Information Required To Initiate The Pest Risk Analysis
For Apple (*Malus Domestica*)

1. Basic information for the PRA request:

1.1. Stakeholder Data:

- Name of individual / institution / company / diplomatic representation or NPPO

General Directorate of Food and Control

- Name of the legal representative

Assoc. Prof. PhD. Yunus BAYRAM

- CPF / CNPJ (does not apply to Diplomatic Representations and NPPOs)

Not relevant

- Complete address

Eskisehir yolu 9. Km Lodumlu, Cankaya, Ankara, TÜRKİYE

- Telephone

90 312 258 76 11

- E-mail

nppoturkiye@tarimorman.gov.tr

1.2. Vegetable product object of the PRA:

Kingdom	: Plantae (Plants)
Division	: Magnoliophyta (Angiosperms)
Class	: Magnoliopsida (dicotyledons)
Order	: Rosales
Family	: Rosaceae (Roseceae)
Sub-family	: Maloideae
Genus	: Malus
Species	: M. *domestica*

Binominal name: *Malus domestica*

- Vegetable part to be imported (fruit, seed, plant, cuttings, etc.)

Fruit

- Intended use (propagation, consumption, processing, etc.)

Consumption

1.3. Identification of production areas or regions

Apple producing regions and provinces

Marmara Region : Bursa, Balıkesir, Çanakkale

Mediterranean Region : Antalya, Isparta, Burdur

Aegean Region : Denizli, Uşak, Muğla, Kütahya

Black Sea Region : Kastamonu, Amasya, Tokat

Central Anatolia Region : Karaman, Niğde, Nevşehir, Konya, Kayseri,

Eastern Anatolia Region : Erzincan, Erzurum, Van

2. PRA process:

2.1. To prepare the PRA report, the DSV/SDA may request the NPPO of the exporting country the information identified below:

Information on pests associated with the crop occurring in the exporting country:

INFORMATİON ON PESTS ASSOCIATED WITH THE CROP OCCURRING IN THE EXPORTING COUNTRY			
Scientific name	**Taxonomic Classification**	**Part of the plant attacked**	**References**
Bacteria			
Agrobacterium tumefaciens (Smith & Townsend) Conn *Current name: Rhizobium radiobacter*	Alphaproteobacteria Rhizobiales Rhizobiaceae	Fruit / reduced Roots / galls along length Roots / galls at junction with stem Roots / hairy root Roots / reduced root system Stems / galls Stems / odour Stems / stunting or rosetting Whole plant / dwarfing Whole plant / uprooted or toppled	https://www.cabi.org/isc/datasheet/3745
Candidatus Phytoplasma mali (Apple proliferation)	Mollicutes Acholeplasmatales Acholeplasmataceae	Fruit / abnormal shape Fruit / discoloration Fruit / reduced size Leaves / abnormal colours Leaves / abnormal forms Leaves / abnormal leaf fall Leaves / fungal growth Leaves / leaves rolled or folded Leaves / yellowed or dead Roots / reduced root system Stems / gummosis or resinosis Stems / stunting or rosetting Stems / witches broom Whole plant / distortion; rosetting	CABI, 2019a, https://www.cabi.org/isc/datasheet/6502
Erwinia amylovora (Burrill) Winslow et al.	Gammaproteabacteria Enterobacteriales Enterobacteriaceae	Fruit / mummification Leaves / necrotic areas Leaves / wilting	CABI, 2019d. https://www.cabi.org/isc/datasheet/21908

		Leaves / yellowed or dead Stems / canker on woody stem Stems / dieback Stems / discoloration of bark	
Pseudomonas syringae pv. syringae van Hall	Gammaproteobacteria Pseudomonadales Pseudomonadaceae	Fruit / lesions: black or brown Fruit / lesions: on pods Fruit / lesions: scab or pitting Fruit / ooze Inflorescence / blight; necrosis Leaves / abnormal colours Leaves / necrotic areas Leaves / odour Leaves / yellowed or dead Roots / cortex with lesions Seeds / lesions on seeds Stems / canker on woody stem Stems / dieback Stems / discoloration of bark Stems / gummosis or resinosis Whole plant / dwarfing Whole plant / unusual odour	CABI, 2019g. https://www.cabi.org/isc/datasheet/45014 (see reference) EPPO, 2019c. https://gd.eppo.int/taxon/PSDMYS
Fungi			
Alternaria alternata (Fr.) Keissl.	*Ascomycota* *Dothideomycetes* *Pleosporales* *Pleosporaceae*	Fruit	Anonymous, 2008
Armillaria mellea (Vahl) P. Kumm.	*Basidiomycota* *Agaricomycetes* *Agaricales* *Marasmiaceae*	Root, stem, leaf	Anonymous, 2008

Cytospora cincta Sacc.,	*Ascomycota* *Sordariomycetes* *Diaporthales* *Cytosporaceae*	Trunk, branch, shoot	Gökçe et al. 2011; Anonymous, 2021
Gymnosporangium confusum Plowr.	*Basidiomycota* *Pucciniomycetes* *Pucciniales* *Pucciniaceae*	Leaf, fruit, shoot	Anonymous, 2008
Monilinia fructigena (Aderh. & Ruhland)	*Ascomycota* *Leotiomycetes Helotiales* *Sclerotiniaceae*	Shoot, fruit, leaf, blossom	Anonymous, 2008; CABI, 2021
Phytopthora cactorum (Lebert & Cohn) Schröter	*Oomycota* *Oomycetes* *Peronosporales* *Peronosporaceae*	Root, stem, leaf	Anonymous, 2021a
Podosphaera leucotricha (Speg.) Niessl	*Ascomycota* *Leotiomycetes* *Erysiphales* *Erysiphaceae*	Leaf, shoot, blossom	Anonymous, 2008; CABI,2021
Rosellinia necatrix Prill.	*Ascomycota* *Sordariomycetes Xylariales* *Xylariaceae*	Root, stem	Anonymous, 2008
Venturia inaequalis (Cooke) G. Winter	*Ascomycota* *Dothideomycetes* *Pleosporales* *Venturiaceae*	Branch, fruit, leaf, shoot	Anonymous, 2008 CABI,2021

Insects			
Anoplophora chinensis (*Forster*, 1771)	Insecta Coleoptera Cerambycidae Regulated quarantine organism Pest Free Area(s) in accordance with ISPM 4 is (are) determined in Türkiye **Regulated quarantine organism**	Leaves/external feding Roots/internal feding Stems/gummosis or resinosis Stems/internal feding Stems/visible frass Whole plant/frass visible Whole plant/plant dead; dieback	https://www.cabi.org/isc/datasheet/5556#tohostPlants
Ceratitis capitata (Wiedemann)	Insecta Diptera Tephritidae Pest Free Area(s) in accordance with ISPM 4 is determined in Türkiye **Regulated quarantine organism**	Fruit/internal feeding	https://www.cabi.org/isc/datasheet/12367#tohostPlants
Aculus schlechtendali (Nalepa)	Arachnida Acarina Eriophyidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Fruit/external feding Leaves/abnormal colours Leaves/abnormal forms Leaves/abnormal leaf fall Leaves/wilting Leaves/yellowed or dead	https://www.cabi.org/isc/datasheet/56112

Aphis pomi Deg	Insecta Hemiptera Aphididae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Fruit abnormal shape Growing point/external feeding Inflorescence/external feeding Infloroscence/honeydew or sooty mould Leaves/abnormal colours, forms, leaf fall, external feding, honeydew or sooty mould, leaves rolled or folded	https://www.cabi.org/isc/datasheet/6215
Cydia pomonella L.	Insecta Lepidoptera Tortricidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Fruit/Frass visible, internal feeding, obvious exit hole, premature drop The pest has potential to cause losses above economic threshold level only if no control measures taken	https://www.cabi.org/isc/datasheet/11396
Diaspidiotus perniciosus Comstock	Insecta Hemiptera Diaspididae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Regulated as quarantine organism**	Fruit /lesions: black or brown Leaves/abnormal colours, abnormal leaf fall, necrotic areas Stems/dieback, discoloration of bark whole plant:dwarfing, early senescence, plant dead, dieback The pest has potential to cause losses only if no control measures taken	https://www.cabi.org/isc/datasheet/46224#tosymptomsOrSigns

Drosophila suzukii (Matsumura)	Insecta Diptera Drosophilidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Regulated as quarantine organism**	Fruit/internal feeding Inflorescence/external feeding	https://www.cabi.org/isc/datasheet/109283#tosymptomsOrSigns
Eriosoma lanigerum (Hausm.)	Insecta Hemiptera Pemphigidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Fruit/honeydew or sooty mould Roots/galls along length, galls along length, galls at junction with stem, swollen roots Stems/Canker on woody stem, external feding, galls, honeydew or sooty mould	https://www.cabi.org/isc/datasheet/21805
Hyphantria cunea Drury	Insecta Lepidoptera Erebidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Leaves/external feeding, webbing whole plant/external feeding	https://www.cabi.org/isc/datasheet/28302
Lepidosaphes ulmi (L)	Insecta Hemiptera Diaspididae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Fruit/abnormal shape, discoloration, premature drop Leaves/abnormal colours, external feeding, wilting Stems/dieback, external feeding whole plant/external feeding	https://www.cabi.org/isc/datasheet/30375

Lopholeucaspis japonica (Cockerell)	Insecta Hemiptera Diaspididae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Regulated as quarantine organism**	Fruit/external feeding Leaves/abnormal leaf fall, external feeding, yellowed or dead Stems/dieback, external feeding whole plant/early senescence, plant dead, dieback	https://www.cabi.org/isc/datasheet/31328
Melolontha melolontha L	Insecta Coleoptera Scarabaeidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Fruit/external feding Inflorescence/external feeding Leaves/ external feeding, wilting, yellowed or dead Roots/external feeding, internal feeding whole plant/plant dead, dieback	https://www.cabi.org/isc/datasheet/33326
Panonychus ulmi Koch.	Arachnida Acarina Tetranychidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Leaves/abnormal colours, abnormal leaf fall	https://www.cabi.org/isc/datasheet/33684
Parthenolecanium corni Bouche	Insecta Hemiptera Coccidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Growing point/external feeding Leaves/external feding Leaves/honeydew or sooty mould, wilting Stems/external feeding, honeydew or sooty mould whole plant/external feeding	https://www.cabi.org/isc/datasheet/45556

Polyphylla fullo L	Insecta Coleoptera Scarabaeidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Fruit/external feding Inflorescence/external feeding Leaves/ external feeding, wilting, yellowed or dead Roots/external feeding, internal feeding whole plant/plant dead, dieback	https://www.cabi.org/isc/datasheet/42196
Pseudaulacaspis pentagona (Targioni Tozzetti)	Insecta Hemiptera Diaspididae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Leaves/abnormal leaf fall, necrotic areas, yellowed or dead Roots/external feding Stems/dieback, discoloration of bark, distortion, external feeding whole plant/dwarfing, early senescence, plant dead, dieback	https://www.cabi.org/isc/datasheet/45077
Scolytus rugulosus (Müller)	Insecta Coleoptera Scolytidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Attacks all deciduous fruit trees; normally found in dead or dying wood, but can be attracted to living trees that are in a somewhat unhealthy condition. Adult produces small (1 mm) holes through the bark on the twigs of fruit trees (C), especially above a bud or other projection. Holes are sometimes indicated by sawdust or borings on the bark.	https://www.cabi.org/isc/datasheet/49215 https://www.canr.msu.edu/ipm/diseases/shothole_borer

Stephanitis pyri (Fabr.)	Insecta Hemiptera Tingidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined **Non regulated**	The nymphs and adults live on the undersides of leaves and feed by sucking plant sap after piercing the parenchyma tissue with their stylet. Whitish spots appear at the feeding sites. The damaged leaves fall prematurely. Thus, they weaken the plants and cause losses both in quality and yield	https://www.cabi.org/isc/datasheet/19570059 https://doi.org/10.16970/entoted.770859
Synanthedon myopaeformis (Bork.)	Insecta Lepidoptera Sesiidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Damage caused by the larvae was observed on the trunks of apple trees in various orchards	https://www.cabi.org/isc/datasheet/52303 https://dergipark.org.tr/tr/download/article-file/135017
Tetranychus urticae Koch	Arachnida Acarina Tetranychidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Leaves/abnormal colours, abnormal leaf fall, webbing	https://www.cabi.org/isc/datasheet/53366
Amphitetranychus viennensis Zacher	Arachnida Acarina Tetranychidae Pest Free Area(s) in accordance with ISPM 4 is/are not determined in Türkiye **Non regulated**	Fruit/Premature drop, reduced size, Leaves/abnormal colours, webbing	https://www.cabi.org/isc/datasheet/53368

Tropinota hirta (Poda)	Insecta Coleoptera Scarabaeidae Pest Free Area(s) in accordance with ISPM 4 is (are) not determined in Türkiye **Non regulated**	Adults emerging in spring throughout the blossoming period of trees and other plants mostly feed on flowers	https://gd.eppo.int/taxon/EPISHI DOI:10.19159/tutad.39395
Virus			
Apple mosaic virus (ApMV)	*Riboviria* *Bromoviridae Ilarvirus*	Leaves / abnormal colours and patterns Whole plant / distortion; rosetting	Anonymous, 2021b

For each pest listed above, indicate the biology, etiology and epidemiology.

BACTERIA

Agrobacterium tumefaciens (Smith & Townsend) Conn[1*]

Agrobacterium tumefaciens is a rhizoplane bacterium whose characteristics are Gram-negative, strictly aerobic, bacilliform rods measuring 1 x 3 μm, and whose nutritional requirements are non-fastidious. The rods bear flagella that are arranged subpolarly around the cylindrical circumference of the cell, referred as circumthecal flagellation (Figure 5). When *A. tumefaciens* cells perceive plant phenolic compounds, the virulence genes that are located in the resident Ti (tumor-inducing) plasmid are expressed, resulting in the formation of a long flexuous filament called the T pilus (see next section). The activation of VirA also shuts off motility of the circumthecal flagella, presumably when *A. tumefaciens* cells attach to plant cells. Attachment to the plant cells is a prerequisite for initiating the transfer of the T-DNA into the plant cell. Both the circumthecal flagella and the T pilus play an essential role in virulence, presumably by bringing the bacterial cell to its target followed by attachment to the plant host, respectively.

Agrobacterium tumefaciens naturally resides on the rhizoplane of woody and herbaceous weeds. Its presence in soils originates from galls that were broken or sloughed off from infected plants during cultivation practices or disseminated as infected plant material. Irrigation aids in further dissemination of the *A. tumefaciens* bacterial cells. *Agrobacterium tumefaciens* is also spread by infected and infested planting stocks originating as nursery stock from uncertified sources. Secondary spread then occurs through pruning and cultivation equipment, particularly when galls are removed manually with the same cutting tools used in pruning. Tilling equipment can be contaminated by cutting through galls at or near the base of trunks of infected trees. Rogueing (removal) of infected trees and replanting in the same spot where the infected tree had grown is poor practice because sloughed off galls serve as sources of abundant populations of *A. tumefaciens*.

A. tumefaciens enter a plant wound, disease will be more severe and a large gall will be seen rapidly growing at the infection site. Plants that are systemically infected (such as grapevines) will harbor *A. tumefaciens* for extended periods of time in the absence of overt symptoms. Tissue injuries induced by accidental wounds made during cultivation practices or by frost will elicit new infections with the appearance of numerous galls along the vascular system of the host.

Candidatus Phytoplasma mali (Apple proliferation)

The natural means of transmission is partly unknown, although transmission by root fusion may occur. Leafhoppers have been reported as vectors of the disease (Seemüller, 1990) but other extensive experiments failed to support this (Refatti *et al.*, 1986). There is no seed or pollen transmission. Proliferation has been transmitted by grafting from apple to apple. There is one report of graft transmission from apple to pear, but this has not been confirmed by subsequent experiments. There are also reports of its transmission to *Catharanthus roseus* using *Cuscuta* sp. (Marwitz *et al*., 1974; Heintz, 1986). Proliferation is often disseminated in scion wood; although the causal agent does not appear to be systemic, trees may yield a high proportion of apparently healthy but infected buds.

Distribution of phytoplasmas in the tree is not constant over the year. In winter the content of phytoplasmas declines in the tree due to sieve tube degeneration. They also concentrate more

in the roots but, during April to May, reinvade the stem from the roots and reach a peak in late summer or early autumn (Seemüller *et al.*, 1984). The distribution pattern of the phytoplasmas in the tree is also dependent on temperature. In France, phytoplasmas could be found throughout the trees at temperatures of 21-25°C, causing symptoms; at 29-32°C symptoms were inhibited and phytoplasmas were found only in the roots, but reinvaded the stems when plantlets were stored at the lower temperature (Ducrocquet *et al.*, 1986).

When a tree is inoculated with an infected bud the first symptoms appear the following year, mostly on the inoculated branches. When carried in the rootstock, the causal agent produces symptoms on the first growth of the scion. It appears to be localized mainly in suckers and terminal shoots, where it has been observed in the phloem of leaf petioles, midribs and stipules.

Infected trees are particularly sensitive to powdery mildew (*Podosphaera leucotricha*). There appears to be an interaction between apple rubbery wood disease and apple proliferation, the former promoting transmission of the latter. For more information, see Bovey (1963; 1972), Seidl & Komarkova (1974).

***Erwinia amylovora* (Burrill) Winslow et al.**

The fireblight pathogen overwinters exclusively in infected host plants. The bacterium spreads from active lesions via pollinating insects during the flowering period, birds, rain splashing, wind and contaminated pruning tools. It enters the host through natural openings (nectaries, stomata, hydaphodes) or accidental ones (wounds) during flowering or shoot growth. The disease cycle has been fully illustrated by Beer, 1979; Paulin, 1996; Agrios, 2005; Khan *et al.*, 2012.

The long distance spread of fire blight is a rare event which in most cases seems to be the result of plants or plant tissues being moved across the oceans. Short distance spread is the result of the characteristics of the pathogen, especially its ability to produce an exudate (bacteria embedded in exopolysaccharides) which is easily transported by wind, rain, insects or birds. This is very efficient; once the pathogen has moved into a new territory it almost always colonizes and becomes established. This is accompanied by economic losses in regions where apple, pear or loquat are grown commercially; it might prevent the survival of local cultivars and could disrupt international trade. To date fire blight has colonized most of North America, Western Europe and most of the countries around the Mediterranean Sea as well as New Zealand. Outbreaks of fire blight are irregular and difficult to control.

***Pseudomonas syringae pv. syringae* van Hall**

Pseudomonas syringae overwinters on infected plant tissues such as regions of necrosis or gummosis (sap oozing from wounds on the tree) but can also overwinter in healthy looking plant tissues. In the spring, water from rain or other sources will wash the bacteria onto leaves/blossoms where it will grow and survive throughout the summer. This is the epiphyte phase of *P. syringae's* life cycle where it will multiply and spread but will not cause a disease. Once it enters the plant through a leaf's stomata or necrotic spots on either leaves or woody tissue then the disease will start. The pathogen will then exploit and grow in intercellular space causing the leaf spots and cankers. *P. syringae* can also survive in temperatures slightly below freezing. These below freezing temperatures increase the severity of infection within trees like sour cherry, apricot, and peach.

Diseases caused by *P. syringae* pv. *syringae* tend to be favoured by wet, cool conditions — optimum temperatures for disease tend to be around 12–25 °C (54–77 °F), although this can vary according to the pathovar involved. The bacteria tend to be seed-borne, and are dispersed between plants by rain splash.

Although it is a plant pathogen, it can also live as a saprotroph in the phyllosphere when conditions are not favourable for disease. Some saprotrophic strains of *P. syringae* have been used as biocontrol agents against postharvest rots.

The mechanisms of *P. syringae* pathogenicity can be separated into several categories: ability to invade a plant, ability to overcome host resistance, biofilm formation, and production of proteins with ice-nucleating properties.

FUNGI

Alternaria alternata

Symptoms: The fruit infection commence as small brown spots that later enlarge and be necrotic. The fruit spots are light to dark brown in color. Alternaria fruit rot infections commonly begin in the orchard following rain during flowering and early fruit development. In the later stages of infection, arils show a brown decay and black sporulation can be seen inside the fruit. In advanced stages of internal decay, the fruit's exterior shows some shriveling (Mamgain et al., 2013; Anonymous, 2021).

Biology/Epidemiology*: Alternaria alternata* is a wound parasitic disease agent. *A. alternata* can penetrate the host tissue through the epidermis, stomata and wounds. The fungus can also live as saprophytes in weakened or dead tissues of many plants. Although the optimal development of the disease is humid environment and a temperature of 26–28^{o} C. Under favorable conditions, symtoms of disease appear 8-10 days after penetration.

A. alternata is a weak pathogen and an extremely common saprophyte, found in weakened or dead tissues of many plants, food residues, soil, etc. are on the items. In general, airborne dispersal has been reported as the most common method of dispersal for *Alternaria* spp., although cases of splash dispersal have been described. It can be carried by wind, birds and mechanically (Mamgain et al., 2013; Anonymous, 2021; Blancard, 2021)

Regulatory status in Türkiye: Non-quarantine organism

Economic significance: It has no potential to cause economic losses in Türkiye.

Armillaria mellea

Symptoms: Affected trees exhibit a general decline or weak appearance. Affected roots are characterized by a white mycelial growth within the bark, and a fan-shaped, white fungal mat is often present between the bark and wood (Anonymous, 2008; Downer and Lacan, 2020).

Biology/Epidemiology*:* The fungus overwinters as rhizomorphs or as vegetative mycelium in both living and dead trees. During the spring the rhizomorphs and vegetative mycelium resume growth through the soil and infect healthy roots. Rhizomorphs enable the fungus to move from an infected tree to an adjacent healthy one, while vegetative mycelium primarily enables local infection to spread within a tree's root system. After the infected tree is killed, the pathogen

lives for many years as a saprophyte. In the late summer or early fall mushrooms produce large quantities of windblown spores.

The pathogen reproduces by release of basidiospores produced by its mushrooms. These basidiospores are involved in dispersal but are thought to seldom play an active role in infection of new hosts, instead possibly colonizing dead stumps, downed trees, and other woody debris near the parent mycelium. There are no other spore-bearing phases in the Armillaria life history. Infection is thought to proceed primarily by direct Armillaria-to-host contact, either when healthy roots grow into contact with residual roots or when rhizomorphs grow out from infected roots and contact susceptible roots (Ananymous, 2008; Downer and Lacan, 2020).

Regulatory status in Türkiye: Non-quarantine organism

Economic significance: It has no potential to cause economic losses in Türkiye

Cytospora cincta

Symptoms: *Cytospora* species cause branch dieback and cankers on trees or shrubs. Cankers on stems and branches are often elongate, slightly sunken, discolored areas in the bark. Bark above infected cambium may appear sunken and yellow, brown, reddish-brown, gray, or black. Diseased inner-bark and cambium turns reddish-brown to black, and becomes watery and odorous as it deteriorates (Anonymous,2021).

Biology/Epidemiology*:* These fungi overwinter as fruiting bodies on bark and as vegetative mycelium in cankers. During wet weather in the spring fruiting bodies, which appear like small black pimples on the bark, exude thin threads of spores that are washed to other branches by rainsplash. The fungus attacks trees or parts of trees that are injured or in a weak or stressed condition. The fungus grows in the living bark (phloem) and wood (xylem) and kills by girdling the branch or tree. The fungus can attack tree bark during the fall-winter spring seasons when temperatures are warm but the tree is dormant and cannot defend itself. Trees affected by drought, late spring frosts, insect and fungi defoliation, sunscald, herbicides, or mechanical injury are susceptible to *Cytospora* infection.

Spores of *Cytospora* species infect freshly wounded tissue. The spores are released after fruiting bodies have absorbed water during rain events. Conidia ooze out of the wet fruiting bodies and are dispersed by rain splash and blown by wind. The disease can also spread through production materials and pruning (Tattar, T.A., 1989; Anonymous, 2021).

Regulatory status in Türkiye: Non-quarantine organism

Economic significance: It has no potential to cause economic losses on apple in Türkiye.

Gymnosporangium confusum

Symptoms: Rust appears first as small, yellow-orange lesions on the upper surface of leaves and young fruit. Small orange-brown pustules (pycnia) develop within the lesions. After several weeks, yellow-brown lesions (1-15 mm in diameter) develop on the undersurface of leaves. These under-leaf lesions produce small, dark, tubular structures (aecia). Similar lesions may also occur on fruit (Anonymous, 2008).

Biology/Epidemiology*:* The disease agent spends the esial period of its life cycle in apple and the telial period in juniper species which are intermediate hosts. On these hosts, aecia develop after dikaryotization of spermatia produced in spermogonia (pycnia). The aecia form aeciospores infecting the alternate host juniper (Juniperus spp.). During the winter the fungus survives as mycelium on juniper, in spring on juniper telia with teliospores are formed. The basidiospores released by the germinated teliospores infect apple species. Both the aeciospores and the basidiospores are airborne and can be spread over large distances (Anonymous, 2008).

Regulatory status in Türkiye: Non-quarantine organism

Economic significance: It has no potential to cause economic losses in Türkiye

Monilinia fructigena

Symptoms: Superficial, circular, brown spots, expand outward on the surface of the fruit and result in a soft decay of the flesh. Tufts of gray fungus, often arranged in concentric band, may develop on the surface of the lesions. The floral parts wilt, turn broen, and collapse.

Biology/Epidemiology*:* The fungus can survive long periods of adverse environmental conditions as mycelium within mummified fruits, twigs, cankers and other infected tissues. When conditions become favourable (usually after a dormant period), spores are produced on infected tissues and the fungus is dispersed to start a new cycle of infection, which coincides with early spring growth of host plants.

In the spring or early summer, when temperatures, day-length and relative humidities are suitable, tufts of conidiophores form sporodochia on the surface of the mummified fruit and infected tissues, and bear chains of conidia. Conidia are transported by wind, water or insects to young fruit. Initial infection is via wounds. Apothecia may be produced in spring on mummified fruit that have overwintered on the ground. The liberation of ascospores normally coincides with the emergence of young shoots and blossoms of plants. When spores alight on susceptible tissues under favourable environmental conditions, they germinate to initiate infections.Conidia are generally formed on mummified fruit and blighted twigs at temperatures of >5°C. Germination and germ tube growth are partially inhibited by light, but sporulation is enhanced. Fungus disseminatred by rain and infect blossoms. Infection commonly occurs occurs from airborne conidia through wounds (Anonymous, 2021; CABI,2021).

Regulatory status in Türkiye: Non-quarantine organism

Economic significance: It has no potential to cause economic losses in Türkiye

Phytopthora cactorum

Symptoms: In general, *P. cactorum* is capable of infecting both young and old plants, and causes root rots and crown rots of the many genera it infects. Although the symptoms this pathogen produces varies between the types of organisms it infects, in general disease occurs during periods that are both wet and warm. Furthermore, most infections are caused by zoospores entering the plant through wounds. On older trees, *P. cactorum* causes the formation of sap exuding dark colored cankers on the trunks of trees, as well as leaf size and number reduction, chlorosis, and dieback of branches. *P. cactorum* can cause crown, collar, and root rots in apple trees. When infecting apple trees, the organism can attack through wounds either above or below the soil line, impairing phloem and root function, and causing stunting, foliar

disorders, and death after several years. Furthermore, because the pathogen causes damage to the phloem of the tree, one diagnostic method is to check for necrotic phloem tissue at the base of the tree which will be orange to red-brown in the early stages and dark brown in the later stages of infection (Fujita, 1990; Anonymous, 2021)

Biology/Epidemiology*: P. cactorum* is a homothallic (only having one mating type, can mate with itself) oomycete, and displays the right angled mycelial branching with a constriction at the base of the branch, which is highly characteristic of other Phytophthora species. although the hyphae are not the main survival unit of *P. cactorum*, as long as they are not completely desiccated, they are capable of surviving until just above freezing temperatures.

P. cactorum produces one sexually produced survival spore called an oospore, and one asexually produced survival spore called a chlamydospore. In addition to the chlamydospore, *P. cactorum* also produces another asexual spore called a sporangium. Depending on moisture conditions, sporangia can either germinate or release zoospores. Zoospores are produced in wet conditions by either oospores or sporangia. After being released, zoospores swim to a nearby wound on a suitable host, germinate, and enter wounds to cause a hyphal infection of the roots or crown vascular system.

Because Phytophthora is a soilborne pathogen, the ideal condition for *P. cactorum* growth is in saturated soil. *P. cactorum* stays in the soil as dormant resting oospores and chlamydospores, or within infected plant tissue. When conditions are met and the soil is wet enough, sporangia are produced, carrying on the life cycle of the pathogen. The minimum amount of time the plant must be saturated to produce an infection depends on factors such as genetics, physiological processes, and the environment. However, when a plant is allowed to sit in soil that is heavy and soggy for long periods of time, the chance of infection is increased. A plant's inability to fight off the pathogen is impeded when saturated soil conditions limit the amount of available oxygen for its roots. In many cases, most host plants are the most susceptible to infection during spring and autumn when the soil is wetter and at a more ideal temperature for zoospore production and activity (Fujita, 1990; Anonymous, 2021)

Regulatory status in Türkiye: Non-quarantine organism

Economic significance: It has no potential to cause economic losses in Türkiye. The disease dont cause economic losses when when control methods are used carefully.

Podosphaera leucotricha

Symptoms: *Podosphaera leucotricha* causes a range of symptoms. On stems, symptoms include wilting and discoloration. Wilting and leaf curling occur on leaves. Symptoms of the inflorescence include discoloration (non-graminous plants), dwarfing, stunting, and twisting. On fruit symptoms include net-like russeting and deformed fruit. Depending on the stage in the disease cycle, symptoms vary. The primary blossom mildew emerges at pink bud stage. Flowers are deformed with pale green or yellow petal and are covered in white mycelium and spores. The secondary mildew may have lesions that appear as chlorotic spots on the upper leaf surface. Symptoms of the secondary mildew also included distorted leaves and premature falling of leaves. Infections on leaves appear first as whitish, feltlike patches of fungal mycelium and spores, most commonly on the lower surface. These lesions may appear as chlorotic spots on the upper surface or may spread to the upper surface and cover the entire leaf with a white,

powdery mass of spores and mycelium. Apple blossoms emerging from infected buds may give rise to small, russeted fruit (Anonymous, 2008; Sutton et al., 2014).

Biology/Epidemiology*: Podosphaera leucotricha* has a polycyclic disease cycle. Mycelium overwintering in dormant buds typically produces primary infection on young leaves, which produce inoculum in the form of conidia for the secondary cycles. In spring, the overwintered fungus is evident as 'primary' mildew on leaves emerged from buds infected during the previous growing season. Conidia are released from the primary mildew during the colonies disperse in air and initiate an epidemic of 'secondary' mildew on growing shoots. Young developing fruitlets may also be infected. Secondary mildew epidemics are effectively continuous from day to day.

The infection process does not require surface wetness. Daily infection intensity on leaves is mainly determined by the dose of landed conidia, which is dependent on the concentration of airborne conidia and wind speed.Apple shoots have a long growing season causing the tree to stay susceptible for several months. Although the mycelium can overwinter in dormant buds, overwintering potential is limited primarily by temperature. In severe winters, infected buds are killed as they are more susceptible to the cold than healthy buds. Spores are airborne and can be spread over large distances (Anonymous, 2008; Sutton et al., 2014).

Regulatory status in Türkiye: Non-quarantine organism

Economic significance: It has no potential to cause economic losses in Türkiye

Rosellinia necatrix

Symptoms: Fruit cease growth and may shrivel. Leaves are smaller than normal. And some premature defoliation may ocur. The characteristic below ground symptom is the rotting of small roots by white mycelium, which then invades larger roots. Diseased trees are easily uprooted from soil. İnfected roots placed in a moist chamber quickly become overgrown with characteristic dense white hyphae (Anonymous, 2008)

Biology/Epidemiology*:* The entire life cycle of *R. necatrix* occurs in soil. The pathogen spreads by root-to-root contact or by growth of mycelial strands through soil. The infection on apple occurs after ecotrophic mycelium has colonized the root surface. Root penetration occurs through lenticels or wounds, or directly from a penetration sclerotium. After infection, mycelia invade the xylem, where the release of toxins is followed by aerial symptoms of decreased vigor and wilting. Advanced infections show white, cottony mycelium on the infected root surface and a general rotting of roots. Characteristic white mycelial fans occur under the bark of the roots. Due to the ability of *R. necatrix* to live as a saprophyte, it can survive in soil for long periods on woody debris ´ (Anonymous, 2008).

Regulatory status in Türkiye: Non-quarantine organism

Economic significance: It has no potential to cause economic losses in Türkiye

Venturia inaequalis

Symptoms: Symptoms of the infection occur on leaves, fruit, flowers, and young green shoots. Foliar symptoms begin to occur in the early spring around budbreak and mainly present as light green lesions that progress to an olive-brown color with a velvety texture due to conidia

formation as time passes. These large scab-like lesions can warp the leaf's shape and can eventually lead to defoliation. Lesions formed by primary infection via ascospores tend to have more distinct borders when compared to lesions as a result of a secondary infection cycle via conidia. Young fruit, often infected by foliar conidia, can also display similar symptoms to infected leaves. In this case the lesions progress to bare, brown and corky spots. The apple skin and flesh can split open as the fruit enlarges, though young fruits often prematurely drop. Mature fruits are more resistant to infection and only form small, black 'pin-head scabs' which might not even be noticeable until after storage (Anonymous, 2008).

Biology/Epidemiology*:* The infection cycle begins in the springtime, when suitable temperatures and moisture promote the release of *V. inaequalis* ascospores.

These spores rise into the air and land on the surface of a susceptible tree, where they germinate and form a germ tube that can directly penetrate the plant's waxy cuticle. A fungal mycelium forms between the cuticle and underlying epidermal tissue, developing asexually the conidia, that germinate on fresh areas of the host tree, which in turn produce another generation of conidial spores. This cycle of secondary infections continues throughout the summer, until the leaves and fruit fall from the tree at the onset of winter.

V. inaequalis overwinters mostly as immature Perithecia, where sexual reproduction takes place, producing a new generation of ascospores that are released the following spring. Scab lesions located on the woody tissues may also overwinter in place, but will not undergo a sexual reproduction cycle; these lesions can still produce ineffective conidial spores in the spring.

Venturia inaequalis survives in winter mainly as pseudothecia on dead, scabbed leaves on the ground. Under some environmental conditions, the fungus can survive in winter as conidia, and when this occurs, these conidia contribute to the primary inoculum

Infection and spore production are dependent upon available moisture. Infection by ascospores and conidia is highly dependent upon how long the leaves or fruit stay wet, as well as on the average temperature (Anonymous, 2008)

Regulatory status in Türkiye: Non-quarantine organism

Economic significance: The disease dont cause economic losses when cultural, chemical, biological plant disease control methods are integrated.

	INSECTS
Anoplophora chinensis (*Forster*, 1771)	https://www.cabi.org/isc/datasheet/5556#tohostPlants
Ceratitis capitata (Wiedemann)	https://www.cabi.org/isc/datasheet/12367#tohostPlants
Aculus schlechtendali (Nalepa)	https://www.cabi.org/isc/datasheet/56112
Aphis pomi Deg	https://www.cabi.org/isc/datasheet/6215
Cydia pomonella L.	https://www.cabi.org/isc/datasheet/11396
Diaspidiotus perniciosus Comstock	https://www.cabi.org/isc/datasheet/46224#tosymptomsOrSigns
Drosophila suzukii (Matsumura)	https://www.cabi.org/isc/datasheet/109283#tosymptomsOrSigns
Eriosoma lanigerum (Hausm.)	https://www.cabi.org/isc/datasheet/21805
Hyphantria cunea Drury	https://www.cabi.org/isc/datasheet/28302

Lepidosaphes ulmi (L)	https://www.cabi.org/isc/datasheet/30375
Lopholeucaspis japonica (Cockerell)	https://www.cabi.org/isc/datasheet/31328
Melolontha melolontha L	https://www.cabi.org/isc/datasheet/33326
Panonychus ulmi Koch.	https://www.cabi.org/isc/datasheet/33684
Parthenolecanium corni Bouche	https://www.cabi.org/isc/datasheet/45556
Polyphylla fullo L	https://www.cabi.org/isc/datasheet/42196
Pseudaulacaspis pentagona (Targioni Tozzetti)	https://www.cabi.org/isc/datasheet/45077
Scolytus rugulosus (Müller)	https://www.cabi.org/isc/datasheet/49215 https://www.canr.msu.edu/ipm/diseases/shothole_borer
Stephanitis pyri (Fabr.)	https://www.cabi.org/isc/datasheet/19570059 https://doi.org/10.16970/entoted.770859
Synanthedon myopaeformis (Bork.)	https://www.cabi.org/isc/datasheet/52303 https://dergipark.org.tr/tr/download/article-file/135017
Tetranychus urticae Koch	https://www.cabi.org/isc/datasheet/53366
Amphitetranychus viennensis Zacher	https://www.cabi.org/isc/datasheet/53368
Tropinota hirta (Poda)	https://gd.eppo.int/taxon/EPISHI DOI:10.19159/tutad.39395

VIRUS

Apple mosaic virus

ApMV is primarily transmitted via root grafting and via infected vegetative propagation equipment. These two transmission routes are the primary source of inoculum for the virus (Grimová et al. 2016; Petrzik, 2005). Experimentally, the virus can be sap-transmitted by mechanical inoculations especially to herbaceous plants such as periwinkle (Vinca rosea) and cucumber (Cucumis sativus) (Grimová et al. 2016). Furthermore, ApMV is not currently thought to be seed or pollen transmitted due to limited time and space within studies. There have also been no reported insect vectors for the virus.

In general, ApMV does not have much affect on fruit production and quality. However, bud take and growth reduction were observed in grafted apple seedlings (Rebandel et al., 1979). Crop losses of up to 42% were recorded in infected hazelnut (Aramburu and Rovira, 1995) and average losses of 25% were recorded from almonds affected by almond mosaic, a complex disease in which ApMV plays a major aetiological role (Martelli and Savino, 1997).

4. Mention the general phytosanitaty management of the crop with emphasis on the previously mentioned pests.

BACTERIA

***Candidatus* Phytoplasma mali (Apple proliferation)**

Plants of apple for planting should come from a source found free from apple proliferation phytoplasma during the previous growing season. From countries where the disease occurs, the plants must additionally be no further than the second generation from the mother plant and

must be tested by an EPPO-approved method (OEPP/EPPO, 1990). The EPPO certification scheme for fruit trees (OEPP/EPPO, 1991/1992) covers apple proliferation phytoplasma and should give a high security for phytoplasma-free planting material.

FUNGI

Armillaria mellea-Cytospora cincta-Phytopthora cactorum-Rosellinia necatrix

This disease is controlled by sanitation and cultural practices.

Alternaria alternata - Gymnosporangium confusum - Monilinia fructigena-Podosphaera leucotricha

Disease is controlled by a combination of cultural practices and fungicides applications.

Venturia inaequalis

Cultural practices, chemical control, and biological control are applied.

INSECTS

Anoplophora chinensis (*Forster*, 1771)	https://www.cabi.org/isc/datasheet/5556#tohostPlants
Ceratitis capitata (Wiedemann)	https://www.cabi.org/isc/datasheet/12367#tohostPlants
Aculus schlechtendali (Nalepa)	https://www.cabi.org/isc/datasheet/56112
Aphis pomi Deg	https://www.cabi.org/isc/datasheet/6215
Cydia pomonella L.	https://www.cabi.org/isc/datasheet/11396
Diaspidiotus perniciosus Comstock	https://www.cabi.org/isc/datasheet/46224#tosymptomsOrSigns
Drosophila suzukii (Matsumura)	https://www.cabi.org/isc/datasheet/109283#tosymptomsOrSigns
Eriosoma lanigerum (Hausm.)	https://www.cabi.org/isc/datasheet/21805
Hyphantria cunea Drury	https://www.cabi.org/isc/datasheet/28302
Lepidosaphes ulmi (L)	https://www.cabi.org/isc/datasheet/30375
Lopholeucaspis japonica (Cockerell)	https://www.cabi.org/isc/datasheet/31328
Melolontha melolontha L	https://www.cabi.org/isc/datasheet/33326
Panonychus ulmi Koch.	https://www.cabi.org/isc/datasheet/33684
Parthenolecanium corni Bouche	https://www.cabi.org/isc/datasheet/45556
Polyphylla fullo L	https://www.cabi.org/isc/datasheet/42196
Pseudaulacaspis pentagona (Targioni Tozzetti)	https://www.cabi.org/isc/datasheet/45077
Scolytus rugulosus (Müller)	https://www.cabi.org/isc/datasheet/49215 https://www.canr.msu.edu/ipm/diseases/shothole_borer
Stephanitis pyri (Fabr.)	https://www.cabi.org/isc/datasheet/19570059 https://doi.org/10.16970/entoted.770859
Synanthedon myopaeformis (Bork.)	https://www.cabi.org/isc/datasheet/52303 https://dergipark.org.tr/tr/download/article-file/135017
Tetranychus urticae Koch	https://www.cabi.org/isc/datasheet/53366

Amphitetranychus viennensis Zacher	https://www.cabi.org/isc/datasheet/53368
Tropinota hirta (Poda)	https://gd.eppo.int/taxon/EPISHI DOI:10.19159/tutad.39395

VIRUS

Apple mosaic virus

ApMV is included in Annex-1/B list of the Regulation on Plant Quarantine (Harmful Organisms That Have Limited Existence in Türkiye, That are Subject To Quarantıne and That Hinder Importation). ApMV is present in restricted distribution in Türkiye. The seedlings in the production area are examined macroscopically aspect pests. In case of suspected the virus detection, samples are taken again for analysis. It is sent to the laboratory for diagnosis. When the seedlings are exported in a different province, they are transported to the export point by plant passport. At the control stage, the plant passport is given to the inspector. Once all processes have been completed,the EU have requested that "Consignment complies with Annex VII points 3 a, 3 b 4 a, 45, 46 a(i), 46 b Option of Annex VII of Commission Implementing Regulation (EU) 2019/2072. -That no symptoms of diseases caused by non-European viruses been observed on the plants at the place of production since the beginning of the last complete cycle of vegetation. The plants have been: (i)- Officially certified under a certification scheme requiring them to be derived in direct line from material which has been maintained under appropriate conditions and subjected to official testing for at least Apple mosaic virus using appropriate indicators or equivalent methods and has been found free, in these tests, from those pests. (b)- No symptoms of diseases caused by Apple mosaic virus have been observed on plants at the place of production, or on susceptible plants in its immediate vicinity, since the beginning of the last complete cycle of vegetation (Anonymous 2019).

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3.Post-harvest management information:

3.1.Packaging methods

The harvested apples are brought to packaging houses in boxes, where they are selected according to their health, for, colour and quality. Then, the fruits are divided into groups according to their sizes and subsequently are placed in their packaging containers.

Such operations are performed manually in small establishments, with machines in large establishments. Quality classification and sizing of apples are made according to Turkish Standards. According to this, table apples are separated into three quality classes: extra, first quality, second quality.

In quality classes there will be no decomposed or wormy fruits; however, in second quality class tolerance is given for decomposed or wormy fruits, not exceeding 2%.

The best is to pack the apples immediately after sizing, whether they are presented to the market or stored. Packing starts by wrapping the apples with paper. Apples wrapped with paper, are diagonally placed in boxes on their sides.

Figure 1. Packaging of apples

3.2. Inspection procedures

Regulation on Plant Passport System and Registration of Operators (12.01.2011 dated and O.G. 27813)

This regulation is applied for domestic movement of plant and plant products. The purpose of this Regulation is to register the plants, plant products and other substances which might be the carrier of pests, and those who produce, import and store those plants and substances; to monitor the circulation of these materials and take necessary measures by finding the sources in case of determination of a pest.

Regulation on Plant Quarantine (03.12.2011 dated and O.G. 28131)

Full document of Regulation on Plant Quarantine, Türkiye is available at https://www.ippc.int/en/countries/turkey/reportingobligation/4 . As a summary of the Regulation, Part Four indicates the export procedures as follows:

PART FOUR

Exportation

Exportation inspections

ARTICLE 17- (1) Natural or legal persons or their legal representatives thereof who want to export plants, plant products or other substances shall apply to the Directorate with the Export Application Form, a sample of which is specified by the Directorate and request the official inspection of the plants and plant products to be exported.

(2) The official inspections are conducted taking into account factors such as the harmful organism that the product may carry and the locality of the product, except for the plants, plant products and other substances the exportation of which have been banned.

(3) The plants, plant products and other substances that are desired to be exported and the packagings thereof are subjected to official inspection with respect to phytosanitary requirements of the receiving state. If necessary, further laboratory analyses are made or have such made.

(4) The analyses are made in the laboratories specified in paragraph three of article 5 of this Regulation, in accordance with their nature.

(5) For plants, plant products or other substances that satisfy the phytosanitary requirements of the receiving state, a Phytosanitary Certificate is drawn up as one original and two copies, in accordance with the sample given in Annex-7 and as per ISPM–12 rules. The original and one copy is given to the exporter. One copy is kept in the Directorate. The number of approved copies as requested by the exporter is given to the exporter.

(6) Following the issue of the Phytosanitary Certificate and the Re-Export Phytosanitary Certificate the plants, plant products and other substances must exit within 14 (fourteen) days. The plants, plant products and other substances, the exit procedures have not been carried out are inspected again.

(7) For products that are desired to be exported, but that do not satisfy the phytosanitary requirements of the receiving state in the official inspections made, the owner of the product or his representative is informed.

(8) In case the required particulars do not fit into the relevant section of the Phytosanitary Certificate during issuing the Phytosanitary Certificate, such particulars are attached to the Phytosanitary Certificate as a list. Such lists must bear the same number, date, signature and stamp as the Phytosanitary Certificate. In the relevant section of the Phytosanitary Certificate it is stated that the required particulars in that section are attached.

(9) If the plant and plant product to be exported have not been produced in Türkiye and if they are plant and plant products for which information concerning the area of production or the stages of growing are required, a Re-Export Phytosanitary Certificate is drawn up and an approved copy of the Phytosanitary Certificate of the country of origin is attached thereto. For plant and plant products for which information concerning the area of production or the stages of growing are not required, in case the importer country does not require a Re-Export Phytosanitary Certificate, a Phytosanitary Certificate is drawn up, stating the country of origin.

(10) A Phytosanitary Certificate and a Re-Export Phytosanitary Certificate are drawn up, in the spaces that are left empty are filled out with the expression "None / Yok" in order to prevent subsequent additions or such a section is blocked and closed.

(11) The plants, plant products or other substances for which an official inspection has been conducted and a Phytosanitary Certificate has been issued may if deemed necessary be subjected again to an official inspection until their exit. In case non-compliance with respect to the first inspection is determined for the products that are re-inspected, the existing Phytosanitary Certificate is cancelled. If the customs procedures for the product have been started, the Customs Directorate is informed in order to prevent the exit of the product.

Plants, plant products and other substances that are returned

ARTICLE 18- (1) For plants, plant products and other substances that have been exported but returned for various reasons, an application must be made to the Directorate with an Entry Application Form, a sample of which has been specified by the General Directorate. The original of the Turkish Phytosanitary Certificate of the product or the certified copy of it provided by the Directorate which prepared the Phytosanitary Certificate, the customs clearance statement and a photocopy of the invoice of the product shall be attached to the Entry Application Form.

(2) Taking into account the reasons of returning the product, after it is determined whether the returned plants, plant products and other substances are the same as the exported plants, and plant products, it is determined whether they are free from the harmful organisms that are subject to quarantine that are given in Annex-1 and Annex-2 of the present Regulation.

(3) The plants, plant products and other substances that are determined to be in compliance with the provisions of this Regulation are allowed to enter into Türkiye. The plants, plant products and other substances that are deemed unsuitable to enter into Türkiye as the result of official inspection are exported to a third country if they satisfy phytosanitary requirements or are destroyed.

(4) In case the returned plants, plant products and other substances are contaminated with any organism that is known to exist in Türkiye and that is subject to control other than the harmful organisms that are subject to quarantine and that are given in Annex-1 and Annex-2 of this Regulation, fumigation or disinfection is carried out if it is possible to decontaminate such harmful organisms by fumigation or disinfection, the expenses to be borne by the owner; if after such treatment they are found to be free from the harmful organisms in the official inspections, they are allowed to enter Türkiye.

(5) In case the exported product is returned by the importer country, the Directorate that performs the procedures on the returned plants, plant products and other substances shall inform the General Directorate within 2 (two) days.

3.3. Post-harvest treatments / disinfestations

A "Good Hygiene Practices Guide for the Production and Packaging Stages of Fresh Fruits and Vegetables" has been prepared by the participation of related institutions and organizations, under the supervision of the Ministry, to direct the concerned sector in all stages from primary production to the consumer in Türkiye. This guide has been made available to food establishments, and food establishments are obliged to implement the procedures based on the

HACCP principle specified in the legislations. To this end, the *"Good Hygiene Practices Guides"* are important sources for ensuring food safety and helping the food sector.

In addition, the Ministry has made available the "Good Hygiene Practices Guide for Storerooms and Cold Storerooms" and food establishments are obliged to implement the procedures based on the HACCP principles specified in the legislations. To this end, the "Good Hygiene Applications Guide for Storerooms and Cold Storerooms" is important in ensuring food safety and helping the food sector. The guide covers rules for storing foodstuffs under hygienic conditions and in compliance with the principles of food safety. The physical, microbiological and chemical risks that the foodstuffs confront at the storing stage before reaching the final consumer and how to prevent and control such risks are explained. Basic hygiene rules are addressed and within this context, how to design buildings and spaces such as building surroundings, social facilities are explained. Furthermore, subjects such as staff hygiene, waste and return management, insect control are detailed. Training and informing the staff are addressed; critical limits concerning storage conditions determined for the characteristics of some product groups are given.

3.4. Storage conditions

The Ministry has made available the "Good Hygiene Practices Guide for Storerooms and Cold Storerooms" and food establishments are obliged to implement the procedures based on the HACCP principle specified in the legislations. To this end, the "Good Hygiene Practices Guide for Storerooms and Cold Storerooms" is important in ensuring food safety and helping the food sector.

The guide covers rules for storing foodstuff under hygienic conditions and in compliance with the principles of food safety. The physical, microbiological and chemical risks that the foodstuffs confront at the storing stage before reaching the final consumer and how to prevent and control such risks are explained. Basic hygiene rules are addressed and within this context, how to design buildings and spaces such as building surroundings, social facilities are

explained. Furthermore, subjects such as staff hygiene, waste and return management, insect control are detailed. Training and informing the staff are addressed; critical limits concerning storage conditions determined for the characteristics of some product groups are given.

The harvested apples are kept in storehouses until they are transported to the market. Such storehouses may be common storehouses, cold storehouses or cold storehouses with different atmosphere.

The time the apples are kept in storehouses, storing time of the fruit, feeding the tree will vary with the season and the variety.

Many apple varieties may be stored for a long time at –1 to 0°C and a relative humidity of %8590. The temperature in commercial storehouses is between 0-2°C. Apples freeze at –2°C.

For Golden and Starking apples, the most convenient conditions are 0°C and % 90 relative humidity, and for Granny Smith +3°C. With a timely harvest and ensuring suitable storage conditions, Golden Delicious and Starspur Golden Delicious varieties may be stored in storehouses for 5 months, Starking Delicious and Starkrimson Delicious varieties 7 months, Granny Smith variety for 9 months.

3.5. Conditions of national / international transport

General information:

1. List of importing countries
2. Regulated pests for other importing countries
3. Quarantine treatments for pests
4. Description of the Surveillance and Monitoring System

We do not have a research and monitoring program for apples.

3.6.Official control programs

Türkiye is in the accession period to European Union therefore plant health regulation are in line with EU regulations and the pesticides registered in Türkiye are all same with EU.

For all crops in Türkiye, pesticides are applied according to the Technical Instructions for Plant Protection and according to the principles of integrated pest management.

Regular training programmes are available for farmers on pesticide applications and all farmers who wants to apply pesticides have to be trained and got certificate. Also taking notes on pesticide application into the Producer Registration Book is obligatory for farmers (Regulation on advise, application and registration of plant protection products 03.12.2014, OG 29194) for some crops including apple.

Pesticides Control Program Before Harvest is applied for main crops produced in Türkiye including apple. In this program, samples are taken from production areas and sent to laboratories for pesticide analyses. If there is any unregistered pesticides or over maximum residue limit found, penalties are applied. If appropriate, certificates are provided to farmers covered in this programme.

To maintain safe movement of plants domestically which produced inside the country, Regulation on Plant Passport System and Registeration of the Operators (12 January 2011,

27813 O.G) is in force. According to this regulation, strict control measures are applied on production sites of plants.

3.7. Description of the Official Phytosanitary Certification System (field inspection; sampling; additional declaration)

Türkiye is a member of the International Plant Protection Convention (IPPC) and is obliged to implement the International Standards on Phytosanitary Measures (ISPM) published by the IPPC. Within this context, Phytosanitary Certificates / Re-Export Phytosanitary Certificates are issued in exportation of plants and plant products with respect to plant health. In issuing such certificates, the phytosanitary requirements of the importer country are taken into account, in compliance with the ISPM No: 7 and ISPM No: 12 rules. Within this context, before exportation, a phytosanitary inspection is absolutely made on the products for which a Phytosanitary Certificate / Re-Export Phytosanitary Certificate is to be issued. If required, inspections on seeds to be shipped at the field period are made or if required, laboratory tests before exportation are made, and thus, a Phytosanitary Certificate is issued. In Türkiye, plant health inspectors are responsible from exportation and importation controls, sampling and issuing certificates. Such inspectors are authorised after completing a certain training programme.

3.8. Description of the Risk Mitigation System

Our apple production areas are controlled within the scope of the Apple Integrated Control Program and the Integrated and Controlled Product Management Project. In addition, disease and pest control activities are carried out within the framework of IPM principles.

Prediction and warning systems are also used in the fight against apple diseases and pests.

3.9. Pest-free areas and locations

In Türkiye we have not pest free areas for apple production areas

3.10. Areas of low pest incidence and eradication programs

In Türkiye we have not low pest incidence area or eradication programs for apple production areas.