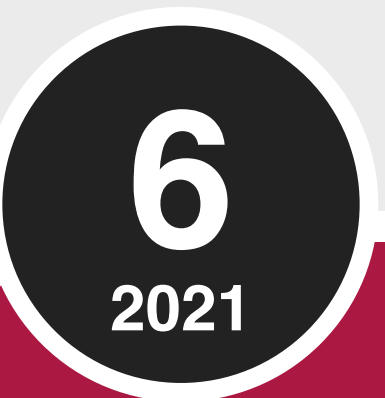


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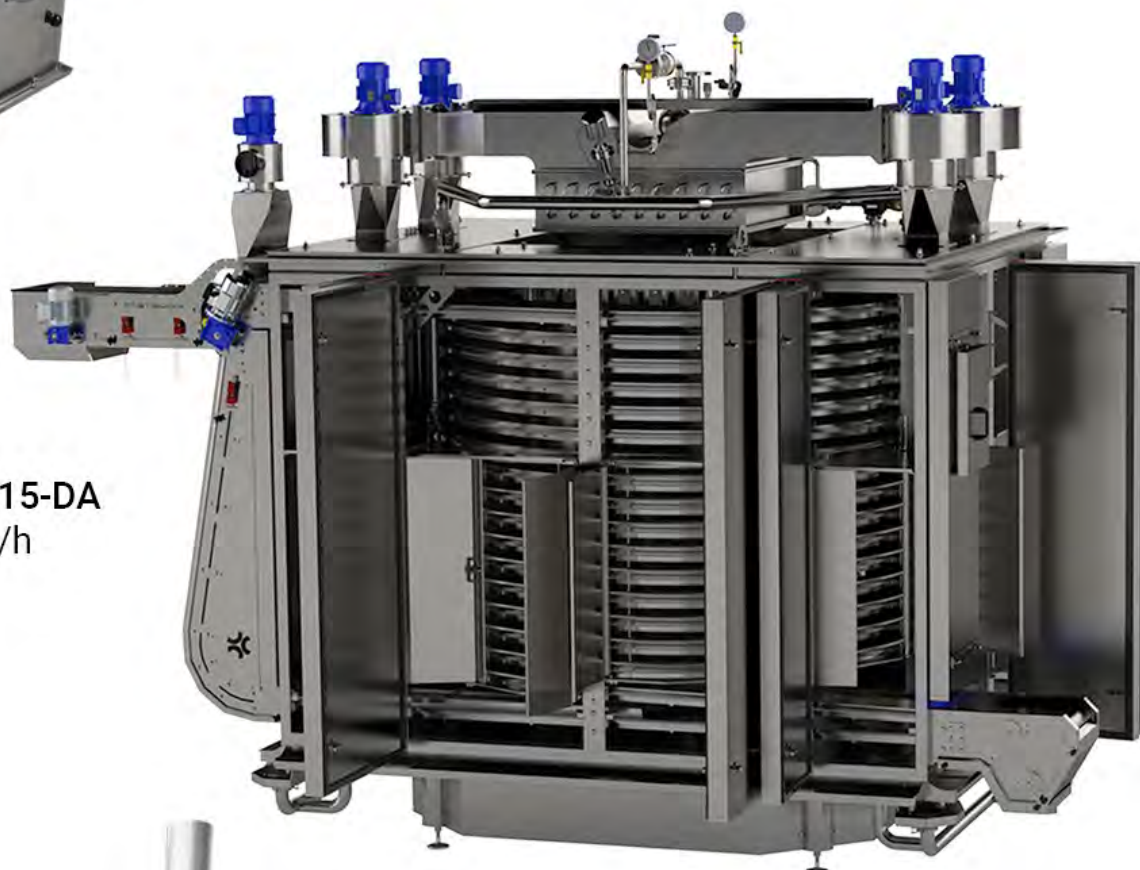
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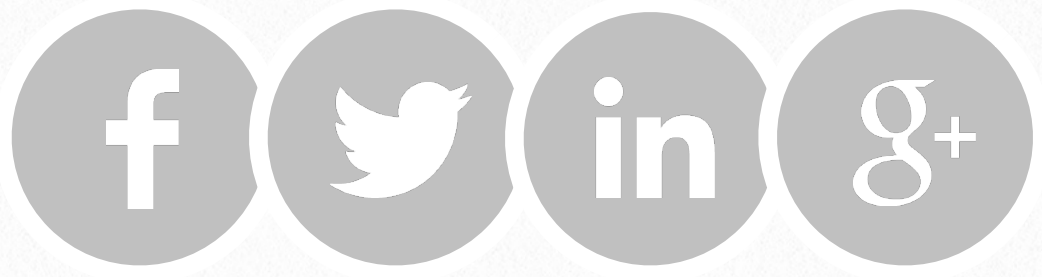
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1



A “hybrid” Pastaria Festival makes its debut at Tuttofood

Delia Sebelin



The 5th edition of the Pastaria Festival - the free day dedicated to specialised information for pasta producers - wrapped up on 26 October at Fiera Milano in Rho. For the first time, the event adopted a hybrid format, including both in-person and virtual components, with live streaming.

For its fifth edition, the Pastaria Festival decided to respond to the post-Covid challenge, by returning to a live, in-person event.

The choice was made “in grand style”: for the first time the free information day for pasta producers and supply chain operators was held as part of the international exhibition, Tuttofood. The bet paid off: the results for the international Agrifood exhibition and the contemporaneous Host (Fiera Milano Rho. 22 - 26 October 2021) greatly exceeded expectations, attesting to the determination of the Food & Beverage world (and the pasta sector in particular) to react to the difficulties left in the wake of the pandemic. The need to show their Green Pass at the entrance to Fiera Milano and the mask requirement did not dampen the enthusiasm of those who came to Rho as participants or visitors.

From one pavilion to the next, the ‘entrepreneurial energy’ emanating from the exhibitors was palpable. “We’re back and raring to go!”, an enthusiasm borne out, first and foremost, by the innovative products launched during the event (see [*Dal più grosso al bollito, è sempre... pasta!*](#) on Pastaria.it).

A word from the pasta producers

The Pastaria Festival has shone the spotlight on a sector that has made our country an undisputed leader. The event, which enjoyed the sponsorship and collaboration of the most important Italian and international associations of pasta producers, as well as contributions from researchers and lecturers of the most renowned Italian universities, reviewed the progress of research applied in the field of fresh and dried pasta.

But it also provided an opportunity to reflect on a period in history that has left a painful aftermath and less than appealing prospects: the rising prices of raw materials, energy and fuel threaten to render life difficult for pasta producers. “It is not only the soaring price of durum wheat that worries us”, say the leaders of some pasta associations, “the prices of soft wheat, milk and eggs are also on the rise, albeit to a lesser degree. This creates problems not only for producers of semolina pasta but also for those of fresh pasta. Not to mention the hike in energy costs, further darkening an already gloomy outlook”.

Hence the request for “help from the institutions” and the hope that large scale distribution channels can meet the “needs



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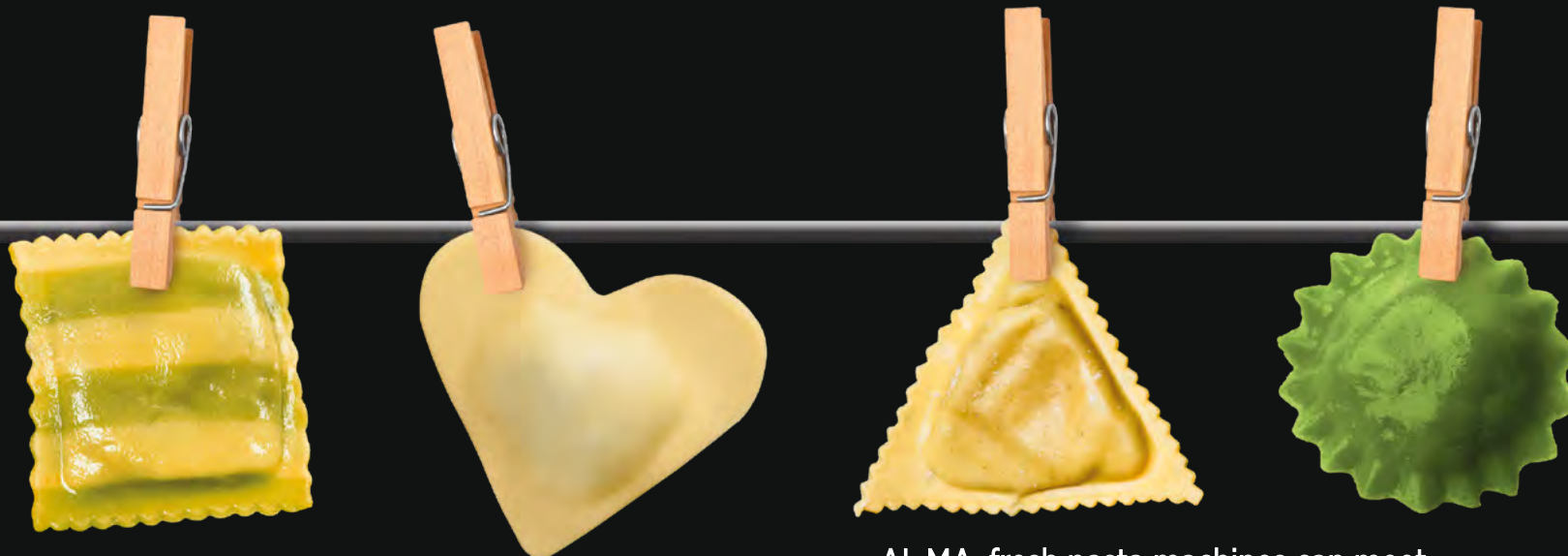


of producers, many of whom may not otherwise be able to absorb the costs”. But the pasta producers are not cowed in the face of such adversity, and are responding accordingly. This was demonstrated by the words of the newly elected president of the International Pasta Organization, Carl Zuanelli, who opened the proceedings of the Pastaria Festival, together with Riccardo Felicetti (Unione Italiana Food), Fabio Fontaneto (APPAFRE), Gherardo Bonetto (APPF) and Lorenzo Pini (Pastaria): “Current supply shortages, combined with pressure on prices triggered by inflationary increases, are all short-term

obstacles [...]. My mantra for the pasta sector is: renew, innovate or perish. If we work courageously and synergistically, the future of the sector looks bright. But in order to achieve this, while we are still sailing in these uncertain waters, supply chain operators will have to undertake a series of actions. Long-established family-run pasta factories and start-ups need to place the emphasis on quality and artisanship, moving towards premiumization. All sector operators must be willing to join forces in order to produce high-quality traditional products. This might seem like an obvious point to make, but it is

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of paramount importance for transformative success”.

The programme

In the Retail Plaza area of pavilion 6 at Tuttofood, and in live streaming on the Zoom platform (in both Italian and English), Pastaria Festival participants had the chance to enjoy a rich and varied programme, throughout the day, which included the following talks:

- Fabio Licciardello (University of Modena and Reggio Emilia, GSICA), Elena Torrieri (University of Naples Federico II) *Design and innovation for pasta packaging*;
- Francesca Mostardini (University of Parma, GSICA), Davide Pollon (Corepla), *Ecodesign and end-of-life scenarios for fresh pasta packaging*;
- Sara Limbo (University of Milan, GSICA), *The perishability of packaged fresh pasta during the distribution phases: the*

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role of packaging gases and the characteristics of light sources;

- Alessandra Marti (University of Milan), Maria Ambrogina Pagani (University of Milan), *Production and characterisation of legume pasta;*
- Maria Cristina Messia (University of Molise), Emanuele Marconi (University of Molise), Francesca Cuomo (University of Molise), *Development of innovative pasta of high dietary and nutritional value and environmental sustainability;*
- Gabriella Pasini (University of Padua), *Protein extracts from insects to produce*

“high protein content” pasta;

- Margherita Dall’Asta (Università Cattolica del Sacro Cuore di Piacenza), Gianluca Giuberti (Università Cattolica del Sacro Cuore di Piacenza), *Digestibility of legume pasta;*
- Francesco Sestili (Tuscia University), *Innovative wheats to reduce the glycaemic index of pasta;*
- Pasquale Catzeddu (Porto Conte Ricerche), *Fresh pasta produced from fermented durum wheat flours: technological and nutritional aspects;*
- Marco Dalla Rosa (University of Cesena),



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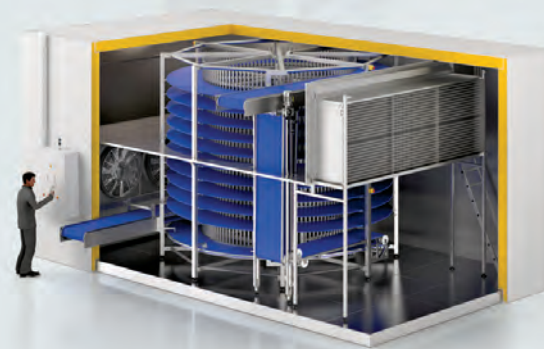
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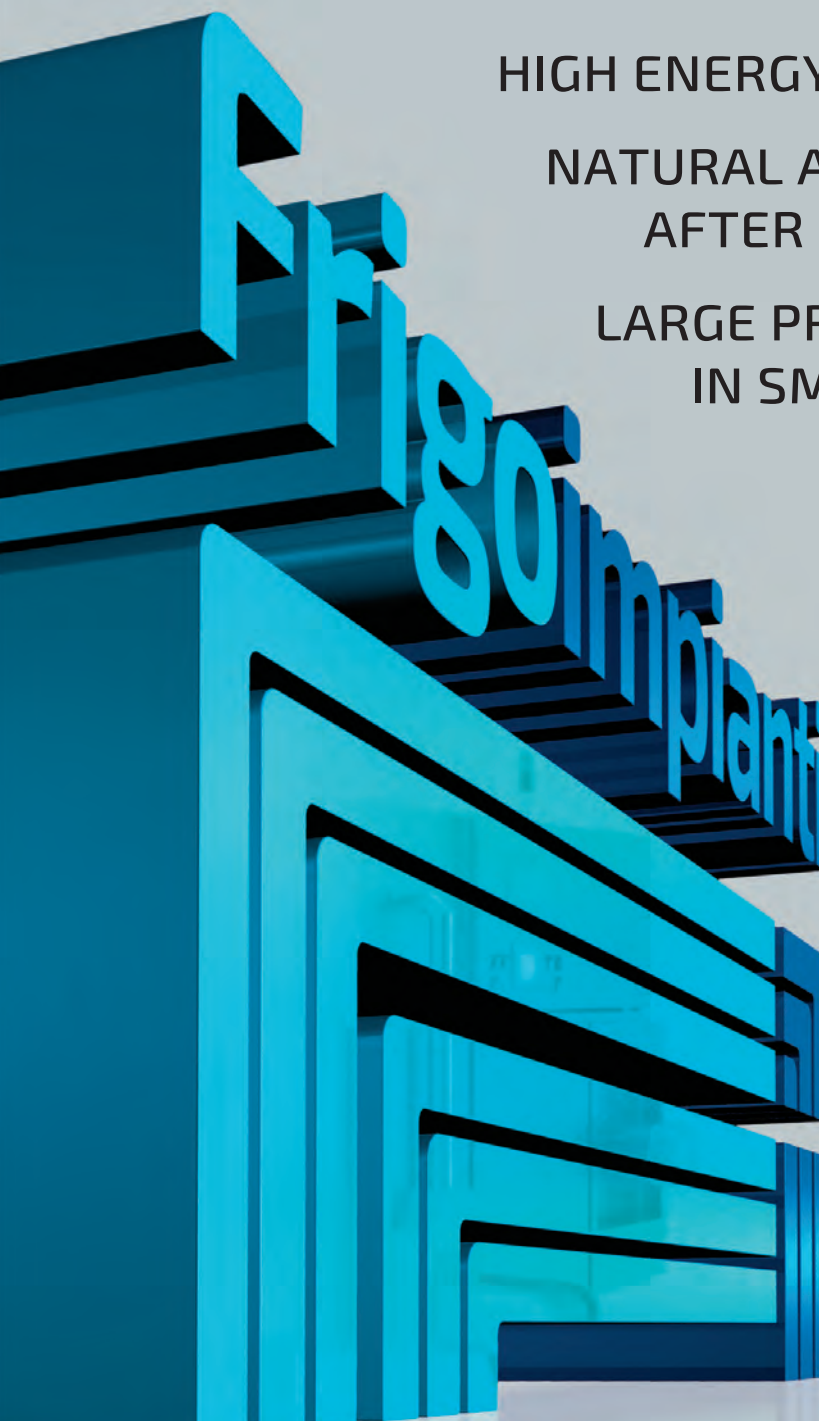
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Stefano Zardetto (University of Cesena), *Application of MAP packaging to increase the safety and shelf-life of filled fresh pasta*;

- Luca Sivelli (Biofresh), *Biofresh: ozone management systems for the containment of mould on pasta* ([click here to watch the video of the presentation](#));
- Alessio Cappelli (University of Florence), *Promotion of short supply chains and local production in response to the COVID-19 crisis and the environmental emergency*;
- Stefano Galli (Nielsen), Sara Beretta (Nielsen), *Pasta and new dietary habits: continuity and new trends*;
- Matteo Figura (NPD Europe), *Away from home pasta consumption before and after the pandemic*.

Also during the event, Pastaria Awards for degree and doctoral theses on the subject of pasta were presented to Ambra Bonciolini (*Formulation of egg pasta fortified with tannins: assessment of antiradical activity and cholesterol oxidation*), Emanuele Fagetti ([Nutritional and health properties of pasta enriched with leftover carrot pulp extract capsules](#)), Veronica Gallo (*Modelling in vitro digestion as strategy in developing tailored food for specific consumer population*).

The Pastaria Festival papers will be published in Pastaria over forthcoming

issues of the magazine.

The sponsors

The event was made possible thanks to solid support from leading international companies in the supply of machinery and systems, ingredients and services for pasta production, aware of the importance of specialised training and continuous professional development.

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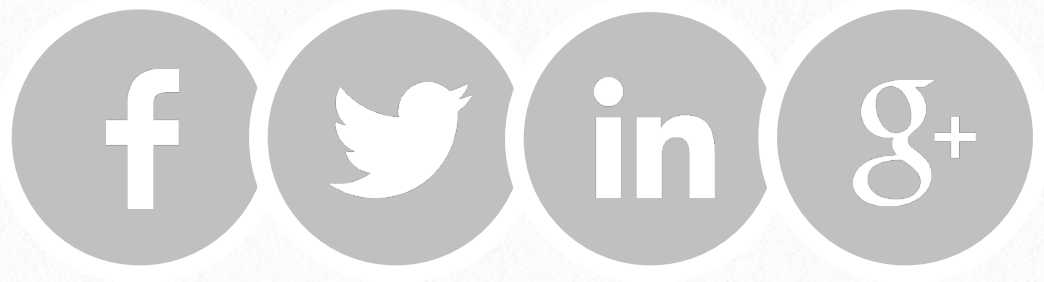
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2



Authentic pasta? The benefits of rapid analysis using infrared spectroscopy

**Annalisa De Girolamo,
Salvatore Cervellieri,
Erminia Mancini,
Michelangelo Pascale,
Antonio F. Logrieco,
Vincenzo Lippolis**
Institute of Sciences of Food
Production, CNR-National Research
Council of Italy, Bari, Italy



Analysis using infrared spectroscopy may be useful for evaluating the authenticity of Italian pasta and detecting adulteration of durum wheat pasta with soft wheat.

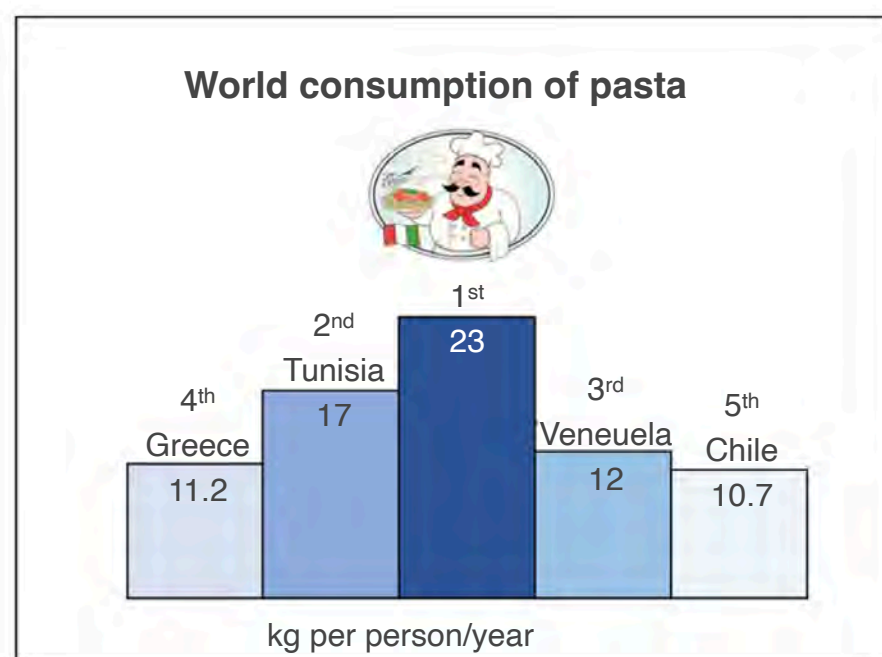
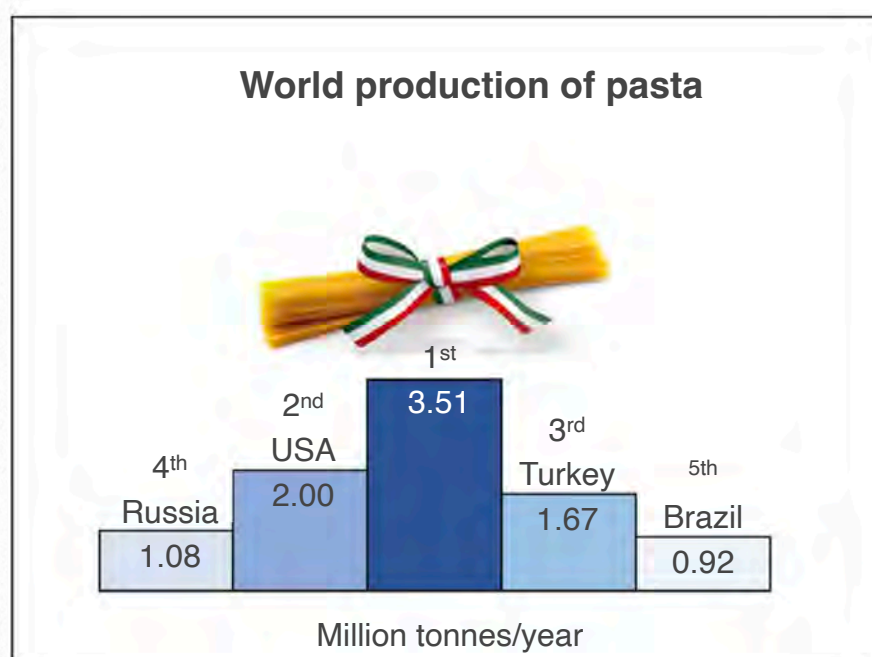
Wheat is a typical agricultural produce of our country and a raw material for many food products, first and foremost pasta, the flagship product of the Italian culinary style and hallmark of Made in Italy products around the world. Queen of the Italian table since time immemorial, pasta has always been considered synonymous with the core values of Italian food and a cornerstone of the Mediterranean diet, a universally recognised dietary model, not only for its taste but also for the health benefits that accrue to the consumer. Indeed, thanks to its indisputable characteristics, such as its nutritional value, high digestibility, long shelf life, wide range of available shapes and low cost, it is a food of paramount importance. So much so that it has been designated by

WHO (World Health Organization of the United Nations) and FAO (Food and Agriculture Organization of the United Nations) as a ‘healthy, sustainable, quality food model’ [1].

Market and supply chain

The pasta production market in Italy represents the peak of a supply chain that also directly incorporates the semolina milling industry and a large part of the country’s agriculture dedicated to the production of durum wheat. Italy is Europe’s largest producer, and the world’s second largest, of durum wheat for pasta, with a harvest of 4 million tonnes in 2019 concentrated in southern Italy, especially in Apulia and Sicily, which alone account for around 40% of national production [2].

Figure 1 WORLD PRODUCTION AND CONSUMPTION OF PASTA IN 2019

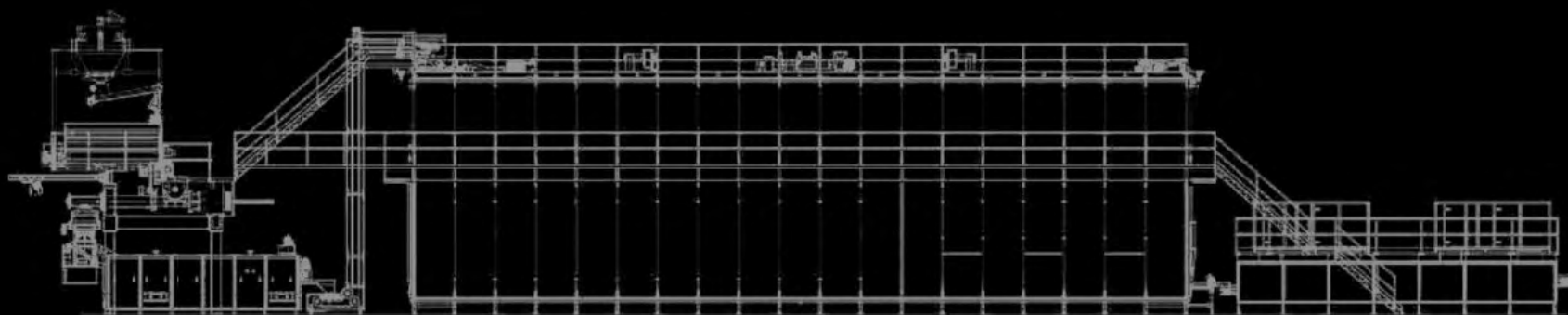


Source: International Pasta Organizations, IPO, e Union of Organizations of Manufactures of Pasta Products of the EU, UNAFPA

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Italy also ranks first in the world for consumption, which in 2019 reached 23 kg per capita – International Pasta Organization (IPO) data – when production topped 3.5 million tonnes ([Figure 1](#)) [3]. Given the size of this market, Italian pasta inevitably enters into competition with international manufacturers.

The importance of the origin of the grain

In Italy, there have been a number of cases of pasta fraud involving misleading information on product labels regarding the origin of the durum wheat used in its production. Recent studies, conducted also on a European scale, have demonstrated that Italian consumers attach increasingly more importance to the information on the product label, particularly as regards the origin of the foodstuff and its raw materials.

Implementing Regulation (EU) no. 775/2018 has been in force since 1 April 2020 in order to guarantee maximum transparency on product labels. With this document, the European Commission introduced the rules for implementing art. 26, paragraph 3 of Regulation (EU) no. 1169/2011, according to which, if the country of origin or place of provenance of a food differs from that of its primary

ingredient, this information must be indicated on the label [4-5].

In the specific case of durum wheat pasta, a more restrictive regulation is in force in Italy, laid down by the Ministerial Decree of 26 July 2017 (extended until 31 December 2021), according to which packages produced in Italy must also indicate on the label the place in which the wheat was grown and milled, specifying whether these stages took place in one or more countries. If these stages took place in various parts of the world, depending on the origin, the following indications may be used: EU countries, non-EU countries, EU and non-EU countries. Additionally, if at least 50% of the durum wheat has been grown in one country, such as Italy, the following wording should be used: “Italy and other EU and/or non-EU countries” [6-7].

Dried semolina pasta

Among the different types of pasta, semolina dried pasta accounts for the largest market share, with a wide variety of products differentiated in terms of consumption habits and frequency, organoleptic characteristics and price positioning. The quality parameters and characteristics of this type of food product and its raw material are laid down in



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Presidential Decree no. 187 of 2001 [8]. According to this decree, dried pasta is defined as being the product obtained exclusively from durum wheat semolina and water, with a minimum protein content equal to or greater than 10.5%.

Additionally, given the fact that Italian wheat can only meet 60-70% of pasta production requirements, pasta makers are obliged to import wheat from abroad (approx. 30-40% of the total, depending on the year) choosing the best grains produced in dedicated areas such as France, Australia, Mexico and North America [9]. The use of top-quality foreign wheat not only guarantees a protein level of around 13%, but also makes it possible to manage the variability of domestic production.

From an online consultation involving more than 26,000 Italian pasta consumers, it emerged that over 84% consumers consider it 'very important' that the pasta they purchase should be made with Italian raw materials, processed in the country [10]. These results were also confirmed in a recent survey conducted on a further 2,400 Italian consumers, in which 84% of consumers said that they felt reassured when consuming Spaghetti & Co., made from wheat grown exclusively in Italy [11]. The growing demand for 100% Made in

Italy wheat products is prompting pasta factories to increase their production.

Targeted analyses

Given the fraudulent procedures carried out on this product in the past, the focus of the companies in the industry and the supervisory bodies is increasingly concentrated on the availability of rapid and reliable analytical methods to authenticate these food products, protect consumer rights, detect fraudulent procedures and support current legislation.

There are a number of analytical methods that can be used to test the authenticity of foodstuffs, most of which are referred to as "targeted" methods that monitor specific molecules in a food and include mainly chromatographic, isotopic, spectrometric or molecular techniques. Notwithstanding their high sensitivity and accuracy, they require the use of sophisticated and expensive instrumentation, and skilled personnel are needed for preparing the samples and conducting the analyses [12].

Infrared spectroscopy

Given the fact that infrared spectroscopy or IR spectroscopy, is an untargeted analytical method, it does not analyse specific molecules but records a spectral profile related to the presence of specific

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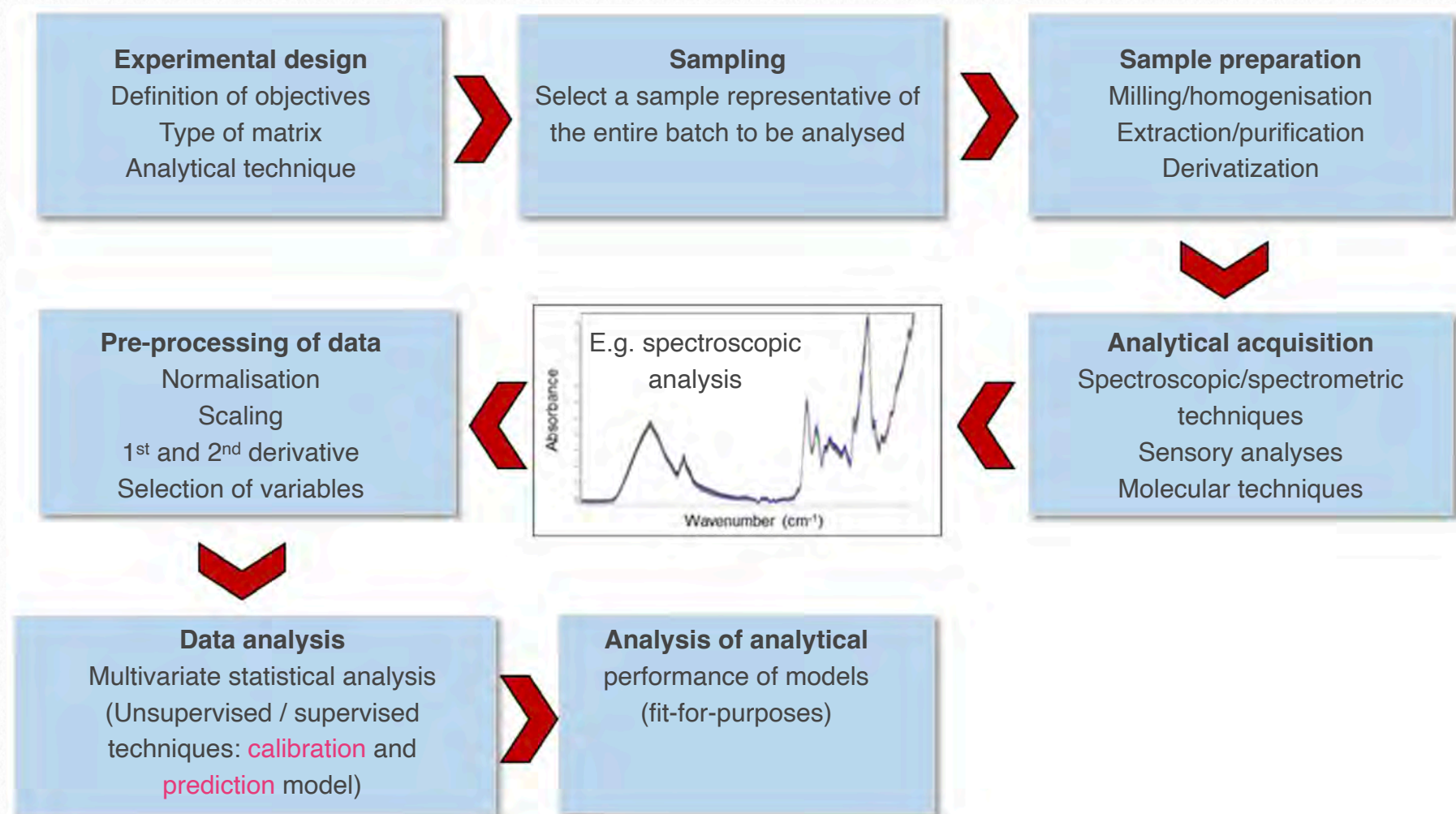
functional groups of the molecules present in the matrix analysed. The spectrum thus obtained is a kind of unique digital fingerprint of the sample, which reflects factors such as botanical origin, place of cultivation, soil, climatic conditions and type of production. All this information is collected in special databases and then utilised for constructing classification models based on the use of statistical analysis [13].

The development of classification models involves an initial phase, called “calibration”, which consists of the analysis of a set of samples (training set) of the classes to be discriminated and

subjected to study, appropriately selected in a sufficiently representative number. The second phase, called “prediction” (or validation), is carried out on a set of samples (test set) to find out the class to which they belong with respect to the parameter analysed (e.g. geographical origin, botanical origin, adulterant content) (Figure 2). Generally speaking, 70% of the complete dataset is used to create the training set, while 30% is used as the test set.

After pre-processing of the data, the spectral information is correlated with the parameter under investigation by means of multivariate statistical analysis, resulting in

Figure 2 GENERAL APPROACH TO THE PHASES OF SAMPLE ANALYSIS USING UNTARGETED METHODS





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a statistical classification model. A statistical analysis of the unknown samples (test set) provides information on the analytical performance of the statistical model developed and is expressed in terms of sensitivity (fraction of samples correctly classified for each class) and accuracy (fraction of samples correctly classified with respect to the whole set) [14].

In this context, the research group led by Annalisa De Girolamo, from the Institute of Sciences of Food Production of the National Research Council (CNR-ISPA), conducted a study to assess the applicability of Fourier transform near-infrared spectroscopy (FT-NIR), in combination with statistical multivariate analysis, to analyse the authenticity of pasta made with 100% Italian durum

wheat [15] and detect any soft wheat adulteration in durum wheat pasta [16].

The authenticity of 100% pasta Italian durum wheat

The study aimed at assessing the authenticity of pasta made with 100% Italian durum wheat was conducted on 361 pasta samples belonging to 33 different Italian commercial brands purchased in the two-year period 2018-2020. Based on label information, samples were classified as either pasta made from durum wheat grown in Italy (Pasta 100% ITA, n=176) or pasta made from mixtures of durum wheat grown in different countries (Pasta MIX, n=185) ([Table 1](#)).

With a view to representing the dynamics of the Italian market as closely as possible, a number of different shapes (long and

Table 1 LIST OF ITALIAN PASTA SAMPLES USED IN THE STUDY WITH RESPECTIVE INFORMATION ON THE COUNTRY OF ORIGIN OF THE WHEAT ON THE LABEL

Pasta classification	Country of wheat cultivation (label info)	No. of samples
100% Italian pasta	Italy	176
Pasta MIX	EU countries NON-EU countries EU and NON-EU countries Italy and other EU countries - Italy and other EU and NON-EU countries	185

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Table 2 DIVISION OF THE PASTA SAMPLES COLLECTED INTO TRAINING SET AND TEST SET, SUBDIVIDED INTO TWO SAMPLE CLASSES ON THE BASIS OF THE INFORMATION ON THE LABEL REGARDING THE COUNTRY WHERE THE WHEAT WAS GROWN

Pasta classification	Training set	Test set
Pasta 100% ITA	120	56
Pasta MIX	118	67

short), drawing methods (bronze or Teflon), cultivation methods (organic and traditional) and types of production (artisanal or traditional) were selected. After milling, an aliquot of each sample was acquired by FT-NIR spectroscopy (Nicolet iS50 FT-IR, Thermo Fisher Scientific Inc., Madison, WI, USA) in the spectral range from 10,000 to 4,000 cm^{-1} . A spectral database was obtained and then divided into two subgroups – the training set (n=238) and test set (n=123) – using a statistical approach (Kennard-Stone algorithm) according to [Table 2](#) [17]. The spectral data were pre-processed to enhance the differences between classes and remove any noise or scattering.

The classification model was developed using the training data set, in which each sample analysed was allocated to one of the predetermined classes based on the information known. Specifically, three different statistical classification approaches were applied, namely Partial

Least Squares – Discriminant Analysis (PLS-DA), Principal Component – Linear Discriminant Analysis (LDA) and Support Vector Machine classification (SVMc) [14]. The entire procedure for analysing pasta samples using FT-NIR spectroscopy is outlined in [Figure 3](#).

Each prediction model should be periodically implemented acquiring IR spectra of additional samples, equally distributed among the classes under study in order to constantly improve its accuracy, robustness and reliability. Given the fact that, as of 2020, more and more Italian companies have started producing 100% Italian wheat pasta, future activities will aim to include in the model developed new samples whose brands were not yet available when this study was conducted. New samples of pasta produced with mixtures of Italian and imported durum wheat will also have to be added, in order to include new varieties and crop years and obtain statistical models that are always representative and up to date.



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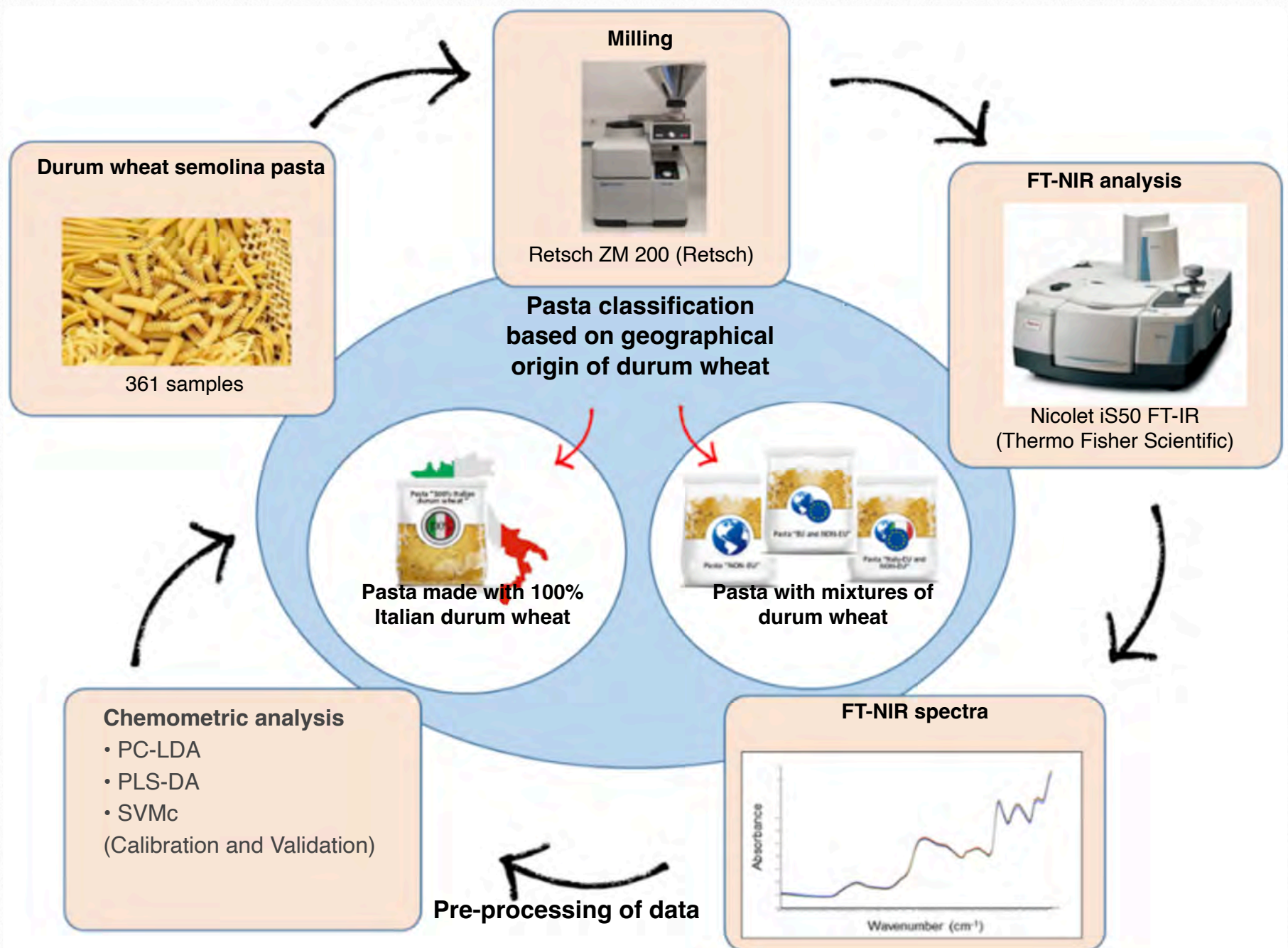
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Figure 3 PASTA ANALYSIS SCHEME USING FOURIER TRANSFORM NEAR-INFRARED SPECTROSCOPY (FT-NIR) IN COMBINATION WITH MULTIVARIATE STATISTICAL ANALYSIS (PRINCIPAL COMPONENT-LINEAR DISCRIMINANT ANALYSIS, PC-LDA; PARTIAL LEAST SQUARES-DISCRIMINANT ANALYSIS, PLS-DA; SUPPORT VECTOR MACHINE CLASSIFICATION, SVMc)



Soft wheat adulteration

Given the difference in price between durum wheat and soft wheat, the latter being cheaper, the most frequent type of fraud is that of replacing part of the former with the latter in the production process. So FT-NIR spectroscopy has also been used to detect the adulteration of durum wheat pasta with soft wheat [16], in

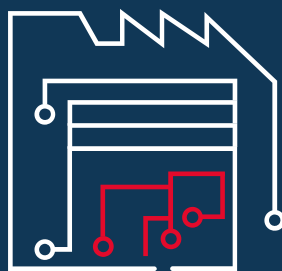
compliance with current pasta legislation [18]. In fact, Presidential Decree no. 187/2001 stipulates that Italian dried pasta marketed in Italy must be made exclusively from durum wheat semolina. There is, however, a tolerance of up to 3% of soft wheat, to account for cross-contamination phenomena during the storage or transportation of durum wheat. In the case

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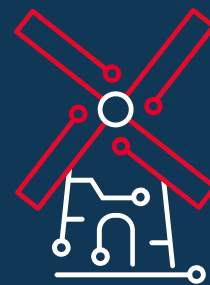
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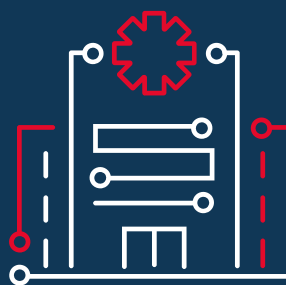
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Table 3 COMPARISON OF THE ANALYTICAL PERFORMANCE (SENSITIVITY AND ACCURACY) OF THE THREE CLASSIFICATION MODELS APPLIED TO THE ANALYSIS OF DURUM WHEAT PASTA SAMPLES

Samples	Classification models*	Sensitivity of the aforementioned classes (%)		Accuracy (%)
		100% ITA	Wheat MIX	
Training set	PC-LDA	98	95	96
	SVMc	93	85	89
	PLS-DA	94	87	86
Test set	PC-LDA	95	94	94
	SVMc	96	82	89
	PLS-DA	88	82	85

* *PC-LDA, Principal Component-Linear Discriminant Analysis; PLS-DA, Partial Least Squares-Discriminant Analysis; SVMc Support Vector Machine classification*

of durum wheat pasta exported abroad, a higher quantity of soft wheat semolina may be used, as long as this is stated on the label [18].

In the particular case of the study conducted at CNR-ISPA, samples of Italian and foreign durum wheat pasta were used. The study, the aim of which was to detect the adulteration of durum wheat pasta with soft wheat, was conducted on 120 samples of dried pasta produced and marketed in Italy and 154 samples of dried pasta produced and marketed abroad, of various different brands. Also in this study, a procedure similar to that used in the previous study was employed: after milling, each sample was acquired by FT-NIR spectroscopy and subjected to

multivariate statistical analysis (PC-LDA and PLS-DA), after pre-processing of the data, in order to build classification models and be able to discriminate samples on the basis of their soft wheat content, thereby identifying any adulteration. Each sample was analysed in parallel using a reference method based on an ELISA assay for the quantitative determination of soft wheat content ([Figure 4](#)) [16].

The ELISA analysis showed that only 4 of the 120 Italian pasta samples contained soft wheat within a range of 0.2 to 0.5%, thereby fully complying with current legislation [18]. With regard to the samples produced outside Italy, on the other hand, 116 out of 154 contained soft wheat at levels of up to 28%.



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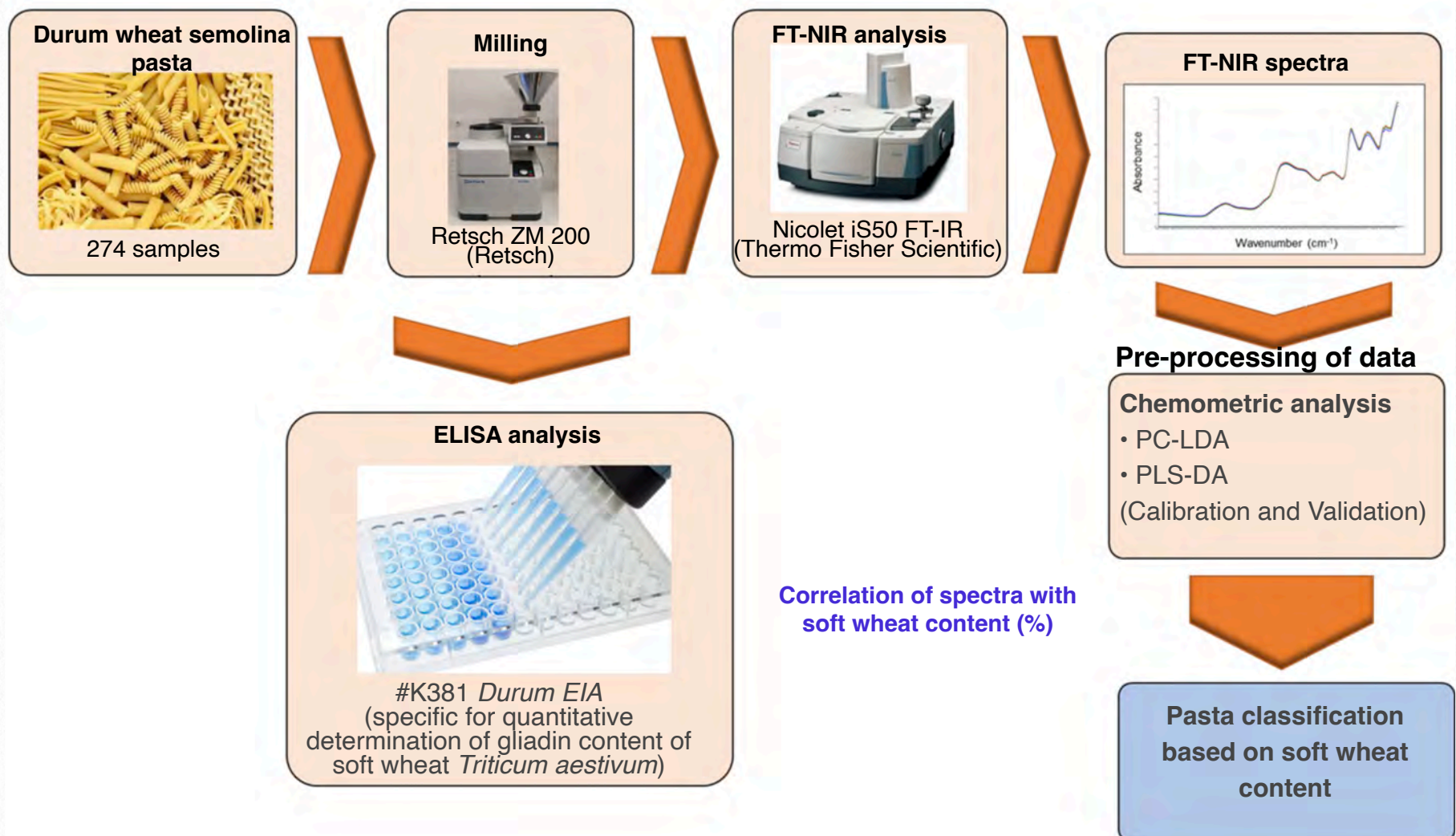
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Figure 4 PASTA ANALYSIS SCHEME USING FOURIER TRANSFORM NEAR-INFRARED SPECTROSCOPY (FT-NIR) IN COMBINATION WITH MULTIVARIATE STATISTICAL ANALYSIS (PRINCIPAL COMPONENT-LINEAR DISCRIMINANT ANALYSIS, PC-LDA; PARTIAL LEAST SQUARES-DISCRIMINANT ANALYSIS, PLS-DA; SUPPORT VECTOR MACHINE CLASSIFICATION, SVMc)



Conclusions

Research carried out at CNR-ISPA has demonstrated the effective applicability of Fourier transform near-infrared spectroscopy (FT-NIR) for assessing the authenticity of Italian pasta and detecting the adulteration of durum wheat pasta with soft wheat.

The results presented herein indicate that among the various statistical classification approaches tested, Principal Component-Linear Discriminant Analysis

(PC-LDA) gave the best analytical performance in terms of sensitivity and accuracy, for calibration and validation alike.

Among the various untargeted methods used for detecting fraud in cereals and cereal products, IR spectroscopy is rapidly gaining ground thanks to its advantages as a robust and accurate technique, as well as being rapid, easy to use, inexpensive and requiring no special sample preparation, which also greatly impacts the

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sustainability of the analysis. The use of this method reduces the number of audits and control analyses usually conducted by quality control laboratories, procedures which generate high costs for companies. Moreover, given the fact that most mills and pasta factories already have an IR spectrometer for assessing quality parameters and controlling food production processes, there is a clear advantage in being able to use this technique for other purposes as well, monitoring both the authenticity of the pasta and the presence of any adulteration, thereby safeguarding the consumer from food fraud.

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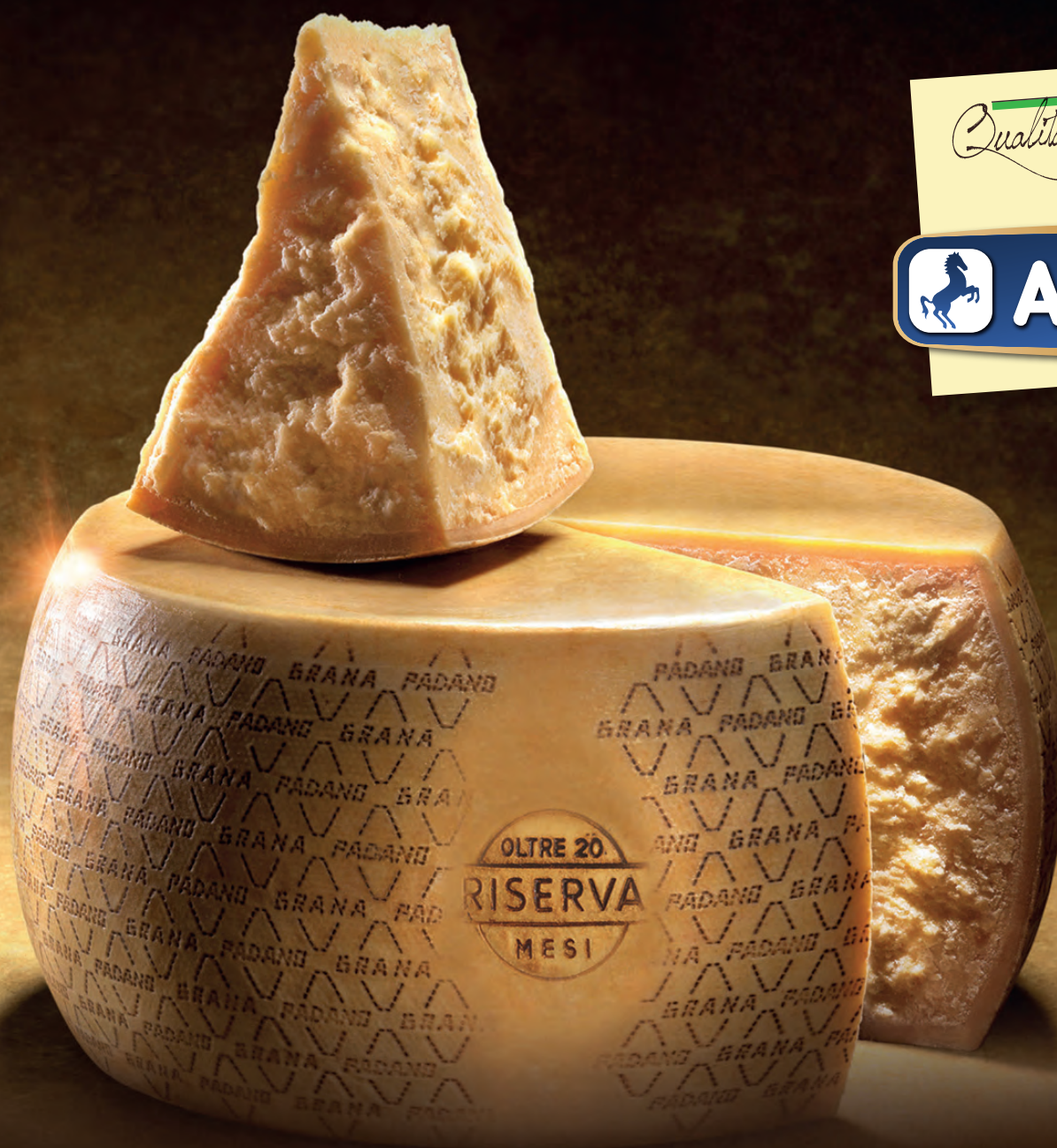
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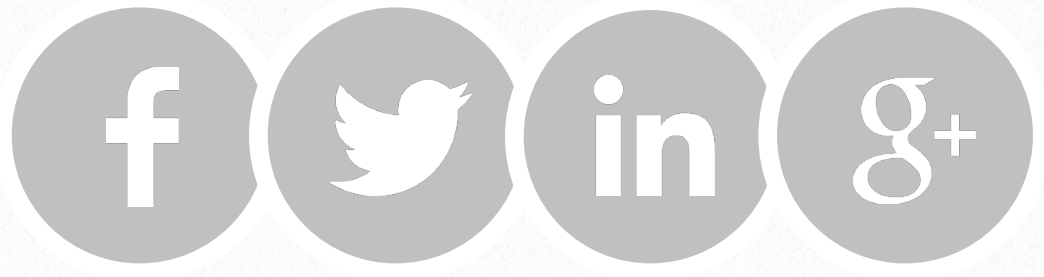
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The spectre of food inflation returns to haunt Italy

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With the huge hikes in wheat prices (+90% in one year), the price alarm has also sounded for pasta and flour.

The increase in wheat prices has initiated a dangerous knock-on effect in the cereal supply chain, with a re-appearance on the food commodities front of the inflationary scenario that preceded the great crisis of 2008-2009, when the financial bubble was at its peak.

Current price trends, which show year-on-year increases of double or triple figures, depending on the commodities in question (energy is currently the most inflationary component), incorporate fundamental elements but also factors of a speculative nature, which suffice to explain the surge in the cost of living, which has soared to the highest level in almost ten years in Italy and 13 years in the USA.

In the cereal sector, and in particular in the wheat-pasta supply chain, the sharp rises in the prices of raw materials are fuelling concern, especially among industrial operators, both as regards the economic and financial repercussions on operating margins and the implications on consumer prices, already evident in the ISTAT data.

A glance at the cost-of-living index is enough to dispel any doubts. Inflation is now bordering on the 3% mark, a level not seen since September 2012. According to ISTAT, energy goods continue to act as a driver, contributing almost two percentage points to inflation and accounting for much of the acceleration compared to September. But also heating up the prices is the food sector, with processed food reaching a high of 1.4% in October (compared to the same month in 2020).

In September, the latest consolidated figures for pasta showed an increase of 2.6%, against 0.6% in August, and even a deflationary trend in July (-0.2% year-on-year).

This is a sign that something has already changed and that, in the light of the most recent developments in flour and wheat listings, there are likely to be scenarios manifesting further tension in relation to consumer pasta prices, under operating conditions, at the industrial stage, which are now bordering on negative margins.

Suffice it to say that the milling industry now spends 550 euro for a tonne of wheat, compared to 290 euro a year ago. A 90% rise in price that has pushed semolina listings - which are also affected by increases in energy products



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(electricity and fuel) - up to 775 euro per tonne, from 480 euro last year (+60%).

The “perfect storm” had already been announced in the summer by Italmopa, the Association of Italian Millers, given the major drops in production expected in key countries and the low levels of global durum wheat stockpiles.

A forecast that was confirmed by an unprecedented market trend, with values now exceeding the historical record of 2008, and creating the knock-on effect of pushing up prices at each stage of the pricing process.

Meanwhile, durum wheat production statistics are worsening from month to month. The latest indications from UK analysts at the IGC (International Grains Council) attest to a fall in the 2021/22 world harvest of 6%.

The forecast also includes a collapse in exports from Canada to the US and a dramatic reduction in global trade, with an estimated year-on-year drop of 23%. By the end of the season, stocks will be at their lowest for 14 years, against a backdrop of global imbalances likely to result in further increases.

The fate of the wheat marketing year is negatively linked to the continuous downward revisions of the North American crop estimates. In Canada, the world’s largest producer and exporter of durum

wheat, this year’s exceptional drought almost halved the harvest, estimated at around 3.5 million tonnes (-46%). In the US, the effects of disinvestment, coupled with the negative climate trend, has wreaked even more havoc on the harvest, estimated by the country’s Department of Agriculture, the USDA, to be as low as one million tonnes, a year-on-year drop of 85%.

Only in Europe have self-sufficiency rates improved significantly compared to last year, but the surge in world market prices has also impacted continental price lists, in a market largely characterised by widespread withholding of the supply and a general shortage of imported grains.

Suffice it to say that Canada alone will only be sending the equivalent of around 50% of the 1.5 million tonnes it sent to Italy in 2020. From the analysts’ perspective, the reduction in imports from the US is likely to be even more drastic, dropping from 664,000 tonnes in the last twelve months almost to zero.

Returning to the subject of prices, according to Federconsumatori, record grain listings have already led to double-digit increases in bread and pasta at the retail level.

By Christmas, forecasts Coldiretti, a (half-kilo) package of traditional dried pasta will cost 20 cents more, on average.



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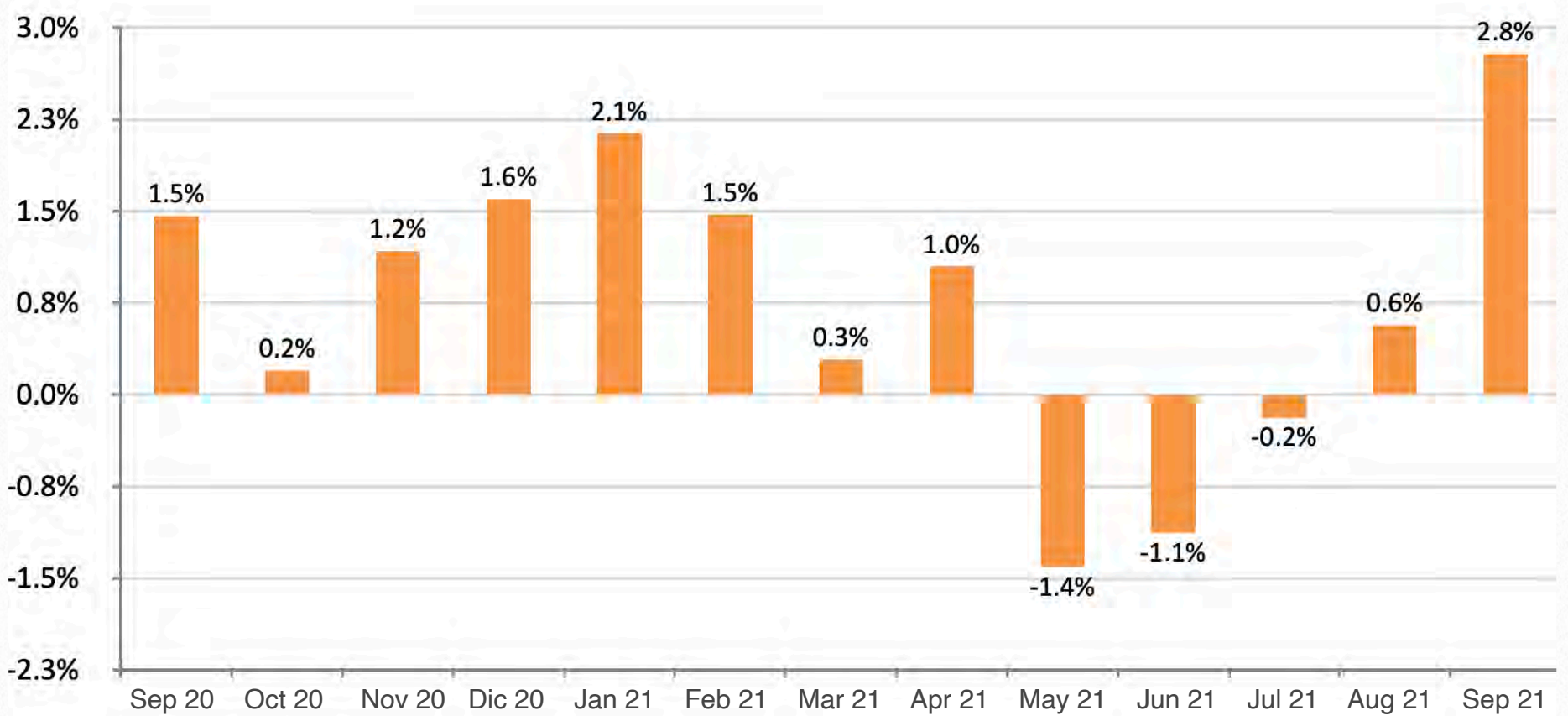


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Chart 1 CONSUMER PRICE INDEX FOR PASTA. TREND VARIATION RATES



This also creates an image problem for producers, who will have to shoulder the responsibility.

Operators are also alarmed by the introduction of an electronic loading and unloading register for cereals and flour. A regulation, explains Italmopa, that heralds a further increase in costs, given the particularly onerous adaptation process that company production structures will be forced to undertake. If the required amendments to the ministerial provisions are not made, the association concludes, companies could enter a phase of operational stalemate, at a time that is already complex due to logistical

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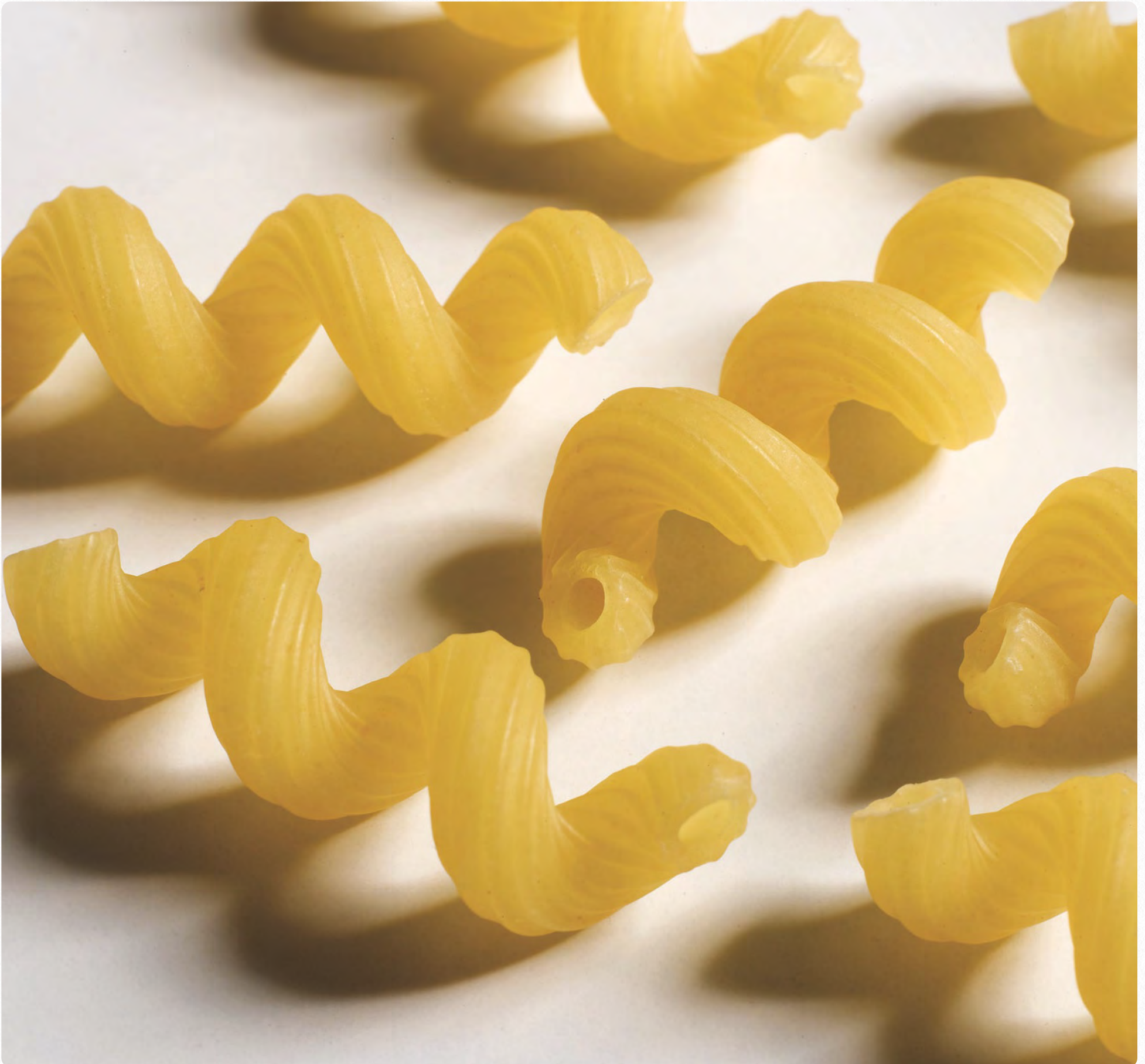
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4

Short news



Editorial staff



Barilla invests €30 million in the Rubbiano sauce production plant

The Parma-based group has set its sights on developing Europe's largest sauce production plant. Indeed, having previously established 4 production lines dedicated to condiments in Rubbiano, Parma (the first two in 2012, and the others in 2018), it is now investing €30 million in a fifth, scheduled to begin operating in April 2023. The goal: to increase production of pestos, including Pesto alla Genovese. The project

also aims to boost employment at the facility.

Giovanni Palopoli, Barilla Group Operation Meal Solution Director, is enthusiastic about the project, noting that it is “in keeping with our desire to continue to invest in the country's economic system at a time when everyone must do their part to contribute to a unique opportunity to relaunch the national economy. Thanks also to this additional investment, Rubbiano is increasingly establishing itself as Europe's largest and most sustainable sauce









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production plant, with a focus on the quality of the products, and specifically pestos, which are currently enjoying great success on the Italian and international markets”.

Local quality and international vision

High quality standards, technology 4.0, food safety, sustainability and a strong drive towards internationalisation: these are the defining features of the investment in Rubbiano and Barilla’s production philosophy.

Having opened in 2012, the Rubbiano facility currently employs approximately 300 people, and occupies an indoor area of approximately 30,000 sq.m.

Production at the facility aims to replicate the principles of great home cooking on an industrial scale, with the ingredients taking centre stage in the finished product (all fresh basil used is 100% Italian, while 100% of the tomatoes come from the Po Valley).

Barilla has been operating in the pesto and ready-made sauces market since 1969 and today is market leader in Italy and continental Europe, enjoying double-digit growth in recent years (particularly as regards pestos) both in Italy, where these products are recognised for their quality and high service value, and abroad. Growth in the Americas and in Europe has been particularly significant, with sales of sauces keeping pace with those of pasta.

Aksia acquires Master gnocchi

Aksia Capital V, a fund managed by Aksia Group, acquires 100% of Master (Vadelago, Treviso), a market leader in the production of high-end gnocchi.

This marks the sixth investment by Aksia, set up just two years ago, which has acquired significant experience in the food sector, including through transactions on behalf of its portfolio companies Valpizza, Nappi and CRM – Casa della Piada.

It is now consolidating its presence in the gnocchi, fresh pasta and high-end ready meals market. The aim is to become a leader in these sectors.

Despite the acquisition, Master’s founders Adriano Bianco and Giovanni Favretto will retain their positions at the company: the former as Chairman and the latter as CEO. Aksia is seeking to accelerate Master’s expansion abroad, with the company already regarded as a key player in Italy.

Germinal breaks into the world of pasta

Germinal, a leader in the organic segment of the sweet and savoury bakery products and ready meals market, breaks into the world of pasta.

This follows the completion of the organisational and corporate restructuring

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of the Astra Bio organic pasta factory, which involves operational management being handed over to the Treviso-based group, with the support of the Tasci Group, run by entrepreneur Roberto Giordani, as financing partner.

“This operation lets us expand our offering in the pasta segment,” explains Emanuele Zuanetti, CEO and founder of the Germinal Group, “and forms part of our journey to promote sustainable organic produce: from the field to the table. Our pasta factory only produces organic pasta and uses wheat from a 100% Italian agricultural supply chain. Recognising the value of supply chains, in the context of a circular economy, is one of our long-term strategic objectives.”

This new acquisition sees the group hold 3 production plants: one for bakery products (sweet and savoury), one for fresh ready meals and, as of today, the Astra Bio pasta factory, dedicated to producing organic pasta.

Granoro on air with its new TV commercial

Granoro launches its new multi-channel advertising campaign, which aims to turn the spotlight on its supply chain vision.

This vision has been a defining feature of the past decade for the historic Apulian

pasta factory, since the launch of its “Dedicato” pasta line, produced using 100% Apulian wheat sourced from 340 farms in the Apulia region.

From 7 November, the new commercial, “La nostra visione” [Our Vision], will be aired by broadcasters Rai, Mediaset, La7 and Sky, with greater frequency during high viewing slots such as prime time. Developed by the Wunderman Thompson creative agency, the commercial was shot in the wheat fields of the Apulian plains and the characteristic landscapes of Le Murge near Bari. Its message is conveyed to the consumer in a simple, authentic way, highlighting the company’s values and promoting the concept of a group of small enterprises coming together to create something great. In keeping with this concept, the actors are also members of the “Granoro Dedicato” supply chain, as the brand chose to feature its employees and farmers in the commercial.

The claim “Granoro Dedicato. Assaggia un’altra storia” [Granoro Dedicato: Try a different story] is the central message of the communications campaign, chosen to promote a pasta that is extraordinary, first and foremost, because it represents a vision, an ideal, an ethical and sustainable project.

The new commercial is part of a broader plan that, as well as TV, also involves a



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digital and social media channel campaign across the Facebook, Instagram, Youtube and Spotify platforms, with the aim of raising awareness, optimising reach and maximising the opportunities for encounter between brand and consumer. A significant out-of-home advertising campaign is also planned for the cities of Bari, Milan, Rome and Naples, as well as cinema advertising

Cooperativa Girolomoni wins award at SANA 2021

The recent edition of Sana, the organic fair held in Bologna in September, saw Cooperativa Girolomoni take the award for best dried pasta product launched in the last year, thanks to two new products made using the Cappelli variety of durum wheat (linguine and strozzapreti). The BIO AWARDS 2021 award, sponsored by Bio&Consumi and judged by a jury from



Giovanni Battista Girolomoni,
Chairman of Cooperativa Agricola Gino Girolomoni

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the sector, was collected by general manager Gian Luca Bettarelli. The cooperative worked with NaturaSì, Italian leader in organic product distribution, on the project to promote the Cappelli variety, a synergic collaboration that also focused on consumer education and awareness-raising.

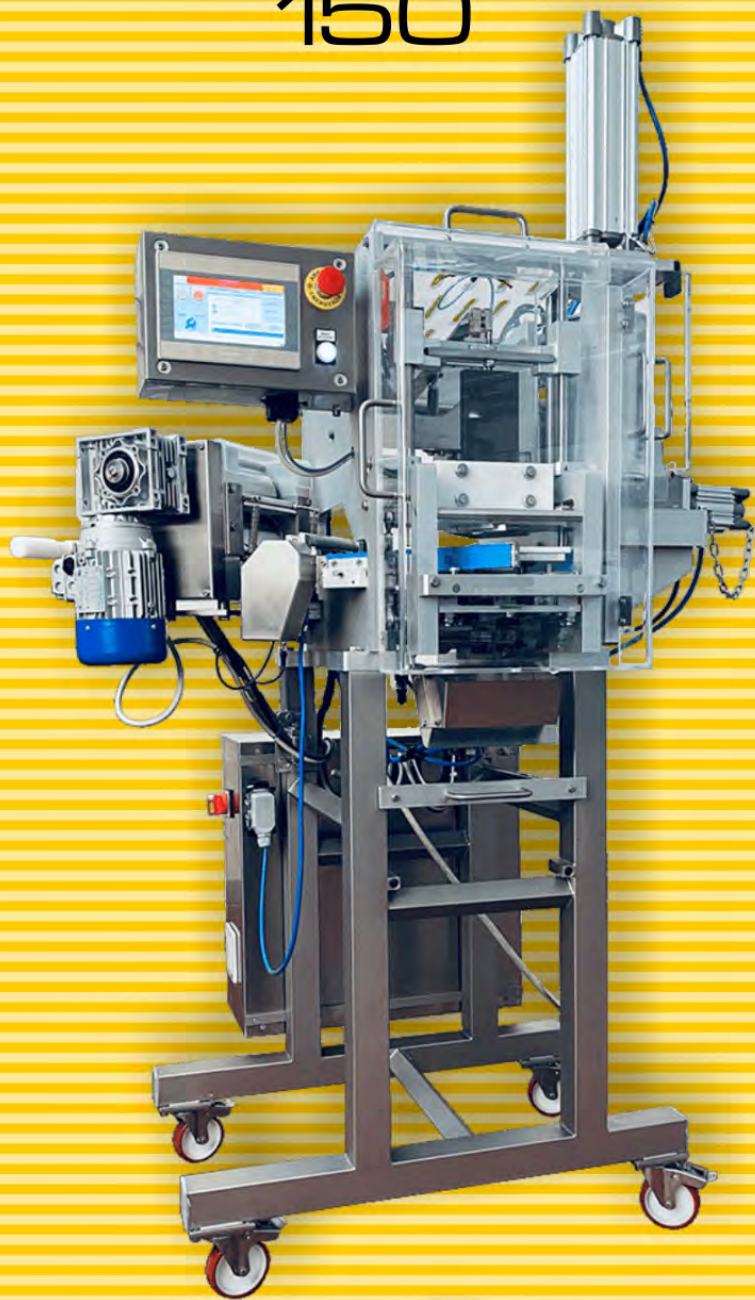
Girolomoni was also selected as a case study for its efforts in the field of sustainability at the *Rivoluzione bio – food: packaging & bio* conference that took place at Sana. The cooperative, which this year celebrates 50 years in business, presented its new, 100% recyclable packaging at the Bologna fair. The product of a long journey undertaken to identify the best solution, Giovanni Battista Girolomoni, chairman of the cooperative notes that: “In eliminating plastic, we wanted to avoid shortcuts that might have seemed better in the eyes of the consumer, but that in fact were not optimal for the environment, particularly in terms of the actual recyclability of the product”.

The Girolomoni durum wheat range is packaged in paper from reels, sourced from responsibly managed forests, certified in class A for recyclability by Aticelca; the inks are water-based and the heat sealants are water-based and solvent-free. The “Grani di una volta”



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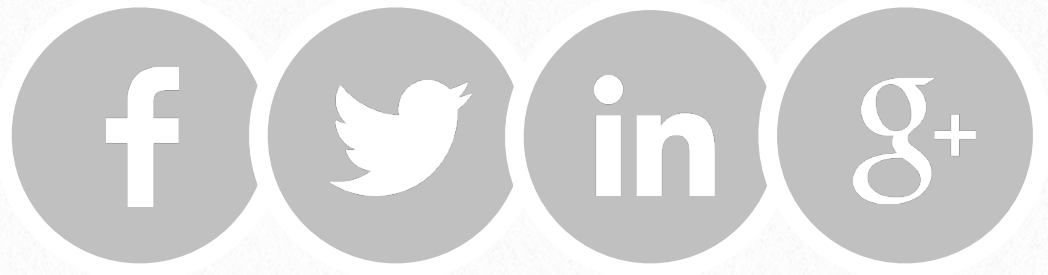
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Frastagliato



5



Nutritional and health properties of pasta

enriched with encapsulated extracts from carrot pomace

Emanuele Fagetti

Department of Food, Environmental and Nutritional Sciences (DeFENS),
University of Milan



The effect of the addition of encapsulated carrot pomace extract in oil on the nutritional and health properties of short, dried durum wheat semolina pasta was evaluated in Emanuele Fagetti's degree thesis, summarised here, which won an award at the Pastaria Awards 2021.

The carrot (*Daucus carota*), a biennial herbaceous species and member of the Apiaceae family, is the world's most important root vegetable. (Que et al., 2019; Ahmad et al., 2019). Global production is 40,000 million tonnes. According to data for the year 2018, expressed in millions of tonnes, its main producers are China (18.01), Uzbekistan (2.19), USA (1.50), Russia (1.41) and Ukraine (0.84), while Italy has a modest ranking in the European panorama (0.55) (FAOSTAT, 2020).

Carrots are a good source of nutrients such as vitamins, minerals and fibre. (Que et al., 2019). [Table 1](#) shows the indicative values of its centesimal composition.

Carotenoids, natural pigments with properties beneficial to human health, help boost the immune system, reducing the risk of degenerative diseases such as cancer, cardiovascular diseases, macular degeneration and the formation of cataracts. Being antioxidants, they act as free radical trapping agents and singlet oxygen quenchers. (Sharma et al., 2012).

Carrot root is particularly rich in carotenoids, especially β -carotene (75%), α -carotene (23%) and lutein (1.9%) as well as containing traces of β -cryptoxanthin, lycopene, and zeaxanthin. (Ahmad et al., 2019).

Carrots are rich in phenolic acids, such as caffeic and chlorogenic acids, but also in anthocyanins (a class of flavonoids). (Ahmad et al., 2019).

Orange carrots were found, by Oviasogie et al. (2009), to have total polyphenol values of $26.6 \pm 1.7 \mu\text{g/g}$ while purple carrot juice was described by Karakaya et al. (2001) as having total polyphenol contents of $772.0 \pm 119 \text{ mg/L}$.

During the industrial processing of fruit and vegetables, a great deal of waste is generated, consisting of peel, seeds, pomace, etc. This waste is prone to bacterial proliferation, so processes involving drying (Nagarajalah et al., 2015), freezing or freeze-drying (Anzelmo et al., 2010) are needed in order to extend its shelf-life, and such processes are costly. But failure to carry them out would result in the loss of a significant amount of valuable nutrients. (Nagarajalah et al., 2015). In recent years, fibre, antioxidants and vitamins have gained considerable importance, so waste products from the production of juice (*pomace*) are of particular interest. (Kirbas et al.,



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Table 1 CENTESIMAL COMPOSITION OF *DAUCUS CAROTA* (CREA, 2019) (CREA, 2021)

Water (g/100 g)	Carbohydrates (g/100 g)	Fat (g/100 g)	Proteins (g/100 g)	Fibre (g/100 g)	α -carotene (mg/kg)	β -carotene (mg/kg)
90.0	7.6	0.2	1.1	3.1	37.8	49.7

2019). *Pomace* accounts for around 30-50% of the processing by-products of carrots. (Kirbas et al., 2019; Hui and Evranuz, 2016).

Consumer needs, growing health awareness and increasing life expectancy have led to the designing of food products that not only meet basic calorie requirements but also benefit human health, thanks to their specific nutritional properties. The same objective is also achieved through bioactive compounds, which are safe functional molecules with acknowledged health properties. However, these compounds tend to degrade easily during storage and food processing alike. Encapsulation protects the natural extracts and bioactive compounds from biotic (microorganisms) and abiotic (light, oxygen, heat, humidity) factors, and is, therefore, a useful method not only in the food sector but also in the pharmaceutical field. (Dias et al., 2015). There are different encapsulation technologies: coacervation, extrusion, use of supercritical fluids, spraying, ultrasound to name a few, including freeze-drying. The compound to

be protected (core material) is mixed or homogenised with the carrier material, or shell, and then subjected to the selected technique: in particular, spray-drying consists of injecting an atomised liquid into a drying chamber which leads to the formation of microspheres or microcapsules within a short processing time. Freeze-drying, on the other hand, is a multi-stage operation requiring several hours of processing: deep-freezing and two drying phases in a confined environment under high vacuum, involving sublimation of the ice into steam, then final storage. (Pasrija et al., 2015).

Only a small part of the studies conducted on encapsulation so far include their evaluation in food matrices. Generally speaking, the papers have dealt with production technologies of encapsulated products, analysing the characteristics of the technical process, with a view to optimising both the process and the encapsulate. (Sun et al., 2020; Faria et al., 2020).

The aim of this research thesis was to study the influence of the addition of

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encapsulated carrot pomace extracts on the nutritional and health properties of dried pasta.

Materials and methods

Five different types of durum wheat semolina pasta were prepared: one as is, two enriched with encapsulates obtained through spray-drying (one at 10% and the other at 20%) and two enriched with the encapsulates obtained through freeze-drying (one at 10% and the other at 20%). The encapsulates were produced at the University of Novi Sad, Serbia, from carrot juice production waste products, i.e. pomace, extracted with sunflower oil, using whey protein concentrate as a carrier material, plus inulin for the spray-dried products. (Šeregelj et al., 2021).

The five pasta samples were cooked to the optimal cooking time (OCT) after which sample weight gain and dry residue in the cooking water were measured.

The pasta samples, both raw and cooked, were subjected to the following analyses: moisture and protein content (AOAC, 2000), colour by Minolta Tristimulus Colorimeter, carotenoids (Alfieri et al., 2014), tocopherols (Hidalgo and Brandolini, 2010) and/or furosine (Hidalgo et al., 2006) by HPLC.

The following additional analyses were also carried out on the cooked pasta samples after *in vitro* gastrointestinal digestion: antioxidant activity (β -carotene bleaching assay; reducing power; superoxide anion assay), anti-hyperglycaemic, anti-inflammatory and anti-proliferative activity (cell growth activity) in human cell lines HT-29 (colon adenocarcinoma) and MRC-5 (human foetal lung).

Results and discussion

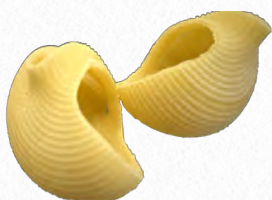
In the uncooked pasta, the two encapsulates affected the colour and furosine content in different ways. The spray-dried one gave the pasta a brighter colour but with lower levels of yellow and red than the freeze-dried one and lower levels of furosine ([Table 2](#)), despite the fact that the process involved temperatures of up to 130°C. This was probably due to the different composition of the carrier material used for encapsulation (SD 71% serum protein and 29% inulin; FD 100% serum protein).

The pasta enriched with the encapsulates gained less weight during cooking and left less dry residue in the cooking water, probably due to the presence of serum proteins in the formulation ([Table 3](#)).

It can also be observed that the



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Table 2 COORDINATES OF COLOUR AND FUROSINE CONTENT (mean ± sd; mg/100 g protein) OF DRIED RAW PASTA

	<i>L</i> *	<i>a</i> *	<i>b</i> *	Furosine
Control	70.8 ^b ± 0.6	5.7 ^d ± 0.6	52.4 ^a ± 1.5	75.6 ^e ± 8.5
10% SD	74.5 ^a ± 2.2	5.9 ^d ± 0.3	42.9 ^c ± 0.7	220.0 ^d ± 17.6
10% FD	66.8 ^c ± 1.0	7.9 ^b ± 0.2	50.7 ^b ± 1.3	304.0 ^c ± 12.5
20% SD	74.1 ^a ± 2.4	6.5 ^c ± 0.3	42.6 ^c ± 0.3	386.6 ^b ± 4.6
20% FD	61.8 ^d ± 0.7	10.5 ^a ± 0.3	52.0 ^{ab} ± 0.5	425.5 ^a ± 16.3

Different letters indicate significant differences between the different pasta samples, p ≤ 0.05

FD-enriched pasta has a lower dry residue than the SD-enriched paste, probably due to the different composition of the carrier material of the two encapsulates.

The pasta made with the addition of the encapsulates was found to be enriched in α -carotene, β -carotene and cis β -carotene, while the control pasta only contained lutein and zeaxanthin, the xanthophylls of the semolina. The mass balance shows that during the pasta-making process the carotenes from

the encapsulates were very stable while the xanthophylls from the semolina underwent an average degradation of 26.4%. After cooking, there was a slight decrease in the carotenes, while the xanthophylls were more stable (Table 4). There was a less significant loss of α - and β -carotene in the pasta enriched with SD, compared to FD, at 10% (a mean of 4.3% vs 31.8%, respectively) and at 20% (19.9% vs 30.7%). The cis β -carotene isomer showed a loss of only 10%.

Table 3 OPTIMAL COOKING TIME (OCT), WEIGHT GAIN AND COOKING LOSSES (mean ± sd) OF THE PASTA

	OCT (min)	Increase %	Dry residue (g 100 g)
Control	13	127.1 ^a ± 2.5	4.6 ^a ± 0.02
10% SD	14	112.3 ^b ± 1.6	4.4 ^a ± 0.01
10% FD	14	108.3 ^b ± 1.6	3.8 ^c ± 0.13
20% SD	15	96.7 ^c ± 0.4	4.2 ^b ± 0.17
20% FD	15	98.4 ^c ± 1.1	3.5 ^d ± 0.04

Different letters indicate significant differences between the various pasta samples (p ≤ 0.05)

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Table 4 TOTAL XANTHOPHYLL AND CAROTENE CONTENT(mean ± sd; mg/kg ss) IN RAW AND COOKED PASTA

	Total carotenoids	Total xanthophylls
<i>Raw pasta</i>		
Control	nr ^d	3.90 ^a ± 0.31
10% SD	2.52 ^c ± 0.05	3.57 ^{ab} ± 0.19
10% FD	3.07 ^c ± 0.01	3.31 ^{bc} ± 0.02
20% SD	4.71 ^c ± 0.01	3.06 ^c ± 0.07
20% FD	5.63 ^c ± 0.31	2.90 ^c ± 0.13
<i>Cooked pasta</i>		
Control	nr ^d	3.81 ^a ± 0.23
10% SD	2.38 ^b ± 0.28	3.57 ^{ab} ± 0.34
10% FD	2.19 ^b ± 0.04	3.22 ^{abc} ± 0.05
20% SD	3.87 ^a ± 0.37	2.98 ^{bc} ± 0.22
20% FD	4.18 ^a ± 0.45	2.78 ^c ± 0.22

Different letters indicate significant differences between the various raw or the various cooked pasta samples, p ≤ 0.05

The enriched pasta showed an increase in the tocopherol content due to the presence of sunflower oil, which is particularly rich in α-tocopherol, and β-tocopherol, while the control pasta presented α-tocopherol, α-tocotrienol, β-tocopherol and β-tocotrienol, naturally present in semolina. Following the pasta-making process, an average degradation of 21.2% for α-tocopherol, 29.0% for α-tocotrienol and 9.3% for β-tocotrienol was observed. Degradation continued during cooking, with values of

14.1% for α-tocopherol, 11.4% for α-tocotrienol, 25.3% for β-tocopherol and 3.0% for β-tocotrienol.

Last but not least, the enriched pasta samples presented higher levels of antioxidant activity, anti-hyperglycaemic activity, anti-inflammatory activity and antiproliferative activity (HT-29 and MRC-5) in the digested products of the cooked pasta than in control pasta, with slightly higher values in the freeze-dried pasta compared to the spray-dried pasta.

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Emanuele Fagetti at Pastaria Festival 2021

Conclusions

Encapsulation stabilises the bioactive compounds in the product during the pasta-making process. No significant differences were observed between the two different types of encapsulates for either carotenoids or tocopherols. The addition of encapsulated carrot pomace extract in oil significantly increases the carotene content and contributes to the health properties of the pasta.

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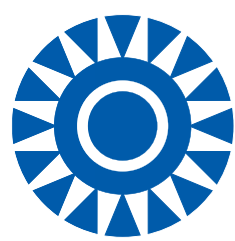
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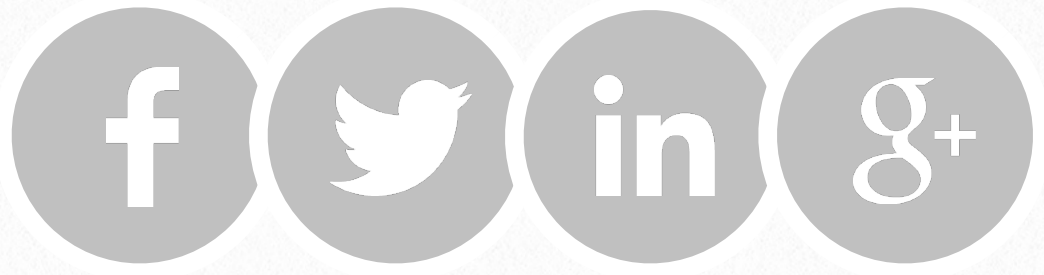
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6



Coop Report, Italians more digital and sustainable in the “next normal”

Pastaria Centre for Economic Research



The shopping trolley has also been transformed since the first lockdown. 8% less in pasta sales in the first half of 2021, after the “boom” following the panic of 2020.

A country transformed by the pandemic, clinging to the hope of a new normality, but anxious about growing income inequality. The economy is growing faster than forecast, with the GDP expected to be up 6% in December. But there is also an increase in hardship, with labouring rates of employment and the risk of broadening the already wide generation gap.

A situation - as outlined in the digital preview of the Coop Report 2021 - that is arduous to decipher. The most acute phase of the health emergency has left a feeling of uneasiness,” analysts write, “but there is also an enthusiasm that has restored optimism and confidence among economic operators, now in a much brighter mood than they were prior to Covid.

The shopping trolley has also been transformed since the first lockdown. Consumers continue to pursue well-being through food, but have reduced their tendency to pay for pure image content.

And if pantry staples were topping the Italian shopping list during the lockdown phase, other products are now being given more attention, particularly protein products and the entire alcoholic beverage department, especially aperitifs, beers and wines.

Against this backdrop, Nielsen data confirm a return to normality as regards the pasta and rice purchases of Italian families.

For dried semolina pasta in particular, the first six months of 2021 saw a drop in sales of more than 8% compared to a year ago, due to a statistical effect of the comparison with an “anomalous” 2020 in which spending had sky-rocketed by levels of almost 9%, amidst the panic triggered by closures and queues in front of supermarkets.

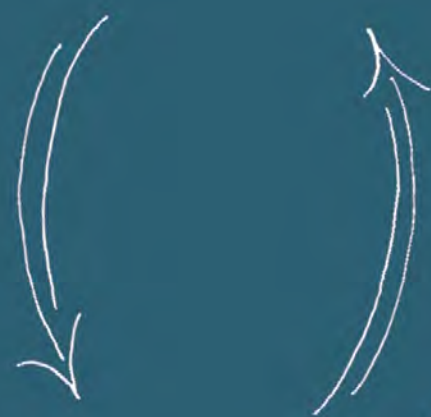
Scrolling down through the products monitored by Nielsen, similar evidence can be seen for rice, the 9.5% rise in purchases in 2020 being countered by a drop of 11% in the first six months of 2021. The same considerations apply to ready meals and frozen pizzas, while fresh pasta is one of the few items in this department to show positive momentum in the first half of this year, albeit subdued compared to the growth throughout the whole of last year.

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The figures, which do not display that post-pandemic “rebound” effect, show a growth in expenditure of more than 2 percentage points in the cumulative result for June (in comparison with the first half of 2020). It is important to note that last year fresh pasta increased by as much as 7% - again in terms of retail turnover - benefiting from the greater emphasis placed by the Italian consumer on the entire pasta and first courses department. More generally, by analysing emerging purchasing behaviour and opinions on

personal and social situations, the Coop Report has developed the profile of an Italian consumer now more concerned about global warming, but confident about the role that technology and digitalisation can play in a future that, for many, has already arrived.

In this context, food profiles and identities easier to arrange in clusters are emerging. Let's start with one fact: only 18% of consumers do not identify with any culture, declaring themselves ‘no style’. A group of 24% generically identifies with the

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Mediterranean diet as its consumption style, but new and old clusters are emerging in the jumble of trends, from organic fans to veg&veg, from gourmets to high protein to low carbs.

The novelty of 2021 is the appearance of the clan of “climatarians” - experts report - i.e., those (one out of six Italians) who claim to adapt their diet to the needs of environmental protection and mitigation of climate-changing gas emissions.

More generally, it emerges that 88% of Italian consumers associate food with the concept of sustainability. For 33%, this means compliance with environmentally-friendly production methods, for a further 33% it implies the use of ecological packaging materials, for 21% it means guarantees regarding the origin of raw materials and processed products and for 9% participation in certified ethical responsibility schemes.

In terms of distribution channels, retailers fear that traditional business models may be creaking under the weight of the “pandemic” impact on household incomes, a phenomenon that has already strengthened, and will continue to consolidate, the role of discount stores (85% of the consensus expects a further increase in sales in this channel), exacerbating the competitive tension

between large-scale distribution brand names.

The gradual integration of the physical network with the new virtual channels now seems inevitable, undergirded by staff retraining. Even after the tour de force of 2020 (+121%), online purchasing remains a niche segment for the food sector, unlike other product areas, such as consumer electronics or clothing.

After the steady growth of the first half of 2021 (+46%), several economic operators are convinced that the next 12 to 18 months will usher in a pause for reflection, or more moderate growth in e-commerce, at a rate expected to be less than 20%.

This forecast will, of course, be impacted by the number of new infections and the risk of new restrictive measures being introduced, but the experience gained throughout this emergency has most likely traced a path along which to move forward, improving the Italian approach to digital solutions in general, from smart working to home banking to online shopping.



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