وزارت جهاد کشاورزی
سازمان تحقیقات، آموزش و ترویج کشاورزی
موسسه آموزش و ترویج کشاورزی

معاونت علمی و فناوری
شبکه دانش کشاورزی

سلسله برنامه‌های ویدیو کنفرانس انتقال دانش به روز در گستره ملی بخش کشاورزی

عنوان:

بیماری‌های ویروسی مهم هسته‌دارها و روش‌های مدیریت آنها

سخنران:

دکتر رضا پوررحیم

عضو هیأت علمی موسسه تحقیقات گیاهپزشکی کشور

پژوهشگر مروج ارشد/ محقق معین / مدرس

۲۱ بهمن ۱۴۰۳- ساعت: ۱۱/۳۰

روش های تکثیر رویشی (غیرجنسی) مهمترین عامل در اشاعه بیماریهای ویروسی در درختان میوه هسته دار است.

در حال حاضر ترکیباتی همانند قارچکشها که بتوان علیه ویروسهای گیاهی روی گیاهان آلوده تیمار نمود، بصورت تجاری تولید و عرضه نشده است.

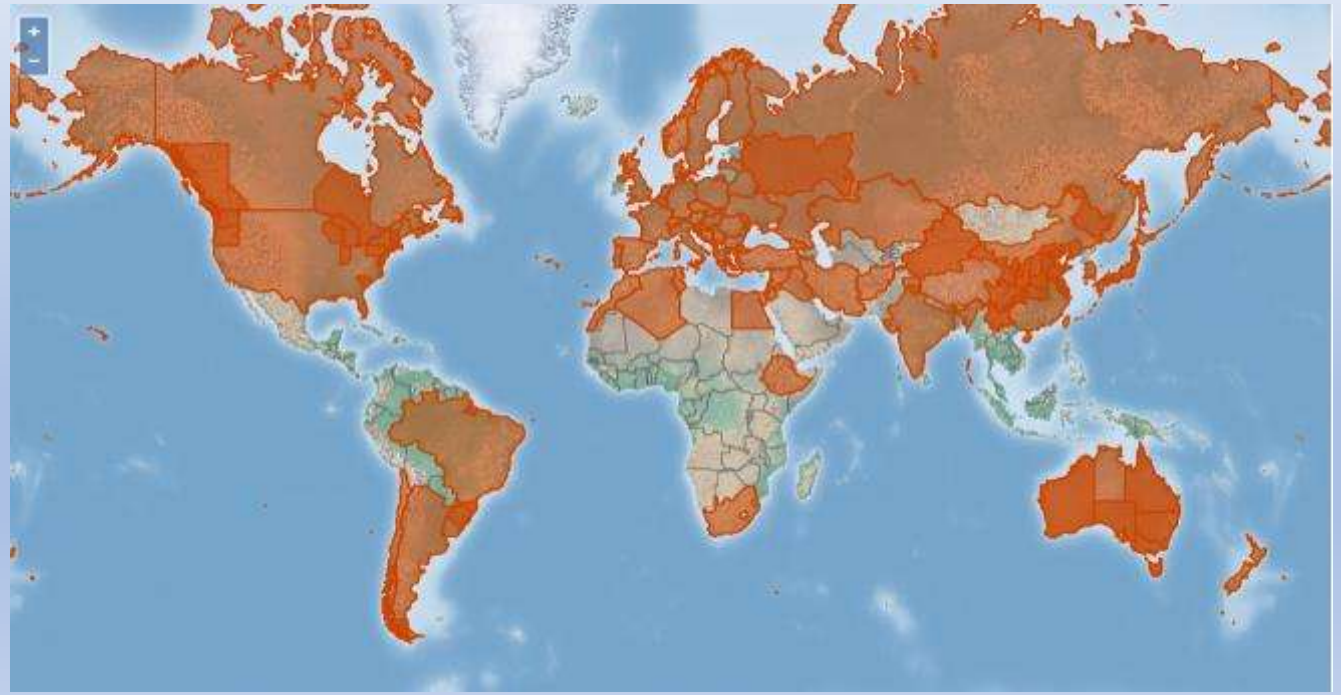
لذا اساس روشهای مدیریت این عوامل، متکی بر اصول پیشگیری می‌باشد.

*گام اول آشنایی با علائم بیماری (تشخیص)

ویروس لکه سبزرد برگ سیب

Apple chlorotic leaf spot virus

این ویروس قادر به ایجاد آلودگی و بیماری تقریبا در تمام هسته دارها می باشد از جمله در هلو، آلو، زردآلو، بادام و گیلاس
این ویروس دارای انتشار و وقوع بالایی بوده و از تمام مناطق کشت هسته دارها گزارش شده است (به غیر از نهال و مواد تکثیری گواهی شده).

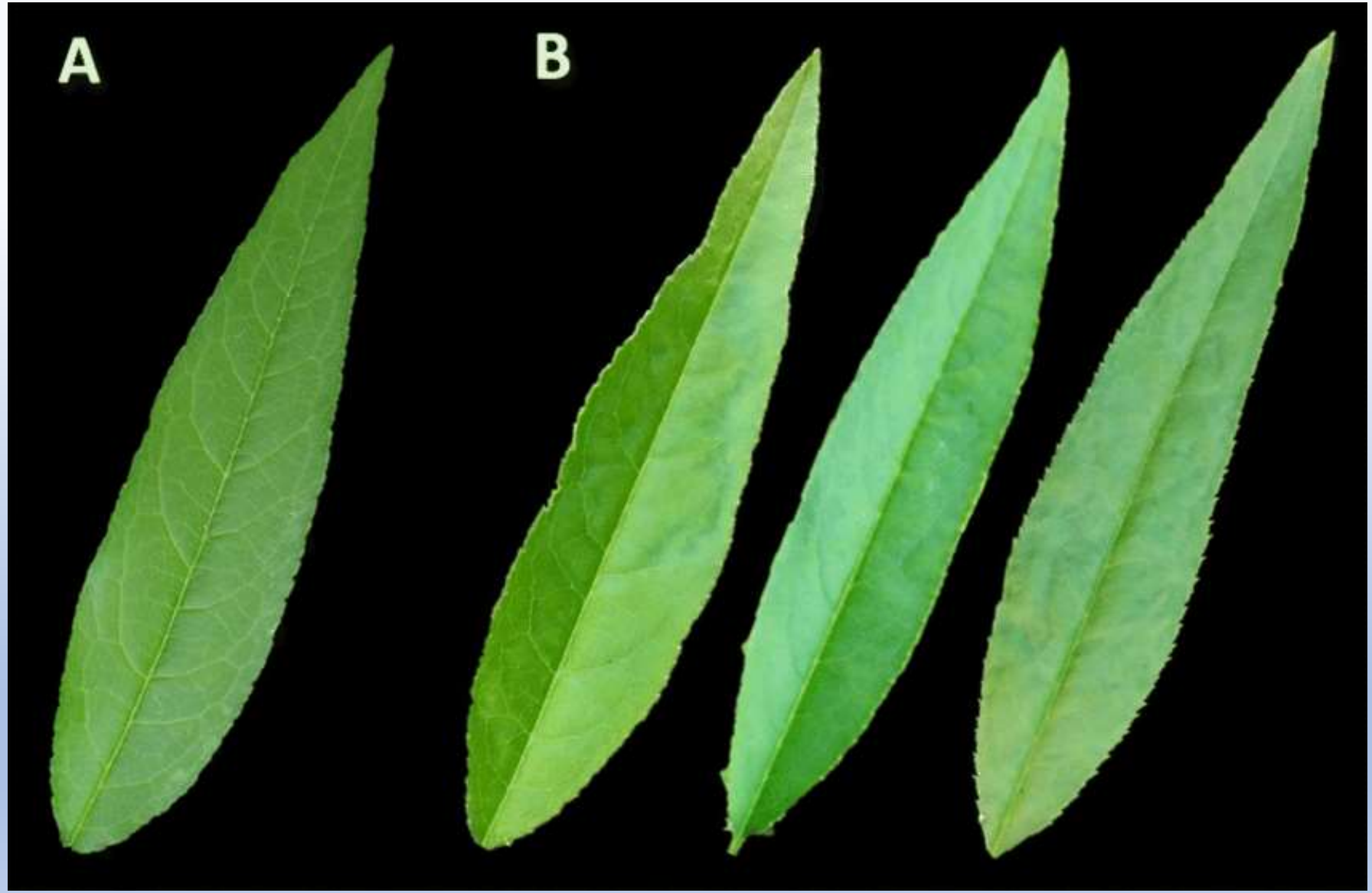


علائم این ویروس عموما روی برگها، میوه و تنه درخت آلوده قابل مشاهده است. شدت علائم به نژاد ویروس و گونه گیاهی و رقم آن بستگی دارد.

برخی نژاد(سویه)ها موجب بروز علائم شکاف در روی شاخه و تنه یا علائم شبه آبله (pseudopox) در میوه در آلو، زردآلو و هلو می شوند.

این ویروس به تنهایی یا در آلودگی توام با ویروس PNRSV موجب بروز لکه های آفتاب سوخته و نکروزه روی میوه در گیلاس و آلبالو می شود. غالب ارقام گیلاس و آلبالو بدون علائم بارزی به این ویروس آلوده می شوند.
در برخی ارقام هلو، ویروس ACLSV موجب لکه های سبز تیره، آفتاب سوخته یا خطوط مواج و حلقه های رنگ روشن (شبیه علائم ناشی از ویروس آبله آلو) در برگها می شود.

برخی سویه های ویروس ACLSV در زردآلو موجب ناسازگاری پیوند یا بدشکلی شدید در میوه می شوند (مشهور به شبه آبله زردآلو یا لکه سوختگی میوه زردآلو) (apricot seudopox,) (apricot fruit blotch)


A
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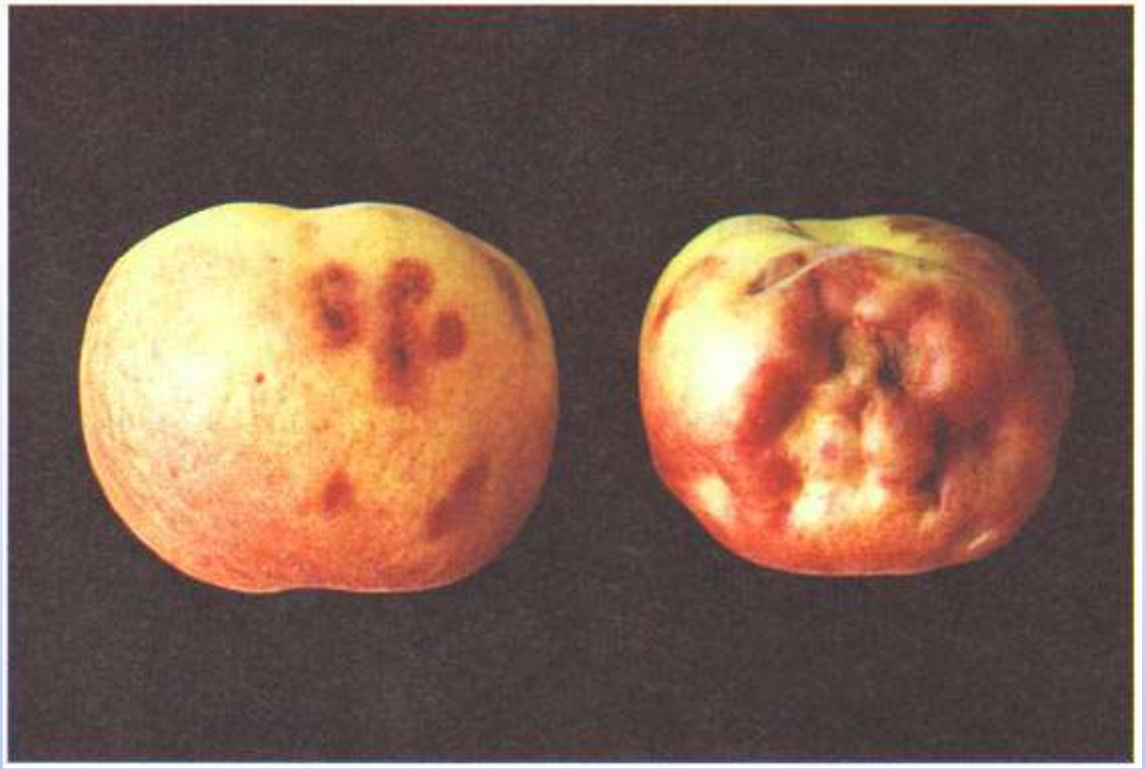
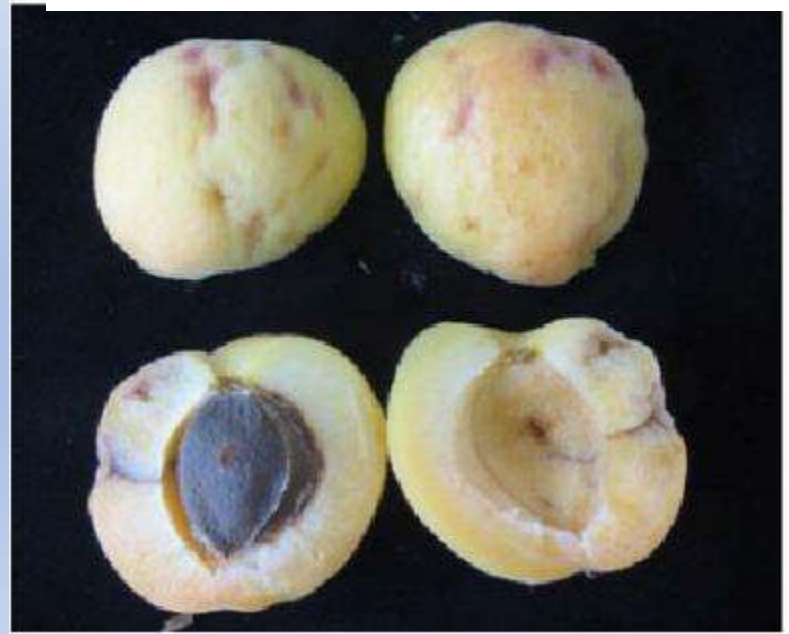
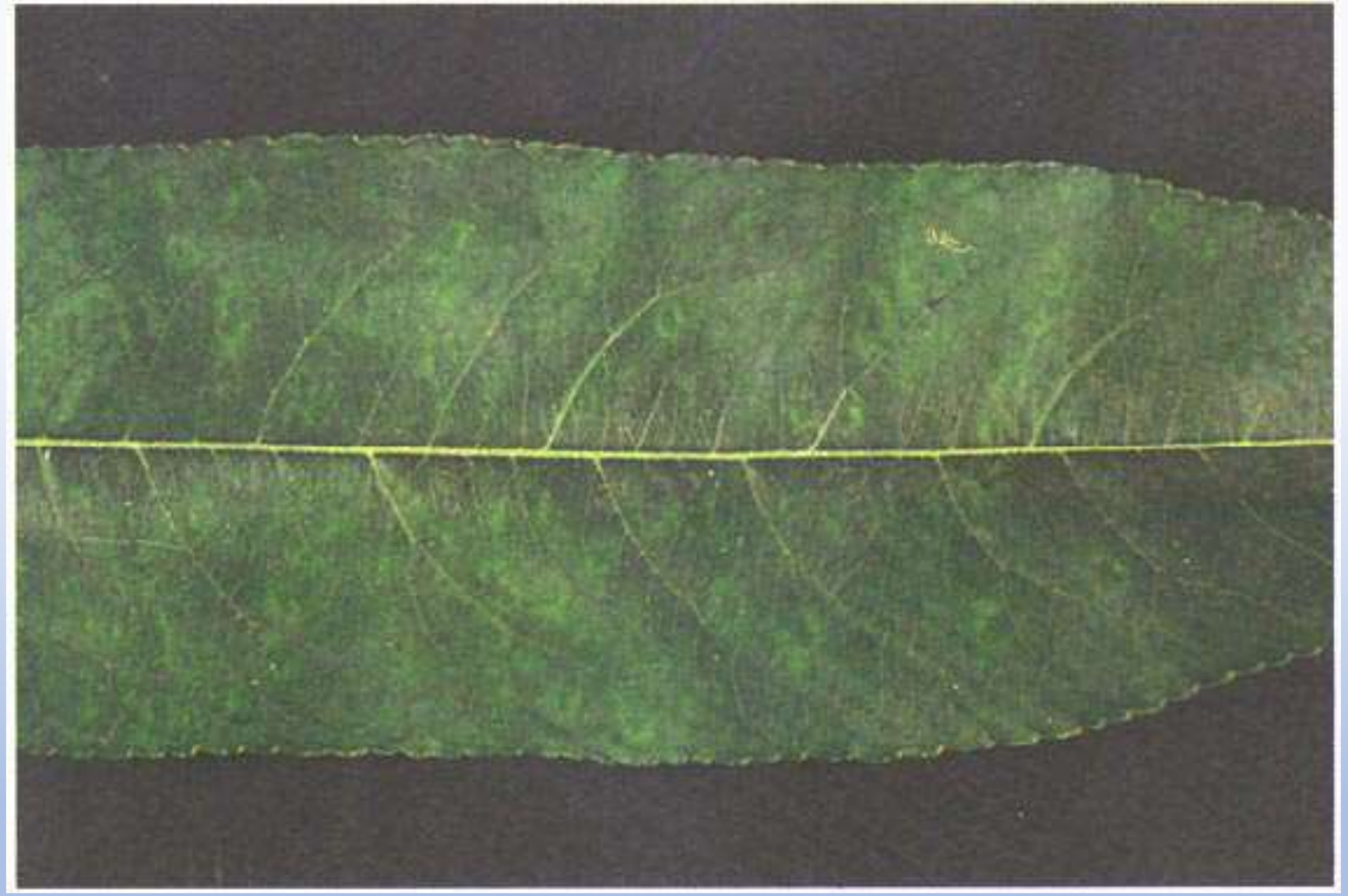


علائم شبه آبله در روی میوه زردآلو

Pseudopox symptoms

علائم شبه آبله (شبه شارکا)





تشکیل نقوش خطی و حلقوی برنگ سبز روشن (سبزرد) در برگ هلو

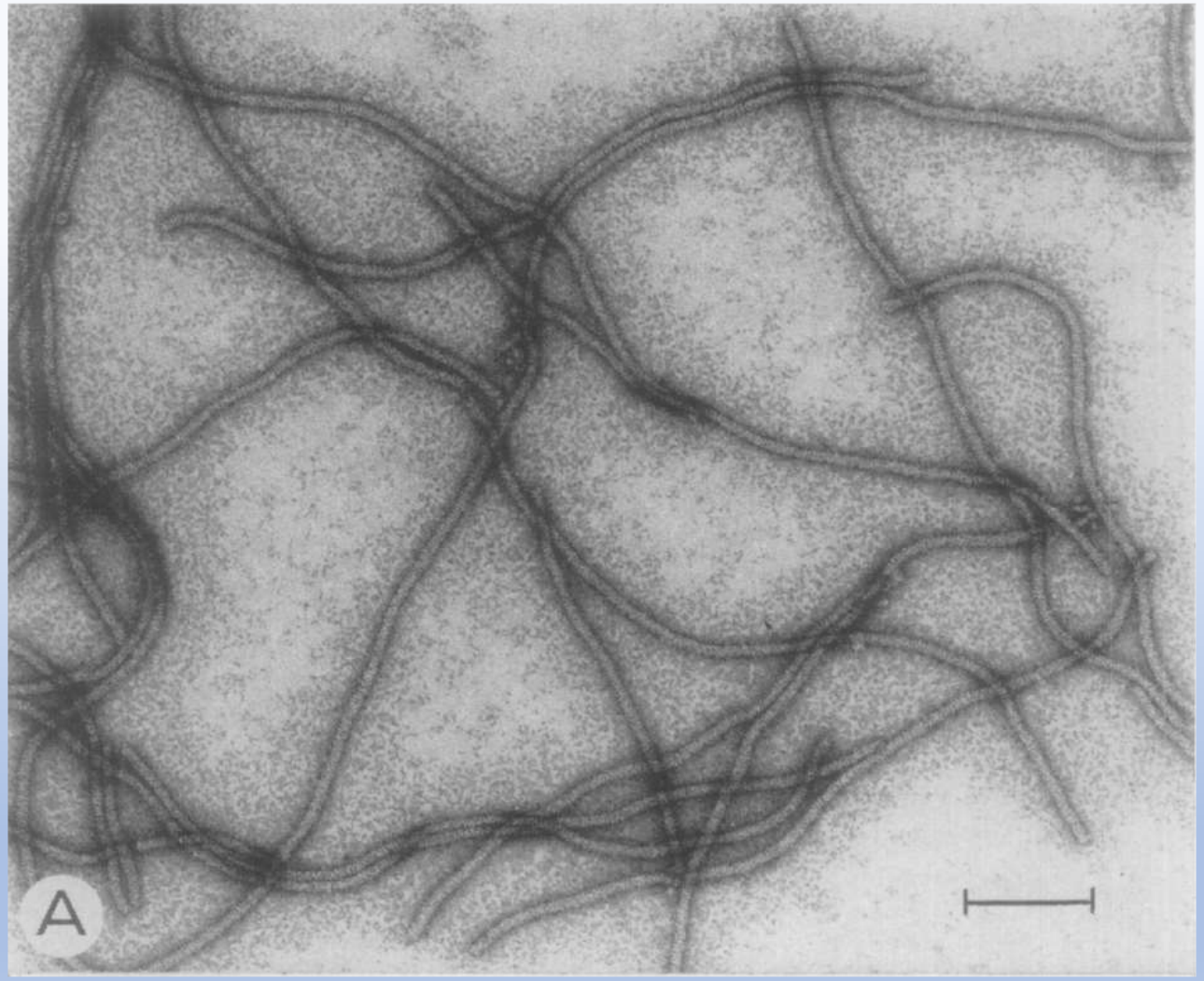
علائم موزائیک و تغییر رنگ برگ هلو ناشی از آلودگی ACLSV

- Domain: Virus
- Group: "Positive sense ssRNA viruses"
- Group: "RNA viruses"
- Order: Tymovirales
- Family: Betaflexiviridae
- Genus: Trichovirus
- Species: Apple chlorotic leaf spot virus

ویروس دارای پیکره رشته ای خمش پذیر است.

Some strains induce serious diseases in stone fruits, such as pseudopox disease of plum and apricot, and plum bark split.

ویروس براحتی از طریق پیوند از گیاه آلوده به گیاه سالم منتقل می شود.


A

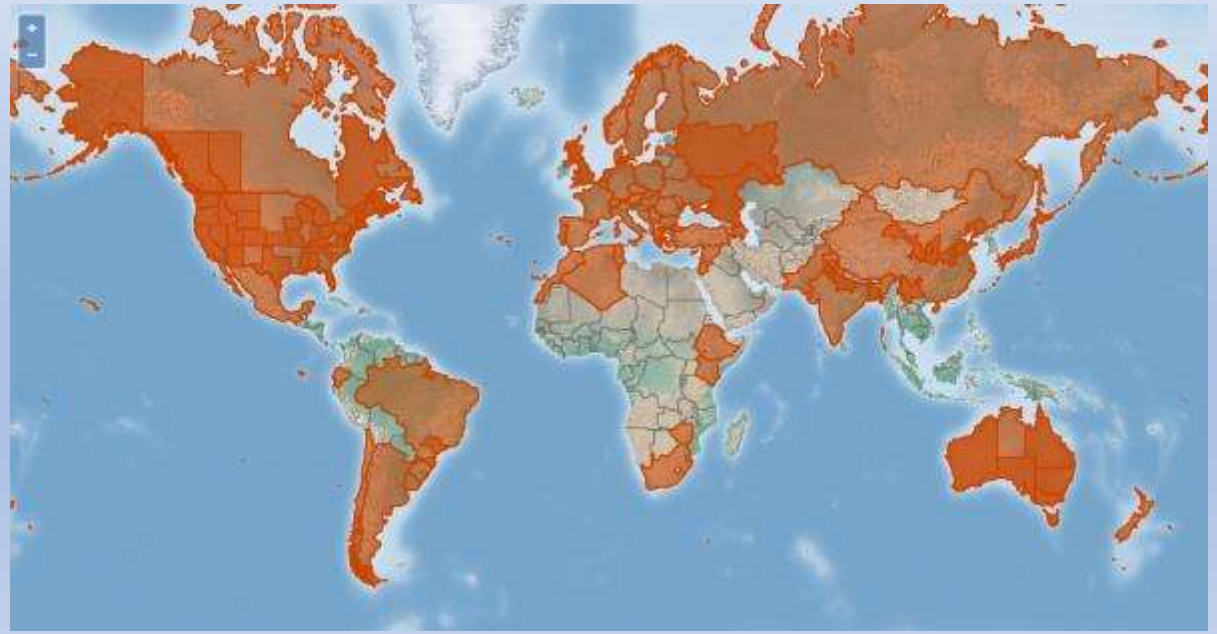
Genome organization of ACLSV, showing the relative positions of the ORFs and their expression products.
Mtr, methyltransferase; P-Pro, papain-like protease; Hel, helicase;
Pol, polymerase; MP, putative movement protein; CP, capsid protein.

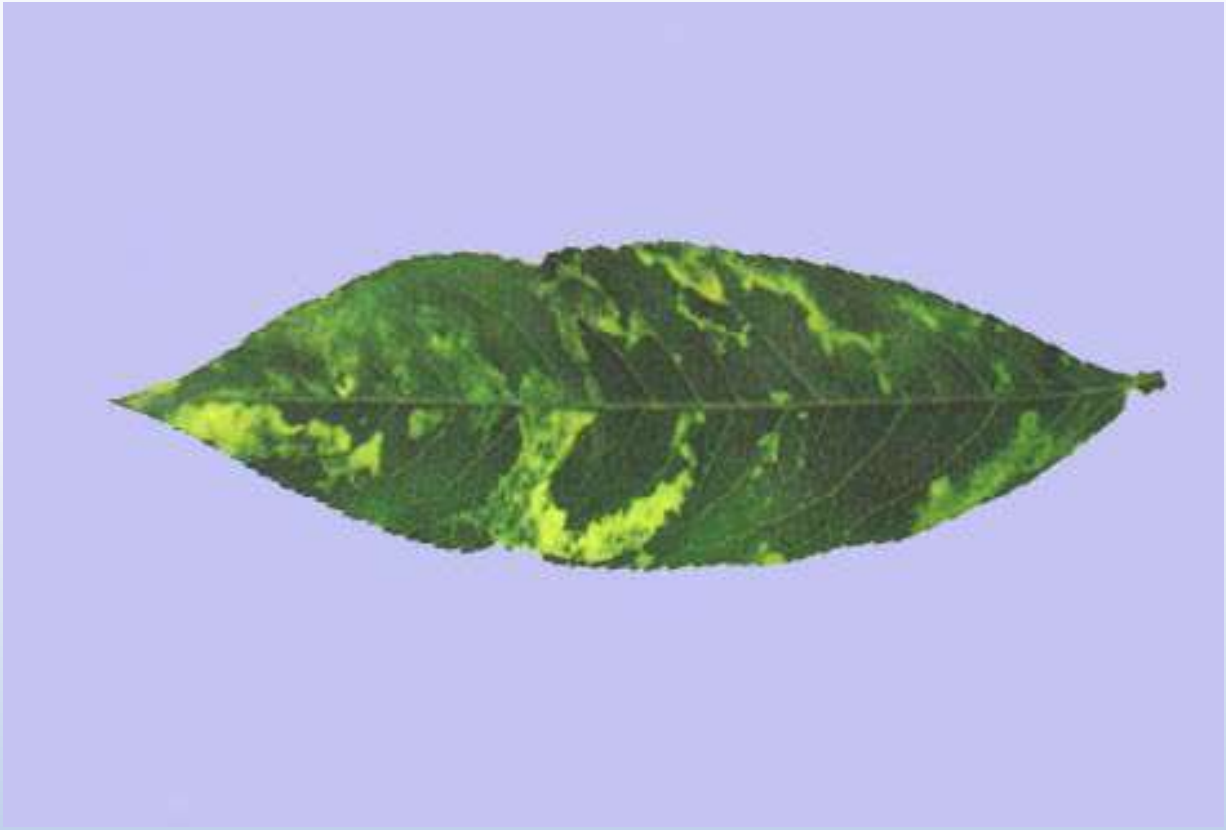
Apple mosaic virus

ویروس موزائیک سیب

Apple mosaic virus (ApMV) is the causal agent of several diseases of the line pattern type affecting most cultivated *Prunus* spp., including plum, almond, peach, apricot, cherry, and sour cherry.

Natural hosts: various *Prunus* spp., such as apricot, cherry, plum and peach show plum line pattern-like symptoms when infected. Not all isolates from *Prunus* induce typical mosaic symptoms in apple.
ApMV also occurs naturally in apple, strawberry, *Rubus* spp., *Rosa* spp., birch *(Betula* spp. توس), hop *(Humulus lupulus)*, horse chestnut شاه بلوط هندی*(Aesculus hippocastanum)* and filbert *(Corylus axima)*.





علائم موزائیک زرد در برگ هلو ناشی از آلودگی ApMV

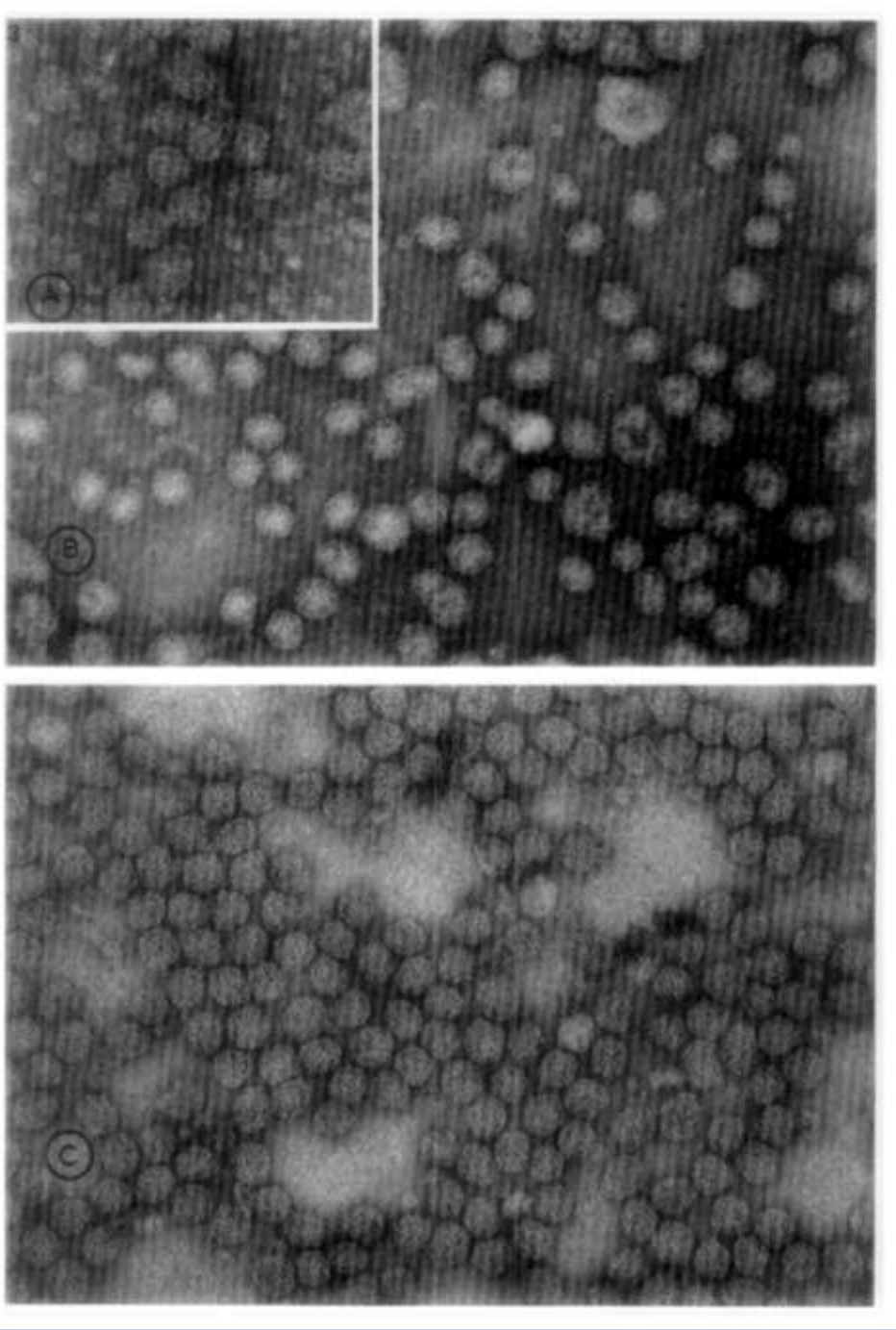
علائم موزائیک (نقش برگ بلوط) در برگ زردآلو ناشی از آلودگی ApMV

علائم رگبرگ روشنی در برگ بادام ناشی از آلودگی ApMV

Transmitted by grafting, and to herbaceous plants by mechanical inoculation.
No natural vectors are known.

Seed transmission has been reported in hazelnut.

Order:	*Martellivirales*
Family:	*Bromoviridae*
Genus:	*Ilarvirus*


A
B
C

Apricot latent virus ***ویروس نهان زردآلو***

Apricot latent virus (ApLV) was first described in Moldova, former USSR, from latently infected apricot cv. ‘Silistra 4’ introduced from Bulgaria.

Sequence comparisons allowed ApLV to be assigned as a new, independent viral species in the genus *Foveavirus.*

Symptoms caused by ALV on infected leaves of certain woody hosts:
1 uninfected peach leaf;
2 infected peach leaf;
3 infected *P. ceracifera* leaf


b

Iranian Journal of Virology 2021;15 (1): 15-25

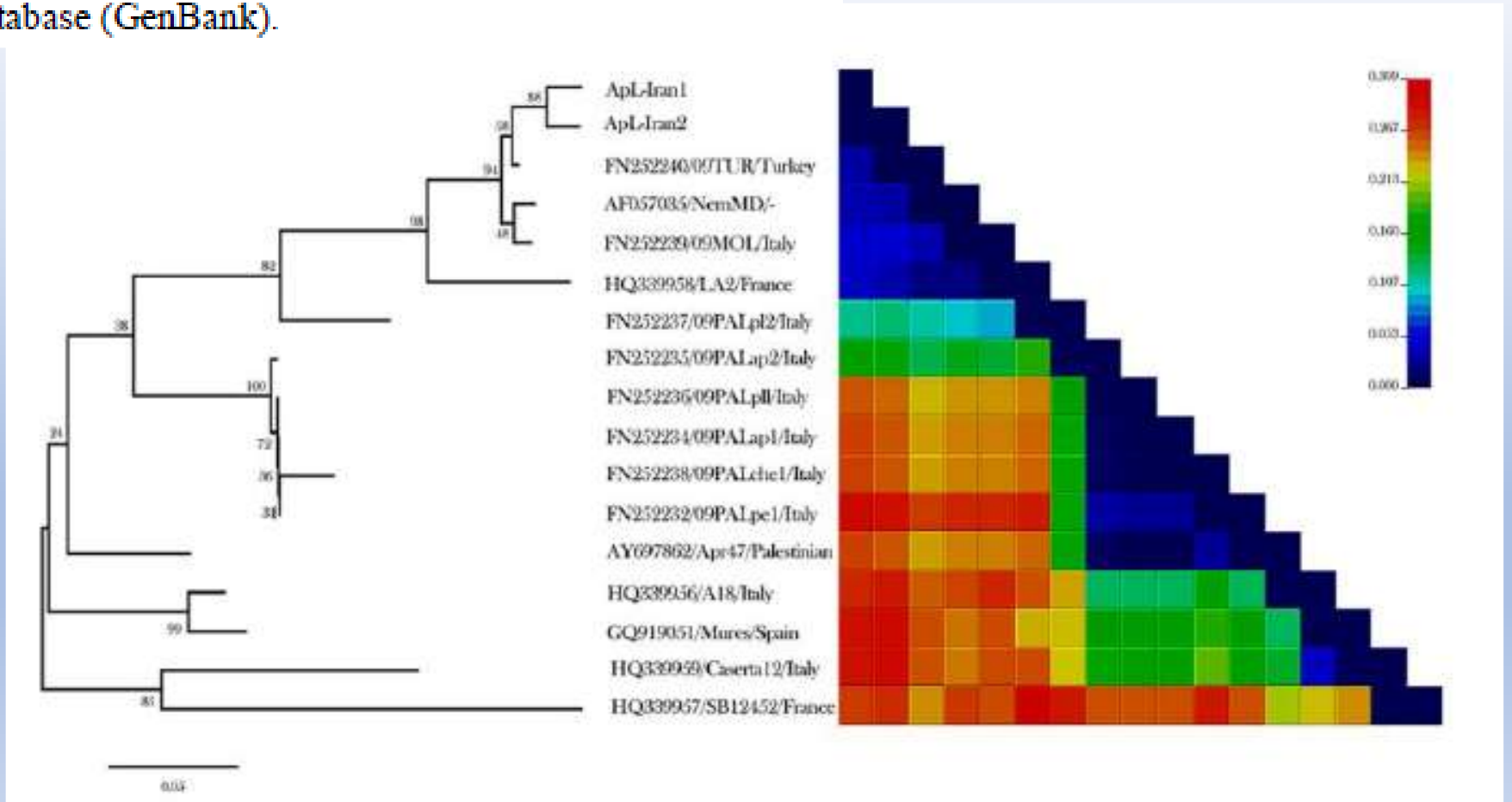
Original Article

The Major Mechanisms of Genetic Differentiation Among Apricot Latent Virus (ApLV) Isolates

Pourrahim R[1*], Farzadfar S[1]

1. Plant Virus Research Department, Iranian Research Institute of Plant Protection (IRIPP), Agricultural Research, Education, and Extension Organization (AREEO), Tehran, Iran.

Fig. 2. Maximum Likelihood (ML) tree and two dimensional of nucleotide diversity plot showing the relationship among Apricot latent virus (ApLV) isolates. The tree was constructed using seventeen CP nucleotide sequences of ApLV isolates. Numbers at each node indicates the percentage of supporting puzzling steps (or bootstrap samples) in ML method. The name of each isolate and the country of its origin are listed in the accession number in the International Gene Sequence Database (GenBank).



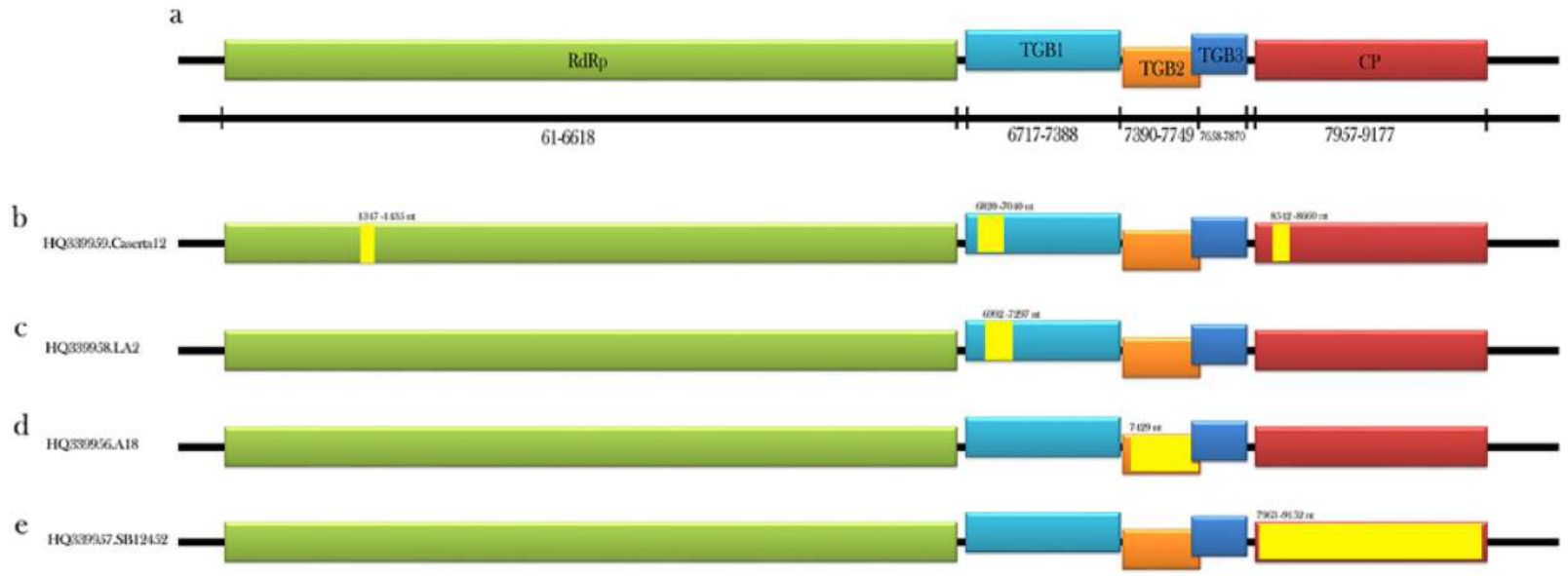


Fig. 4. The schematic recombination sites are shown for different genes of Apricoat latent virus using RDP4. The potential recombination sites were indicated by yellow box

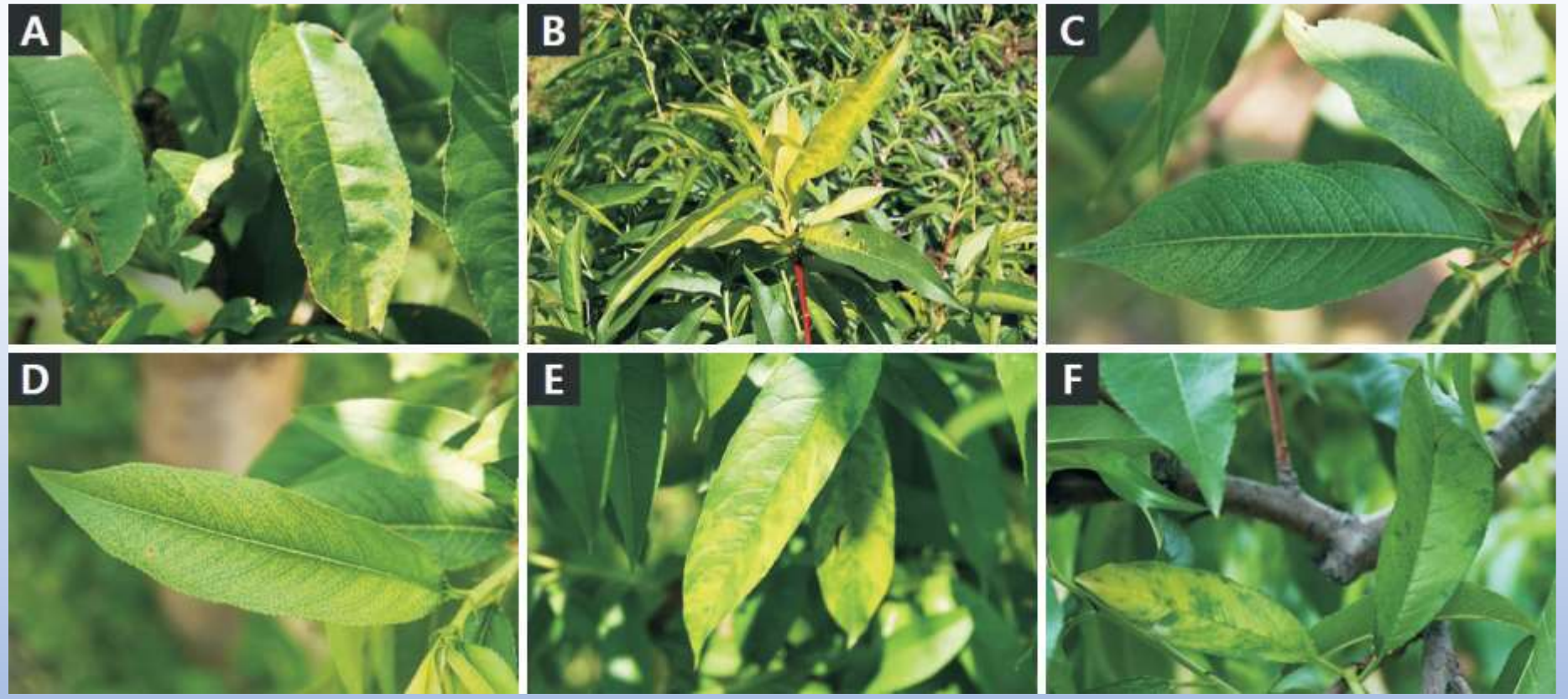
***Apricot pseudo-chlorotic leaf spot virus* (APCLSV)**

ویروس لکه برگ شبه سبزرد زردآلو

Apricot pseudo-chlorotic leaf spot virus (APCLSV) is a novel, still poorly known *Trichovirus* in the family Betaflexiviridae.

It is most closely related to *Apple chlorotic leaf spot virus* (ACLSV) and infects stone fruit trees of the *Prunus* genus.

Its presence has so far been detected in apricot, plum, Japanese plum, and peach trees in Italy, Spain, France, Hungary, Turkey, Jordan, and Australia.


A
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Asian prunus viruses 1, 2, and 3

ویروس های آسیایی هسته دارها ۱، ۲ و ۳

The three Asian prunus viruses 1, 2, and 3 were discovered very recently in several *Prunus* sources of mostly Asian origin, which previously had been reported to contain viral agents showing serological cross-reactivity with *Plum pox virus.*

These viruses were determined to have a genome organization similar to that of other Foveaviruses in Betaflexiviridea, and analysis indicated that the three agents are significantly divergent from each other, supporting the idea that they represent three closely related but nevertheless distinct viral species.

Cherry green ring mottle virus

ویروس پیسک حلقه سبز گیلاس

The disease cherry green ring mottle (CGRM) was first reported in 1937 affecting sour cherry trees in Michigan, U.S.A., and was described as a viral disease in 1951.

Cherry green ring mottle virus (CGRMV) infects:
several *Prunus* species, including sweet cherry, sour cherry, oriental flowering cherry, peach, nectarine, and apricot.

The disease has been found after indexing of symptomless sweet cherry trees in New York, Wisconsin, Oregon, and Washington in the United States and in British Columbia and Ontario, Canada as well as in several European countries, Africa, New Zealand, and Japan.

- Domain: Virus
- Group: "Positive sense ssRNA viruses"
- Group: "RNA viruses"
- Order: Tymovirales
- Family: Betaflexiviridae
- Genus: Foveavirus
- Species: Cherry green ring mottle virus

ویروس CGRMV در آلبالو علائم ملایم پیسک حلقوی ایجاد می کند ولی در زردآلو، هلو و گیلاس غالبا علائم بارزی ایجاد نمی کند.

The virus produces symptoms on sour cherry, primarily the variety Montmorency. Apricot, peach, and sweet cherry are symptomless hosts.

Yellow mottling with irregularly shaped green islands or rings appear on the leaves of infected trees (A). A less common symptom is yellowing of the lateral veins, usually accompanied by a tip distortion (B).

Fruit are misshapen with corky-brown, discolored pits, streaks or rings in the epidermis that extend into the flesh of the fruit. Infected fruit are bitter.

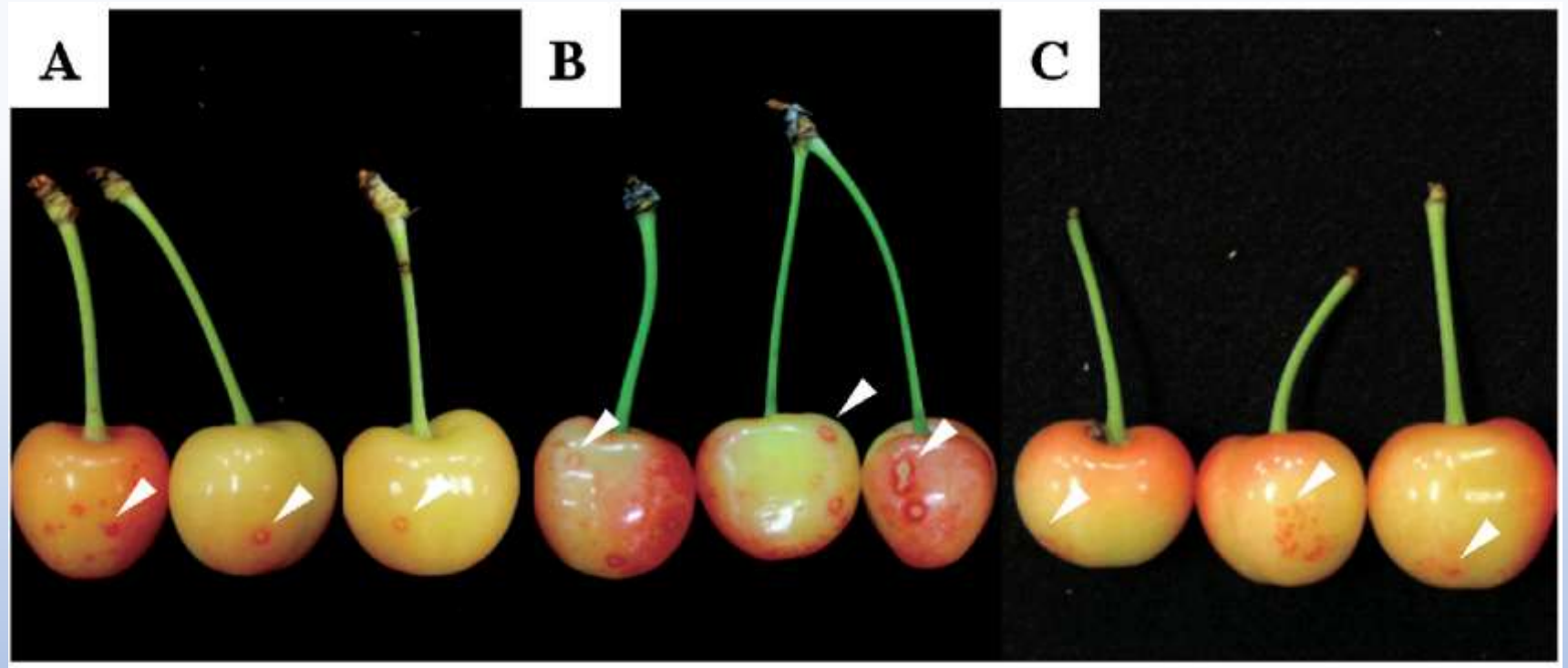


Fig. 1. Abnormal cv. 'Sato Nishiki' cherries with ring spot symptoms on the pericarp. A: Daegu isolates, B: Gyeongsan

Cherry leaf roll virus **(CLRV)** ویروس برگ قاشقی گیلاس

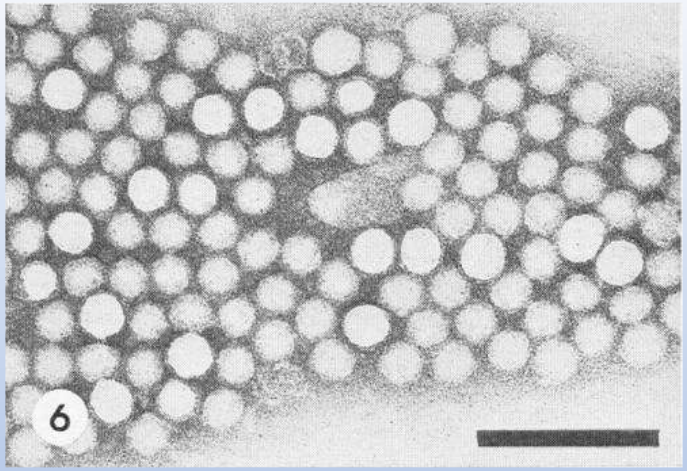
Cherry leaf roll virus (CLRV) was first reported in 1933 in English walnut and sweet cherry.
Since then numerous hosts have been recorded revealing its wide natural host range, which includes 17 genera of woody plants and a variety of herbaceous plants.
CLRV belongs to the *Nepovirus* genus, and unlike the majority of other members of this genus, it is not considered to be transmitted by nematodes. However, reliable investigations on nematode transmission are still lacking.

Order: Picornavirales
Family:Comoviridae
Genus:Nepovirus
Species: *Cherry leaf roll virus*

Table 1. Natural hosts and symptoms of Cherry leaf roll virus

Botanical name	Common name	Symptoms (virus strain)	Source
Juglans regia	English walnut	Leaf pattern and black line, terminal shoot dieback	Savino *et al.*, 1977; Cooper, 1980; Cooper J.I and Edward M.L. (1980) Mircetich *et al.*, 1980
Ulmus americana	American elm	Chlorotic mosaic, ring pattern and dieback	Mayhew & Epstein, 1971
Prunus avium	Sweet cherry	Leaf rolling and death. Flower pedicels shortened.	Cropley, 1961; Schimanski *et al.*, 1975.
Betula pendula	Silver birch	Chlorotic ringspot, leaf patterns, yellow vein netting.	Schmelzer, 1972a; Cooper & Atkinson, 1975;
Sambucus nigra	Black elder	Chlorotic ringspot, leaf patterns, yellow vein netting.	Schmelzer, 1966; Schimanski & Schmelzer, 1972; Hansen & Stace-Smith, 1971.
Rubus spp.	Bramble spp	Chlorotic ringspot, leaf patterns, yellow vein netting.	Cropley & Tomlinson, 1971; Jones, 1976; Jones & Wood, 1978.
Comus florida	Flowering dogwood	Chlorotic ringspot, leaf patterns, yellow vein netting.	Waterworth & Lawson, 1973
Ptelea trifoliata	Hop tree	Yellow spotting	Schmelzer 1972b
Olea europaea	Olive	Symptomless	Savino & Gallitelli, 1981
Rheum rhaponticum	Rhubarb	Symptomless	Tomlinson & Walkey, 1967
Berteroa incana	Hoary Alyssum	Symptomless	
Delphinium elatum	English larkspur	Symptomless	Ahmed & Bailiss, 1975
Rumex obtusifolius	Bitter dock	Symptomless	Walkey & Cooper, 1973
Fagus sylvatica	Common or European Beech	Severe leaf rolling, leaf yellowing and premature leaf loss	

Order: Picornavirales
Family:Comoviridae
Genus:Nepovirus
Species: *Cherry leaf roll virus*



Cherry mottle leaf virus **(CMLV)** ویروس برگ پیسک گیلاس

Cherry mottle leaf disease was first observed in Oregon in 1920, and the infectious nature of the disease was established in 1935.
The causal agent was described as a virus in 1941, and approximately 50 years later, *Cherry mottle leaf virus* (CMLV) was isolated and partially characterized.

CMLV occurs naturally in sweet cherry, ornamental flowering cherry, peach, and apricot.

این ویروس موجب بروز علائم پیسک سبزرد و بدشکلی برگها در برخی ارقام گیلاس می شود.

The disease affects fruit quality and quantity and is the most severe disease on some cherry cultivars in some regions.

The *Cherry mottle leaf virus* is transmitted by budding, grafting, and has been experimentally transmitted by a microscopic eriophyid mite, *Eriophyes inaequalis*.

Order:	*Tymovirales*
Family:	*Betaflexiviridae*
Genus:	*Trichovirus*

Cherry necrotic rusty mottle and *Cherry rusty mottle viruses*

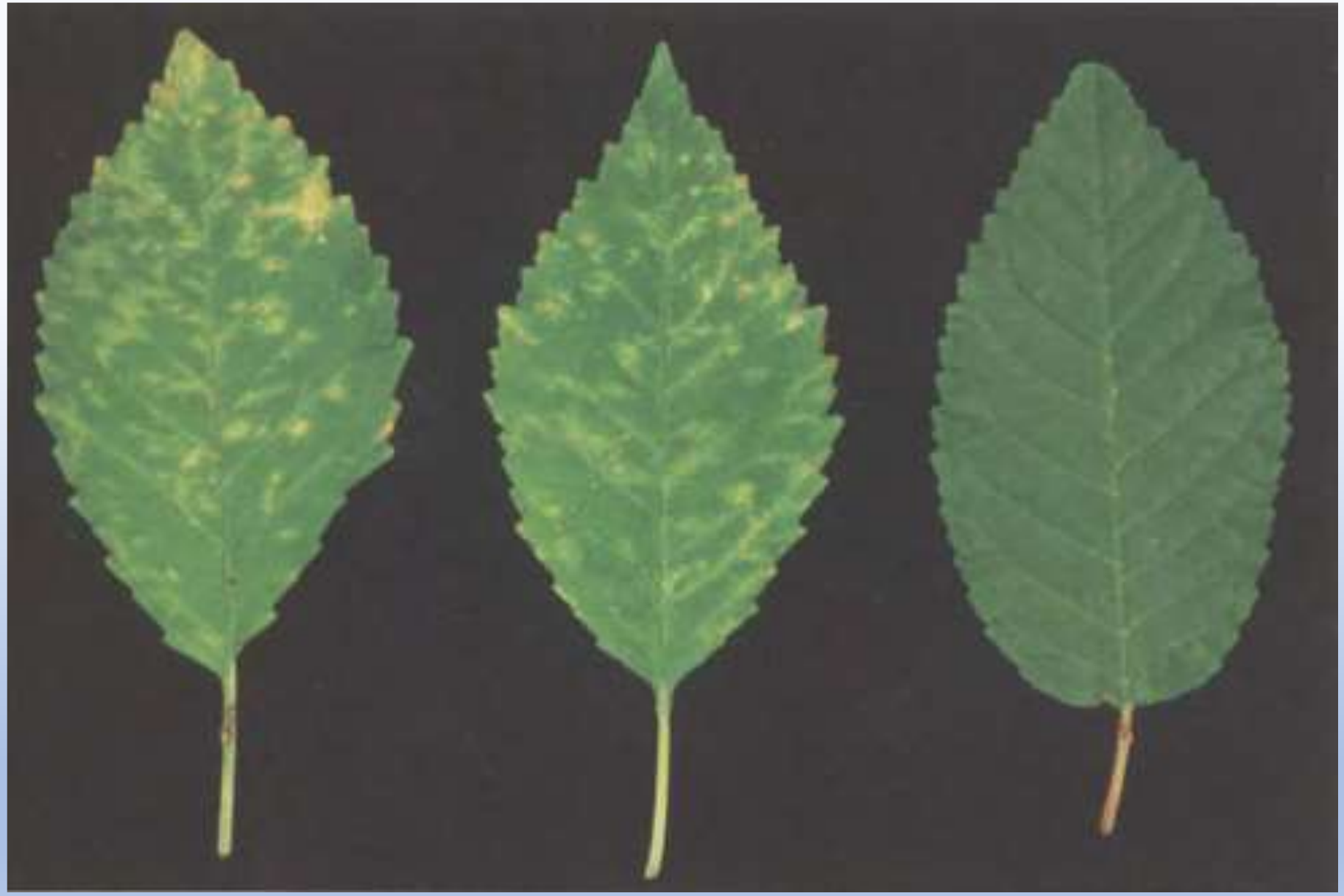
ویروس پیسک زنگار گیلاس و ویروس پیسک زنگار نکروتیک گیلاس

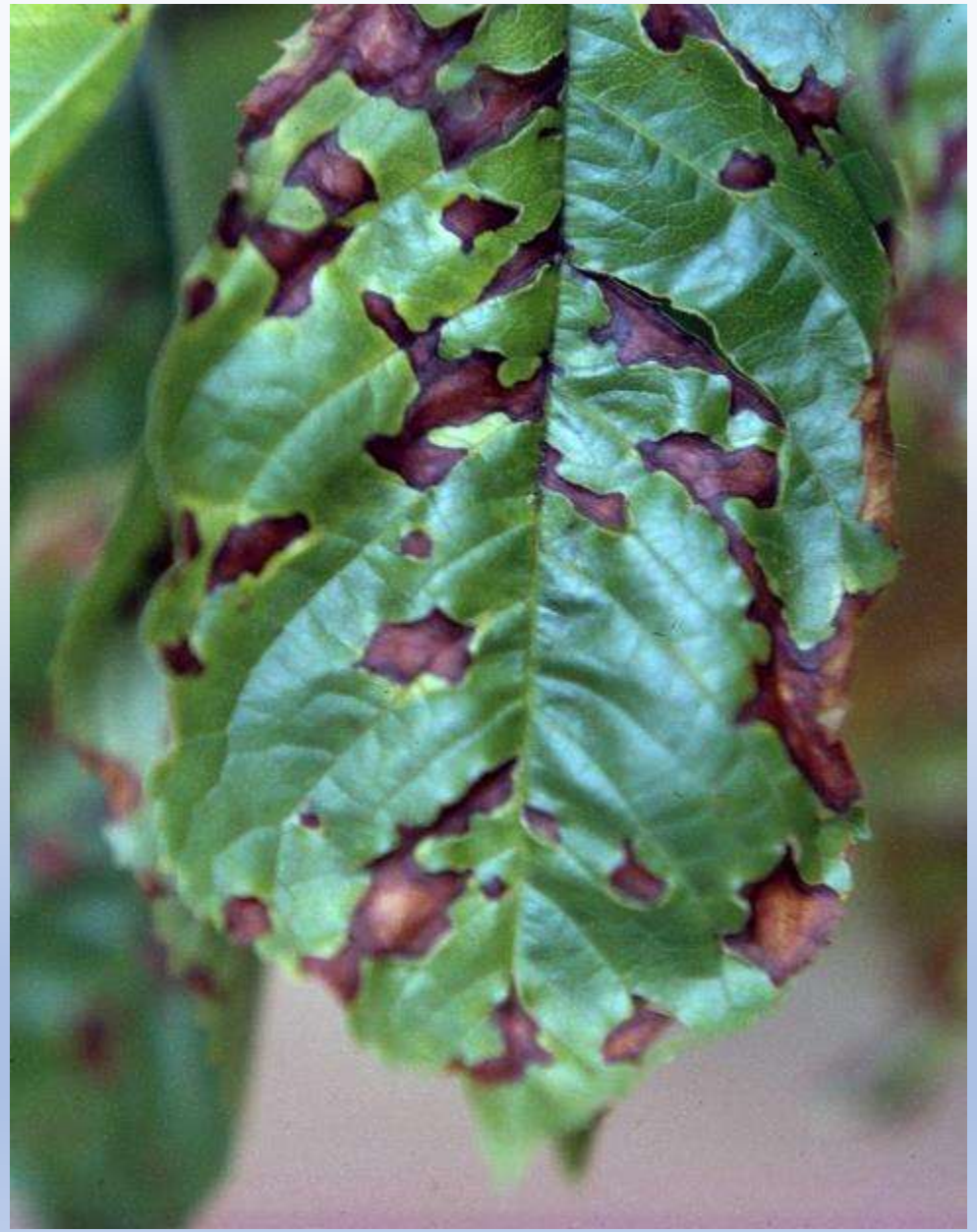
Cherry necrotic rusty mottle (CNRM) was first identified in Utah and named rusty mottle disease.

The name was subsequently changed to necrotic rusty mottle when it was found to be clearly distinct from a disease from Washington described in 1940 under the same name.
In 1947, two forms of rusty mottle were recognized in Oregon, now referred to as cherry rusty mottle, or CRM (American).

To complicate matters further, a rusty mottle disease was identified in England; it was later determined to be different from the American disease and is now referred to as CRM (European). This disease now encompasses a group of diseases with similar symptomatology.

While data are still limited, evidence suggests that CNRM, CRM (American), and CRM (European) are caused by closely related viruses of the family *Betaflexiviridae.*





Cherry rasp leaf virus **(CRLV)** ***ویروس برگ سوهانی گیلاس***

Cherry rasp leaf disease is caused by *Cherry rasp leaf virus* (CRLV).
The disease was described first in Colorado in 1935, and association of the disease with a virus was established in 1942.
Rasp leaf disease in cherry results in reduced fruit production, tree vigor, and life expectancy.

This is a virus that has economic significance for both the stone fruit and pome fruit industries, so characterization and control of this virus has broad implications.

Cherry rasp leaf virus (CRLV) is readily transmitted by grafting and by dagger nematodes. Several weeds such as dandelion and red raspberry also are hosts. The virus also spreads to apples where it induces flat apple disease.
Picornavirales: Secoviridae: Cheravirus

Prominent projections (enations) are found on undersides of leaves.

These take the shape of leafy outgrowths or raised protuberances between lateral veins and along the midrib.

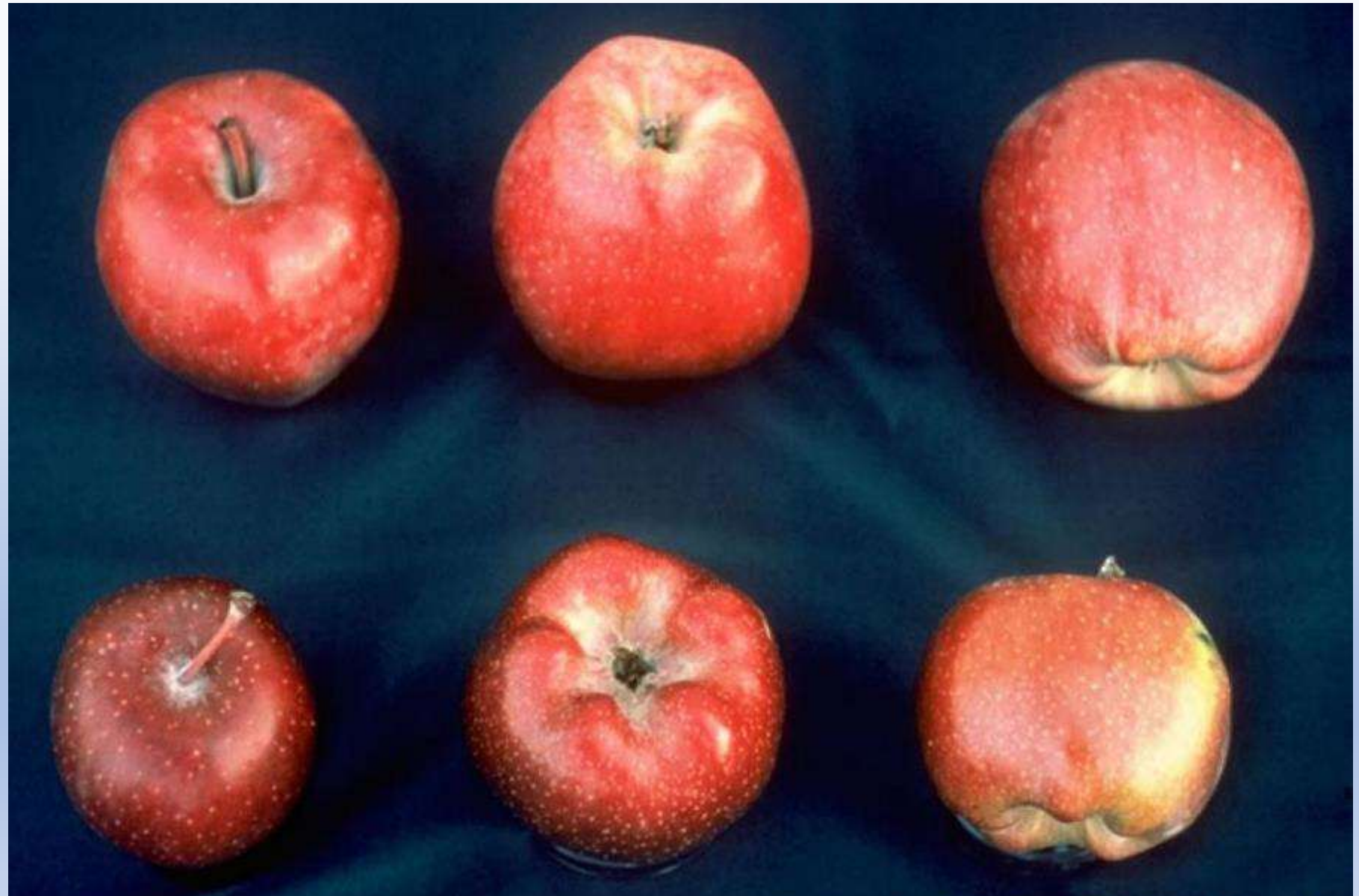
Leaves are more or less deformed; many are extremely narrow, folded, and distorted.

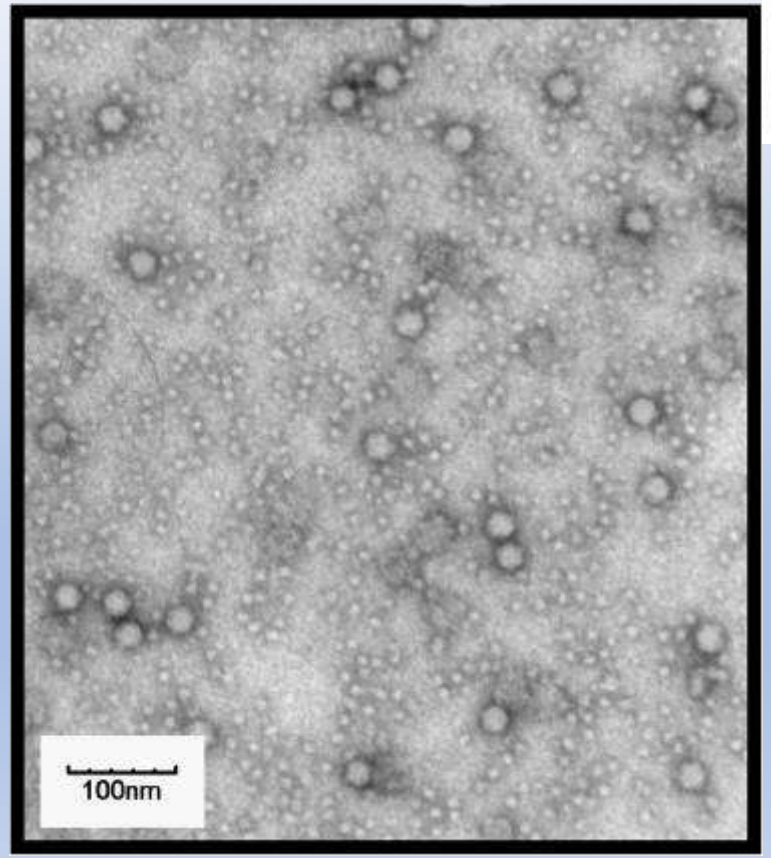
Upper surfaces have a rough, pebbly texture with depressions corresponding to projections on the lower surface.

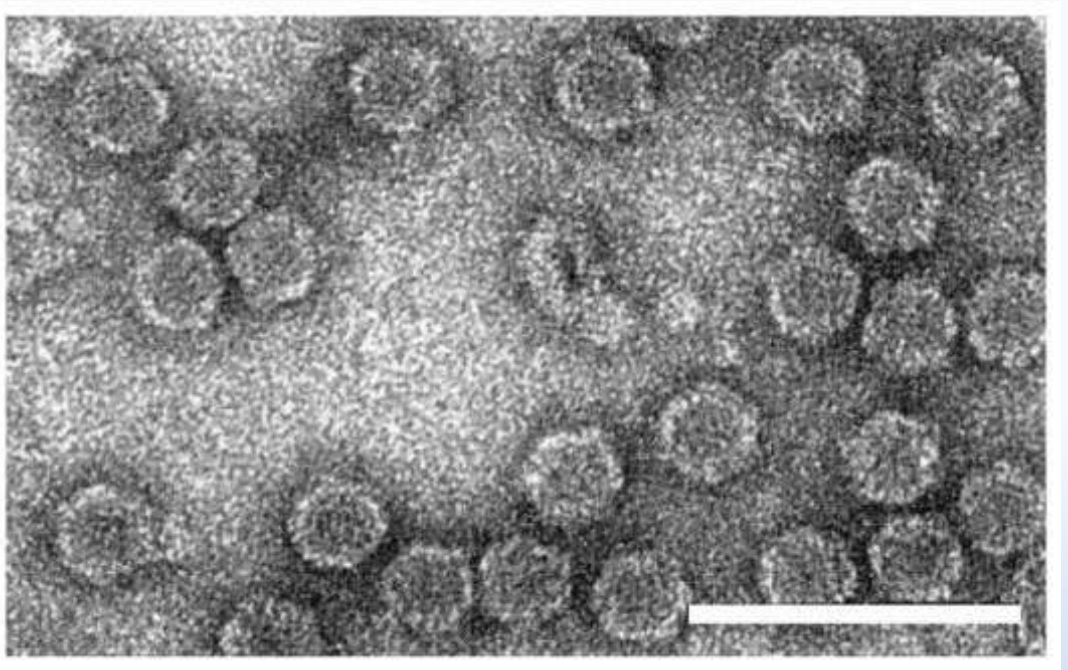
Fruit production is reduced. Severely affected branches and young trees may die.

CRLV

این ویروس در سیب زرد و قرمز موجب کاهش رشد شاخه، پیچیدگی برگها رو به بالا و کوچکی و پهن شدن میوه می شود. Apple flatten fruit




100nm



***Little cherry virus*-1 and -2**

ویروس کوچکی گیلاس ۱ و ۲

Little cherry disease (LChD) is a complex and serious viral disease of cherry.

It is distributed worldwide in ornamental and sweet cherry and has a great impact on fruit quality of infected trees.

Recently, it was established that little cherry disease is associated with two different viruses in the family *Closteroviridae: Little cherry virus*-1 and -2. The viruses can be found in single and mixed infections.

- Domain: Virus
- Group: "Positive sense ssRNA viruses"
- Group: "RNA viruses"
- Family: Closteroviridae
- Genus: Closterovirus

Little cherry virus-1 and -2

Little cherry virus-1 and -2 can be readily transmitted by all types of grafting, including top-working and root-grafting between neighboring trees.

Little cherry virus 2 is also transmitted by apple (*Phenacoccus aceris*) and grape (*Pseudococcus maritimus*) mealybugs; there is no known insect vector for Little cherry virus-1.

Plum bark necrosis stem pitting-associated virus (PBNSPaV)

ویروس همراه ساقه آبله ای نکروز پوست آلو

Plum bark necrosis-stem pitting disease (PBNSP) was first recognized in California in *Prunus salicina* cv. Black Beaut, and an associated virus transmitted by grafting to almond, sweet cherry, Japanese flowering cherry, and several prune and plum cultivars was reported later.

A similar disease had been observed a year earlier in southern Italy in apricot cv. Tyrinthos. In both cases, symptomatic plants contained dsRNAs 15–17 kbp in size that belonged to a putative closterovirus denoted Plum bark necrosis stem pitting-associated virus (PBNSPaV).

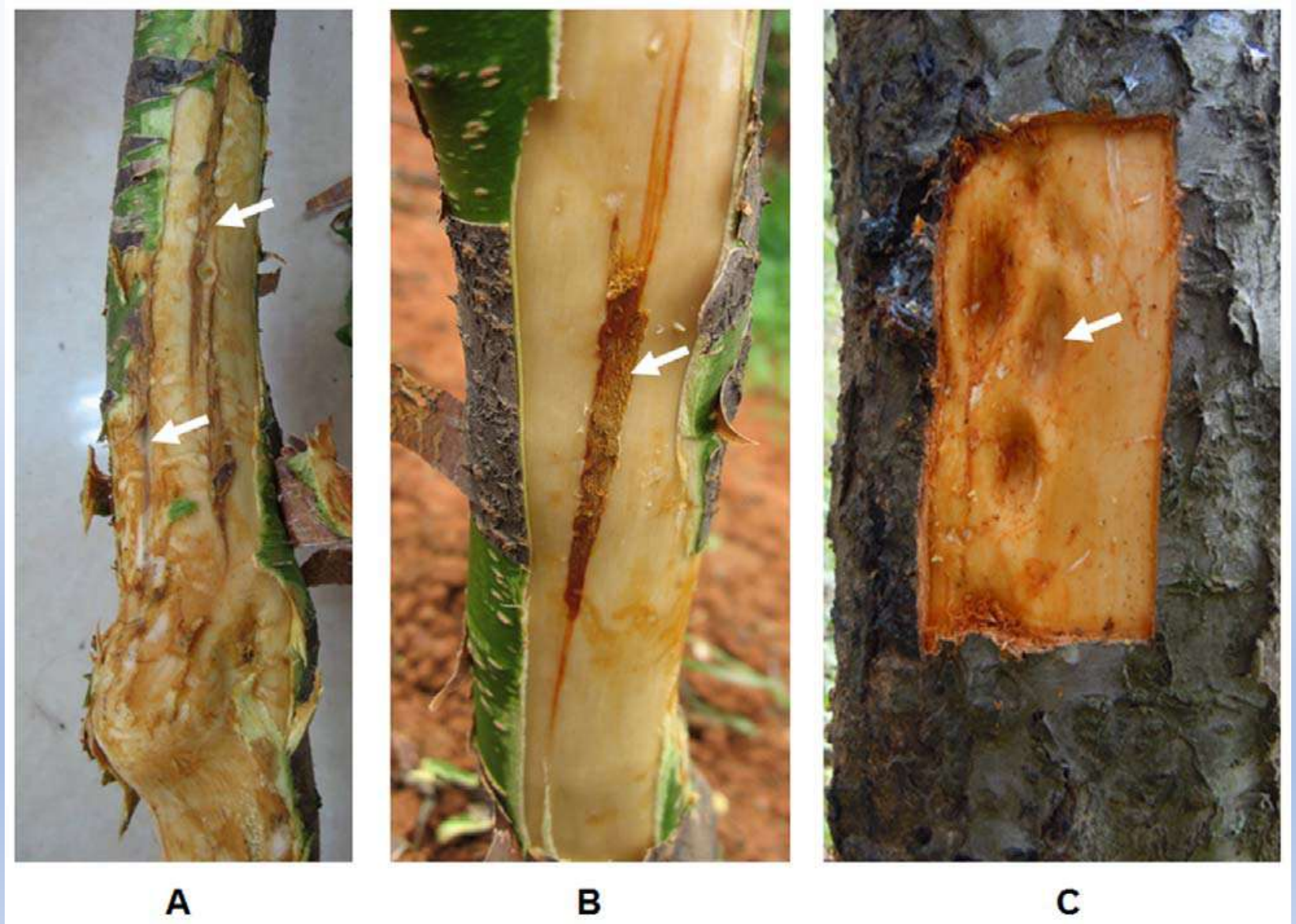
The same virus was later found in Italy in naturally infected almond, peach, sweet cherry, apricot, and plum trees with symptoms of stem pitting, a disease now known to affect cultivated and ornamental *Prunus* species in Europe and elsewhere.

PBNSPaV spread by grafting and no known vector

- Domain: Virus
- Group: "Positive sense ssRNA viruses"
- Group: "RNA viruses"
- Family: Closteroviridae
- Genus: Ampelovirus

Plum bark necrosis stem pitting-associated virus (PBNSPaV)

ویروس همراه ساقه آبله ای نکروز پوست آلو



Plum bark necrosis stem pitting-associated virus (PBNSPaV)

ویروس همراه ساقه آبله ای نکروز پوست آلو

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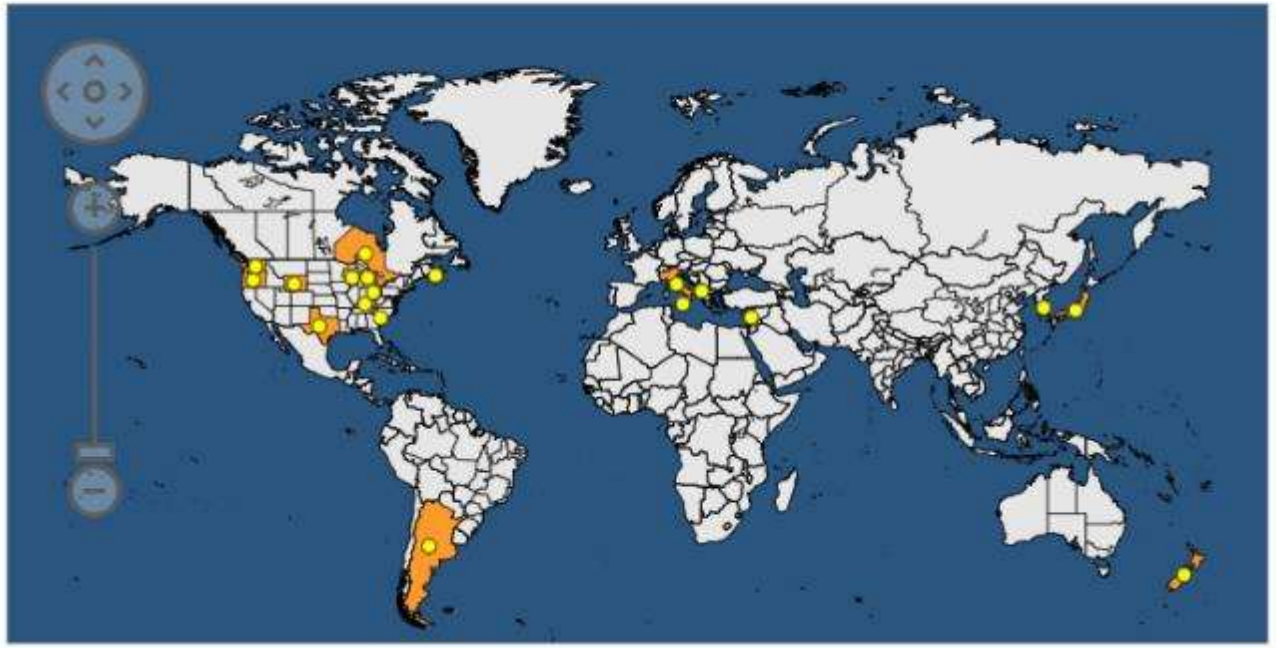
American plum line pattern ilarvirus

American plum line pattern virus (APLPV) is the least extensively documented *Ilarvirus* reported to infect stone fruits.
The virus infects stone fruits, in particular, Japanese plum, peach and flowering cherry, causing generally clear-cut symptoms.
Sap and grafting transmission of the virus was reported early.
Detection by ELISA was described.
The full genomic sequence of a Northern American isolate of APLPV and its detection by molecular hybridization and RT-PCR have been described.
Recently, simultaneous detection by one-step RT-PCR of eight stone-fruit viruses, including APLPV, was set up.

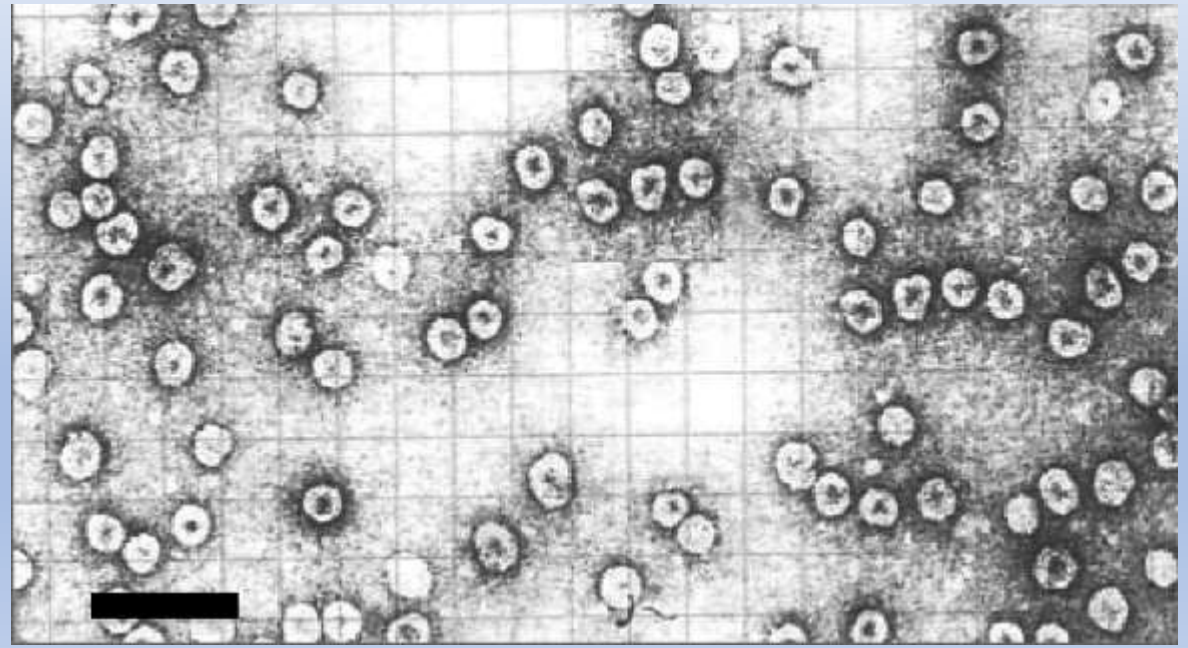
Bromoviridae, Ilarvirus



APLPV is a positive-sense RNA virus with a tripartite genome.
It has four types of quasi-isometric particles, 26, 28, 31 and 33 nm in diameter.

The virus is known to be transmitted only by propagating material.

Several APLPV isolates of Mediterranean origin have been sequenced and comparative analysis revealed low genetic diversity among their coat and
movement proteins, as well as with the proteins of American isolates.



Symptoms caused by APLPV on Japanese plum:
a) chlorotic rings in early spring,
b) yellow oak-leaf pattern in summer and
c) creamy-white line pattern in late summer.

Chlorotic to golden leaf borders of Japanese plum caused by APLPV.

Chlorotic pattern caused by APLPV on GF305 in greenhouse.

Chlorotic rings and vein clearing caused by APLPV on European plum cv. President in greenhouse.

Plum pox virus

ویروس آبله آلو

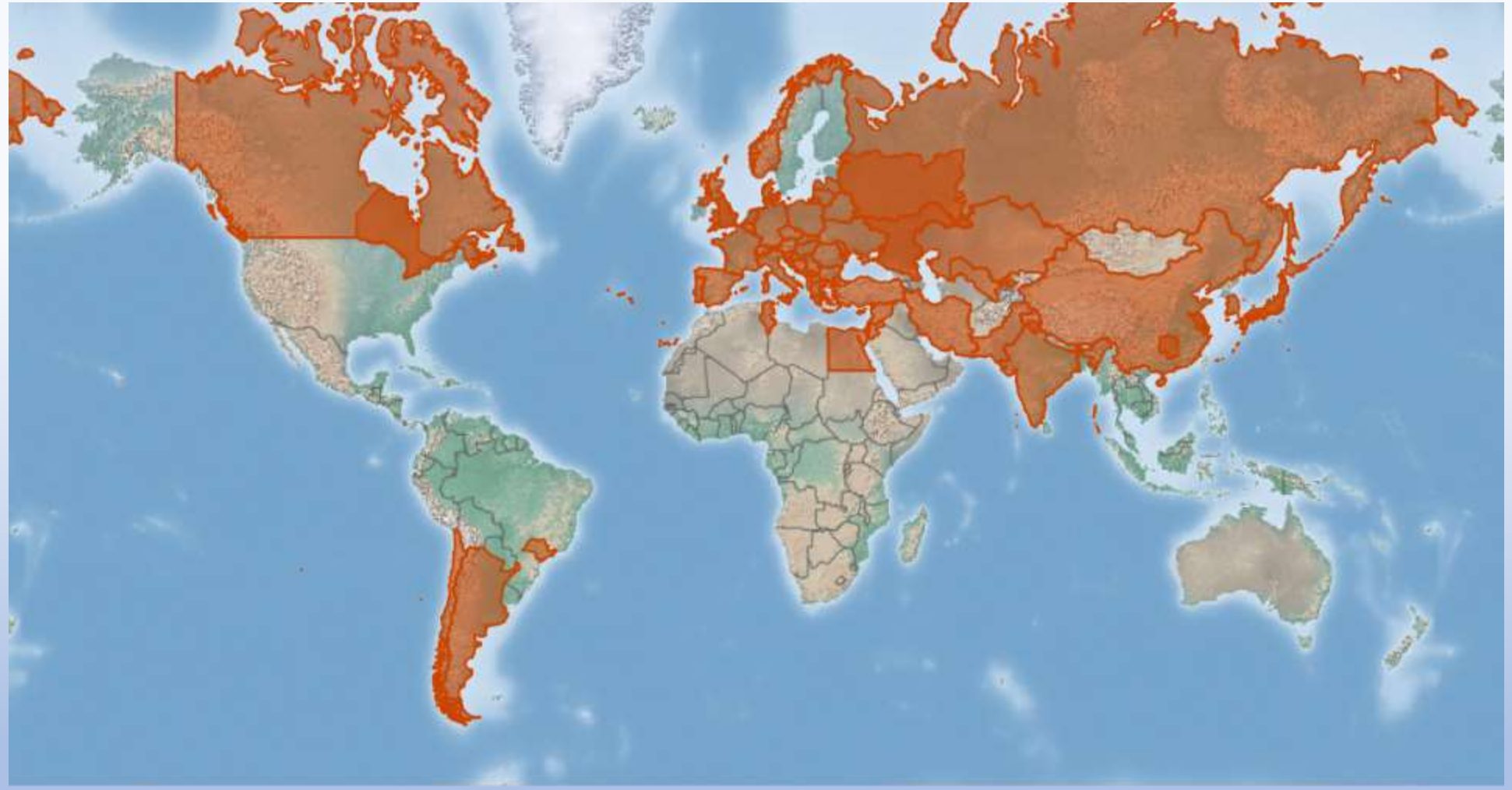
Plum pox or sharka disease, caused by *Plum pox virus* (PPV), was detected in the early 1900s in Bulgaria and Macedonia and was first described in 1932.

The disease thereafter was observed on apricots in Bulgaria and on peaches in Hungary and Germany, and it has progressively spread to fruit-producing areas of most European countries, then to the Mediterranean region.

In the 1990s, the disease was observed on sour and sweet cherry trees in Moldova, Italy, Romania, and Hungary.

Plum pox disease has been recognized for years as the most important viral disorder of stone fruit trees in Europe and the Mediterranean region, and the losses caused by PPV may be dramatic.

Early detection of plum pox virus is important because there is no cure once it gets established in an orchard. Once infected, trees with the virus, and those in a 50-meter radius, need to be removed and destroyed to eradicate PPV. This is important because PPV does not kill trees. If the trees are left to stand, the tree will remain as a reservoir for the virus



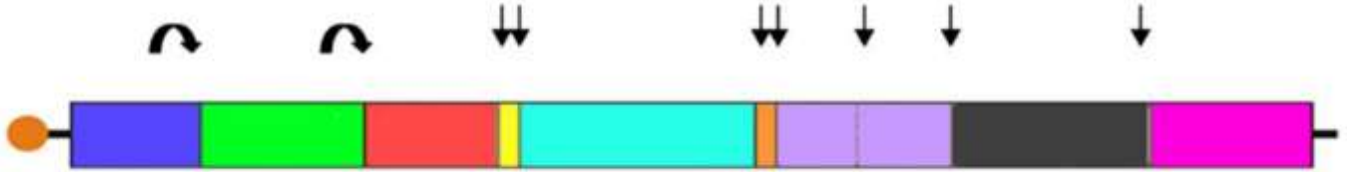
CABI, 2022. Plum pox virus. In: Invasive Species Compendium. Wallingford, UK: CAB International. https://www.cabi.org/isc

Nucleic Acid: ssRNA:~ 10.000 nt

200 nt: well conserved, capsidation and translation

Not conserved, union viral replicase

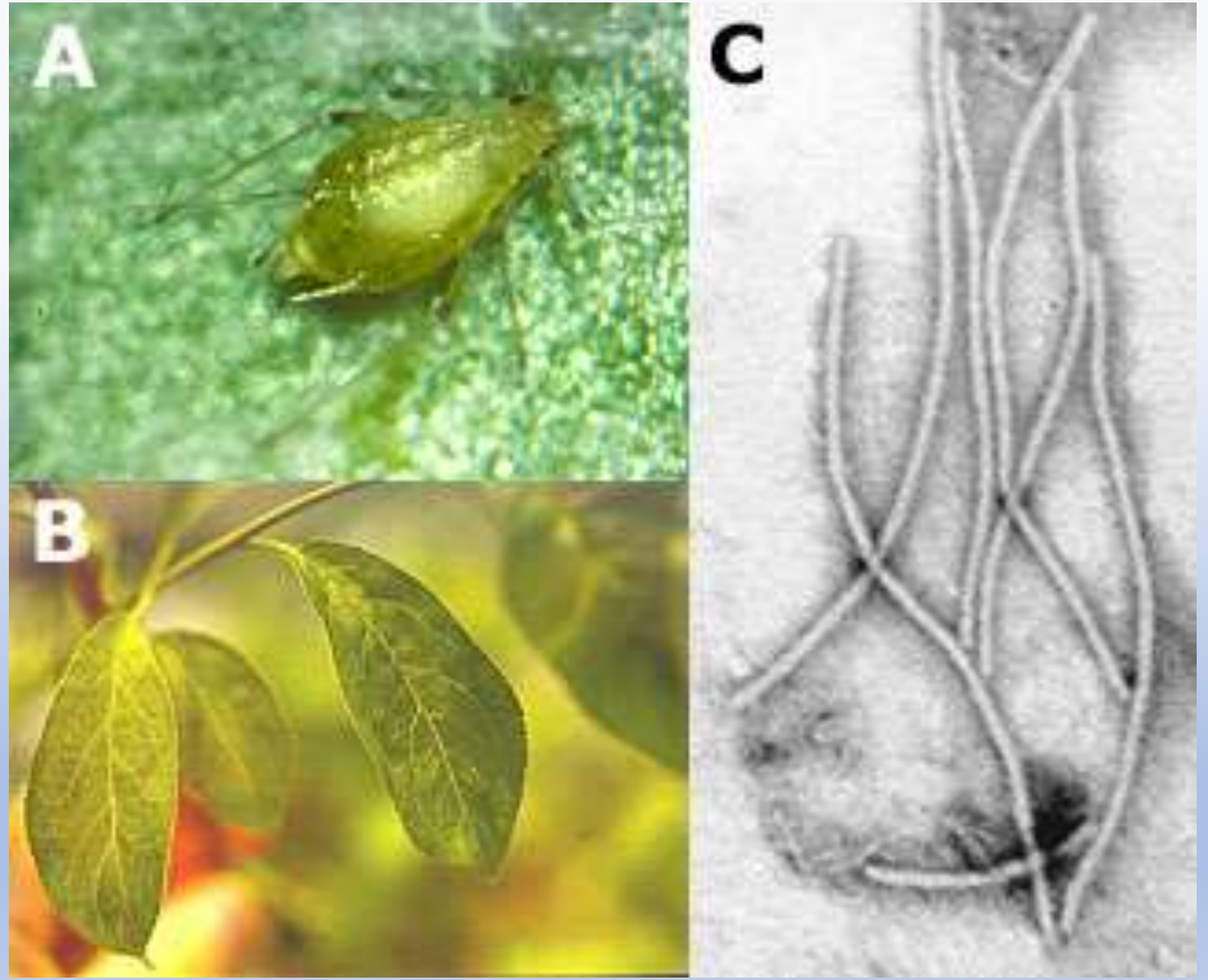
Polyprotein structure: 3.125 - 3.140 aa



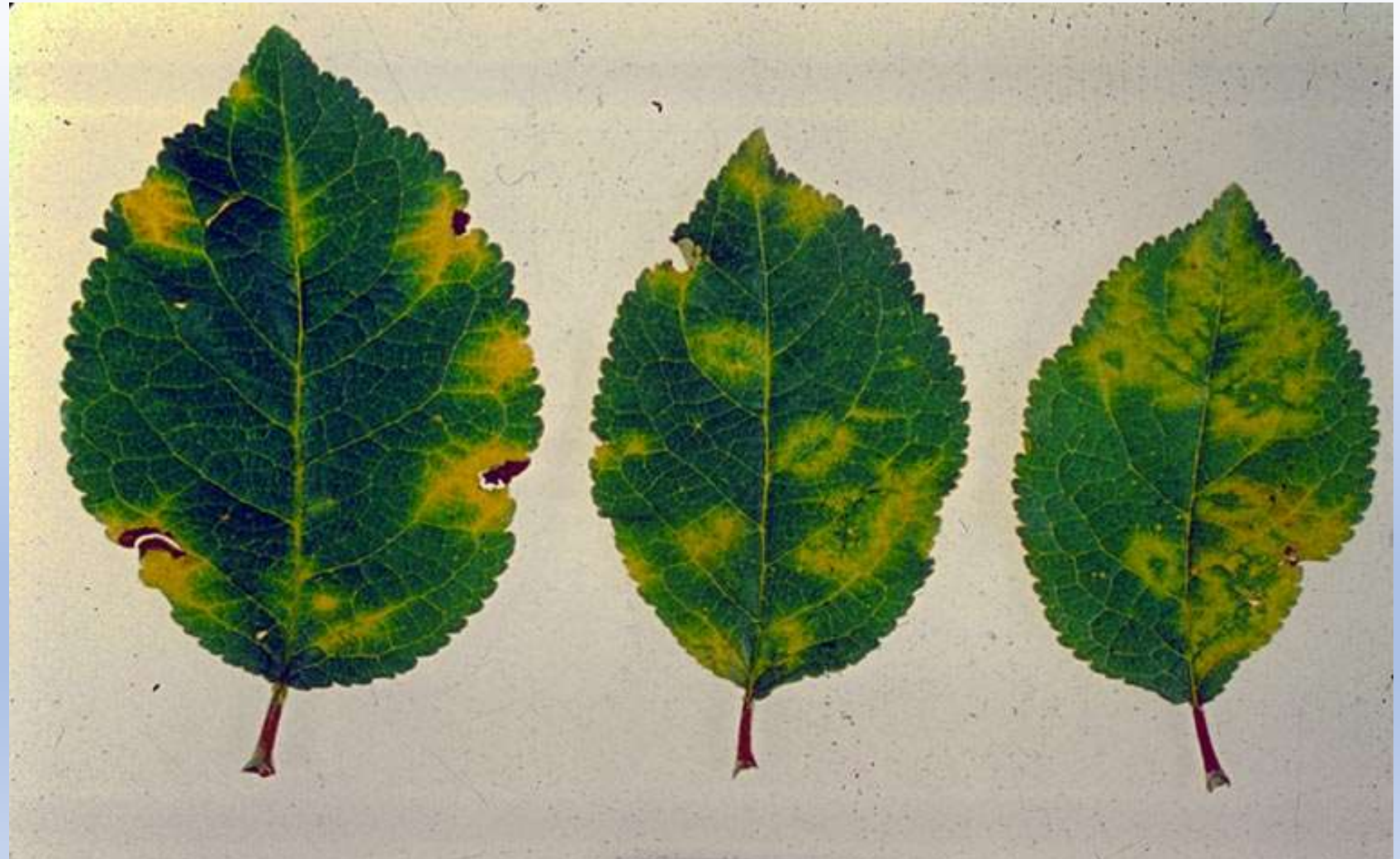
PTGS

Long distance movement PTGS

Short and Long Distance movement

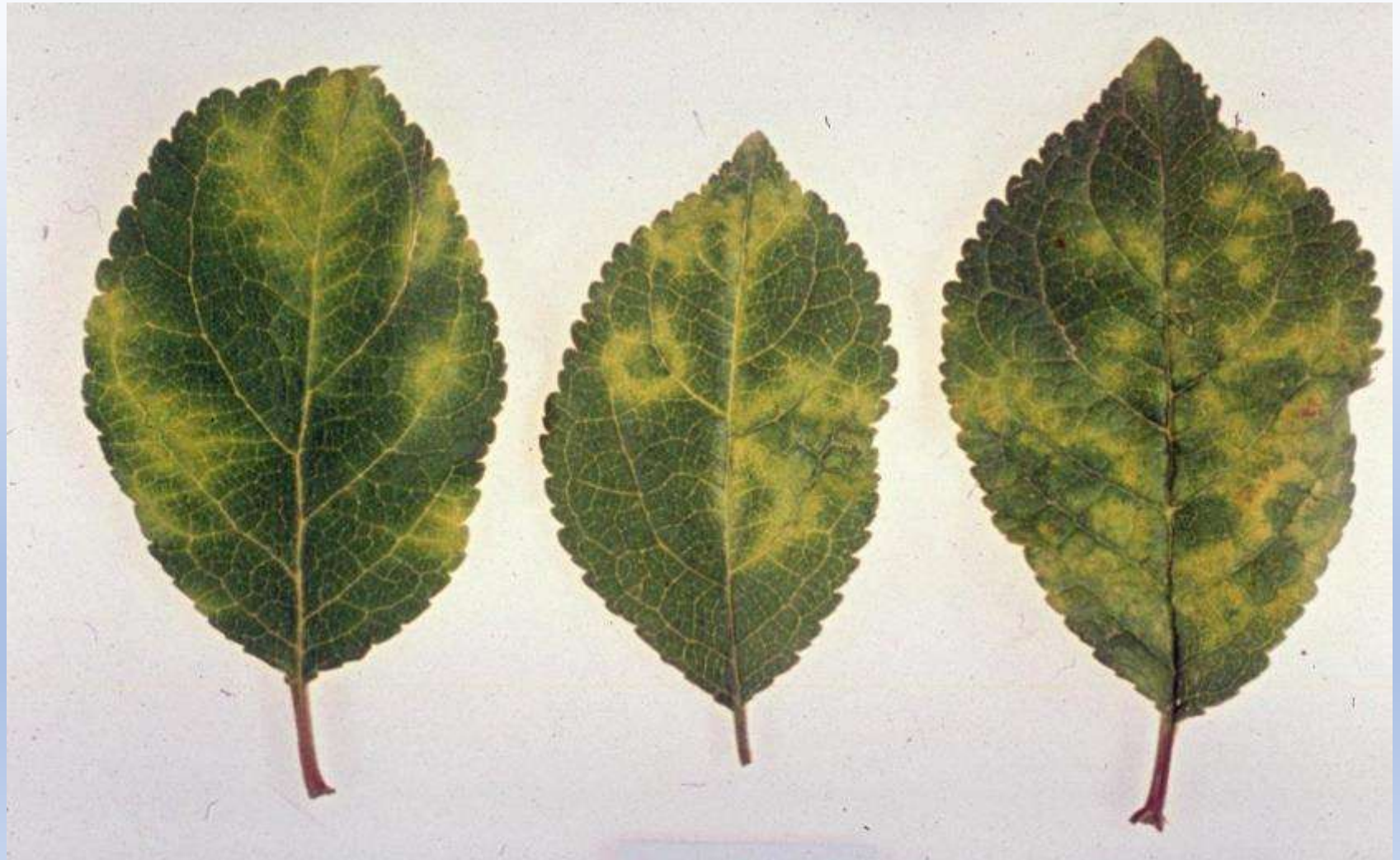

A
B
C

Symptoms of plum pox on leaves of plum cv. Ackermann



Symptoms of plum pox on leaves of plum

Symptoms of plum pox on leaves of plum

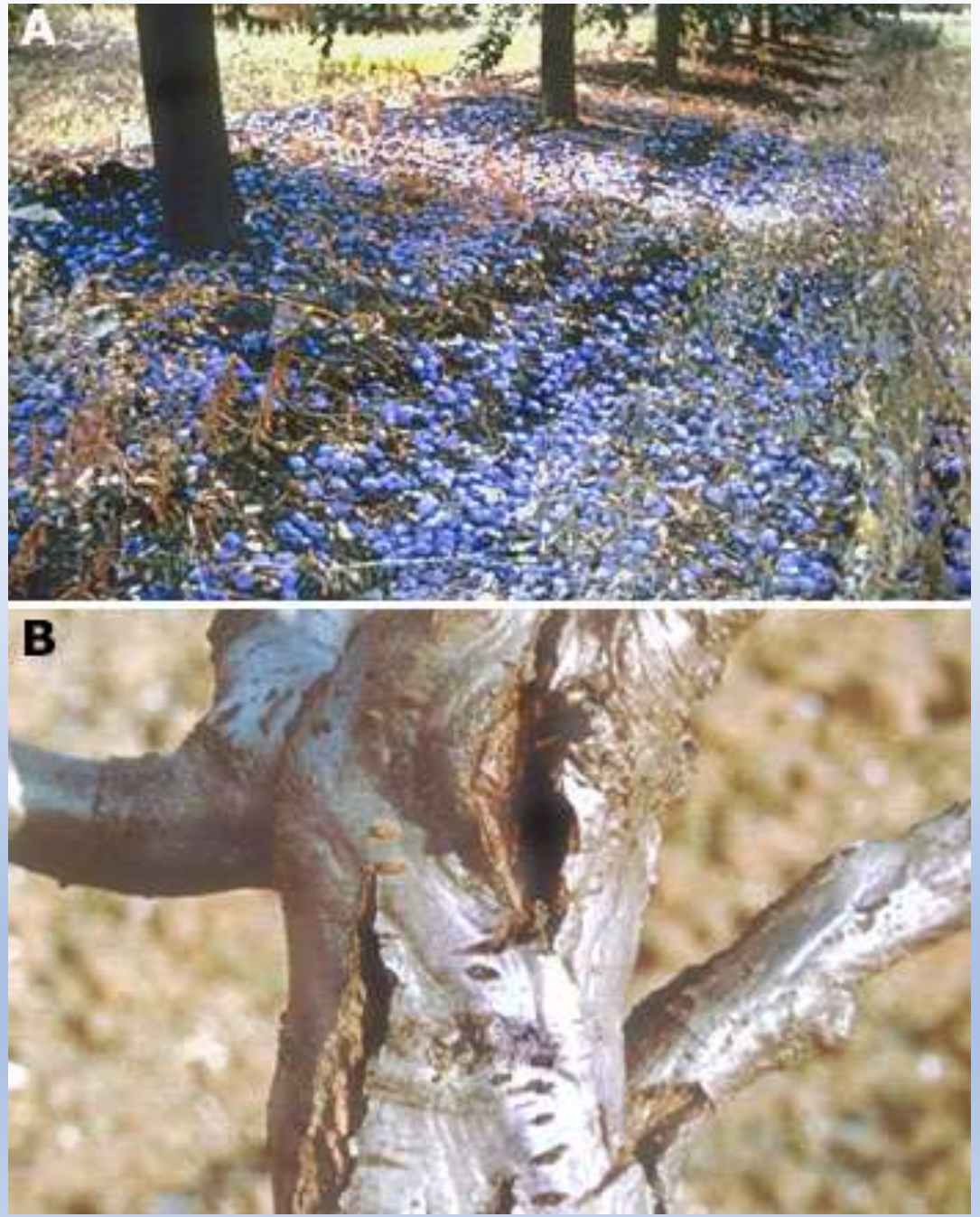


Pigmented rings on an infected peach.

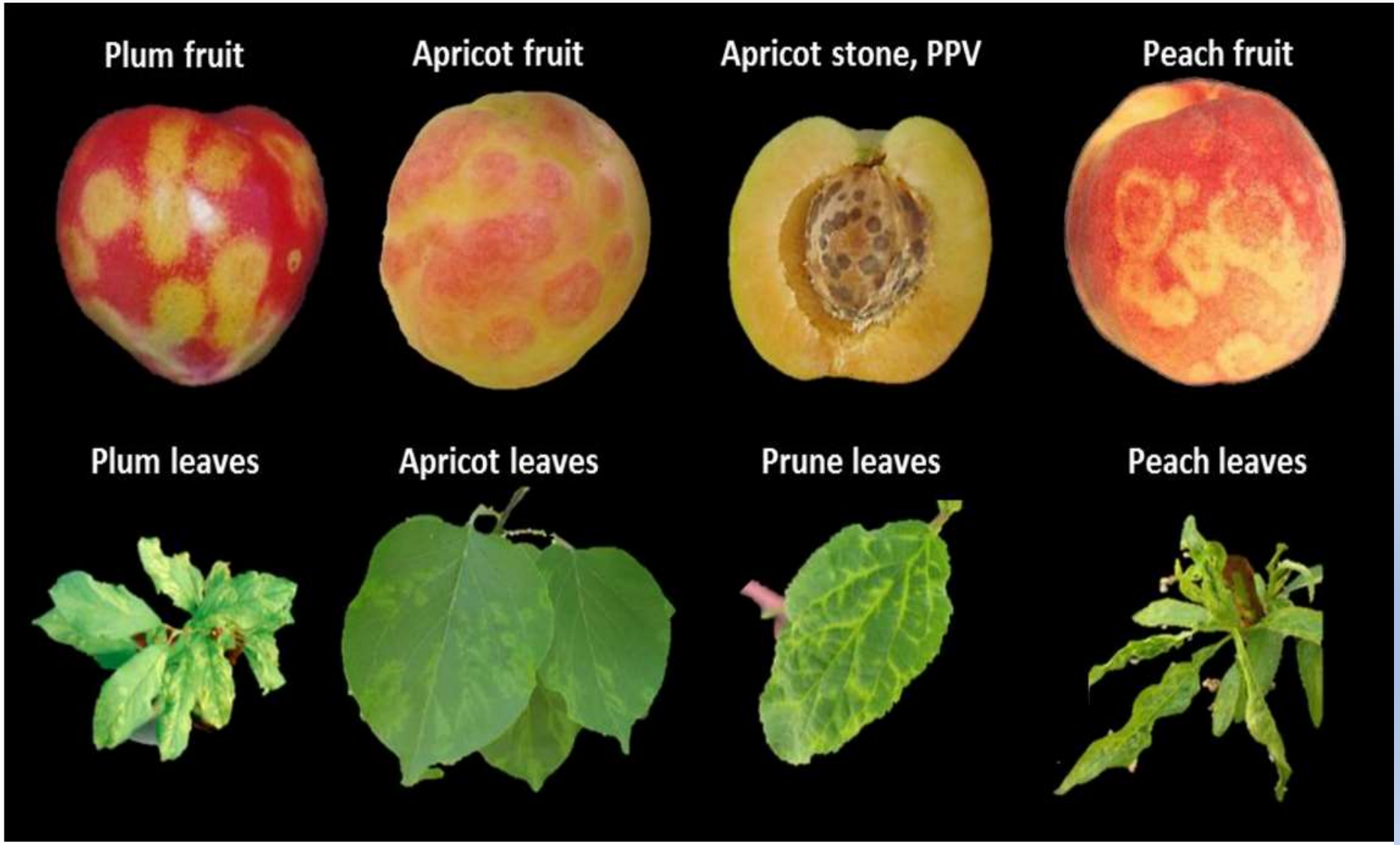
Plum pox virus on apricot seed

Plum pox virus on apricot fruit

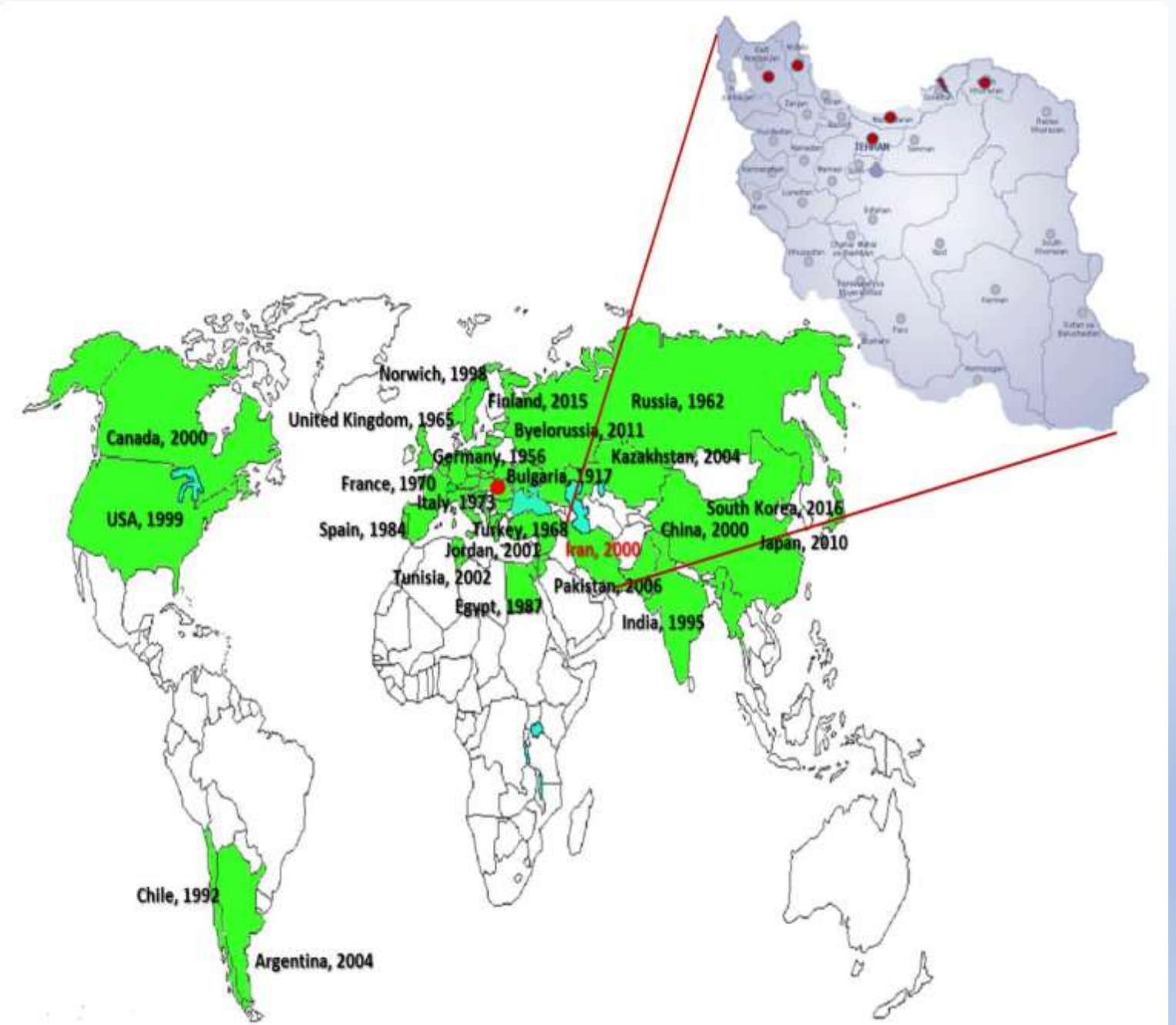
Deformed fruit of infected plum tree.


A
B

Plum pox virus (sharka) symptoms in fruits, endocarps and leaves of different Prunus species including plum, apricot, peach and prune.



Some peach cultivars may show color-breaking symptoms on the flower petals


Norwich, 1998
Finland, 2015
Russia, 1962
United Kingdom, 1965
Byelorussia, 2011
Canada, 2000
Germany, 1956
Kazakhstan, 2004
France, 1970
Bulgaria, 1917
Italy, 1973
South Korea, 2016
USA, 1999
Spain, 1984
Turkey, 1968
China, 2000
Jordan, 2001
Iran, 2000
Japan, 2010
Tunisia, 2002
Pakistan, 2006
Egypt, 1987
India, 1995
Chile, 1992
Argentina, 2004

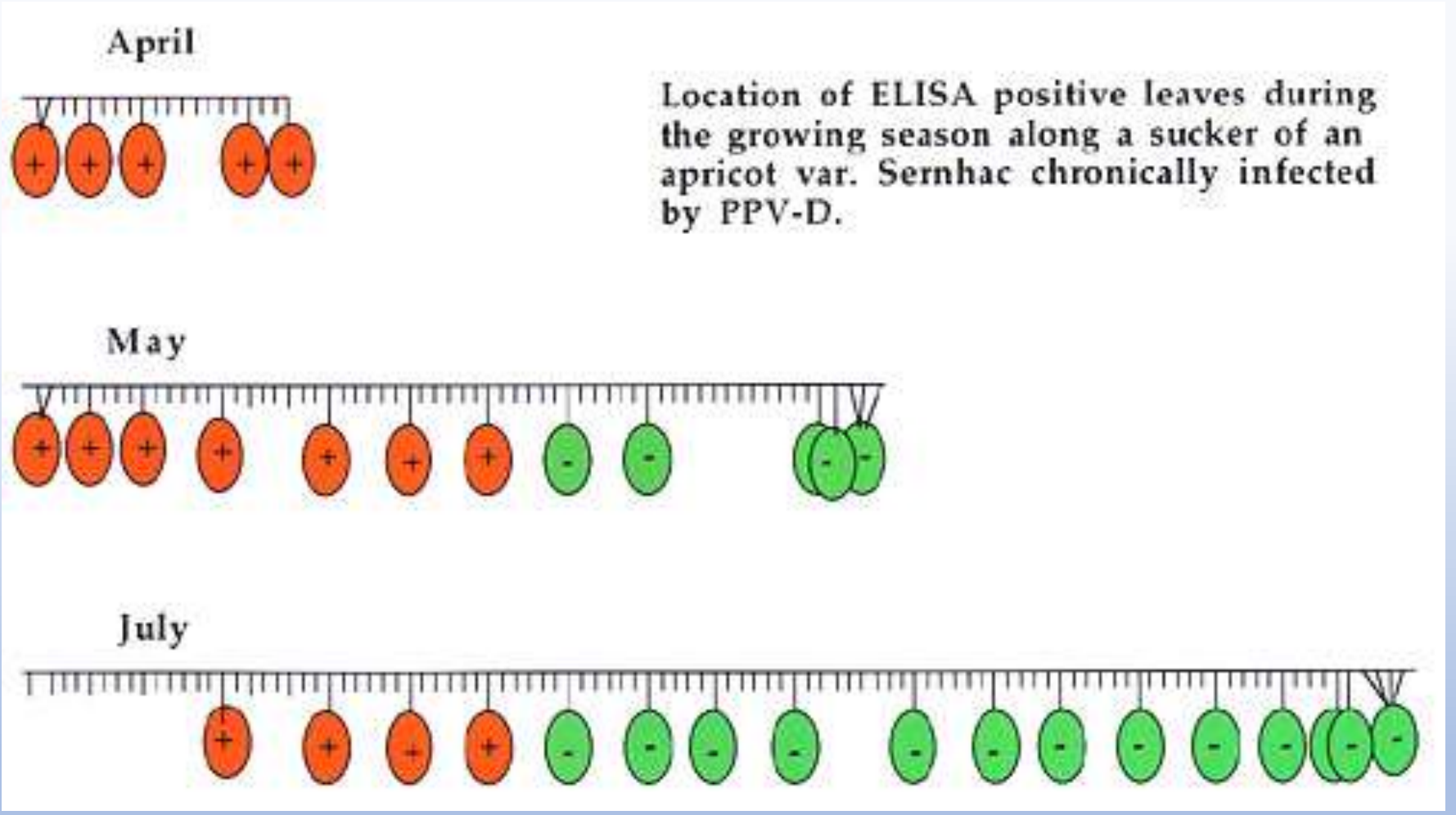
PPV strains described up today.

Isolate Type	Description
PPV-D (Dideron)	Originally described in apricot in France in 1995, it is the most abundant isolate, characterized by a lower aggressiveness and a low speed of diffusion. It affects the apricot tree, plum tree and, to a lesser extent, the peach tree. It is believed to be the original isolate detected in Bulgaria in 1917.
PPV-M (Marcus)	Described in 1995 in peach orchard in Greece, it presents high aggressiveness and speed of diffusion. Affects peach, apricot and plum.
PPV-EA (El Amar)	Originally described in apricot tree in Egypt in 1987, it has high aggressiveness. Affects peach, apricot and plum.
PPV-C (Cherry)	Originally described in cherry tree in Moldavia in 1994. It is the unique PPV that affects the cherry tree in the nature, although also it affects the peach tree, apricot tree and plum tree. It is located in centre Europe.
PPV-Rec (Recombinant)	Recombinant isolate between PPV-M and PPV-D with a breakpoint at the carboxyl-terminal end of the NIb gene described in 2004.
PPV-T (Turkey)	It is a new strain originated in Turkey in 2009.
PPV-W (Winona)	It is a new strain, apparently originated in Eastern Europe and Russia in 2011.
PPV-Pen (Pennsylvania)	It is a new strain described in Pennsylvania (United States) in 2011.
PPV-An (Anatolia)	It is a new strain described in Turkey in 2012.
PPV-CR (Cherry Russian)	It is a new strain, apparently originating in Eastern Europe and Russia in cherry in 2013

Aphid species shown to be vectors of plum pox virus.

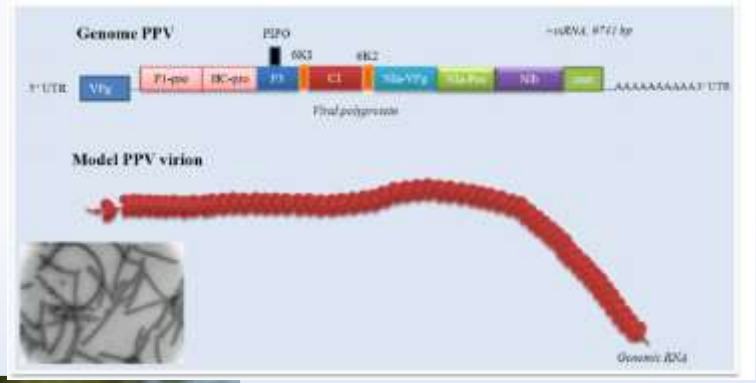
Aphid Species	Colonizes Prunus	Host
Aphis arbuti	**No**	***Arbutus unedo***
A. craccivora*	**No**	**Polyphagous**
A. fabae	**No**	**Polyphagous**
A. gossypii*	**No**	**Polyphagous**
A. hederae	**No**	***Hedera helix***
A. spiraecola*	**Occasionally**	**Polyphagus; Apple; Citrus**
Brachycaudus cardui	**Yes**	***Prunus;* Compositae**
B. helichrysi **	**Yes**	***Prunus;* Compositae**
B. persicae*	**Yes**	***Prunus***
Dysaphis plantaginea	**No**	**Apple; Plantago**
D. pyri	**No**	**Pear; *Gallium***
Hyalopterus pruni*	**Yes**	***Prunus; Fragmites***
Macrosiphum rosae	**No**	***Rosa;* Dipsaceae**
Megoura rosae	**No**	**Leguminoseae**
Myzus persicae **	**Yes**	**Polyphagous**
M. varians	**Yes**	**Peach; *Clematis***
Phorodon humuli **	**Yes**	***Prunus; Hop***
Rhopalosiphum padi	**No**	***Prunus padus;* Gramineae**
Sitobion fragariae	**No**	***Rosa;* Gramineae**
Ureleucon sonchi	**No**	***Lactuca; Sonchus***

*Recognized aphid vectors,
** Most important vectors.
Data communicated personally by J. B. Quiot, INRA, Montpellier, France.



Location of ELISA positive leaves during the growing season along a sucker of an apricot var. Sernhac chronically infected by PPV-D.

Genetic engineering of Plum pox virus resistance: ‘HoneySweet’ plum—from concept to product, 2013



Harvest of ‘HoneySweet’ plums in test plot at Kearneysville, West Virginia, USA

Poplar Flowering Locus T (PtFT) transgenic early flowering *P. domestica* plum line in the greenhouse hybridized with ‘Honey-Sweet’ for rapid incorporation of the ‘HoneySweet’ resistance insert into new *P. domestica* germplasm and cultivars

Prune dwarf virus ویروس کوتولگی گوجه

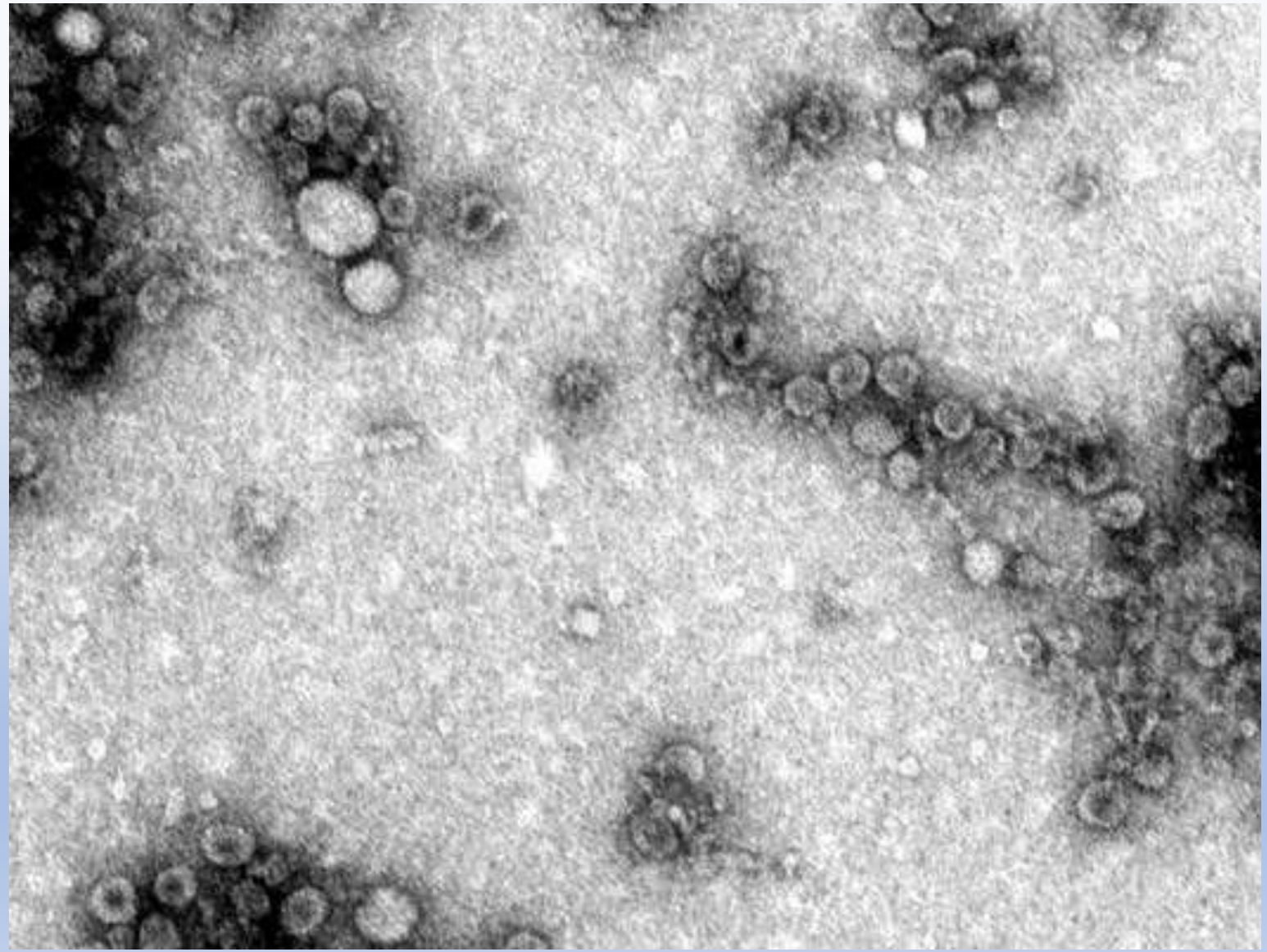
ویروس کوتولگی گوجه یک ویروس مهم اقتصادی بوده و موجب خسارات اقتصادی در گیلاس، آلبالو، بادام و هلو می شود.
این ویروس در درخت آلو موجب کوتولگی و بدشکلی برگها می شود.

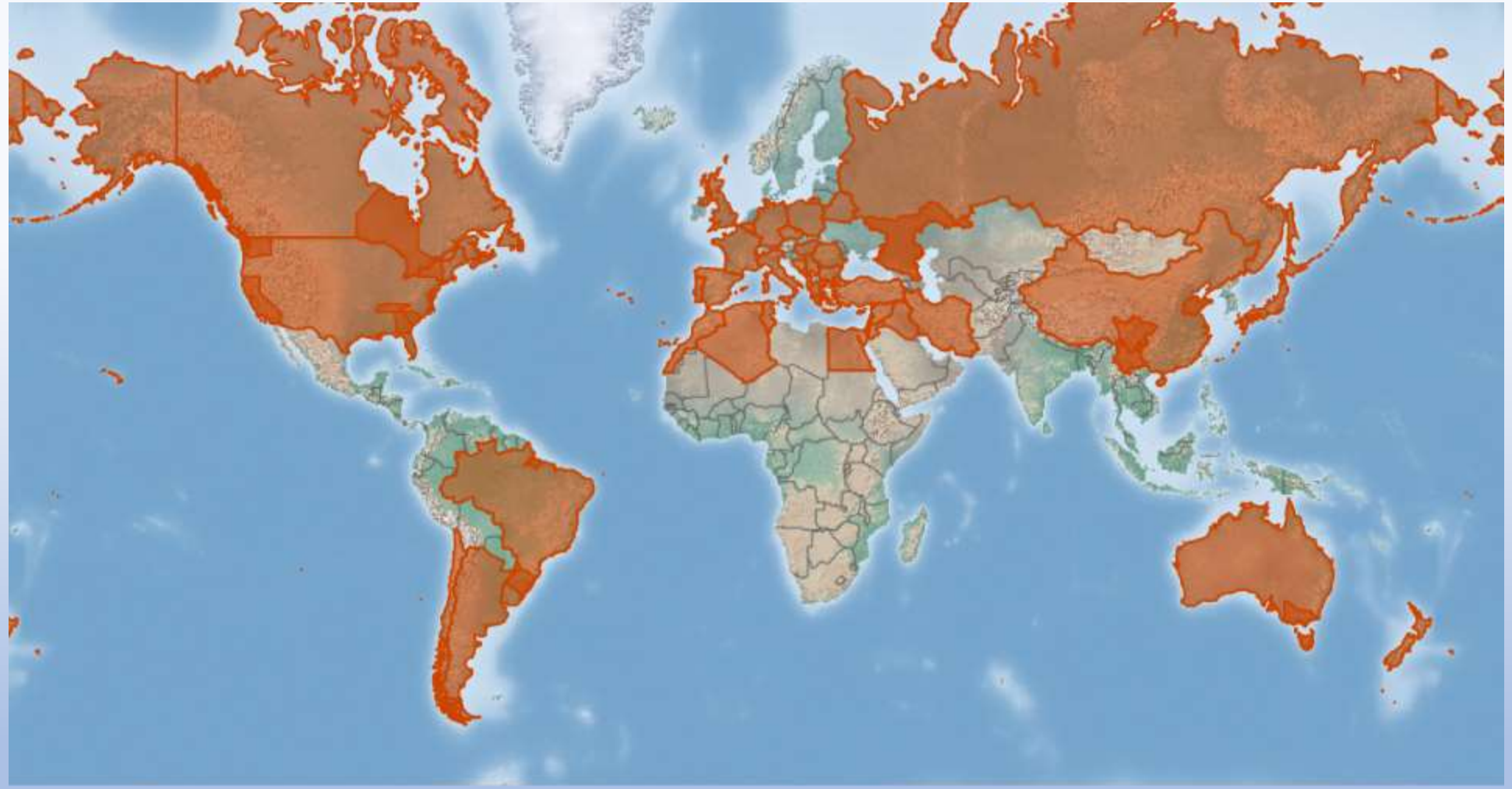
The extent of damage caused by PDV strongly depends on the *Prunus* species or cultivar affected and on the virus isolate involved.

The infection of fruit-bearing trees causes losses mostly in sour cherry and in some plum cultivars.

- Domain: Virus
- Group: "Positive sense ssRNA viruses"
- Group: "RNA viruses"
- Family: Bromoviridae
- Genus: Ilarvirus
- Species: Prune dwarf virus

تصویر میکروسکوپ الکترونی از پیکره های کروی ویروس





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پیسک زرد در برگهای گیلاس ناشی از آلودگی PDV

علائم لکه حلقوی و نقوش خطی در برگ گیلاس آلوده به PDV

رویش برگچه های ریز در پشت برگ گیلاس ناشی از PDV

رویش برگچه های ریز در پشت برگ گیلاس ناشی از PDV

شاخه درخت سالم در سمت راست
و شاخه درخت آلوده به PDV در سمت چپ

لکه های حلقوی سبزرد در برگ هلو ناشی از PDV

بدشکلی و لکه های حلقوی سبزرد در آلبالو محلب *Prunus mahaleb* ناشی از آلودگی PDV

Chlorotic line pattern on a **peach** leaf caused by PDV.
Various patterns of chlorotic mottling, shortening of stem internodes and reduced growth have been observed in peach plants infected by PDV alone or in mixed infections.

Mottling on a plum leaf caused by PDV.
Stunting and chlorotic lines and/or ringspot on the leaves are associated with the presence of PDV.

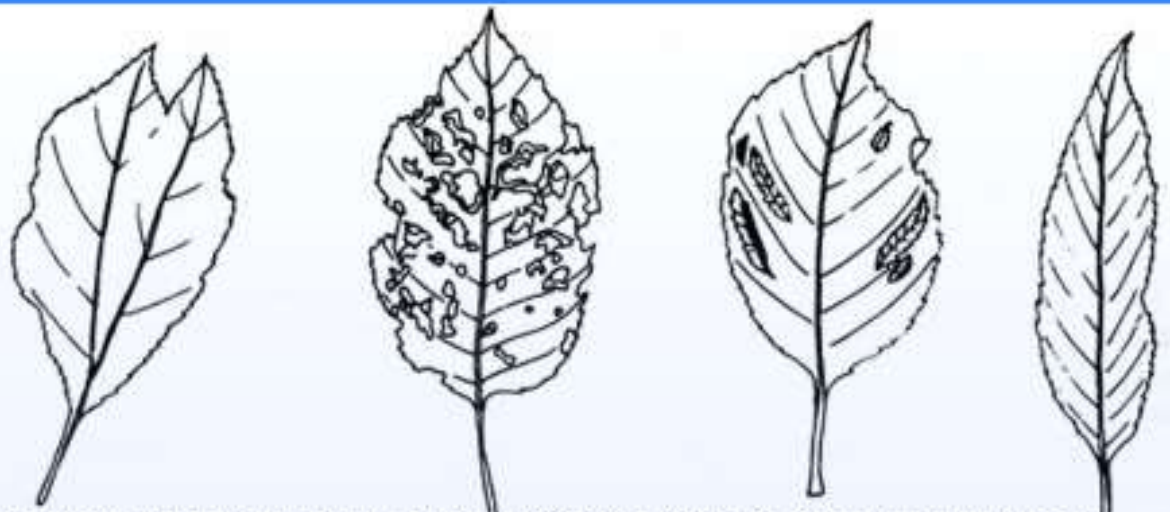
Prune dwarf virus: chlorotic ringspot on almond leaf.

Prune dwarf virus: yellowing and stunt of peach (shortening of the internodes and reduced growth).

Prune dwarf virus: chlorotic line pattern on sweet cherry leaf.

PDV can cause chlorotic ringspots and line patterns on young cherry leaves and red spots on ripening fruits.

PDV may cause up to 50% yield loss in sour cherry, low bud-take in nurseries (40% to 50% compared with healthy stocks) and slower growth of young trees.



http://www.tankonyvtar.hu/hu/tartalom/tamop425/2011_0001_521_Kerteszeti_novenykortan/ch02s02.html

Foliar symptoms:

- in form of rings, green or yellow spots and chlorotic patterns (Prunus spp. hosts)
- can become necrotic with a loss of the necrotised areas resulting in "shot-hole"-type symptoms

Fruit:

- impact fruit growth (by up to 10-30%)
- influence yield (by up to 20-60%)
- delay fruit maturity

Plants in nurseries:

- reducing bud-take
- tree survival rates

Plants on the filed:

- terminal and lateral shoots are often irregular in lenght, stunted or die back at growing points
- occasionally large areas of bark are killed
- severely affected limbs are more susceptible to winter damage

آلودگی توام درخت گیلاس به دو ویروس PDV و PNRSV موجب تشدید علائم و زوال درخت می شود.

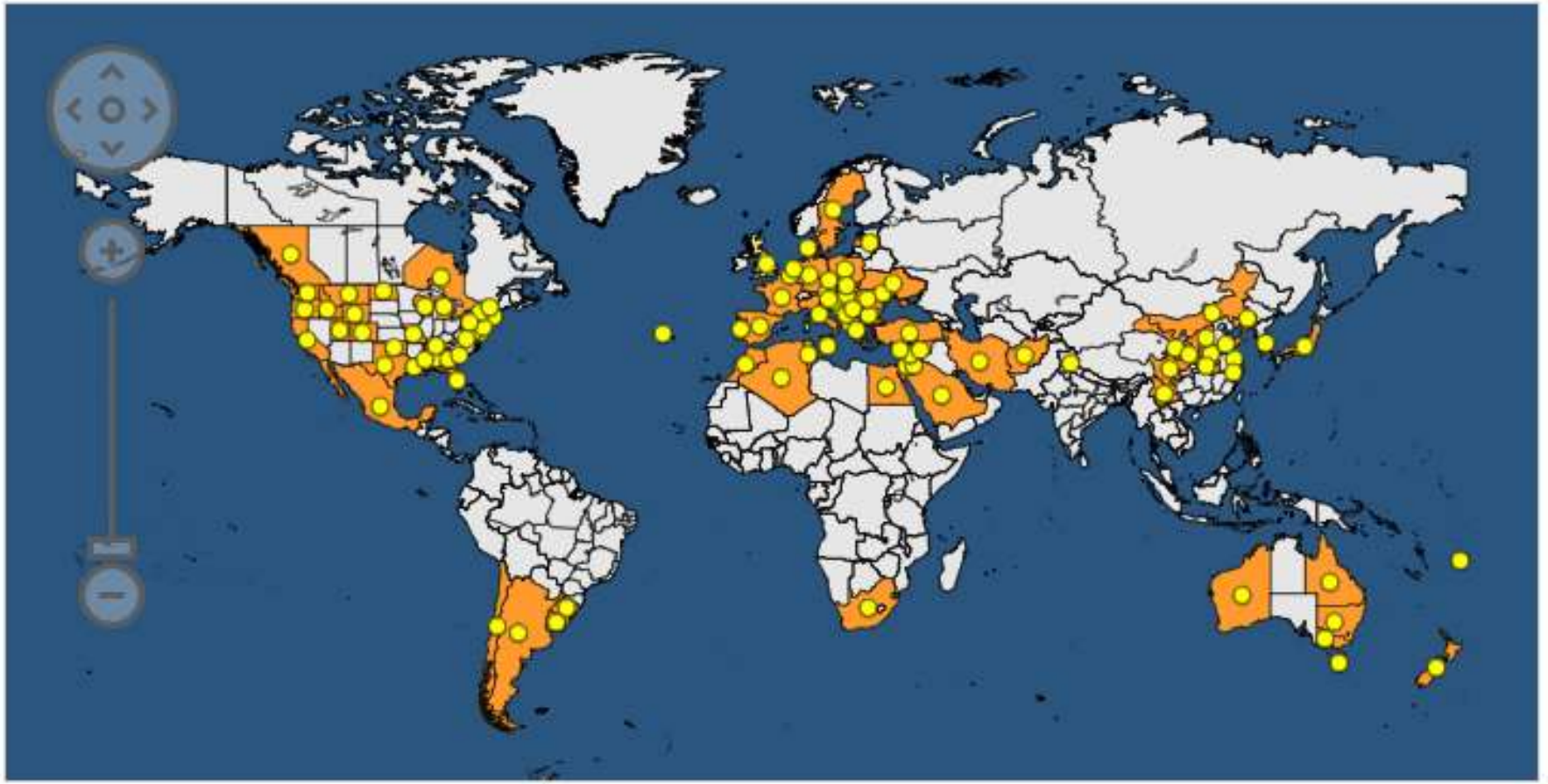
Prunus necrotic ringspot virus ویروس لکه حلقوی نکروتیک هسته دارها

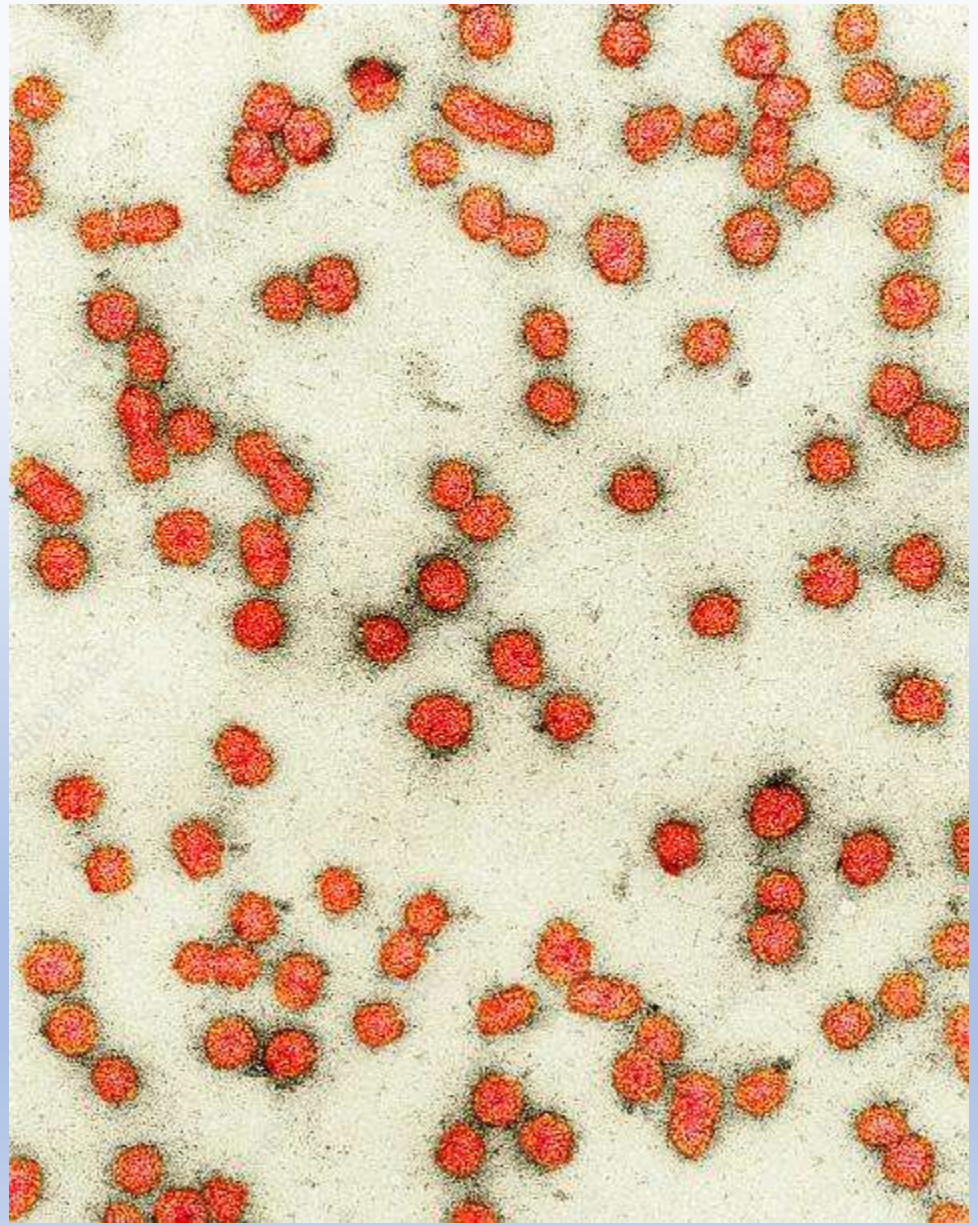
Prunus necrotic ringspot virus (PNRSV) occurs worldwide and is a serious pathogen of many species of *Prunus,* including peach, plum, and sweet cherry.

The ring spot disease was first reported in the United States in 1941 in orchard peach trees (cultivars J. H. Hale and Late Elberta) and was described based primarily on leaf symptomatology, including rings, yellow spots, and chlorotic patterns.

تاکنون سویه ها و واریانت های متنوعی برای این ویروس در جهان گزارش شده است.

نژاد معمول این ویروس موجب کاهش ۵ تا ۱۰ درصدی محصول در درختان آلوده می شود.





Chlorotic and necrotic ring spots on cherry.

Symptoms observed during survey (A) Chlorotic spots on plum, (B) Mosaic and shot holes on plum, (C) Chlorotic symptoms on apple, (D) Necrotic spots on cherry.

Fruit maturity may be delayed, and fruit may be marked.

Transmission:

- grafting transmissible agent (transmissible through vegetative multiplication of infected host plants)
- transmissible via seeds and pollen at variable rates in several natural hosts (Prunus spp., Humulus spp., Rosa spp.)

(It was discoverd also in *Rubus ellipticus* , a wild species from the Himalayan region -maybe *Rubus* spp. can be susceptible in other countries, but about Raspberry and Blackberry we have no information)

Transmission vectors:

- reported transmission by the mite **Vasates fockeui**
- reported transmission by the nematode **Longidorus macrosoma**
- thrips ***Frankliniella occidentalis***

cause pollen-mediated spread mechanism, tranmission of PNRSV via their feeding on infected pollen, PNRSV is transmitted mechanically by infective sap

- PNRSV can be transmitted to healthy trees during pollination by bees.

راهبردهای مدیریت بیماریهای ویروسی درختان میوه هسته دار:

- شناسایی، تعیین ناقلین، تنوع و پراکنش بیماریهای ویروسی در باغات کشور

- ممانعت از ورود ویروس به مناطق غیرآلوده با اعمال روش‌های قرنطینه خارجی و داخلی

- جلوگیری از ورود و استقرار ویروس به باغ‌های جدید با استفاده از نهال‌های سالم (گواهی سلامت)

-پایش، ردیابی و حذف درختان آلوده در باغ‌ها یا نهالستان‌ها

-نظارت بر فعالیت نهالستانها در استفاده از مواد تکثیری سالم در تولید نهال

-ساماندهی و به روز رسانی اطلاعات کلینیکهای گیاهپزشکی و کارشناسان شبکه های مراقبت در پایش باغات

-ساماندهی و حمایت از شرکتهای دانش بنیان تولید هسته های اولیه نهال سالم

-توسعه و بومی سازی دانش فنی و فناوریهای تولید نهال‌های عاری از ویروس (۱-توسعه روشهای تشخیصی، ۲-توسعه روش‌های حذف ویروس از مواد گیاهی مانند حرارت درمانی، شیمی درمانی، سرما درمانی، الکترودرمانی، کشت بافت).

وزارت جهاد کشاورزی
سازمان تحقیقات، آموزش و ترویج کشاورزی
موسسه آموزش و ترویج کشاورزی

معاونت علمی و فناوری
شبکه دانش کشاورزی

سلسله برنامه‌های ویدیو کنفرانس انتقال دانش به روز در گستره ملی بخش کشاورزی

عنوان:

بیماری‌های ویروسی مهم هسته‌دارها و روش‌های مدیریت آنها

سخنران:

دکتر رضا پوررحیم

عضو هیأت علمی موسسه تحقیقات گیاهپزشکی کشور

پژوهشگر مروج ارشد/ محقق معین / مدرس

۲۱ بهمن ۱۴۰۳- ساعت: ۱۱/۳۰