

ITALIAN TRADITIONAL TOMATO VARIETIES: A FOCUS ON THE CAMPANIA REGION

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Resumen

La larga tradición del cultivo del tomate en Italia ha permitido la evolución de una amplia diversidad de variedades tradicionales o variedades autóctonas que han sido cultivadas durante siglos, muchas de las cuales siguen siendo comunes en los mercados locales. La adaptación a las peculiares condiciones climáticas y edáficas, el aislamiento geográfico de varias zonas de cultivo, las técnicas de cultivo específicas, la selección de los agricultores locales, también basada en las preferencias sensoriales de los consumidores, han dado como resultado grupos de variedades locales distribuidas no sólo por regiones, sino por áreas sub-regionales. En la mayoría de los casos, el cultivo de estas variedades autóctonas italianas cubre áreas muy limitadas y se están llevando a cabo en huertos familiares para consumo personal y / o en fincas pequeñas que, por lo tanto, desempeñan un papel clave en el mantenimiento de este valioso germoplasma, que en muchos casos está en peligro de extinción. La región de Campania ha sido, y sigue siendo, un área importante para la producción de tomate con una larga tradición en la selección, cultivo y procesamiento de este cultivo, resultando en un rico reservorio de variedades autóctonas de tomate valiosas. Hasta el momento, sólo tres variedades autóctonas de tomate italiano han obtenido el estatus de protección geográfica conforme a la legislación de la Unión Europea, la IGP “Pomodoro di Pachino” de Sicilia y las dos DOP “Pomodoro S. Marzano dell'Agro Sarnese-Nocerino” y “Pomodoro Del Piennolo del Vesuvio” de Campania. Esta breve revisión abordará algunas de las razas tradicionales más populares de la región de Campania, con especial atención a las dos DOP.

Abstract

The long tradition of tomato cultivation in Italy has allowed the evolution of a wide diversity of traditional varieties or landraces that have been cultivated for centuries and many of them are still common in the local markets. Adaptation to peculiar climatic and edaphic conditions, the geographical isolation of several growing areas, the specific agro-technique, the local gardeners' selection, also based on consumers's sensory preferences, have resulted in groups of landraces distributed not only by region but also by sub-regional areas. In most cases, the cultivation of these Italian landraces covers very limited areas being carried out in family gardens for personal consumption and/or in small-size farms that, therefore, play a key role in the *on farm* maintenance of this precious germplasm, which in many cases is risking extinction. The Campania region has been, and still is, an important area for tomato production with a long tradition in the selection, cultivation and processing of the crop, resulting in a rich reservoir of valuable tomato landraces. So far, only three Italian tomato landraces have been granted a Protected Geographical Status under European Union law, the PGI "Pomodoro di Pachino" from Sicily, and the two PDOs "Pomodoro S. Marzano dell'Agro Sarnese-Nocerino" and the "Pomodoro del Vesuvio" from Campania. This short review will address some of the most popular landraces of the Campania region, with a particular focus on the two PDOs.

1.- TRADITIONAL TOMATO VARIETIES IN ITALY: AN OVERVIEW

The cultivated tomato (*Solanum lycopersicum* L. syn. *Lycopersicon esculentum* Mill.) was introduced in Europe from Central and Southern America, during the 16th century (García-Martínez *et al.*, 2013). In the Old World, the tomato has been most successful in the Mediterranean countries, especially Italy and Spain, where, after an initial use as ornamental plant, it was soon introduced in the local cuisine (Soressi, 1969; García-Martínez *et al.*, 2013). As a secondary center of diversity, Italy counts with a rich selection of traditional varieties or landraces that have been cultivated for centuries and many of them are still common in the local markets (Soressi 1969; Acciarri *et al.*, 2013). Most of these landraces have been developed over the years, in different Italian regions, according to local gardeners' selection aimed to satisfy consumers's tastes, as well as according to adaptation to local climatic and edaphic conditions (Mazzucato *et al.*, 2008; Acciarri 2013). As a result, a wide diversity of varieties can be observed not

only by region but also by "communal" boundaries. From Northern Italy to Sicily there is a proliferation of varieties with different shapes, colors, flavors and types of plants. The various fruit typologies found different distribution throughout Italy; for example, the flattened-ribbed tomatoes were mainly diffused in Northern regions of the country ("Costoluto Genovese", "Riccio di Parma", "Ladino di Pannocchia") and Central regions ("Costoluto fiorentino", "Pantano romanesco", "Scatolone di Bolsena", "Spagnoletta di Gaeta e Formia"), whereas varieties with oval/round ("Piennolo", "Pizzutello") or elongate ("San Marzano", "Corbarino") fruit shape were mostly found in Southern Italy (Soressi, 1969; Andreakis *et al.*, 2004; Mazzucato *et al.*, 2008).

Throughout the national territory, but especially in the center-south area, many tomato varieties, mostly characterized by small fruits, are grown in open air with very limited or no watering. These landraces may differ in fruit shape, size and color as well as in growth habit (determinate or indeterminate), but they are all characterized by a high adaptability to the cultivation in dry, and most of them have small fruit size (<25 g), high thickness of the skin, absence of the character *jointless*, and considerable difficulty in detaching the pedicle from the berry. These characteristics, along with the traditional cultivation technique (cultivation in dry) exalt the sensory properties of these products intended for fresh consumption, for cunnig, as well as for the preservation of the fresh product for winter consumption (pomodoro "da serbo" o "d'inverno"). In the latter case, the fruits are generally arranged in bunches hanging on different types of supports, which, depending on the area of production, take different names such as "piennolo" or "spungilli" (the trusses are twisted together around a circled twine), in the case of the "Pomodoro del piennolo del Vesuvio", in the Campania region, or "ramasole" (the single fruit are tied together with cotton thread) in the case of the "Pomodoro regina di Torre Canne" in the Puglia region).

In most cases, the cultivation of these Italian landraces covers very limited areas (sometimes only a few hectares) being carried out, in family gardens for personal consumption and/or in small-size farms that conduct, therefore, an important role in maintaining and safeguarding of this important genetic heritage.

Despite the growing consumers' interest for traditional food products, so far, only three Italian tomato landraces have been granted a Protected Geographical Status under European Union law. Two landraces

received the Protected Designations of Origin (PDOs), the “Pomodoro S. Marzano dell'Agro Sarnese-Nocerino PDO” (Salerno, Avellino, Naples – Campania region), and the “Pomodorino del Piennolo del Vesuvio PDO” (Naples – Campania region), and will be described in more details below as typical products of the Campania Region. On the other hand, the Protected Geographical Indication (PGI), was granted to the “Pomodoro di Pachino PGI” (Ragusa, Syracuse – Sicily Region) according to the EC Reg. n. 617 - 04.04.03 (GUCE L. 89 - 05.04.03)

The PGI “Pomodoro di Pachino” initially represented by four fruit typologies, cherry, smooth round and fascinated, since January 2017 (GU Serie Generale n.6 of 9-1-2017) covers also the ‘Datterino’ (Plum e Miniplum), since this typologies has reached a substantial share of production (<http://nutritomagazine.it/en/2015/05/19/pomodoro-pachino-igp/>).

2.- TRADITIONAL TOMATO VARIETIES OF THE CAMPANIA REGION

The Campania region, in Southern Italy, has been and still is an important area for tomato production with a long tradition in the selection and cultivation of the crop. As a result, this region constitutes an important reservoir of valuable tomato landraces, which were developed over the years for spontaneous hybridization and/or mutations and subsequent selections made by the farmers to obtain genotypes adapted to local conditions and with quality requirements well delineated for specific uses (<http://www.progettosalve.it/pp/index.php/2014-07-14-08-54-34/p/pomodoro>). Among the numerous tomato landraces of Campania region the most popular are the two PDOs, “Pomodoro del Piennolo del Vesuvio” PDO and “Pomodoro S. Marzano dell'Agro Sarnese-Nocerino” PDO, and ‘Pomodoro di Sorrento’. Besides these three landraces, which will be described in more details, it is worth mentioning the traditional variety “Pomodorino di Corbara” or “Corbarino” and the “recovery and valorization” project of the traditional variety “Pomodoro Re Umberto” or “Re Fiascone”.

The Corbarino tomato is a typical niche product of the Campania region. It is a small (13-21 g) cherry-like tomato grown on the slopes of the rolling hills of Corbara (from which the name). It includes several landraces showing at least four different fruit shapes (oval, elongate, pear-shaped and round) (Andreakis *et al.*, 2004). The fruits have an intense red colour and a

nice and typical taste when fully mature; they may have different market destinations as fresh, canned (whole and unpeeled tomatoes are dipped into their own juice and canned in glass or tin) or as large hanging bunches called “spunzilli” (Andreakis *et al.*, 2004; <http://www.comune.corbara.sa.it/>). Nowadays, there is an increase in demand of both fresh and canned Corbarino, and a growing interest by the local canning industry (<http://www.agricoltura.regione.campania.it/>). Therefore, the valorization of the Corbarino tomato could represent, for local farmers, a viable alternative to other crops now in crisis, in hilly areas where this typical production represents one of the few still profitable vegetables (<http://www.comune.corbara.sa.it/>).

The traditional variety “Pomodoro Re Umberto” is an old variety grown in the Amalfi Coast already in the early 19th century, and that went disappearing until it became almost impossible to find. The “Associazione Costiera Amalfinata Riserva della Biosfera (ACAR.BIO)” (www.acarbio.it) (in collaboration with the research center Crea-Ort Pontecagnano and the Committee of Rural Districts promoter), thanks to a crowdfunding project, and the “guardian farmers”, managed to put this landrace back in the cultivation and production. The result of this project is a high quality final product, and the label “Re Fiascone” is seen as the beginning of a model of sustainable development for the territory, which aims to boost the local economy, supporting the small “guardian farmers” and, at the same time, safeguarding the delicate terraced landscape of Tramonti, on the Amalfi Coast. This is a valuable example of the positive outcomes derived from the ability to work alongside the “seed savers” and the equally valuable “guardian farmers” who provide land and labor in the name of the desire not to lose a unique biodiversity in the world.

3.- THE “POMODORINO DEL PIENNULO DEL VESUVIO” PDO

The “Pomodorino del Piennolo del Vesuvio” or simply “pomodorino Vesuviano” is one of the oldest and most typical varieties grown in Campania region, so much so to be even represented in the traditional Neapolitan nativity scene (Caiazzo *et al.*, 2014). It owes its name to the ancient practice of the Vesuvius farmers to twist some bunches or “scocche” of ripe cherry tomatoes around a circled twine to form a large bunch “piennolo” that is then hung in dry and ventilated rooms, thus ensuring optimal preservation until the end of the winter (**Fig. 1**).

Given the great peculiarity of this tomato, in 2009, the Protected Designation of Origin (PDO) “Pomodorino del Piennolo del Vesuvio” has been recognized, in accordance with Regulation EU Reg. no. 1238 of 11.12.09 (GUUE L. 332 of 17.12.09)

(<http://www.agricoltura.regione.campania.it/>). The “Consorzio di Tutela della DOP Pomodorino del piennolo del Vesuvio” has been officially recognized in April 2013.



Figure 1.- The “Pomodorino del Piennolo del Vesuvio” stored as “piennolo”.

3.1.- Description of the product

“Pomodorino del Piennolo del Vesuvio” PDO designates the fruit of the small tomato ecotypes known by the folk names “Fiaschella”, “Lampadina”, “Patanara”, “Principe Borghese” and “Re Umberto” and traditionally grown on the slopes of Mount Vesuvius, which are sold both fresh or stored as “piennolo”. They are oval or slightly plum-shaped with a pointed apex, frequent ribbing towards the stalk and thick skin. Hybrids may not be used. In order to be eligible for protection, they must have the following characteristics. When fresh — size: no greater than 25 g; shape parameters: ratio between the largest and smallest diameters of between 1.2 and 1.3; outer colour: vermilion; colour of the flesh: red; texture: very firm; flavour: sweet and sour, lively and intense; refractive index: min. 6.5 °Bx; strongly attached to the stalk. When stored on “piennolo” bunches — outer colour: dark red; colour of the flesh: red; texture: firm; flavour: lively and intense; turgidity: low at the end of storage (<http://eur-lex.europa.eu/legal-content/>).

The fruits are carried in clusters of 5-6 fruits, with clear dark green shoulder before ripening, and then red and vermilion when fully ripe (**Fig. 2**)

The peculiarities of the “Pomodorino del Piennolo del Vesuvio” are the thick and almost crunchy skin, a very compact pulp with a low water content, the the hanging strength to the peduncle, the high concentration of sugars, acids and other soluble solids that make it a long shelf-life product. Over the months the tomato, despite losing his turgidity, takes on a unique and delicious taste, with a slightly bitter aftertaste (<http://www.casabarone.it/>). Indeed, the richness in organic acids determines the vivacity or "acidity" of taste, which is the distinctive character of this tomato. These features are rooted in local soil and climate factors of the geographical area in which the tomato is grown, where the soils of volcanic origin, are made up of pyroclastic material originated by the eruptions of the Somma-Vesuvius volcanic complex. The delicious sweet-sour taste and the slightly bitter aftertaste make the “Pomodorino del Piennolo del Vesuvio” PDO a key ingredient of Neapolitan and Campania cuisine, and has a great versatility in cooking being used in many different ways. Besides the traditional spaghetti and clams, the local chefs are committed to using it in many other dishes, including a variation of the delicious Neapolitan pizza.



Figure 2.- The “Pomodorino del Piennolo del Vesuvio”.

3.2.- Production area

The production area of “Pomodorino del Piennolo Vesuvio” PDO includes the territories of 18 municipalities in the province of Naples, most of which are located within the National Park of mount Vesuvius in the Campania region, at an altitude of 150 to 450 meters above sea level.

3.3.- Method of production

The “Pomodorino del Piennolo del Vesuvio” PDO is cultivated with a traditional method exclusively on lava fields with sandy texture, which require fertilization with organic fertilizers or mineral fertilizers; cultivation is not allowed in a protected environment such as greenhouses or tunnels or soilless. Only localized irrigation methods or micro-distribution of water are allowed. The plants, with indeterminate habitus and very slender stem are grown vertically with development up to 80 cm in height, adequately supported by wires tied between wooden support blades or straws tucked into the ground (**Fig. 3**). In this way the berries do not touch the soil and the fruits, receiving the sun's rays uniformly, acquire the red-intense coloration that distinguishes them. Plant density should not exceed 45,000 plants per hectare. The maximum unit production of tomatoes is fixed at 16 tons/ ha, with an average production per plant that varies between 300 and 500 g depending on the planting density. Harvesting must be done by hand between June 20th and August 31st, by cutting the whole trusses directly (<http://www.agricoltura.regione.campania.it/Tipici/piennolo.html>). During harvesting, the trusses are picked whole when at least 70 % of the tomatoes are red, with the remainder still ripening. All agricultural practices are hand-made due to the irregular arrangement and ground terraces, which make mechanization difficult. The yields, in the absence of irrigation, are very low and do not exceed 10-12 tons/ ha.



Figure 3.- Field of “Pomodorino del Piennolo del Vesuvio”

3.4.- Commercialization

The “Pomodorino del Piennolo del Vesuvio” PDO is appreciated on the market both fresh and in the typical form “al piennolo”, but also as glass preserves, according to an old family recipe of the area called “a pacchetelle”, also referred to in the specification for the PDO.

The fresh type is sold, within four days of collection, as berries or clusters, placed in suitable sealed containers of a maximum weight of 10 kg. The "preserved" type, is sold until spring as single fruits or as clusters arranged in bulk in suitable sealed containers of maximum 10 kg or as “piennoli” that, at the end of storage, may weigh between 1 and 5 kg (maximum). The method of conservation on “piennolo”, together with the cultivation in non-irrigated soils and particularly the thick skin ensure an optimal preservation for up to 7-8 months.

3.5.- Economic and production data

The spread of the “Pomodorino del Piennolo del Vesuvio” PDO in the Vesuvian area is rather fragmented, due to the high fragmentation of crops and for the non-uniform distribution along the entire mountain complex of Somma-Vesuvius. The estimated surface area is approximately 480 hectares (about 10% of the arable area UAA), with annual production of about 4,000 tons of fresh product. At present, it is difficult to determine average sales, due to the very diluted market over time (from July to May of the following year), which results in a very different selling price of the product. For example, the price for the “piennolo” can vary from 1.5 to over 5 euros per kg, being higher in December.

The recognition of the PDO, the intense promotion activity carried out in recent years by the “Consorzio di Tutela of the Pomodorino del piennolo del Vesuvio DOP”, and the renewed commercial interest (also abroad) in this product has revitalized the entire sector so that all the fresh, preserved and processed product is disposed of quickly and without any difficulty, especially on the local market, but in some cases even through the distribution chain.

Although, the PDO certified production has increased since the constitution of the Consortium, there is still a large gap between the certified and the non-certified production; e.g. in 2015 the DOP production has reached 300 tons (Agroquality data of 2015) with an estimate of the productions that have characteristics to enter in the PDO of over 1,000 tons. Given the extremely fragmentation of the crop, the success of the “Pomodorino del piennolo del Vesuvio” PDO has to go through the aggregation amongst the players so as to reduce costs, from production to product marketing and successfully market

(<http://www.coltureprotette.it/tipicita-ai-piedi-del-vesuvio/>).

Even without an appropriate policy for the promotion of the product, the demand remains high, since the quality perceived by consumers is high. Nevertheless, the offer of “Pomodorino del Piennolo del Vesuvio” PDO as canned product or as packaged “piennoli” is still limited, and the difficult orographic conditions of the area along with the structural difficulties of the companies may hinder the desired development of the sector.

4.- THE “POMODORO S. MARZANO DELL'AGRO SARNESE-NOCERINO” PDO

The PDO tomato “San Marzano dell'Agro Sarnese-Nocerino” is certainly one of the most popular and appreciated Italian products in the world for its aroma, flavor and softness characteristics. These characteristics are essentially due to the peculiarities of cultivated soils, strongly affected by the eruptions of Vesuvius and climatic conditions. The name of this long-shaped tomato comes from its native land, the town of San Marzano on the river Sarno, in the Campania region (**Fig. 4**).



Figure 4.- The ‘San Marzano’ tomato

The San Marzano tomato assumed great appreciation from a gastronomic point of view towards the beginning of the '900, when Francesco Cirio founded the first canning industry giving origin to the production of the famous “pelato” (peeled) sauce. In the recent past the San Marzano was also known as “red gold” for the economic value it had for farmers of Agro Sarnese-Nocerino area. The presence of a number of factors such as the Mediterranean climate and the extremely fertile and well-structured soil, the skills and experience gained from the production area farmers over the decades, has contributed to its success in the world, crowned in 1996 with the recognition of the European Union as Protected Designation of Origin (PDO) “Pomodoro San Marzano dell’Agro Sarnese-

Nocerino” PDO in accordance with EC Reg. No. 1236 of 01.07.96 (GUCE L. 89 of 05.04.03). Subsequently, at the proposal of the Consortium, a few changes and additions to the product specification have been approved (<http://eur-lex.europa.eu/legal-content/>).

4.1.- Description of the product

According to the PDO specifications, the product offered for sale to consumers consists exclusively of tomatoes of the S. Marzano 2 and KIROS (ex Cirio 3 selection) varieties, or improved strains of these, grown in the Agro Sarnese-Nocerino area and processed into “pelato” (whole peeled tomatoes) or as “pomodori pelati a filetti” (sliced peeled tomatoes) by means of an industrial processing procedure by operators established in the area of production. The product is generally presented for sale in glass jars or tins (<http://eur-lex.europa.eu/legal-content/>). The intrinsic characteristics that have enhanced the product and thus foster its knowledge and its consumption are: typically sweet and sour taste, long shape of berry with parallel longitudinal depressions, bright red color, few seeds and placental fibers and easy to peel. These, together with the chemico-physical characteristics, make it unique, both in the fresh state and transformed. The PDO only designates the peeled and type sliced peeled (“a filetti”), coming from the processing of ecotype or improved lines of San Marzano. The transformed product must have very specific technological features: uniform red color with a/b colorimetric ratio not less than 2.2; elongated and parallelepiped shape, with length from 60 to 80 millimeters, absence of foreign odors and flavors; dry weight not less than 65% of net weight; refractometric residue of not less than 4%; pH from 4.2 to 4.5. It is allowed the addition of salt (max 3% of n.w.), basil leaves, tomato juice (but only of S. Marzano).

4.2.- Production area

To qualify for the “Pomodoro S. Marzano dell’Agro Sarnese-Nocerino” PDO, tomatoes must be produced by agricultural undertakings and processed by industrial operators in areas belonging to 41 municipalities distributed in the Provinces of Salerno (15), Avellino (2) and Naples (24) as detailed in the production specification. All the listed municipalities are included in the Agro Sarnese-Nocerino area and neighbouring areas and cultivate tomatoes on the irrigated or irrigable arable land on their plains.

Hillside areas are excluded because they are not irrigated (<http://eur-lex.europa.eu/legal-content>).

4.3.- Method of production

The S. Marzano tomatoes are grown exclusively on level, irrigated plots made up for the most part of pyroclastic material that is volcanic in origin and very deep, loose, naturally fertile, with good organic content and high levels of assimilable phosphorous and exchangeable potassium. The tomatoes may be grown in a protective environment to protect the crop from parasites and insect pests. The plants must be grown vertically with suitable staking and horizontal wires. Any form of forcing intended to alter the natural biological cycle of the tomato — especially as regards ripening — is not allowed. The tomatoes are picked in the period between 30 July and 30 September by hand only and at different times, as and when they are fully ripe. They then have to be sorted and transported in plastic containers holding between 25 and 30 kg. Maximum yield is 80 tons/ha and yield in terms of processed product is no more than 80%.

4.4.- Economic and production data

In the '80, the crop has undergone a drastic reduction, both in terms of production and of cultivated area, mainly because of the obsolescence of the landraces used that were unable to compete with the new hybrids coming from U.S.A., but also for phytosanitary problems and economic reasons linked to the costly cultivation technique. To overcome these difficulties, the Cirio Ricerche (nowadays ARCA 2010) started a recovery and improvement action of the populations of landraces selected by local guardian farmers. Subsequently, the Campania region, together with the “Consorzio di tutela del S. Marzano DOP”, have promoted the valorization of the improved landraces allowing the preservation of this important tomato and its international reintroduction. In fact, the San Marzano PDO tomato is witnessing a new season of rebirth and today it is requested not only in Europe and USA, but also in other continents, where it is expanding thanks to the growing success of the “Mediterranean diet”.

Over the past three years, the statistics on the surface cultivated with the San Marzano PDO show interesting results. In fact, it has gone from about 130 hectares of 2013/14 agricultural land to 197 hectares in 2016. The potential production, therefore, increased from 7,800 tons in 2014 to 11,820 tons this year. Specifically, referring to 2015 (the last year for which processing data

are available), certifies that agricultural producers have delivered to the processing companies 7,096 tons of fresh product with a processed production of 4,440 tons (yield of about 63%) (Agriquality data 2015). If we compare this data with the quantity of tomato transformed in Italy in 2015 (about 5.4 million tons) it is clear how marginal the transformation of San Marzano is, and how this typical production could be increased. These data indicate that the great reputation of the product, both fresh and processed, does not correspond to its real commercial value. It is therefore necessary to further invest in a valorization program, to boost its production and commercialization.

5.- THE “POMODORO DI SORRENTO”

The cultivation of “Pomodoro di Sorrento” tomato (also called “Sorrentino” or “Rosa di Sorrento”) began in early 1900s near Sorrento (Parisi *et al.*, 2016). Initially, its cultivation was limited to the so-called area of the Colli (Hills) (between Sant’Agnello and Piano di Sorrento), but the production soon spread in the remaining part of Sorrento Coast, and also concerned the areas surrounding the Vesuvius, even if the tomato has slightly different pomological and organoleptic characteristics from the Sorrento tomato grown in the traditional production area. Nowadays it represents one of the most important and remunerative Italian tomato landraces for fresh market, and it is grown especially as a protected cultivation (Parisi *et al.*, 2016). The Sorrento tomato owes some of its success to the famous Caprese salad, the classic dish of tomatoes, basil and local cheese (mozzarella) from the Lattari Mountains. This large, round, ribbed tomato is light red in colour, verging on pink with green hues when harvested, it is very fleshy and firm and has a sweet, delicate flavor. As for “Cuore di Bue” and “Belmonte” landraces, the pink color of the ripe fruits is due to the *colorless epidermis* (*y*) mutation (Parisi *et al.*, 2016).

The “Pomodoro di Sorrento” landrace shows outstanding organoleptic and nutritional qualities (Sinesio *et al.*, 2007) that are greatly appreciated by consumers, as also shown within the TRADITOM project (Grandillo *et al.* unpublished data).

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