Catalogue of silkworm strains

CREA

Sericulture laboratory of Padova

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2025

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Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria

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ADVOCATING THE ROLE OF SILK ART AND CULTURAL HERITAGE AT NATIONAL AND EUROPEAN SCALE

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Edition 2025 edited by
Luca Tassoni and *Silvia Cappellozza*

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ADVOCATING THE ROLE OF SILK ART AND CULTURAL HERITAGE AT NATIONAL AND EUROPEAN SCALE

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Prefazione

The preservation of silkworm genetic diversity is crucial for the sustainability and advancement of sericulture. This catalogue contributes to this effort by illustrating and describing the unique characteristics of the living collection of silkworm strains maintained at the Sericulture Laboratory of Padova (Padua, Italy), with the goal of making this information accessible and comprehensible to both the international scientific community and enthusiasts.

This catalogue has been meticulously revised and corrected to ensure its accuracy, representing a substantial enhancement to the historical reference material previously documented at the Sericulture Laboratory of Padova. This edition has been updated, expanded, and partially rewritten. Notably, the entire content has been translated into English for the first time, making it accessible to a broader international audience.

The original catalogue, which was written in Italian, evolved through successive additions, resulting in a certain degree of variation in both terminology and style. This edition adopts a harmonised and consistent vocabulary, thereby improving the overall readability and comparability of the strain descriptions. A similar effort has been undertaken with regard to the visual content: the catalogue now includes updated photographs of all strains, captured during the 2023 and 2024 rearing seasons.

Table of content

Abbreviations

AcMNPV	*Autographa californica* multiple nucleopolyhedrovirus
CPV	Cytoplasmic polyhedrosis virus
CREA	Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria
INRA	Institut national de la recherche agronomique
LEPA	Lycée d'Enseignement Professionnel Agricole
MTA	Material transfer agreement
NIAS	National Institute of Agrobiological Sciences
NPV	Nucleopolyhedrovirus
UCBL	Université Claude Bernard Lyon
UNS	Unité Nationale Séricicole

Introduction

Bombyx mori: one species many strains

Silkworm (*Bombyx mori*) is an insect belonging to the Bombycidae family, of the Lepidoptera order. Its origin dates back between 7500 and 4100 years ago, the period during which *B. mori* was probably domesticated from the Chinese wild silkworm, *Bombyx mandarina*, its closest relative[1,2].
Originally domesticated in China, the silkworm underwent a human-driven spread that resulted in the creation of the most local strains adapted and improved for silk production[3]. According to phylogenetic studies, this spread started about 2000 years ago and the consequent differentiation led to the generation of many different strains characterised by specific phenotypic features that are often linked to specific geographic places or countries[1].
Silk is undoubtedly the main reason why the silkworm was domesticated and continues to be farmed around the world. The oldest evidence of silk use, probably preceding the domestication period, dates back to 8500 years ago and was found in a tomb at the Neolithic site of Jiahu (in the present-day province of Henan, China)[4].
Evidence of the use of silk textiles in the ancient Mediterranean world is sporadic and difficult to link with the actual silk. The earliest written references to silk can be found in the classics of Greek-Latin literature. Silk also gave its name to the so-called 'Silk Road', the first network of trade routes between Far East Asia and Europe.
Across the 'Silk Routes', sericulture spread west, reaching the Middle East and European civilisations.
According to the legend told by Procopius, silk was introduced to the Eastern Roman Empire (the Byzantine Empire) in the sixth century, during the reign of Emperor Justinian, by two monks (History of the Wars, Book VIII)[5].
However, the introduction of sericulture in Europe did not take place until the 12th century, when sericulture was introduced in southern Italy (in the present-day regions of Calabria and Sicily).
Silkworm rearing and silk production spread throughout medieval Europe, establishing Italy and France as the continent's leading silk producers. From 1860 onwards, sericulture became a more organised, scientific process. The production of eggs was carried out by specialised reproduction centres. Milan and Lyon were the two main centres of

sericulture at the beginning of the 20th century.
In Italy, most of the industry was located in the north, where the abundance of water and the dense population made intensive rearing possible. Sericulture centres were present in Treviso (Veneto), Marche and Abruzzi. In 1871, the Italian government established the Sericulture Station in Padova (known as the 'Royal Sericulture Experiment Station' at the time and more recently as the 'Sericulture Laboratory') to conduct scientific research in sericulture and coordinate the Sericulture Observatories founded throughout the country a few years later[6].
In the 19th century, the Sericulture Station was responsible for producing healthy silkworm eggs. Over time, this activity was taken over by private centres that specialised in silkworm egg production.
Silkworm egg production was thus organised scientifically, and strain selection became more important. Silkworm egg production centres were established across Italy. Strains acclimatised to different Italian areas were bred and selected for productivity and characteristics such as robustness and disease resistance.

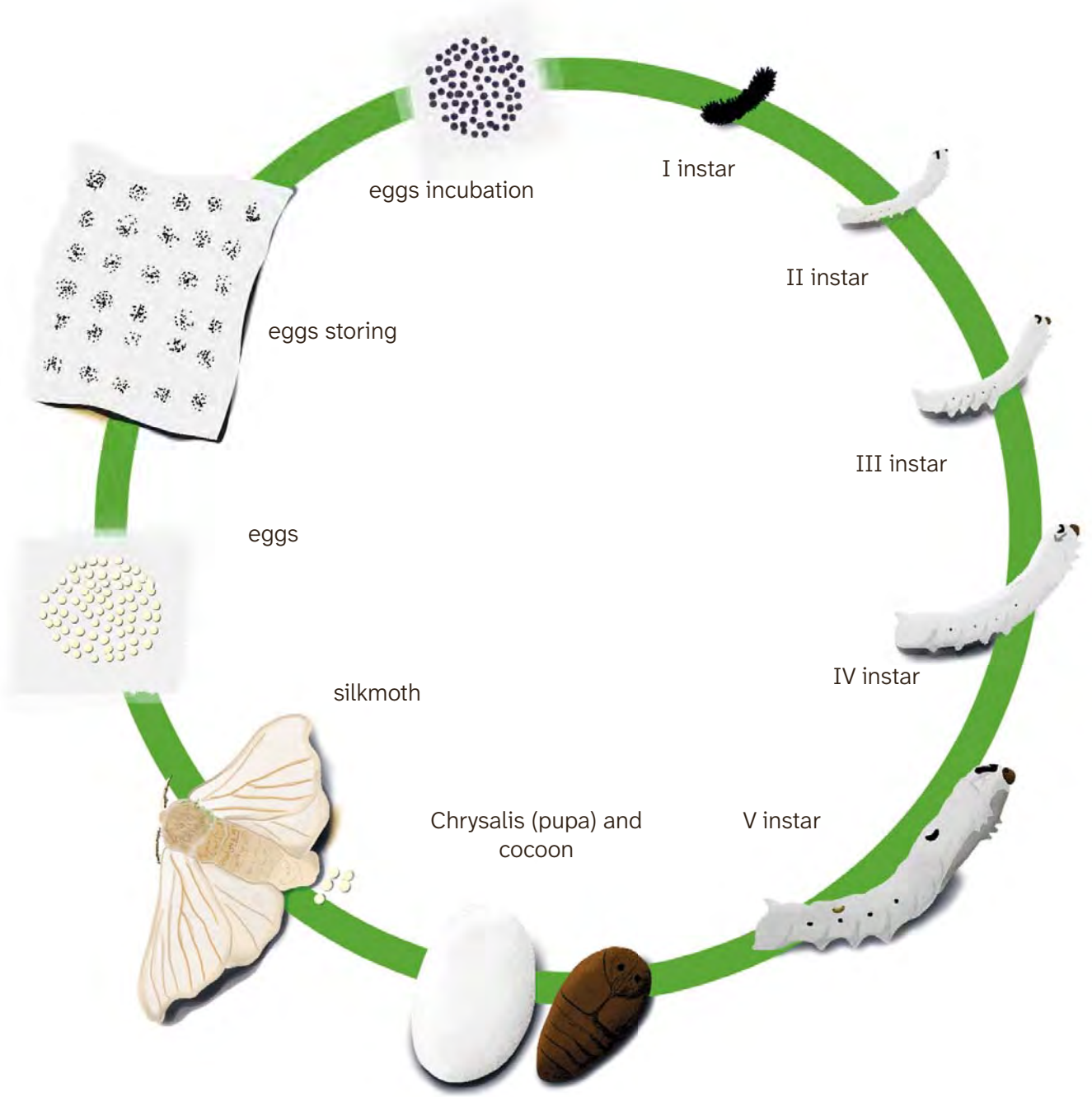
History of the collection and its catalogue

Given the importance of strain selection in the national sericulture industry, the preservation and classification of strains became crucial. Classification of Italian silkworm strains began in 1918 under the direction of Dr Porzia Lorenza Lombardi, head of the Ascoli Piceno Sericulture Station. Dr Lombardi was the first to identify and select ancient Italian strains that had been locally acclimatised and subsequently discarded by the silkworm egg industry. This is the core of the Silkworm Strains Collection preserved to date.
This initial group was later supplemented in 1963 by strains from the Spallanzani Institute in Pavia, where the geneticist Carlo Jucci conducted his research. Following the closure of the Sericulture Station of Ascoli Piceno in 1958, the entire collection curated by Dr Lombardi was transferred to the Sericulture Station of Padova, which would later become known as the Sericulture Laboratory of Padova. The collection was further expanded in 1979 when the San Giacomo di Veglia Reproduction Centre closed and its Japanese-origin strains were incorporated into the Padova collection. From that moment, the Sericulture Station of Padova began to produce experimental hybrid silkworm eggs

to compare them with the eggs yearly imported for farmers from abroad by the National Silkworm Rearers Association. The same organisation imported additional strains from Japan, China and Turkey during the 1990s. However, widespread environmental contamination caused by fenoxycarb in the late 1990s resulted in the permanent discontinuation of breeding activities. In 1997, the Association's preserved strains were officially added to the Padova collection. The first version of this catalogue was compiled in 1963 by Dr Porzia Lorenza Lombardi and subsequently expanded and updated by Dr Silvia Cappellozza in the early 1990s. The current organisation of the catalogue reflects the historical development of the collection, with strains grouped according to the circumstances of their acquisition—whether obtained in the same batch, before a given date, or resulting from genetic crosses performed in the laboratory.

This collection is now maintained at the Sericulture Station of Padova, which belongs to the CREA Research Centre for Agriculture and Environment. Currently, a living collection of 180 strains is reared each year from May to September. From these, parental lines are selected for the production of silkworm eggs, ensuring the continuity of the national sericulture supply chain and representing an

Example of larval phenotypes in the collection


eggs incubation
I instar
II instar
III instar
IV instar
V instar
Chrysalis (pupa) and cocoon
silkmoth
eggs
eggs storing

invaluable genetic resource for scientific experimentation.

Silkworm phenotipic traits

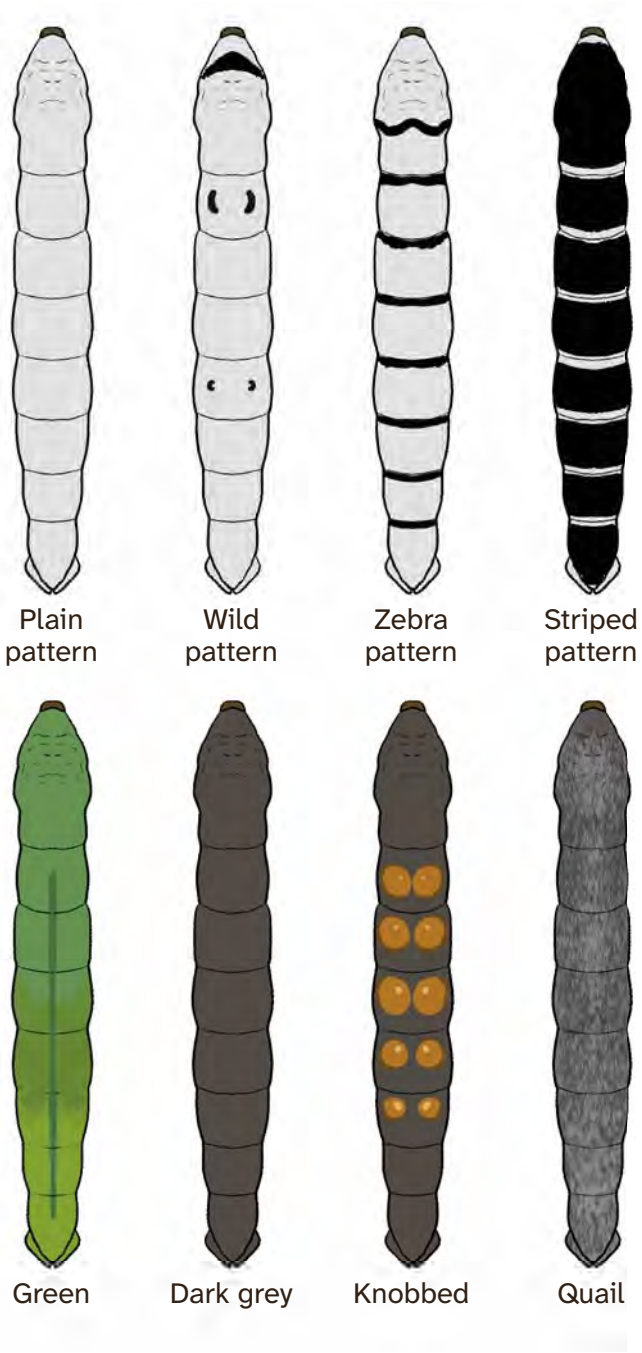
For the purposes of this catalogue, a few phenotypic traits were used to describe each silkworm strain, with a focus on the larval, cocoon and egg life stages.

Larval phenotype

The most evident signs of phenotypic diversity in larvae are morphological. The first evident characeristic is the colour pattern. A single gene (*apontic-like*) is responsible for at least 15 larval markings. Among the known p-alleles, the plain (*p*) and normal (wild) pattern (*+p*) are the most common among strains[7]. The main difference among these two phenotypes is the presence of aposematic patterns in the wild pattern. These consist of eyespot in the thorax, and in body markings, the crescents (second abdominal segment) and star spots (fifth abdominal segment).
Less common colour patterns depending on the p-alleles include:
Moricaud (p^M) is characterised by a colouring pattern that resembles that of the wild silkmoth B. mandarina, with dark greyish-brown lines and dots.
Striped (p^S), with larvae having a solid black body surface, except for the posterior margin of each segment, which is white.
Black (p^B), in which larvae are characterised by a grey-brownish skin colour [7,8].
Other pattern variants associated with other loci include:
Zebra (*Ze*) pattern that consists of a white larva displaying a narrow black band on the anterior portion of each larval segment and dark brown cuticles on both sides of the head [8].
Multilunar (*L*), characterised by the presence of multiple crescent markings
Quail (*q*) mutant that displays darker larval marks caused by an accumulation of melanin and ommochromes in the integument [9].

Life cycle of Bombyx mori: the larva progresses through five distinct instars, followed by pupation within the silk cocoon; the adult silkmoth emerges and deposits eggs; freshly laid eggs are then conserved and subsequently incubated to initiate the next generation.

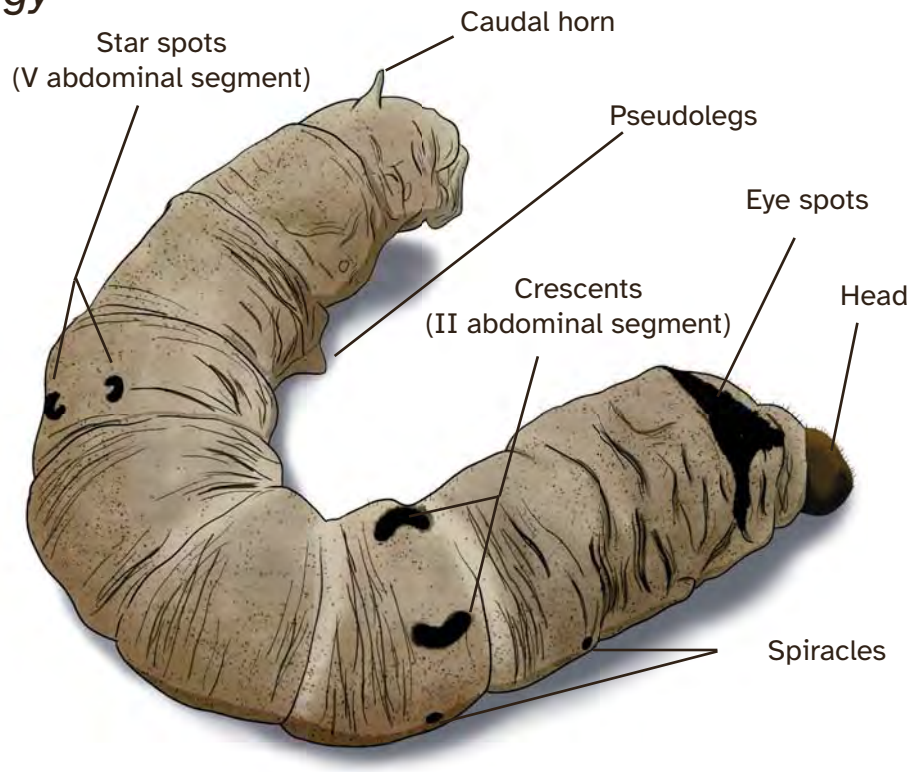
Knobbed (*K*) phenotype in which larvae display several pairs of protuberances (knobs) at larval marking sites that are evident from the third instar [10].
Lemon (*lem*) phenotype characterised by a yellow body colouration during larval stages, caused by a high content of sepiapterin in the integument [11].
Chocolate (*ch*), having the homozygote recessive ch allele, larvae display a reddish-brown skin and head cuticle in newly hatched larvae, instead of the normal black. The same reddish-brown colour is present in the body markings of elder instar larvae [12].
Sooty (*so*), a recessive homozygote larva for the Sooty gene, that displays a smoky colour, and a black pupa [12].
In addition, some strains show marked sexual dimorphism in larval colouration.
Another phenotypic trait observable in the larval stage is the number of moults. Silkworm larvae normally undergo four moults, giving a total of five instars. However, some strains only undergo three moults for a total of four larval instars.
Finally, a phenotypic trait useful for the breeders is the resistance to particular diseases. In fact, many strains are characterised by their resistance to the *B. mori* nucleopolyhedrovirus (NPV) or to the cytoplasmic polyhedrosis virus (CPV).

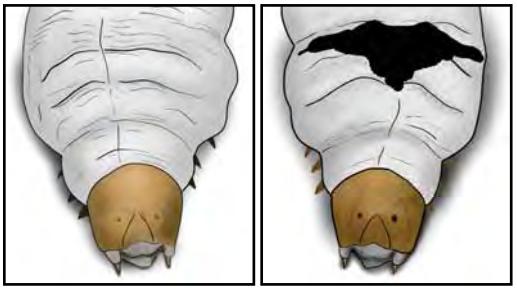


Scheme of the main larval phenotypes observable in the catalogue. From left to right, and from top to bottom: plain pattern, wild-type pattern, zebra pattern, striped pattern, green, dark grey, knobbed and quail pattern.

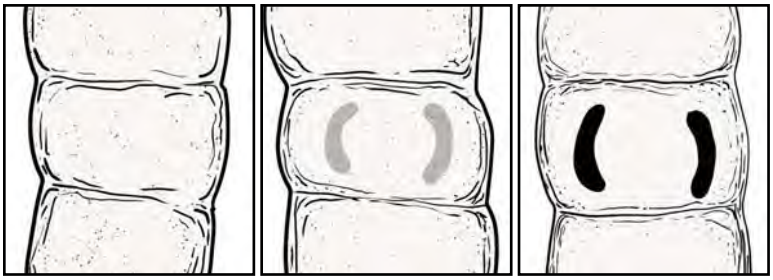
Larval morphology

Anatomy of the silkworm larva, highlighting key features such as the eye spots, crescents, star spots, and main body sections.





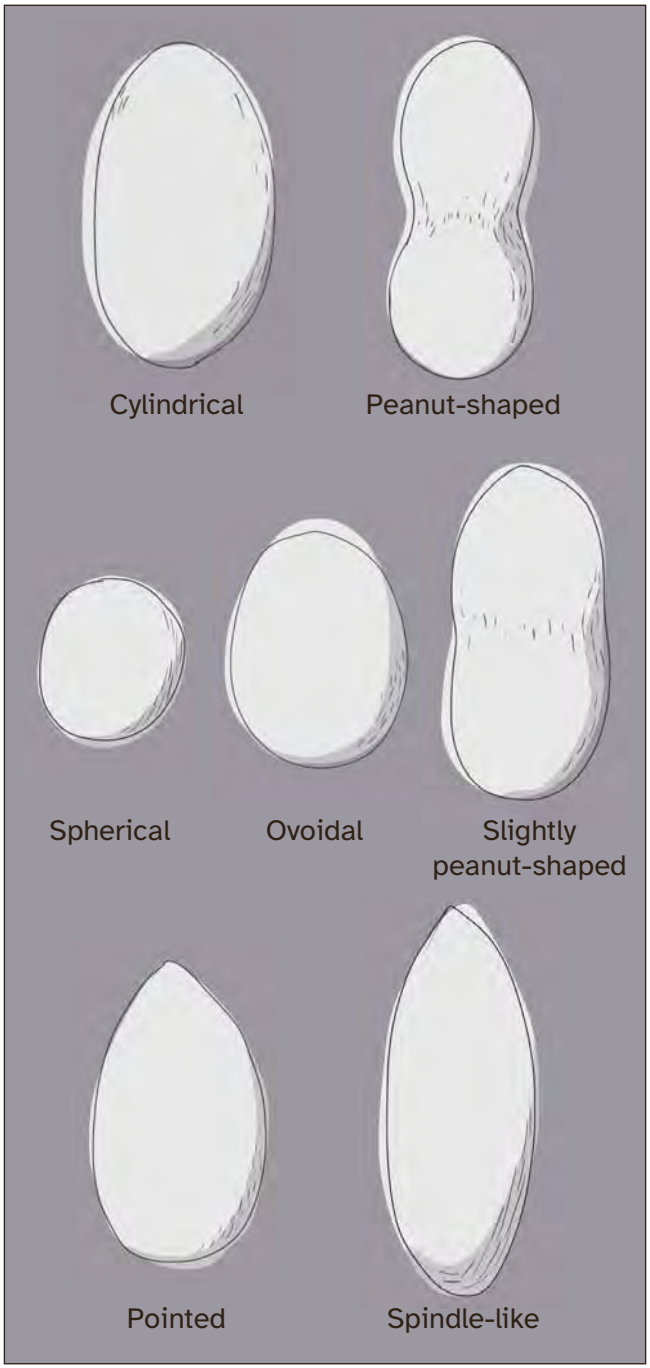
Thorax, without (left) and with eye spots.



Second abdominal segment with body markings at different intensities: absent, barely visible, visible.

Cocoon phenotype

Cocoon colour depends on the presence of selective transporters for pigments in the midgut and the presence of the enzymatic pathway to chemically modify some of them.
Three categories have recently been identified on the basis of the underlying genetic pathway: I) yellow-red cocoons coloured by carotenoids, ranging from golden yellow to pink; II) green cocoons coloured by flavonoids, ranging from pale green to deep green; III) white cocoons with no pigments or traces of them [13].
In silkworm strains exhibiting coloured cocoons, the pigments come from mulberry leaves. They are absorbed in the midgut and transported into the haemolymph. To colour the cocoon, the pigments must be taken up by the silk glands and bind to silk proteins. The pigments can be further modified by chemical modification. Yellow-red cocoon silkworms are characterised by the presence of two main carotenoids, lutein and beta-carotene, which need the presence of carotenoid transporters to be transported in the bloodstream. A single gene, the Yellow blood gene (*Y*), encodes the carotenoid-binding protein responsible for the intracellular transport of carotenoids in the midgut and silk glands. Two other transporters are involved in the membrane transport of



lutein and beta-carotene and are encoded by the Yellow cocoon gene (*C*) and the Flesh cocoon gene (*F*), respectively[13,14]. The mutant homozygous for the recessive $+^{C}$ allele has a defect in the uptake of lutein by the mid-silk gland, producing a cocoon containing only beta-carotene, giving a creamier colour (flesh yellow). The mutant homozygous for the $+^{F}$ allele has a similar defect in beta-carotene uptake and therefore accumulates only lutein, giving a yellow colour. Double mutant, homozygous for both $+^{C}$ and $+^{F}$ alleles, produces white cocoons [14].

Additional loci that contribute to yellow-red cocoons, such as Pink Cocoon (*Pk*, 2–?) and Rusty Cocoon (*Rc*, 2–34.8) have been identified, but their molecular basis remains unclear.

Green silkworm cocoons require specific transporters for flavonoids. However, chemical modifications are also necessary to obtain the green colour, in particular the glycosylation of the 5-O-position of quercetin. This modification is linked to the Green b locus, which encodes the specific enzyme [13]. In addition, a hydrolase family 1 group G 5 (GH1G5, *Green d locus*) performs the deglycosylation of mulberry leaf-derived quercetin glycosides, a process required for quercetin uptake in the midgut [15]. Finally, sugar transporters were identified that may be involved in the

uptake of quercetin glucosides from the haemolymph to the silk glands (*Gn locus*). Evidence was found that flavonoids confer UV protection to the cocoon and have antioxidant activity [15,16].

The appearance of the cocoon can also vary greatly in size and shape. Size is partly dependent on rearing conditions, while shape is typical of each strain, with strains of Chinese origin usually having spherical and oval shapes, whereas silkworms of Japanese origin have a more elliptical and peanut-like shape. Finally, some strains produce cocoons that are mainly made up of sericin and are neither clearly shaped nor reelable. This characteristic is caused by a state of homozygosity for two alleles known as the "naked pupa" and "naked pupa sericin" alleles (*Nd* and *Nd-s*^{D}), both of which map to the locus encoding the fibroin light chain [17,18].

Above: Examples of the cocoon colour variability in the collection.

On the facing page:
Examples of the variability in shape and size of the cocoons in the collection.

Egg phenotype

The egg is an important stage in the silkworm's life. In temperate countries, in which silkworm strains are mostly monovoltine, this phase lasts about 10 months. During this time, the serosa (under the egg shell) protects the embryo from ultraviolet rays. This monolayer membrane contains special pigments that impart the egg its purple-grey or light grey colour. Silkworm genetics is characterised by the presence of a wide array of egg colour mutants, which are attributable to the serosa pigment: red, pale red, yellow, white and brown[19].
Usually, the serosa and moth eye colours are identical. Egg colours can also be caused by a combination of mutations in one or more egg components: the egg shell, serosa pigment, embryo, and yolk[20].
The female moths lay eggs in groups of 400–600 and glue them to the deposition surface. In the case of gene banks, this is usually paper sheets.
The eggs are typically short and elliptical, slightly narrowed at the micropyle. However, there are mutant eggs that are spindle-shaped or elliptical and elongated, large or small in size. The egg shell (chorion) of normal eggs is colourless and semitransparent, with different mutations affecting its structure (wrinkles, patches, opaque areas); these impart specific optical appearances that can combine with the various serosa colours.
With regard to voltinism, this feature is generally maternally determined and depends on the diapause hormone, which also affects egg pigmentation. Despite this, there are pigmented non-diapausing eggs (pnd). Voltinism refers to the number of insect cycles per year, with three possible variations: monovoltinism (one cycle per year only), polyvoltinism (continuous cycles) and the intermediate bivoltinism (two cycles per year). The non-diapausing egg (bi- or polyvoltine) retains its initial yellow pigmentation and only turns greyish when the dark larva, close to hatching, becomes visible through the transparent shell. The monovoltine egg is light yellow at oviposition, and it gradually changes colour from 36 to 48 hours after laying, becoming grey-green, grey-purple, or light brown, with these tracts being distinctive of diapausing eggs.

Other descriptors often used to describe strains include silk thread length, which is strongly influenced by rearing conditions, the ability of the moth to emerge from the cocoon without cutting it, egg colour, resistance to certain diseases, moth colour and the ability to reproduce by parthenogenesis.

Examples of the egg colour variability in the collection.

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Catalogue of silkworm strains

Old Traditional strains acclimatised in Italy before 1970

This section includes all strains that were traditionally reared in Italy prior to 1900, along with those acclimatised in Italy since the first half of the 20th century. They originate from the Middle East, China, Japan and Greece.

Seven strains of this group are identifiable by a number followed by “M” (standing for Mari), as they were introduced from China in 1932 by Benito Mari, who served as an Italian silk adviser to the Chinese government.

Abruzzo

Larva

White with brown stripes (zebra pattern), prominent crescents and coloured eye spots. The larva also displays orange-pinkish dots on the sides and dark brown on the ventral side. Yellow haemolymph.

Cocoon

Flesh yellow, with an intense yellow inner surface. Slightly peanut-shaped.

Egg

Grey.

Notes

This strain originated in Abruzzo, a region of central Italy. Originally composed of zebra and plain larvae. The latter may still occasionally occur. Possibly susceptible to NPV.

Almeria

Larva

Larva is beige with no eye spots or body markings. Crescents may be barely visible (plain pattern). Has a long larval cycle compared to other strains. Yellow haemolymph.

Cocoon

Yellow, light yellow inside, elongated with slight points (spindle-like); some slightly peanut-shaped and somewhat pod-like.

Egg

Grey.

Notes

Imported from Spain in 1938 (the name is a reference to the Almeria region in Spain). This strain was characterised by high silk yield, though reeling performance was poor. It was historically used for the production of silkworm gut (used in fly-fishing leaders). Prone to NPV.

Alpe

Larva

White, with no eye spots (plain pattern) or body markings. Yellow haemolymph.

Cocoon

Yellow-pink, yellow inside, peanut-shaped.

Egg

Grey.

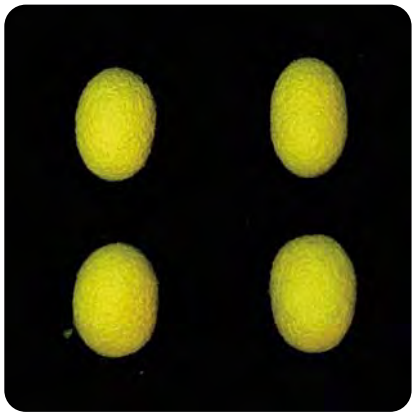
Notes

This is a historically reared Italian strain. Larvae originally displayed eye spots and were crossed with the “Nistari” strain for outbreeding. Prone to NPV.

AP

Larva

Grey-white, with crescents that are barely noticeable and no eye spots (plain pattern). Yellow haemolymph.



Cocoon

Light golden yellow with a tinge of lemon, lighter inside, oval in shape. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

Originating from China, the strain was imported in the early 20th century. It was later used in Italian traditional egg production plants, where it was selected from commonly used strains. The acronym AP refers to Ascoli Piceno, a city in central Italy hosting the homonimous sericulture station. Susceptible to NPV.

AP 11

Larva

Grey-white, with barely noticeable, slightly protruding crescents and no eye spots (plain pattern). White haemolymph.

Cocoon

White, oval, fine grain, small.

Egg

Dark grey.

Notes

Reared in 1990 under the name SA 48, this strain differs in larval colour from the originary green. Over time, white larvae were selected. However, green larvae are still present in small numbers. Some cocoons are slightly peanut-shaped. The acronym AP refers to Ascoli Piceno, the Italian city hosting the homonimous Sericulture Station.

Awojiku

Larva

Light grey larva with black and brown pigmentation, also present beneath the first pair of prolegs (wild pattern). The body shows eye spots and distinct black body markings, and is translucent. Small pairs of black dots are present on each segment. White haemolymph.

Cocoon

White, peanut-shaped.

Egg

Light grey-purple. If bivoltine, dull light in colour; if monovoltine, shiny grey with greenish reflections.

Notes

Imported from Japan in 1918. Two variants were selected in Italy: one with translucent skin, the other with highly pigmented matte skin. Voltinism varies depending on environmental conditions. Prone to NPV.

B

Larva

Grey-beige, with slightly visible crescents and no eye spots (plain pattern). Yellow haemolymph.

Cocoon

Flesh yellow (almost pinkish), yellow inside, more or less slightly peanut-shaped.

Egg

Grey.

Notes

A standard strain in traditional Italian silkworm egg production, included in collections since 1940. Adapted for rearing on artificial diet. Very prone to NPV.

B 14b

Larva

Grey-white, with no eye spots or body markings (plain pattern). White haemolymph.

Cocoon

White, oval.

Egg

Dark grey.

Notes

Imported from China. Originally bivoltine, it became monovoltine in the second year after import. The strain does not appear prone to NPV.

Bagdad

Larva

White, with no eye spots and with barely noticeable body markings (plain pattern). White haemolymph.

Cocoon

White, very large and oval. Slightly peanut-shaped in some individuals.

Egg

Grey.

Notes

Originating in the Middle East (the name refers to the homonimous city in Iraq), it underwent partial genetic selection in Italy. Originally characterised by a long life cycle, still longer than other strains, and loose eggs without glue. Cocoons were not uniformly white and often shapeless, and remarkably big. Adaptable to artificial diet. NPV has been occasionally detected.

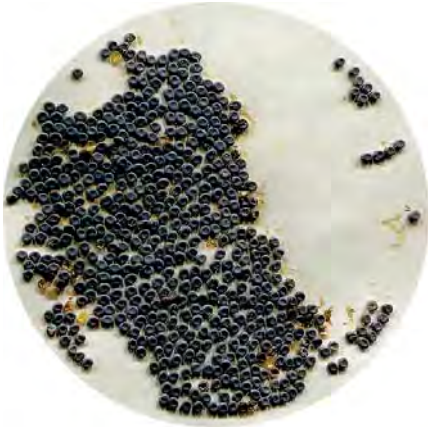
Bianca Italia

Larva

White-grey, bluish and non-pigmented, with no body markings or eye spots (plain pattern). White haemolymph.

Cocoon

White, mostly peanut-shaped, some slightly deformed.



Egg

Grey.

Notes

Strain historically bred in Italy (the name means “White Italy”), obtained by segregation from a yellow population, possibly “Brianzola”. Originally characterised by eye spots and body markings. Still carries yellow cocoon genes, which may reappear when crossed with strains lacking the yellow inhibitor gene. Susceptible to NPV.

Brianza

Larva

Beige larva with barely noticeable but prominent crescents and without eye spots (plain pattern). Yellow haemolymph.

Cocoon

Flesh yellow, peanut-shaped. Yellow on the inner surface.

Egg

Grey.

Notes

This strain was historically reared in northern Italy, in the Brianza region (Lombardy).

BS 16

Larva

Grey-pink (burgundy), with more or less pronounced body markings and eye spots. White haemolymph.

Cocoon

White, peanut-shaped. High mortality frequently observed at the cocoon stage.

Egg

Dark grey.

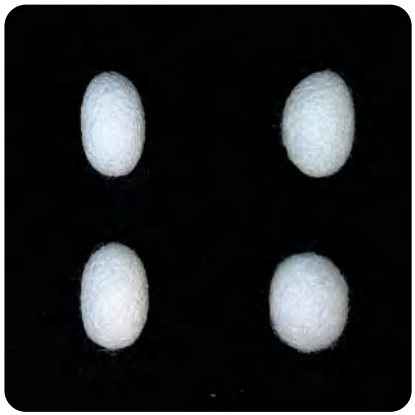
Notes

Originating in the Middle East, it was selected in Italy. Larvae were originally white with eye spots. Not prone to NPV.

GB 408

Larva

White-grey, with eye spots and marked crescents, slightly protruding (wild pattern). Star spots may be present or absent. White haemolymph.



Cocoon

White, oval.

Egg

Dark grey.

Notes

Originating from Japan, but adapted to the Italian environment. Larvae with eye spots were selected over time. The strain is prone to NPV.

Giallo Grecia

Larva

Yellow-white, with no eye spots or marked crescents. Slightly protruding crescents (plain pattern). Yellow haemolymph.

Cocoon

Bright yellow, slightly peanut-shaped.

Egg

Grey.

Notes

Imported from Greece in 1954 (the name means “Yellow Greece”). Larvae originally displayed eye spots. Cocoon colour was initially heterogeneous, later stabilised to yellow in 1999. Prone to NPV.

Gibbosi

Larva

Pinkish beige larva, with the last segments showing a yellowish colouration. Eye spots are absent or only slightly visible. Very prominent knobs on some segments. Yellow haemolymph.

Cocoon

Uniform flesh yellow, oval, peanut-shaped.

Egg

Dark grey.

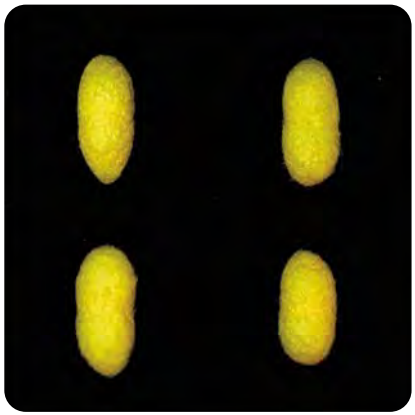
Notes

Imported from China under the name "*Pai-pi-lungh-chiao-tsan*", and reared in Europe since 1888. Originally the knobs display variable dimension. Only the larvae with the largest knobs were selected over time. Many double cocoons are present. Very susceptible to NPV. The name means "knobbed".

Icot

Larva

White, with the last body segments turning yellowish-white. Body markings and eye spots are absent. Slightly swollen (plain pattern). Yellow haemolymph.



Cocoon

Gold, peanut-shaped, pointed at the ends, very poor in silk.

Egg

Dark grey.

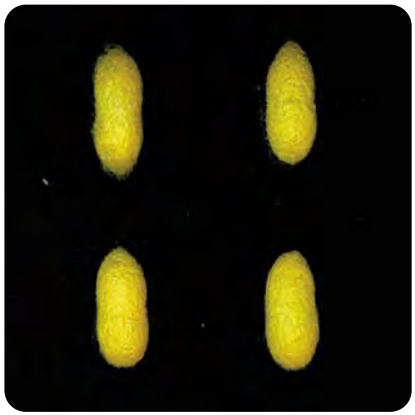
Notes

Imported from India in 1950. Originally bivoltine, later selected for monovoltinism, although bivoltinism can still occur. Prone to NPV.

Nistari

Larva

Small larvae of a yellow-grey colour. Body markings may be more or less pronounced but are swollen. No eye spots (plain pattern). Yellow haemolymph.



Cocoon

Golden yellow, pointed, peanut-shaped, lighter in the centre, poor in silk.

Egg

Grey.

Notes

Originating from India, imported in 1949, and further selected in Italy. Originally polyvoltine. Not very prone to disease.

Novi

Larva

White, pigmented grey-black, with prominent and well-marked eye spots and body markings (wild pattern). Pigmented ventrally to the first pair of prolegs. White haemolymph.

Cocoon

White, more or less slightly peanut-shaped.

Egg

Grey.

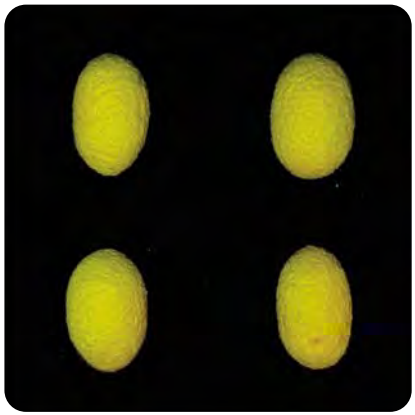
Notes

A historical Italian strain, valued for its cocoon grain and brilliant silk. Since 1989, it has been periodically used for genetic improvement programmes. Although prone to NPV, it was once known for disease resistance. The name refers to Novi Ligure, a town in Piedmont (Italy).

Oro 208

Larva

Whitish-yellow, with no eye spots (plain pattern). Crescents are barely noticeable. Yellow haemolymph.



Cocoon

Gold with lemon hues, oval. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

Selected from a Chinese strain imported in 1929, it was used in Italian traditional egg production plants. Larvae originally showed presence or absence of eye spots, and cocoons were white. The letter “O” stands for “*oro*” the Italian word for “gold”. Very prone to NPV.

Romagna

Larva

White with a pinkish hue, without crescents (or just barely hinted ones) and eye spots (plain pattern). Yellow haemolymph.

Cocoon

Flesh yellow, with an intense yellow inner surface. Peanut-shaped.

Egg

Grey.

Notes

The strain was reared in Romagna region (Italy). It was selected from an “Ascoli” strain known for producing large cocoons. Larvae originally displayed eye spots. Possibly susceptible to NPV.

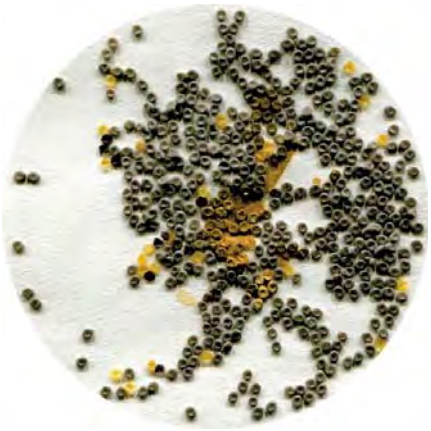
TG 10

Larva

White, without eye spots (plain pattern). The crescents are barely visible or absent and do not protrude. Yellow haemolymph.

Cocoon

Flesh yellow, peanut-shaped. To help silkmoth emergence, it is advisable to cut the cocoon.



Egg

Grey.

Notes

The strain was created in 1922 through selection from a cross between two yellow strains. It was originally divided into TG “long thread” and TG “small eggs”. Larvae originally displayed eye spots, a trait that was later lost. Susceptible to NPV.

Varo S

Larva

Light grey, pigmented larva, with eye spots and crescents (wild pattern), and red haemolymph. The strain was standardised with “Coloured Varo”, obtained from INRA. It corresponds to the Italian “Varo” breed originally selected from pigmented larvae, but with individuals exhibiting a plain pattern.

Cocoon

Golden yellow, elliptical shape.

Egg

Grey.

Notes

This strain was historically bred in the Varo region in southern France. It was imported in 1940 and was known for its rich silk yield, though quality varied significantly among individuals. A proportion of the larvae displayed a masked phenotype. When French strains from INRA were imported into Italy, it was unified with the strain Var3 (LEPA - Les Arcs) and with a VAR strain donated by a group of amateur breeders in 2022. Very prone to NPV.

Verde cinturato

Larva

White-grey larva, without eye spots, or with a small proportion showing slightly visible eye spots (plain pattern). Crescents are barely visible. White haemolymph.

Cocoon

Green, peanut-shaped.

Egg

Grey-purple.

Notes

Imported from Japan. Originally displayed eye spots and crescents. Prone to NPV. The name means “peanut-shaped green”.

Verde ovale

Larva

White larva with clearly visible body markings (wild pattern). Some individuals show less defined eye spots and crescents. White haemolymph.

Cocoon

Green, white inside, oval.

Egg

Grey.

Notes

Imported from China. Prone to NPV. The name means “oval green”.

10 M

Larva

White-greenish-beige, with crescents that are slightly visible or absent. Eye spots and body markings are present in a very low percentage of individuals (plain and wild pattern). Very slight swellings. White haemolymph.

Cocoon

White, peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

Originating from China, selected by Benito Mari (hence the “M” in the name). Obtained via segregation of a white Chekiang strain. Larvae originally displayed eye spots and body markings. Can be reared on artificial diet. Prone to NPV.

120 M

Larva

White-grey, without eye spots or with barely noticeable ones. Body markings are absent or slightly visible and somewhat swollen (plain pattern). White haemolymph.

Cocoon

White, oval, pointed at one or both ends, slightly peanut-shaped, low silk content, some fluffy. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

Originating from China, selected by Benito Mari (hence the “M” in the name). Derived from a Chiansu x Chekiang cross. NPV occasionally detected.

175 FA

Larva

Yellowish white, with faintly pronounced eye spots consisting of two small dots. Crescents are barely visible. White haemolymph. This is a three-moulting strain, although it may occasionally undergo four moults (in summer-autumn).

Cocoon

White, elongated, peanut-shaped, pointed at one or both ends.

Egg

Grey.

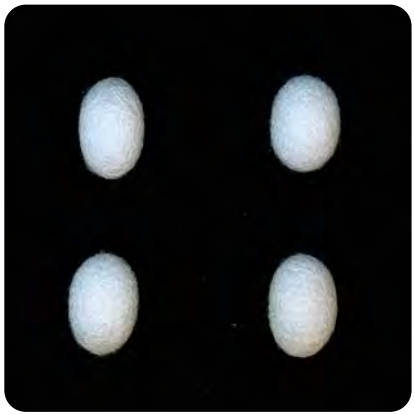
Notes

Obtained from a genetic cross between G 122 and C 122, imported from Japan in 1951; the pure strain was established in 1952. Over time, it lost the flossy cocoon texture and the dirty white colour. The strain is highly susceptible to NPV.

190 M

Larva

White-grey, with no eye spots and with light grey, slightly swollen body markings (plain pattern). White haemolymph.



Cocoon

White, oval, fine grain.

Egg

Grey.

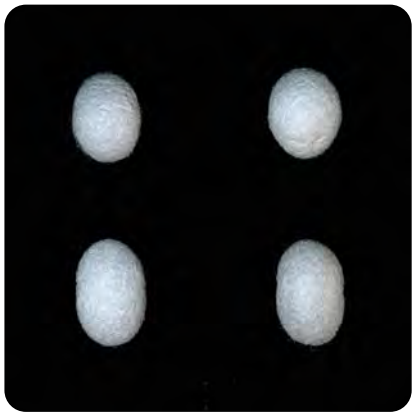
Notes

Originating from China, selected by Benito Mari (hence the “M” in the name). Obtained from a bivoltine Chekiang strain. Not very susceptible to NPV.

280 M

Larva

White-greyish, without eye spots. Body markings are barely noticeable yet prominent (plain pattern). White haemolymph.



Cocoon

White, oval.

Egg

Dark grey.

Notes

Originating from China, selected by Benito Mari (hence the “M” in the name). Derived from “gold Szechwan” x “gold Hopé”. Originally, eye spots could be present or absent. Prone to NPV.

351 M

Larva

White larva with crescents and star spots barely visible but protruding (plain pattern). Eye spots are absent. White haemolymph.

Cocoon

White, peanut-shaped, fine grain. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Grey.

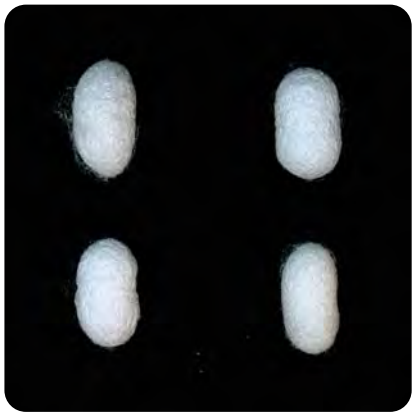
Notes

Originating from Persia, selected by Benito Mari (hence the “M” in the name). Can be reared well on artificial diet. Not very susceptible to NPV.

441 M

Larva

White-greenish-beige. Crescents are slightly visible or absent. Eye spots and body markings are present in a very low percentage of individuals (plain and wild pattern). White haemolymph.



Cocoon

White, peanut-shaped, coarse grain.

Egg

Dark grey.

Notes

Originating from China, selected by Benito Mari (hence the “M” in the name). Derived from a cross of “white Szechwan” x “yellow Roussellau”. Can be reared well on artificial diet. Selected for absence of eye spots and body markings. Prone to NPV.

772 M

Larva

White, with no body markings or eye spots (plain pattern). White haemolymph.

Cocoon

White, oval-spherical. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Grey.

Notes

Originating from China, selected by Benito Mari (hence the “M” in the name). Derived from polyvoltine, bivoltine, and monovoltine strains. Originally showed eye spots. A peanut-shaped cocoon phenotype is still present in the population. Prone to NPV.

Strains obtained by crossing or selection

Over the years, many strains have been obtained by crossing pure strains to obtain stabilised lines with specific features. Moreover, random mutations occurring over time can generate mutants that differ from their parents and are selected by breeders to develop new strains.

Cinese bianco bava lunga

Larva

White, without eye spots and star spots, but with light crescents (plain pattern). White haemolymph.

Cocoon

White, oval, inner thin layer. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

Derived from a Chinese strain selected in Japan. Previously used for genetic improvement. Prone to NPV. The name means “Long thread Chinese”.

CREA AA

Larva

White larvae with visible body markings (wild pattern). The last abdominal segments are slightly pigmented. White haemolymph.

Cocoon

Oval cocoon, white, some slightly peanut-shaped. To be cut to facilitate emergence.

Egg

Grey.

Notes

The strain was obtained in 2010 through a cross between the SG1 strain and a coloured strain.

Gialla 9/496

Larva

White larva with brown-black pigmentation between the segments (brown zebra pattern). Prominent black crescents and eye spots are present. Additionally, it is pigmented beneath the first pair of prolegs, with lateral black dots. Yellow haemolymph.

Cocoon

Flesh yellow, slightly heterogeneous, slightly peanut-shaped, some slightly pointed.

Egg

Dark grey.

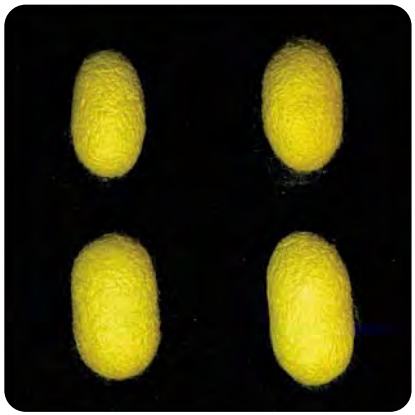
Notes

Selected from a cross between a yellow three-moulting and yellow four-moulting strain to obtain the current four-moulting strain. Occasionally white larvae may appear. The word "*gialla*" in the name means "yellow".

Orgosolo Giallo

Larva

White-yellowish larva, with slightly swollen segments. Eye spots and body markings are absent (plain pattern).



Cocoon

Golden yellow, oval.

Egg

Grey.

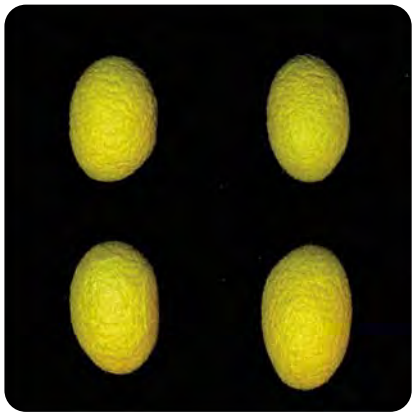
Notes

Supplied in 2023 by *Tramas de Sedas*, Corda family, for the preservation of the traditional strain historically reared in Orgosolo (Sardinia, Italy). In the Padova Sericulture Station's records, the strain is described as having white cocoons, and this is the variant maintained in the collection for many years. However, local oral tradition also refers to the strain with yellow cocoons.

PL 20

Larva

White-pink larva, without eye spots, with faint body markings (plain pattern). Yellow haemolymph.



Cocoon

Golden yellow, white inside, oval.

Egg

Dark grey.

Notes

Derived from multiple crosses over several years among monovoltine strains with cocoons of various shapes and colours. Prone to NPV. Named after Dr Porzia Lorenza Lombardi (hence the “PL” in the name), former director of the Sericulture Station of Ascoli Piceno and later of the Sericulture Station of Padova.

PL 22

Larva

White, without clear body markings or eye spots, almost not swollen. Crescents are barely visible (plain pattern). White haemolymph.

Cocoon

White, oval, slightly peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Grey.

Notes

Derived from a cross between a monovoltine “Cyprus” strain and SA 15 (see SA 15 entry). Originally displayed eye spots. The acronym “PL” refers to Dr Porzia Lorenza Lombardi, former director of the Sericulture Station of Ascoli Piceno and later of the Sericulture Station of Padova.

PL 24

Larva

White larva, without eye spots, with faint body markings (plain pattern). Yellow haemolymph.

Cocoon

Flesh yellow, elongated, pointed at one end.

Egg

Grey.

Notes

A Chinese strain imported in 1930, historically used in Italian egg production plants. Originally, a small proportion of larvae were white, others black, all with eye spots and body markings. In the fifth instar, larvae with eye spots appeared shiny. The strain is susceptible to NPV. Named after Dr Porzia Lorenza Lombardi (hence the “PL” in the name), former director of the Sericulture Station of Ascoli Piceno and later of the Sericulture Station of Padova.

Romagna B

Larva

Whitish-grey/yellowish, without star spots. Eye spots and crescents are absent or barely visible (plain pattern). Yellow haemolymph.

Cocoon

Flesh yellow, elliptical, not peanut-shaped.

Egg

Grey.

Notes

Selected in 1990 from the "Romagna" strain for its larger cocoons. Originally heterogeneous in colour, the flesh-yellow phenotype was progressively selected until colour stabilisation was achieved in 1994. Prone to NPV.

Rosa C60

Larva

Beige, with faintly visible body markings and no eye spots (plain pattern). Crescents vary in prominence. Yellow haemolymph.

Cocoon

Outer flesh yellow, inner yellow, slightly peanut-shaped. It is advisable to cut the cocoon to facilitate moth emergence.

Egg

Grey.

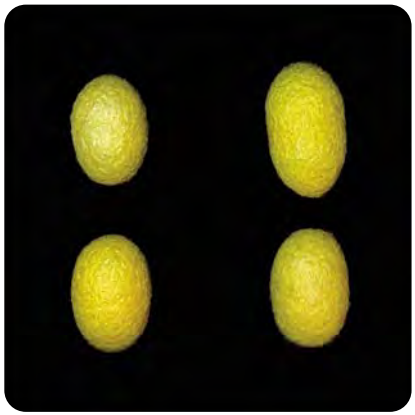
Notes

Obtained from a crossbreeding to rescue the “C60” strain, endangered due to fenoxycarb contamination of leaf, and the “Rosa” strain. Crossbreeding began in 1989, and some striped larvae were observed the first years of rearing. Eventually, only plain larvae were selected. The strain is highly sensitive to NPV.

SA 1 - R9 neri BP

Larva

Black, with white stripes (identical to R9 neri BP) (striped pattern), with eye spots. Yellow haemolymph.



Cocoon

Yellow, predominantly oval.

Egg

Dark grey.

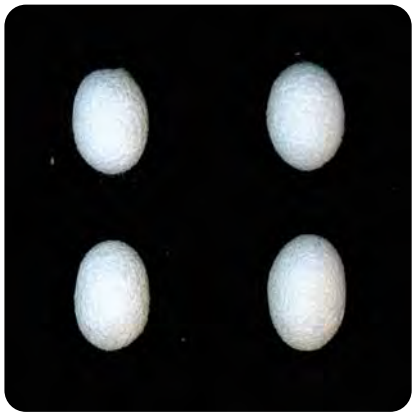
Notes

Cross between strain SA 1 (lost due to fenoxycarb-contaminated leaves) and strain "R9 neri BP". Only black striped larvae have been selected over time. The strain is characterised by high mortality and is highly prone to NPV.

SA 105

Larva

White, with grey intersegments. No eye spots or body markings. Slightly swollen (plain pattern). White haemolymph.



Cocoon

White, oval, medium-large size, medium grain.

Egg

Dark grey.

Notes

Derived from a complex crossbreeding: Chinese 801 M, Japanese 84, 351 M (from Persia), and later crossed with Japanese 115 and Chinese 108. Originally characterised by eye spots and body markings. Prone to viruses (NPV and CPV). The acronym SA refers to “Stazione Ascoli”, the Sericulture Station of Ascoli Piceno (Italy).

SA 15

Larva

Pearl grey-burgundy, pink on the segments. Black eye spots and black swollen crescents. No visible star spots. The skin is shiny in the final part of the fifth instar. White haemolymph.

Cocoon

White, oval, some peanut-shaped.

Egg

Grey-purple.

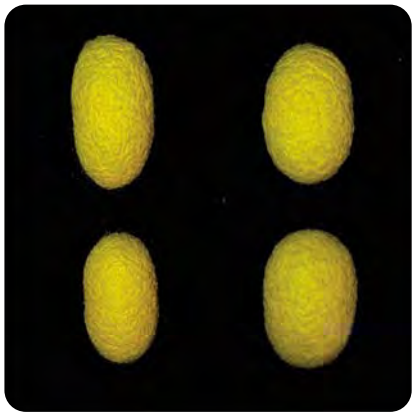
Notes

Obtained from a mutation of the F2 generation of a “bivoltine Nipponishiki” x “monovoltine Majella” cross. The strain shows a high mortality rate, even when crossbred. Likely due to a lethal allele on the female Z chromosome. The acronym SA refers to “Stazione Ascoli”, the Italian Sericulture Station of Ascoli Piceno (Italy).

SA 48 larve verdi

Larva

This strain is characterised by transparent skin, giving the larva a light yellow-bluish colour. Body markings are barely visible and slightly swollen. Yellow haemolymph.



Cocoon

Bright gold, oval (selected shape), some peanut-shaped, coarse grain.

Egg

Dark grey.

Notes

The “transparent skin” trait appeared in the original SA 48 strain. The strain was selected for this characteristic. The acronym SA refers to “Stazione Ascoli”, the Sericulture Station of Ascoli Piceno, in central Italy.

SA 67

Larva

White-grey-yellowish, without eye spots or with two tiny dots in their place. Barely noticeable crescents (plain pattern), with very slight swellings. White haemolymph.

Cocoon

White, peanut-shaped.

Egg

Dark grey.

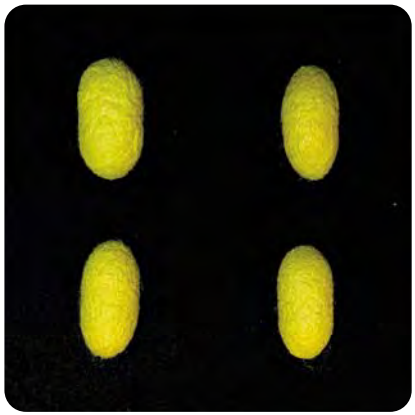
Notes

Derived from a cross between a monovoltine “Cyprus” strain and SA 15 (see SA 15 entry). Originally displayed eye spots. The acronym SA refers to “Stazione Ascoli”, the Sericulture Station of Ascoli Piceno (Italy).

21 Malucelli

Larva

Pinkish beige, small-sized, without eye spots. Crescents are slightly swollen and yellowish (plain pattern). Yellow haemolymph.



Cocoon

Gold, elongated, sometimes pointed at the ends, peanut-shaped.

Egg

Red, turning light grey just before hatching.

Notes

The strain displays a mutation in egg colour, from grey to red. Larvae originally had eye spots. Prone to NPV. The name refers to Dr Piero Malucelli, a researcher of the Sericulture Station of Ascoli Piceno.

Strains obtained by the Spallanzani Institute

The Spallanzani Institute in Pavia was renowned in the past for its research into silkworm reproduction. It was founded in 1939 by the scientist Carlo Jucci, who made a significant contribution to the discipline of ontogenetic development, genetics and artificial fertilisation of the silkworm. The strains conserved at the Spallanzani Institute were then donated to the Sericulture laboratory of Padova in 1963.

Albini

Larva

Small larvae characterised by a dark yellow-green colouration and transparent skin, without body markings or eye spots. Yellow haemolymph.

Cocoon

Flesh yellow, peanut-shaped.

Egg

Light yellow, occasionally brownish or normally pigmented.

Notes

Selected at the Sericulture Laboratory of Padova by Amelia Tonon and later Carlo Jucci, through multiple crosses. Characterised by a slow development cycle and high mortality rate. Slightly susceptible to NPV.

Dominante cioccolato bb

Larva

White-grey larva, with darker grey pigmentation on the last abdominal segments. Both eye spots and body markings are present (wild pattern). White haemolymph.

Cocoon

White, peanut-shaped. However, some cocoons could still appear that are irregular and not peanut-shaped.

Egg

Grey.

Notes

Imported from Japan in 1959. The original name was slightly modified in Italian. Selected from a strain with yellow and white cocoons, leading to one strain with white cocoons and one with yellow. Only the white cocoon strain was maintained. Larvae display moderately translucent skin (Aojuku translucent). Susceptible to NPV. The name means “Dominant chocolate”.

Nemor III

Larva

Beige-white larva. Eye spots are absent or replaced by two tiny dots. Crescents are barely visible, while star spots are absent (plain pattern). White haemolymph.

Cocoon

White, slightly peanut-shaped.

Egg

Dark grey.

Notes

Result of a cross between a female “Mori Abruzzo” (homozygous for white cocoon) and a “gold Chinese” male.

Noupei

Larva

White-grey larva. Body markings are barely visible and eye spots are absent (plain pattern). White haemolymph.

Cocoon

White, peanut-shaped or slightly peanut-shaped.

Egg

Grey.

Notes

Imported from Japan in 1956. Originally characterised by spherical cocoons. Undergoes three moults, yet displays very large larvae. Susceptible to NPV and suffers high mortality at the cocoon stage. The three-moulting trait is influenced by environmental conditions: three moults in spring, four in late summer.

Orgosolo Bianco

Larva

Beige, without eye spots or with only two tiny dots. Body markings are barely visible (plain pattern). Swellings are present on the second and fifth abdominal segments. White haemolymph.

Cocoon

White, peanut-shaped and oval.

Egg

Dark grey.

Notes

Imported from the Phytopathological Observatory of Sardinia (Italy). Originally, larvae were white, with crescents and black stripes (zebra pattern) or moricaud markings. Among the oval and elongated cocoons, peanut-shaped cocoons were selected over time. Susceptible to NPV. The name refers to a village of Sardinia island (Italy).

Polivoltina melanica

Larva

Pearl grey, with eye spots. Abdominal segments display black dots in groups of four. Crescents and star spots are clearly visible, and the head is dark brown (wild pattern). White haemolymph.

Cocoon

Acid green, oval, pointed at one or both ends.

Egg

Grey.

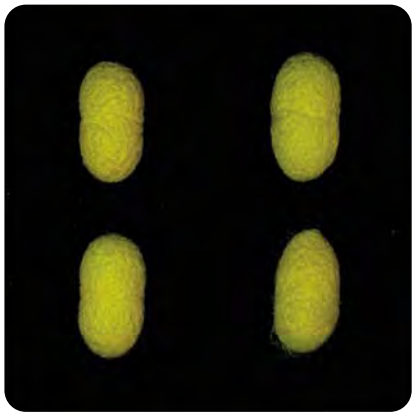
Notes

Imported from Japan. Result of a cross between a black polyvoltine strain and Blackmoth (1957). Carries the *Bm* gene (black moth). Can be reared on artificial diet. Susceptible to NPV. It has two generations per year (bivoltine). The name means “polyvoltine melanic”.

Sejaku green

Larva

Yellowish white, without eye spots or star spots, but with barely noticeable crescents (plain pattern). Slightly pronounced swellings. Yellow haemolymph.



Cocoon

Gold, white inside, more or less slightly peanut-shaped. A low proportion of individuals display lemon-yellow cocoons and is eliminated from reproduction.

Egg

Grey.

Notes

Imported from Japan. Some translucent greenish larvae could appear and are discarded. Prone to NPV.

Strains from the Centre for egg production of S. Giacomo di Veglia

These breeds originate from the Centre for “parent” egg production in San Giacomo di Veglia (Treviso, Italy). This facility was established in 1955 with the aim of producing parental eggs from strains imported from Japan. At the centre, the selection of pure breeds took place, and crosses among parental lines were made. These were then transferred to various egg production plants, where different combinations of polyhybrids were created for distribution to farmers to produce commercial cocoons. Following the decline of sericulture in Italy, the centre was closed in 1978, and the breeds preserved there were transferred to the Sericulture laboratory of Padova.

BC 17

Larva

White-grey, without eye spots and with barely noticeable crescents (plain pattern). Slightly swollen. White haemolymph.

Cocoon

White, oval. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Light grey.

Notes

The strain was imported from Japan in 1958. The life cycle is slow, and the larvae are relatively small, exhibiting variability in size. When reared in autumn, they may undergo five moults instead of four. It is susceptible to NPV.

BC 2

Larva

White-greyish larva, without body markings and with barely visible crescents (plain pattern). White haemolymph.

Cocoon

White, spherical-oval. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Light grey.

Notes

The strain originated in Japan and was imported in 1956. It is quite resistant to diseases but slightly susceptible to NPV.

BC 20/I

Larva

White-grey, with faintly visible body markings. Slightly swollen or not swollen at all. No eye spots (plain pattern). White haemolymph.

Cocoon

White, oval. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Light grey.

Notes

The strain was imported from Japan in 1960. It is susceptible to NPV.

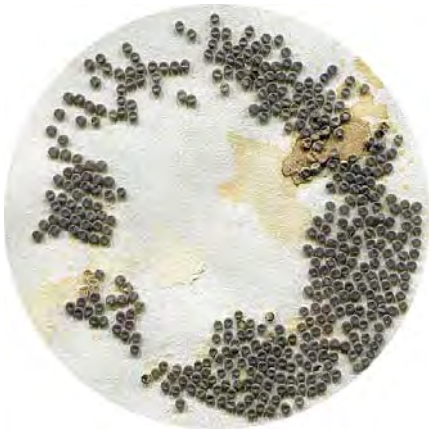
BC 20/II

Larva

White-grey, without eye spots. Body markings are barely noticeable and not swollen (plain pattern). White haemolymph.

Cocoon

White, spherical-oval. It is advisable to cut the cocoon shell to facilitate moth emergence.



Egg

Grey.

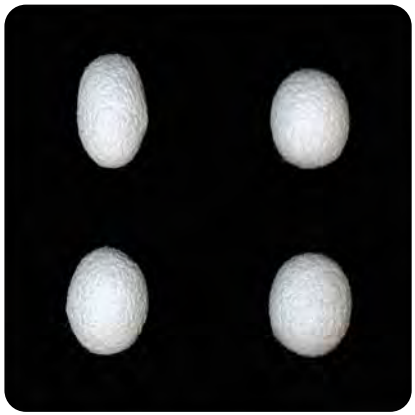
Notes

The strain was imported from Japan in 1962. It can be reared on artificial diet. It is susceptible to NPV.

BC 21

Larva

White-grey, without eye spots. Body markings are faintly visible (plain pattern). White haemolymph.



Cocoon

White, oval-spherical. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Light grey.

Notes

The strain was imported from Japan in 1960. Since 2003, only oval cocoons have been maintained. It is susceptible to NPV.

BC 22/I

Larva

White-grey, without body markings (slightly swollen) or eye spots (plain pattern). White haemolymph.

Cocoon

White, oval, not peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Light grey.

Notes

The strain was imported from Japan in 1960. It is susceptible to NPV.

BC 23

Larva

White, without eye spots or body markings (plain pattern). White haemolymph.

Cocoon

White, oval, not peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Light grey.

Notes

Imported from Japan, it is prone to NPV.

BC 25

Larva

White-grey, without eye spots or body markings. Slightly swollen (plain pattern). Yellow prolegs.

Cocoon

White, spherical-oval, not very rich in silk. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Light grey.

Notes

The strain was imported from Japan in 1966. It is susceptible to NPV.

BC 26

Larva

Grey-white larvae, without body markings or with barely visible ones. Slightly swollen, no eye spots (plain pattern). White haemolymph.

Cocoon

White, oval. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Light grey.

Notes

The strain was imported from Japan in 1966. It is susceptible to NPV.

BC 27

Larva

White, without star spots or eye spots. Crescents may be barely visible or absent (plain pattern). White haemolymph.

Cocoon

White, spherical-oval, not peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence. Some individuals with yellowish cocoons may occur sporadically.

Egg

Grey.

Notes

The strain originated in Japan and was imported in 1966. It is susceptible to NPV.

BC 28

Larva

White, without eye spots. Body markings may be absent or only slightly visible. Crescents are slightly prominent (plain pattern). White haemolymph.

Cocoon

White, spherical-oval, slightly peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Light grey.

Notes

The strain originated in Japan and was imported in 1966. It is susceptible to NPV.

BG 1/II

Larva

White-grey, with darker pigmentation especially on the last abdominal segments. Marked and knobbed body markings, with pigmentation beneath the first pair of prolegs (wild pattern). White haemolymph.

Cocoon

White, peanut-shaped, sometimes slightly pointed at one end. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

The strain originated in Japan. It is susceptible to NPV.

BG 2

Larva

White, with black heterogeneous pigmentation. Eye spots and body markings are prominent and well defined. The third thoracic segment is characterised by bulges and two black dots (wild pattern). White haemolymph.

Cocoon

White, slightly peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

The strain was imported from Japan. It can be reared on artificial diet with good results. It is susceptible to NPV.

BG 28

Larva

White, with evident body markings. Brown eye spots, dark brown crescents, and lighter star spots (wild pattern). White haemolymph.

Cocoon

White, slightly peanut-shaped, slightly cylindrical. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Grey.

Notes

The strain was imported from Japan in 1958. It can be reared on artificial diet. Susceptible to NPV.

BG 35

Larva

Light grey, with heterogeneous brownish pigmentation on the last segments (V, VI, and VII abdominal segments). Clear eye spots and body markings (wild pattern). Crescents are prominent. White haemolymph.

Cocoon

White, slightly peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

The strain was imported from Japan in 1962. It can be reared on artificial diet. Susceptible to NPV.

BG 36

Larva

White, with clearly visible body markings and eye spots. Heavily pigmented, particularly on the last abdominal segments; ventrally pigmented up to the first pair of prolegs (wild pattern). White haemolymph.

Cocoon

White, slightly peanut-shaped, somewhat pointed. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

The strain was imported from Japan in 1966. Larval pigmentation may vary in intensity. It can be reared on artificial diet. Susceptible to NPV.

BG 38

Larva

Beige, with dark brown body markings and eye spots. The thorax is dorsally pigmented in darker grey. Larvae are ventrally pigmented up to the first pair of prolegs (wild pattern). White haemolymph.

Cocoon

White, peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

The strain was imported from Japan in 1966. It can be reared on artificial diet. Susceptible to NPV.

BG 40

Larva

The larva is white, with clear eye spots and body markings. The last abdominal segments are pigmented, and the body is also pigmented ventrally up to the first pair of prolegs (wild pattern). White haemolymph.

Cocoon

White, peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

The strain was imported from Japan in 1966. It can be reared on artificial diet. Susceptible to NPV.

BG 41

Larva

White larva, with clearly visible body markings ranging from black to light brown and prominent. The last segments are slightly brown in colour (wild pattern). A few individuals displaying a plain pattern are occasionally found each year and are removed from breeding. White haemolymph.

Cocoon

White, peanut-shaped, variable in size. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

The strain was imported from Japan in 1966. It can be reared on artificial diet. The strain is fairly resistant, though susceptible to NPV.

BG 5/I

Larva

White-grey, with small eye spots and prominent crescents and star spots. The larva is pigmented beneath the prolegs (wild pattern). White haemolymph.

Cocoon

White, peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

The strain was imported from Japan in 1956. It has been used for genetic improvement. The strain is highly susceptible to diseases, particularly to NPV. A subpopulation (BG5d) was selected for sensitivity to injection with *Autographa californica* NPV.

BG 8/I

Larva

White-beige, pigmented grey-brown especially on the last abdominal segments. White haemolymph. Eye spots and body markings are clearly visible (wild pattern). The wild pattern trait is not homozygous, and a small proportion of white larvae may occur each year.

Cocoon

White, peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

The strain was imported from Japan in 1956. The strain is susceptible to diseases, particularly to NPV.

CC SG

Larva

Grey-white, without eye spots or crescents (plain pattern), slightly protruding. White haemolymph.

Cocoon

White, oval. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Grey.

Notes

The strain was imported from Japan in 1951. In the past, it was used for genetic improvement. It is highly susceptible to NPV.

IG

Larva

White, with eye spots and clearly visible, slightly prominent body markings. Some individuals show slight pigmentation on the last abdominal segments. Small black dots are clearly visible across all abdominal segments (wild pattern). White haemolymph.

Cocoon

White, slightly peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

The strain was imported from Japan in 1951. It can be reared on artificial diet. Highly susceptible to NPV.

NC

Larva

White-beige, without eye spots or star spots. Crescents are barely visible and prominent (plain pattern). White haemolymph.

Cocoon

White, oval. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Grey.

Notes

The strain was imported from Japan in 1954. In the past, it was used for genetic improvement. It is susceptible to NPV.

R 33

Larva

White, without eye spots or body markings, with an almost non-prominent appearance (plain pattern). White haemolymph.

Cocoon

White, oval. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Grey.

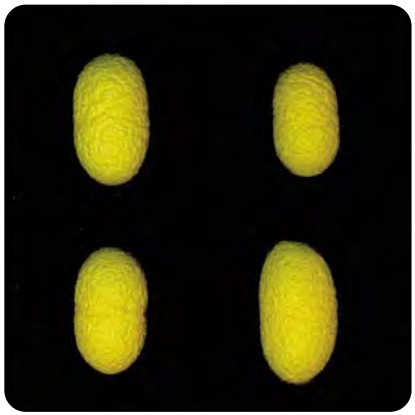
Notes

The strain originated from a cross between the BG19 and BG20/I strains to produce R13 (F1). The F3 of R13 was crossed with BC12, resulting in a strain called R17. R17 was backcrossed with BC20/I, generating R33.

R 3G

Larva

Larvae are pigmented, with eye spots and body markings clearly visible (wild pattern). Two small dots are visible on each thoracic and abdominal segment. The last abdominal segments are darker, and the abdomen appears yellowish. Yellow haemolymph.



Cocoon

Gold, white inside, peanut-shaped or oval. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

The strain was probably obtained through crossbreeding at the San Giacomo di Veglia reproduction centre. It is susceptible to NPV.

RC

Larva

White-grey larva, stubby. Crescents pigmentation is heterogeneous, ranging from light brown to barely visible or absent. Crescents are slightly protruding and wrinkled (plain pattern). White haemolymph.

Cocoon

White, oval-spherical. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Grey.

Notes

The strain was imported from Japan in 1948. After being imported from the San Giacomo di Veglia reproduction centre (TV), it was removed from production lines in 1965. Highly susceptible to NPV.

RC 33

Larva

Larvae are characterised by sexual dimorphism. Males are white, without eye spots or body markings — or with barely visible ones — and have white prolegs (plain pattern). Females are grey with clear eye spots and brown body markings (quail pattern). White haemolymph.

Cocoon

White, oval, not peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Grey.

Notes

The strain was imported from Japan by the San Giacomo di Veglia reproduction centre in the 1950s.

RG 35

Larva

Larvae display clear body markings. Sexual dimorphism is present, with white males (wild pattern) and black females (Moricaud). White haemolymph.

Cocoon

White, peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Dark grey.

Notes

The strain was imported from Japan by the San Giacomo di Veglia reproduction centre in the 1950s. It is adapted to artificial diet and is sensitive to NPV.

TC BB

Larva

White larva, without eye spots, with crescents barely visible or absent (plain pattern). White haemolymph.

Cocoon

White, oval-spherical. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Grey.

Notes

The strain was imported from Japan in 1958. It is susceptible to NPV.

TC BG

Larva

White, with light brown crescents. Eye spots and star spots are absent (plain pattern). White haemolymph.

Cocoon

Flesh yellow, yellow inside, slightly peanut-shaped. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Grey.

Notes

The strain was imported from Japan in 1958. Only peanut-shaped cocoons have been selected for reproduction. Cocoons showing white colouration should be discarded. It is susceptible to NPV.

UC

Larva

The larva is white, with barely visible crescents and no eye spots (plain pattern). White haemolymph.

Cocoon

White, spherical-oval. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Grey.

Notes

The strain was imported from Japan in 1961.

YC

Larva

White-beige, without eye spots or crescents, with faint or absent knobs (plain pattern) and white prolegs.

Cocoon

White, spherical. It is advisable to cut the cocoon shell to facilitate moth emergence.

Egg

Grey.

Notes

The strain was imported from Japan in 1958. Each year, some yellowish cocoons may appear. It is susceptible to NPV.

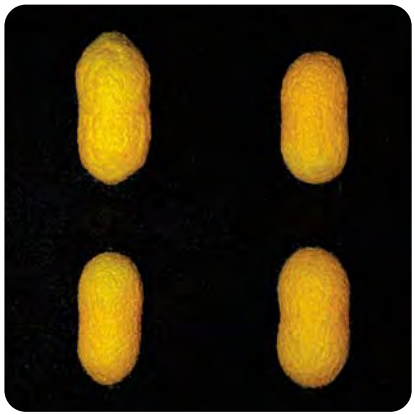
Strains of unknown origin

This group includes breeds of unknown or uncertain origin, for which no historical evidence is available. However, they have been preserved due to their unique characteristics.

Arancio

Larva

Yellowish-beige, highly protuberant, with protuberances and two small black dots on the third thoracic segment. Eye spots are absent, while body markings are light yellow. Prolegs are orange-yellow. Yellow haemolymph.



Cocoon

Orange, white inside, peanut-shaped.

Egg

Grey-purple.

Notes

Its origin is unknown. It is susceptible to NPV. The name means “orange”.

B ceppi uova trasparenti

Larva

Grey-white, small, without body markings or eye spots (plain pattern). White haemolymph.

Cocoon

White, slightly peanut-shaped, somewhat pointed. Poor in silk.

Egg

Yellow, with some rosy shades.

Notes

Selected from an unidentified B strain for a mutation in egg colour (transparency not retained). It is not susceptible to NPV. The name means “transparent eggs”.

B uova gialle

Larva

Grey-white, with light brown or barely visible crescents. Eye spots are brown (wild pattern). White haemolymph.

Cocoon

White, oval, poor in silk.

Egg

The majority of eggs are yellowish, becoming grey before hatching.

Notes

Selected from an unidentified B strain for a mutation in egg colour. The life cycle is fast. It is not susceptible to NPV. The name means “yellow eggs”.

B uova rosse

Larva

Grey-white, with brown eye spots. The larva displays a yellow-brown multi-star pattern. Some individuals lack eye spots or crescents, while others show a diluted multi-star pattern and no eye spots. White haemolymph.

Cocoon

White, predominantly peanut-shaped; some cocoons have a spindle shape, poor in silk.

Egg

Red, turning grey immediately before hatching.

Notes

Selected from an unidentified B strain for a mutation in egg colour. The life cycle is fast. The strain is not susceptible to NPV. The name means “red eggs”.

BO

Larva

Pearl grey-white, without body markings or eye spots (plain pattern). White haemolymph.

Cocoon

White, more or less slightly peanut-shaped.

Egg

Grey-purple.

Notes

The strain's origin is unknown. It is prone to NPV.

Dominante cioccolato BS

Larva

Grey-beige larva, with eye spots and body markings. The abdomen shows darker pigmentation (wild pattern), and the larva is ventrally pigmented up to the first pair of prolegs. Yellow haemolymph. Three-moulter larva.

Cocoon

Yellow, predominantly peanut-shaped, poor in silk.

Egg

Dark grey.

Notes

The strain was imported from Japan in 1958. It is susceptible to NPV. The name means “Dominant chocolate”.

Giallo B

Larva

White-beige larva, without body markings or eye spots (plain pattern). Intersegments are darker. Yellow haemolymph.

Cocoon

Flesh yellow, bright yellow inside, peanut-shaped.

Egg

Grey.

Notes

Origin unknown. Similar to strain B. Some cocoons are characterised by the presence of a hole at one pole. It is prone to NPV. The name means “B yellow”.

Han Han

Larva

Initially yellowish-grey in the fifth instar, later turning greyish-white. Crescents are well visible, while star spots are faint. Eye spots are absent (plain pattern). Yellow haemolymph.

Cocoon

Pink, peanut-shaped, slightly pointed at one or both ends.

Egg

Grey.

Notes

The name is an abbreviation of the strain name “Hankova” (originating from China). It is susceptible to NPV.

Japkino verde

Larva

White larva, pigmented in dark grey, with body markings and eye spots; ventrally pigmented up to the first pair of prolegs (wild pattern). A four-point pattern is clearly visible on each abdominal segment. White haemolymph.

Cocoon

Green, white inside, pointed, slightly peanut-shaped, poor in silk.

Egg

Grey.

Notes

Origin unknown. Bivoltine. It can be reared on artificial diet. The strain is susceptible to NPV. The name means “green Japkino”.

Nistari PG uova trasparenti

Larva

Light greenish larval skin, non-transparent, almost lemon-coloured in the intersegments. Eye spots and body markings are present (wild pattern). White haemolymph.

Cocoon

White, both peanut-shaped and not, pointed.

Egg

Dark grey.

Notes

Probably originated from a random cross between two strains in the 1960s. The original egg transparency trait was lost. In 1991, green larvae were separated from white ones. Larvae exhibit heterogeneity in colouration. Peanut-shaped cocoons have been selectively bred over time. Some cocoons display yellowish reflections. It is prone to NPV. The name means “transparent eggs, green larvae”.

R9 neri BP

Larva

Black larva with velvety skin and eye spots. Extremely narrow white stripes are present at the intersegments (striped pattern). Body markings are not visible. The thorax is slightly lighter, with crescents on the third thoracic segment. Yellow haemolymph.

Cocoon

Yellow, slightly peanut-shaped.

Egg

Grey.

Notes

Its origin is unknown; however, it closely resembles the 'Ascoli' strain. A high percentage of infertile eggs become desiccated during winter preservation, possibly due to inbreeding. The strain is extremely delicate and highly prone to both NPV and flacherie.

Rosa

Larva

Beige, pinkish at intersegmental areas, without eye spots or star spots (plain pattern). Crescents are fairly prominent and yellowish. Yellow haemolymph.

Cocoon

Pink outside, yellowish inside, peanut-shaped.

Egg

Grey.

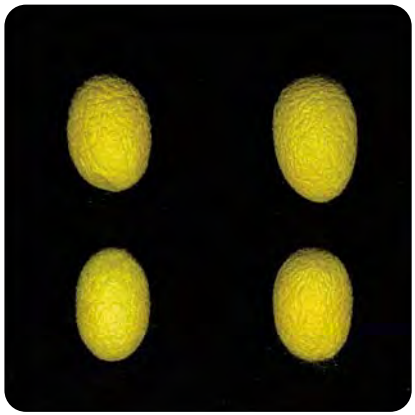
Notes

Its origin is unknown. Larvae are characterised by heterogeneity in size. It is susceptible to NPV. The name means “pink”.

SA 48 larve bianche

Larva

Larvae originally displayed two different phenotypes: the first has transparent grey-green skin, without eye spots and with body markings absent or barely visible; the second is white, with no eye spots or body markings (plain pattern). Yellow haemolymph.



Cocoon

Golden yellow, oval. Some cocoons show slightly peanut-shaping. It is advisable to cut the cocoon to facilitate moth emergence.

Egg

Dark grey.

Notes

Reared in 1990 under the name SA 48, this strain differs in larval colour from the originary green. Over time, white larvae were selected. However, green larvae are still present in small numbers. Some cocoons are slightly peanut-shaped. The acronym SA refers to “Stazione Ascoli”, the Sericulture Station of Ascoli Piceno (Italy).

Treotto rosa

Larva

Whitish larva, without body markings and eye spots (plain pattern). Yellow haemolymph.

Cocoon

Pink, yellow inside, pointed at one or both ends, slightly peanut-shaped.

Egg

Grey.

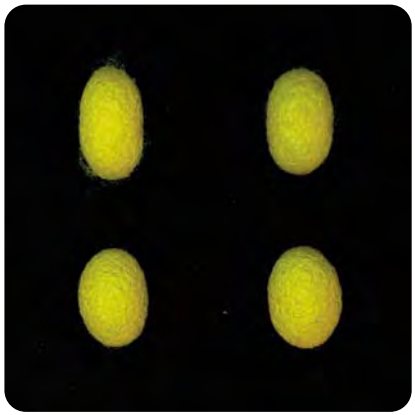
Notes

The strain's origin is unknown. Larvae undergo three moults - a dominant and homozygous trait. In 1991, it was the only strain partially resistant to fenoxycarb, possibly due to the larvae's low weight and the three-moulting trait. Cocoons may show variation in colour shade. It is prone to NPV. The name means "trimolter pink".

199 LS

Larva

Yellowish-beige, with faint and slightly protuberant crescents, with or without eye spots. White haemolymph.



Cocoon

Gold, white on the inner surface, spherical-oval, some peanut-shaped.

Egg

Grey.

Notes

Its origin is unknown. It appears to have been used in the past to produce crosses with yellow cocoons. It is susceptible to NPV.

628 scanalato

Larva

White, without body markings or eye spots (plain pattern). White haemolymph.

Cocoon

White, slightly peanut-shaped.

Egg

Bluish cerulean, some with striped grooves and rough surface.

Notes

Strain established by Benito Mari from a cross between “Szechwan 311” (Chinese) and “Yellow Roussillon” (French). It is not prone to NPV.

Strains acquired after 1990 and derived

This group includes all those strains imported after 1990. Most of them were imported by the National Silkworm Rearers Association (Associazione Nazionale Bachicoltori) in 1997. Some others came from Türkiye (Turkey), while the rest were donated by sericulture stations or obtained from breeders who had reared or purchased them from all over the world.

Ascoli

Larva

Black larva, with white intersegmental regions (striped pattern). Despite the dark colouration, distinct crescents and eye spots are clearly visible.

Cocoon

Yellow, oval, slightly peanut-shaped cocoons characterised by heterogeneous colour when the strain was obtained; individuals with deep yellow colour have been selected.

Egg

Grey.

Notes

In the past, the strain was maintained by the Sericulture Station of Ascoli Piceno, that obtained it by silkworm egg plants. Amateur rearers recovered it and the strain has been preserved by Dr Alessandro Butta (Agriturismo La Campana), who donated it to the Sericulture Laboratory of Padova in 2018. Larvae and cocoons were initially heterogeneous and have since undergone selection. Notably, Dr Lombardi, former director of the Ascoli Sericulture Station, described the strain as having yellow cocoon but white larvae.

Auz 5 S

Larva

Whitish larva, with slightly visible crescents and no eye spots or star spots (plain pattern). Yellow haemolymph.

Cocoon

When the strain was received, cocoons were mostly of two yellow hues: light yellow and vivid yellow, with the latter selected over time. Cocoons are slightly peanut-shaped.

Egg

Grey.

Notes

Donated to the Sericulture Laboratory of Padova in 2022 by a Spanish amateur breeder. As a strain named AUZ 5 was already in the collection, this one was named AUZ5 S (Spanish).

Baco moro

Larva

Larva of light brown "*moricaud*" colour, with body markings and solid black eye spots in the second thoracic segment (blind type). A pink hue is visible along the sides. Yellow haemolymph.

Cocoon

Oval cocoon, elongated, slightly peanut-shaped, gold outside, white inside; selected for more homogeneous colouration.

Egg

Grey.

Notes

The strain was received from the Murcia region (Spain) under the name "*Sierra Morena*" in 2009, through Prof José Cenis Anadón. Very sensitive to NPV.

Bangalore bianco

Larva

White larva, without body markings or eye spots (plain pattern). White haemolymph.

Cocoon

White cocoon, oval, thick; a minority with green hues are discarded. Flossy, sometimes with thin ends or a hole at one end.

Egg

Grey.

Notes

The strain was obtained from hybrid cocoons acquired directly from the cocoon market in Bangalore (India) in 2015 by Dr Silvia Cappellozza. Upon rearing, both white and green cocoons were produced. Moths emerging from these cocoons were separately reproduced and have since been selected for cocoon colour.

Bangalore verde

Larva

Greyish larva. Some individuals display eye spots and body markings, which vary in pigmentation intensity and may be slightly protruding. White haemolymph.

Cocoon

Light green cocoon, oval, thick; a minority are white, flossy, sometimes with a thin end or a hole at one end.

Egg

Grey.

Notes

The strain was obtained from hybrid cocoons acquired directly from the cocoon market in Bangalore (India) in 2015 by Dr Silvia Cappellozza. Upon rearing, both white and green cocoons were produced. Moths emerging from these cocoons were separately reproduced and selected thereafter for cocoon colour.

Bg 5d

Larva

White-grey larva, with distinct black body markings and eye spots (wild pattern). Four small black dots are present on each abdominal segment. White haemolymph.

Cocoon

White cocoons, peanut-shaped, very similar to those of strain BG5, but slightly smaller. To be cut for moth emergence.

Egg

Dark grey.

Notes

A selection of the BG5 strain for susceptibility to infection by *Autographa californica* multiple nucleopolyhedrovirus (AcMNPV) via injection. This experiment, conducted between 2009-2010 in collaboration with the company Spintech (Aachen, Germany), aimed to identify an efficient vector for the insertion of transient genetic constructs via baculoviruses, enabling expression of proteins of interest in the larval silk glands.

Bulgaria 1

Larva

Pigmented larvae, with body markings and eye spots (wild pattern). Abdominal segments display four black dots dorsally. White haemolymph.

Cocoon

White cocoon, peanut-shaped, rich in silk. To be cut to facilitate moth emergence.

Egg

Grey.

Notes

The strain originated from Bulgaria. It was received in 2009 from Prof Panomir Tzenov, from the Scientific Center on Sericulture of Vratsa, as part of a strain exchange.

Bulgaria 2

Larva

White larvae (plain pattern). White haemolymph.

Cocoon

Oval cocoon, white, some slightly peanut-shaped. To be cut to facilitate moth emergence.

Egg

Grey.

Notes

The strain originated from Bulgaria. It was received in 2009 from Prof Panomir Tzenov, from the Scientific Center on Sericulture of Vratsa, as part of a strain exchange.

Cinese 5007

Larva

White, with barely visible body markings. No eye spots (plain pattern). White haemolymph.

Cocoon

Dirty white cocoons, round or oval, some slightly peanut-shaped, coarse grain, not very large, consistent. To be cut to facilitate moth emergence.

Egg

Grey.

Notes

The strain originated from Zhejiang Province, China. It was donated by Prof Li Long in 2009. Bivoltinism can occur.

Cinese 5012

Larva

White, with barely visible body markings (plain pattern). No eye spots. White haemolymph.

Cocoon

Dirty white cocoon, round-oval, some deformed, many doubles, very consistent. To be cut to facilitate moth emergence.

Egg

Grey.

Notes

The strain originated from Zhejiang Province, China. It was donated by Prof Li Long in 2009. Bivoltinism can occur.

Cinese II

Larva

Larva is white, without eye spots or star spots (plain pattern). Crescents are absent or barely visible. White haemolymph.

Cocoon

White, oval.

Egg

Light grey.

Notes

The strain was historically bred in China and donated in 1995 to the Sericulture Laboratory of Padova by Dr Aleksander Xhoxhi, former Director of the Sericulture Institute of Tirana. It is monovoltine (bivoltinism can occur under particular conditions) in the Italian climate and can be reared on artificial diet.

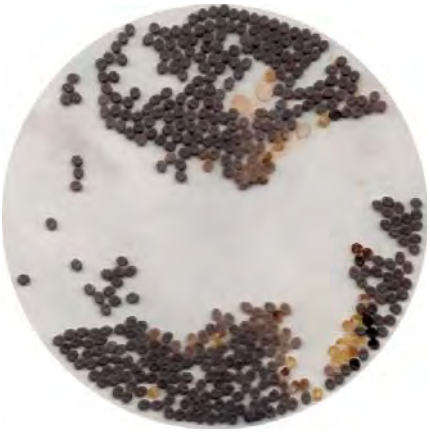
Friulana

Larva

White-yellowish larva, with slightly visible crescents and no eye spots or star spots (plain pattern). Yellow haemolymph.

Cocoon

Vivid yellow, elongated, slightly peanut-shaped.



Egg

Grey.

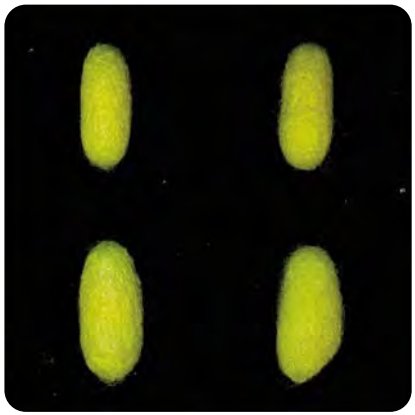
Notes

The strain was obtained in 2016 from a silkworm rearer of Friuli-Venezia Giulia (an Italian region) who had preserved it for many years.

Kyushu

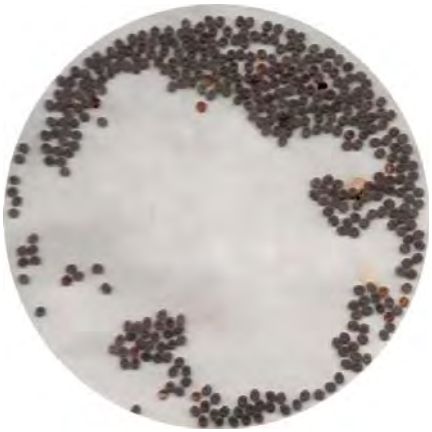
Larva

White-grey larva, with distinct black body markings and eye spots (wild pattern). Additionally, four small black dots are present on each segment. White haemolymph.



Cocoon

Golden yellow, slightly peanut-shaped, elongated cocoons, poor in silk.



Egg

Grey.

Notes

Obtained in 2015 from the National Institute of Agrobiological Sciences (NIAS, Japan) through an official exchange under an MTA. However, due to an error, it was not the requested strain but a different one.

Messico

Larva

White-yellowish larva, with slightly visible crescents and no eye spots or star spots (plain pattern). Haemolymph may be yellow or white depending on the individual.

Cocoon

Cocoons are characterised by a wide range of colours, from white to orange.

Egg

Grey.

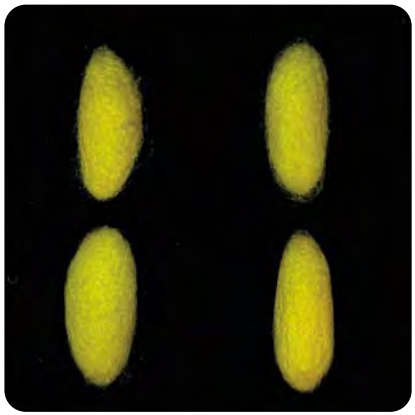
Notes

Donated to the Sericulture Laboratory of Padova by Miriam and Domenico Vivino, following their trip to Mexico where they acquired some eggs (2020).

Nistari polivoltino

Larva

Whitish larva, with clearly visible body markings and eye spots (wild pattern). A pair of dots are clearly visible on the dorsal surface of the abdominal segments.



Cocoon

Golden yellow, oval, pointed, flossy, with thin ends, poor in silk.

Egg

Yellow.

Notes

Imported in 2009 from the UNS (La Mulatière, Lyon, France), under deposit contract. Multiple life cycles (polyvoltine).

Oro gigante 208

Larva

Yellow-grey, without eye spots and with faint body markings. Yellow haemolymph.

Cocoon

Gold, white inside, spherical, large.

Egg

Grey.

Notes

The strain was obtained through crossbreeding with strain Oro 208 in 1997 to rescue the '*Oro gigante*' (Giant Gold) strain, which had been weakened by several years of fenoxycarb pollution affecting mulberry leaves. Sensitive to NPV.

P 50

Larva

Grey larvae, with solid black eye spots in the second thoracic segment (blind type) and body markings. Very small in size. Abdominal segments display four black dorsal dots, which become more evident towards the posterior segments. White haemolymph.

Cocoon

Oval cocoon, pointed, slightly consistent, green colour, sponge-like texture, small.

Egg

Grey.

Notes

The strain, also known as Daizo, originated from Japan. It was received in 2009 from Prof Panomir Tzenov through a strain exchange.

Razza Mosca

Larva

White larva, with clear body markings ranging from black to light brown. Some individuals are entirely white. The last abdominal segments are slightly coloured in brown. The overall appearance suggests the strain may be derived from a hybrid. White haemolymph.

Cocoon

White, rich in silk cocoons, cylindrical and slightly peanut-shaped.

Egg

Grey.

Notes

The strain was obtained in 2016 through Dr Enzo Moretto from the Moscow Zoo, where it had been reared for exhibition purposes.

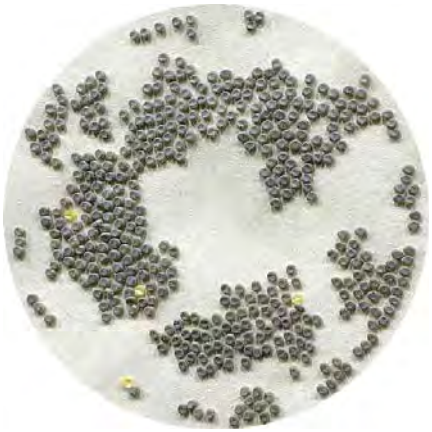
SC 1

Larva

White, without eye spots or star spots. Crescents are barely visible. White haemolymph.

Cocoon

White, oval, rich in silk. It is advisable to cut the cocoon to facilitate moth emergence.



Egg

Light grey.

Notes

Historically bred in Japan. It was imported in 1997 by the Italian National Silkworm Rearers Association (Associazione Nazionale Bachicoltori) through Tino Sartori and entrusted to the Sericulture Laboratory of Padova. Used for genetic improvement and parental line for egg production.

SC 2

Larva

White (plain pattern), without eye spots or body markings. White haemolymph.

Cocoon

White, oval, rich in silk. It is advisable to cut the cocoon to facilitate moth emergence.

Egg

Light grey.

Notes

Historically bred in Japan. It was imported in 1997 by the Italian National Silkworm Rearers Association (Associazione Nazionale Bachicoltori) through Tino Sartori and entrusted to the Sericulture Laboratory of Padova. Used for genetic improvement and parental line for egg production.

SC 3

Larva

White (plain pattern), without eye spots or body markings, or with barely visible crescents. White haemolymph.

Cocoon

White, oval, rich in silk. It is advisable to cut the cocoon to facilitate moth emergence.

Egg

Light grey.

Notes

Historically bred in Japan. It was imported in 1997 by the Italian National Silkworm Rearers Association (Associazione Nazionale Bachicoltori) through Tino Sartori and entrusted to the Sericulture Laboratory of Padova. The strain may display bivoltinism. Used for genetic improvement and parental line for egg production.

SG 1

Larva

Beige larva, with visible eye spots and body markings (wild pattern). White haemolymph.

Cocoon

White, cylindrical, slightly peanut-shaped, rich in silk. It is advisable to cut the cocoon to facilitate moth emergence.

Egg

Dark grey.

Notes

Historically bred in Japan. It was imported in 1997 by the Italian National Silkworm Rearers Association (Associazione Nazionale Bachicoltori) through Tino Sartori and entrusted to the Sericulture Laboratory of Padova. The strain can be reared on artificial diet. Used for genetic improvement and parental line for egg production.

SG 3

Larva

White-grey, pigmented, with eye spots and body markings (wild pattern). White haemolymph.

Cocoon

White, slightly peanut-shaped, rich in silk. It is advisable to cut the cocoon to facilitate moth emergence.

Egg

Dark grey.

Notes

Historically bred in Japan. It was imported in 1997 by the Italian National Silkworm Rearers Association (Associazione Nazionale Bachicoltori) through Tino Sartori and entrusted to the Sericulture Laboratory of Padova. The strain can be reared on artificial diet. Used for genetic improvement and parental line for egg production.

Turco 10

Larva

Grey, with eye spots and body markings (wild pattern). White haemolymph.

Cocoon

White, peanut-shaped. It is advisable to cut the cocoon to facilitate moth emergence. The cocoon is rich in silk.

Egg

Dark grey.

Notes

Historically bred in Turkey ("*Turco*" meaning Turkish strain in Italian), it was imported in 1995 from Bursa by the National Silkworm Rearers Association (Associazione Nazionale Bachicoltori) through Tino Sartori. It was later entrusted to the Sericulture Laboratory of Padova for reproduction. It can be reared on artificial diet and used as a parental line in polyhybrid production. It is moderately sensitive to NPV.

Turco 10 multistar

Larva

Grey, with eye spots and body markings. The strain is characterised by the presence of additional body markings (brown) above each abdominal segment (multistar/multilunar phenotype), though this feature shows high variability within the population. White haemolymph.

Cocoon

White, peanut-shaped.

Egg

Dark grey.

Notes

Obtained as a random mutation from the “Turco 10” strain in 2023. There are no sufficient data about its attitude to be infected by NPV.

Turco 15

Larva

White (plain pattern), with barely visible crescents. Eye spots and star spots are absent. White haemolymph.

Cocoon

White, oval. It is advisable to cut the cocoon to facilitate moth emergence.

Egg

Light grey.

Notes

Historically bred in Turkey ("*Turco*" meaning Turkish strain in Italian), it was imported in 1995 from Bursa by the Italian National Silkworm Rearers Association (Associazione Nazionale Bachicoltori) through Tino Sartori. It can be reared on artificial diet but it is less adaptable than Turco 15. It is prone to NPV. The strain can display a bivoltine behaviour.

Turco 28

Larva

White, with barely visible crescents. Eye spots and star spots are absent (plain pattern). White haemolymph.

Cocoon

White, oval. It is advisable to cut the cocoon to facilitate moth emergence.

Egg

Light grey.

Notes

Historically bred in Turkey, it was imported in 1995 from Bursa by the National Silkworm Rearers Association (Associazione Nazionale Bachicoltori) through Tino Sartori. It can be reared on artificial diet but it is less adaptable than Turco 15. The strain can display a bivoltine behaviour.

Strains from the French national sericulture collection

In 2009, the Institut national de la recherche agronomique (INRA) closed the Unité Nationale Séricicole (UNS) in Lyon. INRA, which had preserved all the silkworm breeds collected over time in France and by French researchers — thanks to their extensive international collaborations — decided to entrust all its assets to the Sericulture Laboratory of Padova through a deposit contract. The aim was to safeguard the silkworm's genetic heritage for future research and to prevent the loss of valuable strains. Approximately 60 breeds were thus transferred to Padova where they have been maintained ever since, except for duplicates of already existing strains.

AUZ 4

Larva

Grey, heavily pigmented larva, with eye spots and body markings (wild pattern). Two dots are visible behind the eye spots, and two small dots are present on the dorsal surface of the abdominal segments. White haemolymph.

Cocoon

White, oval, slightly peanut-shaped, medium grain.

Egg

Grey.

Notes

Previously named “Adrianopoli”, the Italian for Adrianople (modern-day Edirne, Turkey), this strain was obtained from Granieur Auzas, a silkworm reproduction centre in Ardèche region (France). The original Adrianopoli strain displayed both white and pinkish orange cocoons.

AUZ 5

Larva

Yellowish-grey larva, highly pigmented, with well-defined eye spots and body markings. Pigmentation intensifies towards the posterior segments (quail pattern). Yellow haemolymph.

Cocoon

Light yellow with pink hues, pinkish-orange inner layer, oval or slightly peanut-shaped, very consistent in some individuals. Better to cut to facilitate moth emergence.

Egg

Grey.

Notes

Previously named “Adrianopoli”, the Italian for Adrianople (modern-day Edirne, Turkey), this strain was obtained from Granieur Auzas, a silkworm reproduction centre in Ardèche region (France). The original Adrianopoli strain displayed both white and pinkish orange cocoons.

B 40

Larva

Bluish-grey larva, with eye spots and body markings (wild pattern). Two small dots are clearly visible on the dorsal surface of the abdominal segments. White haemolymph.

Cocoon

Loose silk structure formed solely from sericin, white (naked pupa, omozygote: Nd^{H}/Nd^{H}).

Egg

Grey.

Notes

The strain was imported from Kyushu University (Japan, Dr Hashimoto).

B 41

Larva

Bluish-grey larva, with eye spots and body markings (wild pattern). Two small dorsal dots are clearly visible, and a second pair are faintly visible in some individuals. White haemolymph.

Cocoon

Loose silk structure formed solely from sericin, white (naked pupa, omozygote: *Nd*/*Nd*).

Egg

Grey.

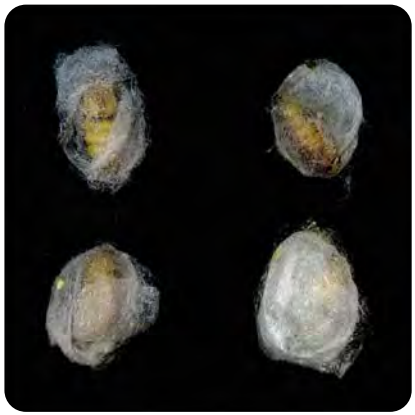
Notes

The strain was donated by Kyushu University (Japan).

B 50

Larva

Bluish-grey larva, with eye spots and body markings (wild pattern). Four small dorsal dots are clearly visible on the abdominal segments. White haemolymph.



Cocoon

Loose silk structure formed solely from sericin, white (naked pupa, *Nd-s*).

Egg

Grey.

Notes

The strain was donated by Kyushu University (Japan).

BL 1AO

Larva

Cream-white larva, without eye spots or star spots, but with barely visible crescents (plain pattern). White haemolymph.

Cocoon

Whitish, oval.

Egg

Grey.

Notes

The strain was created by crossbreeding different strains.

BL 1B

Larva

Greyish larva, with pigmentation of variable intensity. Eye spots and body markings are visible (wild pattern). Four small dorsal dots are clearly present on the abdominal segments. White haemolymph.

Cocoon

Whitish with green hues, elongated and peanut-shaped.

Egg

Grey.

Notes

The strain was created by crossbreeding different strains.

BL 1C

Larva

Dark grey larva, with black eye spots and crescents (quail pattern). White haemolymph.

Cocoon

Whitish, elongated and peanut-shaped, coarse grain, consistent. To be cut to facilitate moth emergence (useful for potential crossing).

Egg

Grey.

Notes

The strain was created by crossbreeding different strains.

BL 1D

Larva

White larva, with a narrow black band on the anterior portion of each segment (zebra pattern). Light brown body markings are clearly visible. White haemolymph.

Cocoon

Pure white, large, peanut-shaped, not very rich in silk, medium-coarse grain.

Egg

Grey.

Notes

The strain was created by crossbreeding different strains.

BRD

Larva

White larva, exhibiting sexual dimorphism. Females show black eye spots and body markings (wild pattern), while males lack eye spots and body markings (plain pattern). White haemolymph.

Cocoon

Pure white, elongated; in some individuals only slightly peanut-shaped. Not very large, very rich in silk. To be cut to facilitate moth emergence.

Egg

Grey.

Notes

The Brd strain is a mutant, reported to be polyphagous, and has been employed as a tester for alternative diets.

CH 2A

Larva

Sand-white larva, with light brown crescents and no eye spots or star spots. White haemolymph.

Cocoon

White, oval or slightly peanut-shaped, some slightly deformed, coarse grain, consistent. To be cut to facilitate emergence.

Egg

Grey.

Notes

Hybrid imported from China to Europe and selected at the Unité Nationale Séricicole (La Mulatière, Lyon, France).

CH 3B

Larva

Creamy-white larva, slightly pigmented, with clearly visible eye spots and body markings (wild pattern). White haemolymph.

Cocoon

White, oval, not very consistent. Both oval and peanut-shaped, with no clear prevalence.

Egg

Grey.

Notes

Originally from China.

CH 4

Larva

White larva, with barely visible body markings and no eye spots (plain pattern). White haemolymph.

Cocoon

Pure white, oval, elongated, drop-shaped; some slightly peanut-shaped. Fine grain, consistency ranging from medium to good.

Egg

Grey.

Notes

Originally from China.

G 133

Larva

White larva, without eye spots and with faint body markings (plain pattern). White haemolymph.

Cocoon

White, oval with ivory reflections, coarse grain, very rich in silk (also suitable for potential crossing). To be cut to facilitate moth emergence.

Egg

Grey.

Notes

Originally from Indian Mysore strain. Resistant against BmNPV.

HKS A

Larva

White larva with blue reflections, pigmented, with visible eye spots and body markings (wild pattern). Star spots may vary in intensity. Abdominal segments display two small black dots on the anterior segments and four small dots on the posterior ones. White haemolymph.

Cocoon

White, oval, slightly peanut-shaped or rounded, reasonably consistent (at least some should be cut to facilitate emergence). Not very large.

Egg

Grey.

Notes

Originally from Japan. Selected from Japanese hybrid strain Kinshu x Showa.

HKS B

Larva

Creamy-white larva, unpigmented (plain pattern). Crescents may be barely visible. White haemolymph.

Cocoon

Pure white, oval, some slightly peanut-shaped, fine grain, very consistent. To be cut to facilitate emergence.

Egg

Grey.

Notes

Originally from Japan. Selected from Japanese hybrid strain Kinshu x Showa.

I 20

Larva

Ash-grey larva, with eye spots and body markings. Two or four small dots are also visible on the abdominal segments. Yellow haemolymph. The larva undergoes three moults (dominant gene) and is therefore smaller than four-moulter larva.

Cocoon

Yellow, peanut-shaped and small in size.

Egg

Grey.

Notes

Originally from Japan, it is a dominant three-moulter strain (obtained from Kyushu University).

K 16

Larva

Yellowish-green larva, without eye spots or body markings. White haemolymph. The resulting silkmoth has white eyes.

Cocoon

White-yellowish, peanut-shaped, not very rich in silk, small.

Egg

Yellow.

Notes

Obtained from Ukraine (Prof Klimenko).

K 22

Larva

Greyish larva, variably pigmented, with eye spots and body markings (wild pattern). White haemolymph.

Cocoon

White-yellowish, peanut-shaped, not very rich in silk, small.

Egg

Sexual dimorphism: Females are grey; males are yellowish white.

Notes

Obtained from Ukraine (Prof Klimenko).

K 23

Larva

Greyish larva, variably pigmented, with eye spots and crescents. Star spots may be faint or absent. White haemolymph.

Cocoon

Pure white, elongated and very peanut-shaped, medium-fine grain, not very large, rich in silk. To be cut to facilitate emergence.

Egg

Sexual dimorphism: Females are grey; males are yellowish white.

Notes

Obtained from Ukraine (Prof Klimenko).

LY 22

Larva

Bluish-white larva, with eye spots and body markings (wild pattern). Additionally, two spaced dots are present behind the eye spots. White haemolymph.

Cocoon

White, large, oval. Preferable to cut the cocoon to facilitate emergence.

Egg

Grey, adhering to the substrate.

Notes

Originally from Japan. Previous name CP86.

LY 5

Larva

Larvae exhibit sexual dimorphism. Males are white, with no eye spots or body markings, or only faint ones, and have white prolegs (plain pattern). Females are grey, with distinct eye spots and brown body markings (quail type). White haemolymph.

Cocoon

White cocoon, oval or slightly peanut-shaped, reasonably rich in silk.

Egg

Grey.

Notes

Obtained from the Sericulture Laboratory of Padova (probably strain RC33). Given in exchange to Dr Chavancy (Lyon) and re-imported in 2009.

M 83

Larva

Dark ash (moricaud) larva, with eye spots and body markings, alongside lighter-coloured individuals (quail type). The population is heterogeneous. White haemolymph.

Cocoon

White, elongated, peanut-shaped, small. Chrysalis and moth have red haemolymph.

Egg

Grey.

Notes

Obtained from INRA, Saint Christol (Mr Pascal).

Paraguay

Larva

Creamy-white larva, with eye spots and body markings (selected in 2000) (wild pattern). The last abdominal segments are more pigmented. Additionally, two small black dots are clearly visible on each abdominal segment. White haemolymph.

Cocoon

White, large, mostly oval, some slightly peanut-shaped.

Egg

Grey.

Notes

Originary hybrid strain from Paraguay.

PK 1

Larva

Yellowish-grey larva, with eye spots and light brown crescents (wild pattern). Star spots and small dots are barely visible. Yellow haemolymph.

Cocoon

Yellow-orange, slightly peanut-shaped.

Egg

Grey, not laid but directly extracted from the ovaries. Reproduced through parthenogenesis.

Notes

Obtained from Ukraine (Prof Klimenko). Previous name: P29.

PK 10

Larva

Dark grey (quail pattern) larva, pigmented, with eye spots and body markings. Between 6 and 8 pairs of brown knobs are found on the thorax and abdomen. Yellow haemolymph.

Cocoon

Golden yellow, ovoid (some slightly peanut-shaped).

Egg

Grey, not laid but directly extracted from the ovaries. Reproduced through parthenogenesis.

Notes

Obtained from Ukraine (Prof Klimenko). Previous name: P178.

PK 11/a

Larva

Grey-black, with white intersegmental regions (striped pattern) and black eye spots. Knobs are present on the thorax and abdomen, corresponding to the position of crescents and star spots. White haemolymph.

Cocoon

Dirty white, short, slightly peanut-shaped, not thick.

Egg

Grey, not laid but directly extracted from the ovaries. Reproduced through parthenogenesis.

Notes

Obtained from Ukraine (Prof Klimenko). It was obtained by selection from PK 11, whose previous name was P5D.

PK 11/b

Larva

Grey-black with white intersegmental regions (striped pattern), with eye spots. Light brown knobs are present on the thorax and abdomen. White haemolymph.

Cocoon

Dirty white, short, slightly peanut-shaped, not thick.

Egg

Grey, not laid but directly extracted from the ovaries. Reproduced through parthenogenesis.

Notes

Obtained from Ukraine (Prof Klimenko). It was obtained by selection from PK 11, whose previous name was P5D.

PK 12

Larva

Grey-yellowish larva. The colour is due to translucent skin. Eye spots and body markings are clearly visible (wild pattern). In addition, four small dots are barely visible on the last segments. Yellow haemolymph.

Cocoon

Golden yellow, slightly peanut-shaped; some oval.

Egg

Grey, not laid but directly extracted from the ovaries. Reproduced through parthenogenesis.

Notes

Obtained from Ukraine (Prof Klimenko).

PK 13

Larva

Creamy-white with brown intersegments (zebra pattern). Eye spots and crescents are present. Yellow haemolymph.

Cocoon

Golden lemon yellow, large, slightly peanut-shaped, not very consistent, many double cocoons.

Egg

Grey, not laid but directly extracted from the ovaries. Reproduced through parthenogenesis.

Notes

Obtained from Ukraine (Prof Klimenko). Previous name: P4n.

PK 14

Larva

Grey with brown intersegments (zebra pattern). Eye spots and crescents are clearly visible, while star spots are light brown. White haemolymph.

Cocoon

Dirty white, ovoid, more or less peanut-shaped.

Egg

Grey, not laid but directly extracted from the ovaries. Reproduced through parthenogenesis.

Notes

Obtained from Ukraine (Prof Klimenko). Previous name: Pze.

PK 17

Larva

Yellow larvae, with no body markings. White haemolymph. Likely heterozygous for the lemon lethal allele (*lem1*). The yellow colour is due to a large amount of 7,8-dihydropteridin accumulated in integument.

Cocoon

Creamy white with green hues, yellowish; one end rounded and the other pointed (spindle-like shape). Quite rich in silk.

Egg

Yellow, not laid but directly extracted from the ovaries. Reproduced through parthenogenesis. Eggs easily desiccate during winter storage due to infertility.

Notes

Obtained from Ukraine (Prof Klimenko).

PK 8

Larva

Dark grey (quail pattern) larva, pigmented, with eye spots and body markings. Between 6 and 9 pairs of yellow knobs are present on the thorax and abdomen, sometimes single knobs on the last abdominal segments. Yellow haemolymph.

Cocoon

Golden straw yellow, ovoid-cylindrical (some slightly peanut-shaped).

Egg

Grey, not laid but directly extracted from the ovaries. Reproduced through parthenogenesis.

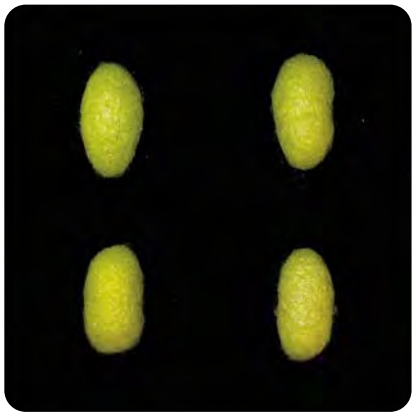
Notes

Obtained from Ukraine (Prof Klimenko). Previous name: P173.

PVN

Larva

Blueish-grey, with well-defined eye spots and body markings. Small black dots are visible. Additional crescents may be present (a very diluted multilunar character, as additional crescents may appear on only one segment, be completely absent, or be very faint). Yellow haemolymph.



Cocoon

Yellow-gold, ovoid.

Egg

Light grey during diapause.

Notes

Originally from Vietnam. It has two generations per year (bivoltinism).

SEK

Larva

White-grey, with eye spots and body markings (wild pattern). Additional star spots may be present, along with four small dots. White haemolymph.

Cocoon

Small, white, peanut-shaped.

Egg

Grey.

Notes

Originally from Japan. Donated by Prof Tazima as a polyphagous strain.

VAR 1

Larva

Creamy-white, without eye spots and with slightly pronounced body markings. White haemolymph.

Cocoon

White-yellowish, ovoid, elongated cocoon, drop-shaped, medium thickness and size, fine grain, with some internal thin layer. Better to cut to facilitate emergence.

Egg

Grey.

Notes

Obtained from LEPA Les Arcs, situated in the Var department (Provence-Alpes-Côte d'Azur region in southeastern France).

VAR 2

Larva

Creamy-white, without eye spots and with slightly pronounced body markings. White haemolymph.

Cocoon

White-yellowish, cylindrical, slightly peanut-shaped, large, spongy (flimsy), with an internal thin layer. To be cut.

Egg

Grey.

Notes

Obtained from LEPA Les Arcs, situated in the Var department (Provence-Alpes-Côte d'Azur region in southeastern France).

VAR 3

Larva

Light grey with a yellowish hue. Eye spots and body markings are clearly visible (wild pattern). In addition, two spaced dots are present behind the eye spots and the abdominal segments display two or four small dots. Red haemolymph.

Cocoon

Golden yellow, ovoidal, elongated.

Egg

Grey.

Notes

Obtained from LEPA Les Arcs, situated in the Var department (Provence-Alpes-Côte d'Azur region in southeastern France).

VM 1

Larva

Creamy bluish-white, without eye spots and with barely visible crescents (plain pattern). White haemolymph.

Cocoon

White, ovoid, fine grain, small, thick. To be cut to facilitate emergence.

Egg

Grey.

Notes

Originally from Vietnam. Previous name: 157 K.

VM 2

Larva

White-greyish larva, with eye spots and body markings (wild pattern), more pigmented in the last abdominal segments. White haemolymph.

Cocoon

White, ovoid/egg-shaped.

Egg

Grey.

Notes

Originally from Vietnam. Previous name: 07.

VM 2A

Larva

Uniform white larva, without eye spots and with barely visible and faintly pronounced body markings (plain pattern). White haemolymph.

Cocoon

White, ovoid.

Egg

Grey.

Notes

Obtained by selection from VM2 (Vietnamese strain).

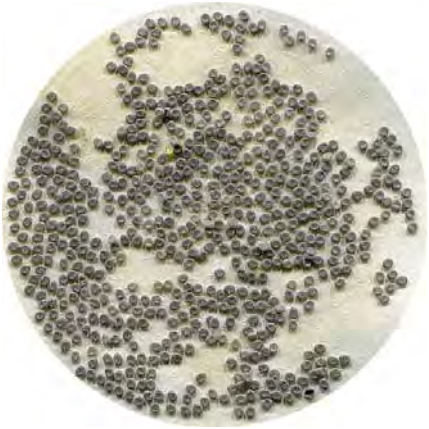
VM 3

Larva

White-greyish larva, with eye spots and crescents. Star spots may be present or absent (mostly wild pattern). White haemolymph.

Cocoon

White, cylindrical, with greenish hues. No need to cut the cocoon.



Egg

Grey.

Notes

Originally from Vietnam. Previous name: K.

VM 4

Larva

White larva, without eye spots or body markings (plain pattern). White haemolymph.

Cocoon

White, cylindrical, drop-shaped, oval, elongated, rich in silk. To be cut to facilitate emergence.

Egg

Grey.

Notes

Originally from Vietnam. Previous name: T.

W 2

Larva

Bluish-white larva, without eye spots or body markings (plain pattern). Three dark spots are present at the abdominal tip (brown tail spot). The head is brown. White haemolymph.

Cocoon

White, more or less peanut-shaped, slightly asymmetrical, somewhat pointed at one end, not very thick silk shell.

Egg

Yellow.

Notes

Originally from Japan (Dr Tamura). Characterised by black chrysalis and dark moth.

ZB

Larva

White larva, striped with brown intersegmental regions (zebra pattern). Eye spots and body markings are present. White haemolymph.

Cocoon

White, cylindrical, slightly peanut-shaped, fine grain, not very rich in silk.

Egg

Grey.

Notes

Previously conserved at INRA, Saint Christol. Previous name: Zébré blanc.

ZJ

Larva

White larva, striped with brown intersegmental regions (zebra pattern), with eye spots and body markings. Yellow haemolymph.

Cocoon

Yellow-orange, peanut-shaped, not very large, rich in silk (to be cut to facilitate emergence), fine grain, intense yellow inside.

Egg

Grey.

Notes

Previously conserved at INRA, Saint Christol. Previous name: Zébré jaune.

141/4

Larva

Grey-brown larva (quail pattern), with eye spots and crescents. White haemolymph.

Cocoon

White, elongated, slightly peanut-shaped.

Egg

Grey, not adhering to the substrate (*Ng* gene).

Notes

The strain was donated by the the UCBL (Lyon, Prof Legay) to the UNS (Lyon, France) in 1982.

141/5

Larva

White larva, with eye spots. Crescents are visible and range in colour from dark to light brown. Star spots are faint (wild pattern). White haemolymph.

Cocoon

White, cylindrical. However, yellow cocoons and white larvae are found each year in small percentages.

Egg

Grey, not adhering to the substrate (*Ng* gene).

Notes

The strain was donated by the UCBL (Lyon, Prof Legay) to the UNS (Lyon, France) in 1982.

201 A

Larva

Yellowish larva, without spots or body markings (plain pattern). Yellow haemolymph.

Cocoon

Yellow, cylindrical, not peanut-shaped.

Egg

Grey.

Notes

The strain was donated by the UCBL (Lyon, Prof Legay) to the UNS (Lyon, France) in 1982. Previous name: 200.

301 A

Larva

White-yellowish larva, with clearly visible eye spots (wild pattern). Crescents and star spots are present and dark yellow in colour. Yellow haemolymph.

Cocoon

Yellow-orange, more orange inside, elongated and peanut-shaped, fine grain, medium size, very consistent. To be cut to facilitate emergence.

Egg

Grey.

Notes

The strain was donated by the UCBL (Lyon, Prof Legay) to the UNS (Lyon, France) in 1982. Previous name: 300.

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