24–27] who generally deal with sensory analysis in the department. Sessions of analysis were carried out in the morning (11:00–13:00) with white light. The sensory laboratory was designed according to ISO 8589 with separate booths.[28] Room temperature was $22 \pm 1\,^{\circ}$C. Mineral water (Sant'Anna, Fonti di Vinadio, Turin, Italy) was provided to cleanse the palate during the sessions. Samples were labelled with a three-digit code.

In the first year, the assessors developed the list of attributes for odour, aroma, taste and structure during eight initial 15 min sessions. For each session, one sample of polenta was used. For this activity a white cultivar (Ostenga), a red cultivar (Pignoletto Rosso) and six yellow cultivars were used (Table 1). Since polenta production takes about 60 min, samples must be examined while still hot, and because only one automatic cooking-mixer was available only one sample could be produced and analysed per sensory session.

Assessors were asked to generate the maximum number of descriptors possible for polenta. The panellists then participated in three 1 h round-table discussions to establish the initial lexicon and to discard any hedonic, redundant or qualitative descriptors, selecting only the most appropriate terms. The panellists discussed and reached agreement for each descriptor on the initial list before proceeding with the subsequent sessions.

The procedure for selecting and identifying the descriptors was adapted from ISO 11 035[29] and Meilgaard,[23] and 'adjusted frequencies' (AFs) were used. Five 15 min sessions were conducted and five samples were examined (one white, one red and three yellow corn cultivars). Each panellist was asked to judge the perceived intensity for each of the descriptors in the initial list. Each intensity was scored on a 5-point scale from 0 (none) to 5 (strong), in accordance with ISO 11 035.[29] For each descriptor, the AF was calculated as $AF = (F \times I)^{1/2}$, where F is the number of times the descriptor was mentioned divided by the total number of times that descriptor could be mentioned, expressed as a percentage, and I is the sum of the intensities given by the whole panel for a descriptor divided by the maximum possible intensity for the descriptor, expressed as a percentage. This calculation method also allowed us to take into account descriptors that are rarely mentioned but which are very important in terms of perceived intensity, and descriptors with low perceived intensity but which are mentioned often. The classification of descriptors according to the size of the means allowed us to eliminate a number of descriptors whose geometrical means were relatively low.

At a 2 h round-table, the selected descriptors were first explained to panellists and then references were determined during the subsequent discussion.

Each descriptor was extensively described and explained to avoid all doubts about the relevant meaning.[22] Eight 1 h training sessions were conducted, during which the panellists were trained in scoring the intensity of each attribute with definitions and references. The intensity scores were discussed to reach a consensus among all panellists.

The training period, reduced to only three 1 h training sessions, was repeated in the second year to counteract the lengthy time gap between tests. After the training period, the sensory profile of polenta obtained by the 12 autochthonous cultivars was evaluated during 36 sessions performed over 2 years. All samples were then evaluated in triplicate. The samples were labelled with three-digit random numbers. Assessors evaluated each parameter on a scale from 0 (absence of sensation) to 9 (extremely intense).

Statistical analysis

For each year, a two-way analysis of variance (ANOVA) with cultivars, judges and their interactions as effects was used to highlight the differences for each sensory parameter. A two-way ANOVA with cultivar and years as effects was also used to highlight the differences for each sensory descriptor. Finally, a one-way ANOVA was used to highlight significant differences among maize cultivars for each year and each term of sensory lexicon. Duncan's mean comparison test was used to highlight significant differences among cultivars. A principal component analysis (PCA) was also performed in order to show relationships among corn cultivars and among variables. Mean value for each parameter was computed across judges, and replicated and used for PCA. All calculations were performed with the STATISTICA for Windows program (Release 7.0; StatSoft Inc., Tulsa, OK, USA).

RESULTS AND DISCUSSION

Generating descriptors

The assessors generated 59 descriptive terms after the eight initial tasting sessions. These descriptors were discussed during 3 h of round-tables to eliminate any hedonic, redundant or qualitative terms. For example, 'excellent, good, bad, anonymous' were eliminated as hedonic terms. Also, terms such as 'typical' were erased because they were judged to be inappropriate descriptions of the sensory attributes of polenta. 'Mouldy', 'oxidized', 'fermented' and other terms used to define defective aspects were also omitted since the aim of the work was to prepare a lexicon to compare fresh maize as opposed to the study of maize cultivars during conservation. Some descriptors were found to be both orthonasal and retronasal, e.g. 'herbaceous'. The panel decided to categorize these terms under both odour and aroma. After the round-table discussion, the panel established an initial list of 27 terms. Of these, 11 were related to odour, five to taste, eight to aroma and three to texture.

Selection of descriptors

The dataset of 27 attributes of polenta was then refined. The terms defined in the previous step were used to examine five polenta samples (one red, one white and three yellow maize) and intensity was scored on a 5-point scale from 0 (none) to 5 (strong). Table 2 shows the AFs for all descriptors. Since there is not a defined value to select descriptors, we arbitrarily took the most important descriptors with AF > 18. This value was obtained by supposing that half of the panellists identified a descriptor for half the samples with an intensity value of half the maximum potential.

Only 13 descriptors achieved this value. Of these, four were related to odour, three to taste, four to aroma and two to texture. During a 2 h round-table discussion, each attribute term was extensively described and explained, and reference standards were defined by panellists and reported in Table 2. For reference standards, simple and well-defined products were used, readily available on the market.

These attributes correspond to the highest-intensity score of the rating scale used for sample sensory description.

Sample evaluation to verify the lexicon

After the 8 h assessment training period, the panellists were asked to describe the sensory profile of 12 autochthonous cultivars. Thirty-six sessions were held over 2 years. *F*-ratios of the two-way ANOVA (Table 3) allowed the verification, for all examined years, of assessor agreement and significant differences with respect to the corn cultivars.

The results of the ANOVA indicated that the levels of intensity for each descriptor were significantly different ($P < 0.001$), implying that all of the descriptors were useful in differentiating sensory qualities among the polenta obtained with different corn cultivars.

Similar results were obtained for all the years considered. The assessor effect generally was not significant for all attributes and could be explained by the effective training period. Only for the 'Particle amount' in 2009 was the assessor effect significant,

Table 2. Adjusted frequencies (AF) obtained for sensory descriptors during the selection phase. References for attributes with an AF > 18 and used for polenta description are also reported

Sensory attribute	AF value	Reference
Odour		
Dry grass	12	
Honey	11	
Smoke	6	
Grassy odour	21	500 mg cis-3-exen-1-ol[a] in mineral water[f]
Caramel	9	
Flour	15	
Cooked chestnut odour	31	2 g chestnut flavour[b] in mineral water
Toast	14	
Cooked potato odour	25	4 g potato boiled flavour[b] in mineral water
Cooked corn odour	82	4 g boiled corn flavour [b] in mineral water
Bread	8	
Taste		
Sweet	95	5 g saccharose[a] in mineral water
Salty	33	2 g sodium chloride[a] in mineral water
Sour	14	
Bitter	45	0.8 g caffeine[a] in mineral water
Umami	6	
Aroma		
Metallic	15	
Grassy aroma	26	500 mg cis-3-exen-1-ol[a] in mineral water
Cooked chestnut aroma	28	2 g chestnut flavour[b] in mineral water
Fermented	11	
Oil	15	
Cooked potato aroma	42	4 g potato boiled flavour[b] in mineral water
Egg	8	
Cooked maize aroma	96	4 g boiled corn flavour[b] in mineral water
Texture		
Slipperiness	14	
Firmness	87	Philadelphia cream cheese[e] – Processed cheese[e] – Tofu[d]
Particle amount	94	10 g minced fresh hazelnuts in 125 g natural yogurt[e]

[a] Sigma-Aldrich Chemical, Milan, Italy.
[b] Flavourart, Oleggio (NO), Italy.
[c] Kraft Foods Italia, Milan, Italy.
[d] Natura Nuova, Bagnacavallo (RA), Italy.
[e] Parmalat, Collecchio (PR), Italy.
[f] For all solutions 1 kg mineral water was used.

Table 3. *F*-ratios and corresponding significance levels for the two-way ANOVA (products, judges) performed for each year and each sensory attribute

	Year 2008			Year 2009		
	Products	Judges	P × J	Products	Judges	P × J
Grassy odour	156.03***	1.35 NS	0.88 NS	285.89***	1.03 NS	1.01 NS
Cooked chestnut odour	733.27***	0.47 NS	1.02 NS	269.29***	1.25 NS	0.97 NS
Cooked potato odour	576.82***	0.23 NS	0.83 NS	259.76***	0.92 NS	0.82 NS
Cooked corn odour	720.90***	1.65 NS	1.2 NS	453.83***	0.44 NS	0.91 NS
Sweet	207.97***	1.32 NS	0.98 NS	526.60***	0.60 NS	1.19 NS
Salty	45.52***	0.81 NS	0.83 NS	339.56***	0.48 NS	1.24 NS
Bitter	248.49***	0.54 NS	0.87 NS	159.63***	0.56 NS	1.10 NS
Grassy aroma	122.81***	0.91 NS	0.79 NS	253.86***	0.69 NS	0.87 NS
Cooked chestnut aroma	628.24***	1.10 NS	1.07 NS	107.61***	2.45***	1.51 NS
Cooked potato aroma	499.97***	1.12 NS	0.85 NS	32.34***	0.66 NS	1.12 NS
Cooked maize aroma	692.58***	0.71 NS	1.26 NS	194.96***	1.40 NS	0.95 NS
Firmness	448.02***	0.52 NS	1.23 NS	110.70***	0.98 NS	0.78 NS
Particle amount	247.36***	1.48 NS	0.82 NS	464.97***	2.22***	1.03 NS

F-ratios marked with asterisk indicate significance at: $^{*}P < 0.05$; $^{**}P < 0.01$; $^{***}P < 0.001$; NS, no significant difference; P × J = products × judges.

Table 4. *F*-ratios and corresponding significance levels for two-way ANOVA (products, years) performed for each sensory descriptor

	Years	Products	Y × P
Grassy odour	21.98***	228.97***	409.07***
Cooked chestnut odour	994.24***	1008.02***	147.41***
Cooked potato odour	148.65***	329.76***	947.95***
Cooked corn odour	3.27 ns	17.2***	879.95***
Sweet	140.35***	557.81***	141.22***
Salty	39.32***	13.96***	38.98***
Bitter	0.02 NS	128.08***	345.02***
Grassy aroma	91.67***	152.69***	120.95***
Cooked chestnut aroma	588.99***	316.06***	226.71***
Cooked potato aroma	581.72***	94.86***	91.11***
Cooked maize aroma	767.85***	262.63***	62.82***
Firmness	1254.33***	10.56***	72.82***
Particle amount	130.57***	875.96***	61.09***

F-ratios marked with asterisk indicate significance at: $^{*}P < 0.05$; $^{**}P < 0.01$; $^{***}P < 0.001$; NS, no significant difference; Y × P = years × products.

probably due to interindividual differences in the use of the scale with this very peculiar descriptor. None of product × assessor interaction showed a significant interaction; thus the discordance among the judges in the evaluation of these descriptors may be considered negligible.

Two-way ANOVA was also used to examine the four maize cultivars studied over 2 years (Pignoletto Rosso, Ottofile Giallo, Ostenga and Scagliolo Marne) for the differences among samples using corn cultivars and years as factors (Table 4).

The years showed a significant effect for all descriptors with the exception of 'Cooked corn odour' and 'Bitter'. These results highlighted that even with the controlled cultivation methods applied in this experiment corn characteristics are largely correlated to the production year.

A one-way ANOVA was then performed for each year using autochthonous corn cultivars as variables, and mean intensity ratings of descriptive attributes are shown in Table 5. Sweet, salty and bitter showed the lower differences among products for each year. Polenta is generally sweet due to the presence of small quantities of sugars, although their concentrations decrease with seed ripening. Culaccione and Ostenga proved the sweetest corn cultivars, while Pignoletto Rosso, Locale Elbano and Scagliolo Marne showed the highest values for bitter.

Grassy odour and aroma were very important sensory parameters for Pignoletto Rosso and Ottofile Giallo in all the years examined.

Cooked chestnut odour and aroma were characteristic for Cinquantino Bianco, Ostenga, Locale Elbano and Marano, while cooked potato odour and aroma were present above all for Locale Elbano, Maranello Verneveil, Ottofile Maceratese and Scagliolo Marne.

Cooked corn odour and aroma values were very high for Culaccione, Locale Elbano, Maranello Verneveil and Ottofile Giallo in 2008, while Marano, Nostrano Isola and Pignoletto Giallo showed the highest values in 2009.

Cinquantino Bianco and Nostrano isola exhibited the highest values for firmness. For 2008, the values of this parameter were generally similar, while 2009 values showed a higher variability among maize varieties.

The particle amount values, owing to maize resistance to milling and starch gelatinization,[30] varied greatly among varieties. Polenta is characterized by the presence of small particles in its structure but if there are too many its quality decreases. In this study, the highest values were shown by Culaccione, Scagliolo Marne, Pignoletto Rosso and Marano.

The mean value for the intensity of each sensory attribute were submitted to PCA. Five principal components were obtained, with eigenvalues of more than 1.0. These five dimensions explained about 87% of the variance. Figure 1 (biplot) shows the variable distribution (sensory attributes) on the plane defined by the first two factors. High correlation is obviously shown by the loading plot between cooked corn aroma and odour. Another high correlation is showed among cooked potato aroma, cooked potato odour and particle amount, and could be due to starch.

Table 5. Mean intensity rating of sensory attributes of polenta obtained with different corn cultivars and results of one-way ANOVA with Duncan's test

2008	Cinquantino Bianco	Culaccione	Locale Elbano	Maranello Verneveil	Ostenga	Ottofile Maceratese	Ottofile Giallo	Pignoletto Rosso	Scagliolo Marne	Significance
Grassy odour	0.9a	2.0b	0.9a	1.9b	1.0a	2.9c	4.0d	3.8d	2.1b	**
Cooked chestnut odour	8.0g	2.0b	0.9a	1.0a	6.9e	1.0a	3.9d	2.9c	1.1a	**
Cooked potato odour	3.0b	5.8d	7.0e	8.0f	1.9a	8.0f	2.0a	4.6c	8.1f	***
Cooked corn odour	0.8a	7.8g	7.9g	6.9f	3.1c	3.9d	7.0f	5.9e	2.0b	**
Sweet	1.9a	7.0e	3.0b	3.8c	5.0d	4.0c	4.1c	2.9b	4.0c	*
Salty	1.9b	1.1a	1.1a	1.0a	1.0a	2.9c	2.1b	1.1a	1.1a	*
Bitter	1.9c	1.2b	5.2f	0.9a	1.0ab	1.0ab	2.0c	2.9d	4.3e	**
Grassy aroma	0.6a	2.0b	0.5a	3.0c	1.9b	0.4a	2.1b	3.0c	2.1b	*
Cooked chestnut aroma	6.9f	0.9b	4.9e	2.0c	4.2d	0.9b	1.0b	0.4a	4.1d	**
Cooked potato aroma	2.2b	6.0e	5.9e	7.1f	2.9c	2.0b	4.0d	2.2b	1.0a	***
Cooked corn aroma	0.5a	7.8g	4.1e	6.0f	2.1c	3.8d	1.0b	2.0c	0.9b	***
Firmness	7.9d	2.0b	2.8c	1.1a	1.9b	3.1c	2.1b	2.0b	2.9c	**
Particle amount	5.1c	7.9f	4.0b	5.9d	3.9b	3.9b	2.9a	6.0d	6.9e	**

2009	Marano	Nostrano Isola	Ostenga	Ottofile Giallo	Pignoletto Giallo	Pignoletto Rosso	Scagliolo Marne	Significance
Grassy odour	0.7e	1.0c	3.9d	0.7ab	0.9bc	4.1e	1.0c	***
Cooked chestnut odour	0.6a	2.4d	4.3e	0.7ab	0.9b	0.6a	1.3c	*
Cooked potato odour	4.4c	4.2c	1.9b	5.4e	2.0b	4.7d	1.2a	*
Cooked corn odour	8.0d	6.8c	6.0b	3.0a	8.6e	3.1a	6.6c	**
Sweet	1.0a	4.2c	8.1e	4.9d	4.0c	2.2b	4.0c	**
Salty	2.4d	4.9e	0.6a	0.5a	0.6a	1.5c	0.9b	*
Bitter	3.8e	3.4d	2.4b	3.0c	2.8c	4.3f	0.5a	**
Grassy aroma	1.1b	0.5a	0.7a	4.5e	3.2c	3.1c	3.5d	**
Cooked chestnut aroma	3.2e	2.3d	1.5c	1.1b	1.1b	0.5a	0.6a	**
Cooked potato aroma	2.4d	1.2bc	1.0bc	0.9ab	1.2c	0.7a	1.0bc	***
Cooked corn aroma	4.2e	2.3b	5.5g	1.5a	3.9d	4.5f	2.7c	**
Firmness	4.7c	6.1e	5.3d	4.1b	2.9a	5.1d	3.9b	**
Particle amount	7.1f	4.6c	1.7a	3.0b	3.3b	5.6d	6.4e	**

Mean values within column with the same letter are not significantly different at $P \leq 0.05$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

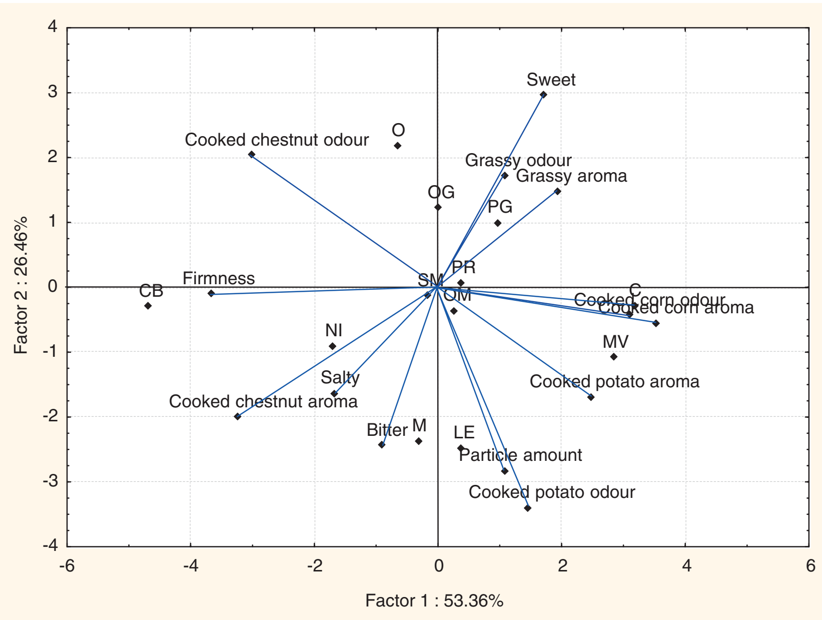

Figure 1. PCA: projection of the sensory attribute of polenta and corn cultivars on the factor plane obtained with the first two factors (CB, Cinquantino Bianco; C, Culaccione; LE Locale Elbano; MV, Maranello Verneveil; O, Ostenga; OM, Ottifile Maceratese; OG, Ottofile Giallo; PR, Pignoletto Rosso; SM, Scagliolo Marne; M, Marano; NI, Nostrano Isola; PG, Pignoletto Giallo).

In fact, cooked potato odour/aroma is similar to that produced by boiled starch. With a high quantity of particles not subjected to milling, this could be more evident. Bitter and salty are directly correlated and inversely correlated to sweet. An inverse correlation was also highlighted by PCA for firmness with cooked corn odour/aroma. Sweet and grassy odour/aroma are also directly correlated. Grassy odour/aroma is due to an incomplete maturation of maize. In this case the seeds also have sugars and hence the presence of the sweet taste.

Figure 1 shows also the positions of the corn cultivars in the factor plane. The first component (explained variance about 53%) distinguishes very well the Cinquantino Bianco (high firmness and cooked chestnut odour/aroma but low cooked corn odour/aroma) and the Culaccione–Maranello Verneveil group (high cooked corn odour/aroma and low firmness). The second component (explained variance about 26%) distinguishes the Ostenga (high sweet and cooked chestnut odour but low bitter, salty, cooked potato odour and particle amount) from the Marano–Locale Elbano group (high particle amount and cooked potato odour/aroma but low grassy odour/aroma and sweet). A clear distinction is also made between the Nostrano Isola (high salty, bitter and cooked chestnut aroma) and the Pignoletto Giallo (high sweet and grassy aroma but low salty and bitter).

CONCLUSIONS

By using sensory descriptive analysis, the sensory attributes of polenta produced with the most simple recipe (maize flour and water) were obtained for the first time. Thirteen terms (four for odour, three for taste, four for aroma and two for texture) were defined and referenced through a sensory evaluation and discussion. The lexicon was validated and applied to define the sensory profile of polenta obtained with different corn cultivars. The results show that all of these descriptors are appropriate for differentiating sensory qualities among samples, and that the defined lexicon can be used to describe the sensory qualities of polenta obtained by fresh corn flour both for basic research, such as maize selection, and product development.

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