

The Occurrence of Root, Collar and Rot Disease and Ornamental Citrus Fruit of Kumquat in Tonekabon Area, a Part of West Mazandaran Province, North of Iran

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ABSTRACT: The different areas of cultivation of ornamental citrus plants were visited and 10 infected samples of root and collar in garden cultivation of ornamental citrus plants from Tonekabon area were collected and investigated separately. Small parts in diameter 3-5 mm were cut from the main and secondary roots , crown and twigs from shrubs infected and then at first was washed with many ordinary water and then surface disinfection with sodium hypochlorite 5% was done and 10-12 pieces were placed on selective media of PARPH , (50 mg Pimaricin, 200 mg Ampicylina, 10 mg Rifampicin, 100 mg Penta chloro nitro benzene (PCNB) and 40 mg Hymexazol in each liter of corn meal agar media , CMA 17 g/l , and they were incubated in 220c in the dark for three days. After 3 days the obtained colonies were purified and *phythophtora* fungi was isolated and identified very well. These signs were include change the color of leaves, leaf loss and canker branch. The other sign was there gum and branch burn. Hard damaged and affected plants will become dry in 1 or 2 months and will die then. We usually can see the dry and dead branches two or several weeks after the rain. The early stages of disease can quickly and easily be detected by a careful inspection. After the favorable conditions for the occurrence of infection, the first signs of decay appear as the big brown wounds with irregular water – soaked spots on the outer margin on the leaves surface. In rainy weather the wounds become large and turn black. If the weather be well, the wounds turn to dark brown and we will observe tip leafed burned. The affected leaves fall on the polluted place or they will dry. The other signs are the bloom decay disease and fruit brown decay. The process of wrinkling and brown shoot down to the stem to decay all of the branch graduate. The most obvious sign is in woody stems and branches are severe gum on the skin surface. The disease agent of root and rot, branch and ornamental citrus fruit decay was earth fungi such as *Phytophthora citrophthora* .

KEYWORDS: *Phytophthora*, fungi, kumquat, root and collar rot

I. INTRODUCTION

Kumquat with scientific name (*fortunella .spp*) has 2 renowned species with scientific names of *Fortunella margarita* and *F.japonica* is one of the ornamental and decorative plants which in addition of being ornamental, has edible fruits. nowadays production of these varieties is increased in north of Iran, so that in Addition to being decorative, its fruit is used in alternant industries. Citrus pots such as kumquat are the only one part of industry production of flowers or ornamental plants in Tonekabon, west of Mazandaran. Therefore in the number of plantations and nurseries, they are one of staples. Ornamental citrus root rot and blight of kumquat because of *phytophthora* in 3-8 gardens and nursery of ornamental citrus in Tonekabon area in the north of Iran has occurred in 2014 and 2015. Lack of recognition of created diseases by less experienced technicians and lack of root rot disease and ornamental citrus fruits and show devastating effects in them. Anyway, supply and poor seedling production can have a bad effect in markets. *phytophthora* fungi is one universal genus and is a forced pathogens of Oomycetes class. This pathogen is described consist of 60 species [1]. *Phytophthora citrophthora* fungi are reported as the main cause of root, collar and fruit rot disease and gummosis was

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reported in citrus trees in the Mediterranean whether [1, 2]. The *phytophthora* genus attacks to a wide variety of plants and it responsible for some of most destructive plant diseases in the world. The fungi diseases of *phytophthora* is studied very well in moderate areas in the world. However, the *phytophthora* fungi diseases are very common in all of warm and humid areas of the world and can cause the dramatic damage to large amounts of products in root and rot, collar, body, leaf, stem and fruit disease. We have estimated 3-6% performance decrease in every year. *phytophthora* blight in citrus garden or ornamental citrus is a serious treat for commercial production and its damages is very important in economic aspect and considered rarely. The *phytophthora* blight is a damaging disease in citrus or ornamental citrus, and damages to products of gardens intensely. The varieties includes: lemon balm , kumquat , bergamot , orange , chino , can attack to lemon . In the garden nurseries which farmers do not adhere to health, and also in cases where the soil is heavy and lacks proper drainage, at least semi of these plants are in feted. In recent years severe out break of the disease in citrus nursery plants includes kumquat of the coastal area in Cecil in Italia. And they observed in that area [3]. In Taiwan, a serious disease of severe decay of kumquat out broke and *citrophthora* fungi was recognized as a disease agent and separated[4] . A survey was conducted of citrus owners in Taiwan in 1995 to 2006 and morphological , physiological and molecular of *citrophthora* fungi compared with each other which was the decay disease agent of kumquat and citrus species [5] .the rot decay of kumquat , *Margarita fortunella* was a big problem in Guilin , Gunngxi area of china which in that , kumquat is one of the main products . The decayed trees graduate became weak and finally they became pale and we observed the trees died , and the separated pathogen of *phythophthora* fungi was *citrophthora* , which determined by morphological characters [6]. In march and April in 2014 and 2015 , the potted plants of *Margarita fortunella* and stem blight was observed in two commercial nursery in Antalya in Turkey . This is the first report of *citrophthora* fungi which is the main cause of this disease in kumquat in turkey. With regard of severe signs in nursery, the *citrophthora* fungi should be considered as a potential threat for kumquat plant [7].

II. MATERIAL AND METHOD

Sampling

The different areas of cultivation of ornamental citrus plants were visited and 10 infected samples of root and collar in garden cultivation of ornamental citrus plants from Tonekabon area were collected and investigated separately.

Isolation, purification and identification of pathogen

Small parts in diameter 3-5 mm were cut from the main and secondary roots , crown and twigs from shrubs infected and then at first was washed with many ordinary water and then surface disinfection with sodium hypochlorite 5% was done and 10-12 pieces were placed on selective media of PARPH , (50 mg Pimarcin, 200 mg Ampicylina, 10 mg Rifampicin, 100 mg Pentachloronitrobenzene (PCNB) and 40 mg Hymexazol in each liter of corn meal agar media , CMA 17 g/l , and they were incubated in 22⁰c in the dark for three days. After 3 days the obtained colonies were purified and *phythophthora* fungi was isolated and identified very well.

III. RESULTS

Signs and Symptoms

These signs were include change the color of leaves, leaf loss and canker branch. The other sign was there gum and branch burn. Hard damaged and affected plants will become dry in 1 or 2 months and will die then. We usually can see the dry and dead branches two or several weeks after the rain. The early stages of disease can quickly and easily be detected by a careful inspection. After the favorable conditions for the occurrence of infection, the first signs of decay appear as the big brown wounds with irregular water – soaked spots on the outer margin on the leaves surface. In rainy weather the wounds be come large and turn black. If the weather be well, the wounds turn to dark brown and we will observe tip leafed burned. The affected leaves fall on the polluted place or they will dry. The other signs are the bloom decay disease and fruit brown decay. The process of wrinkling and brown shoot down to the stem to decay all of the branch graduate. The most obvious sign is in woody stems and branches is severe gum on the skin surface. In the short period of time, after heavy rains, more 0/7 % of the trees kumquat became polluted and damaged in medium production areas in 2015-2016. (figure 1-7)

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Figure1. Change the color of leaves, leaf loss and canker branch



Figure 2. Drying kumquat tree due to *Phytophthora citrophthora* fungus



Figure 3. Dry and dead kumquat branches



Figure 4. A Kumquat fruit brown rot

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Figure 5. Gum secretion on the skin surface in infected kumquat trees and branch burn



Figure 6. A kumquat tree suffered from a serious *Phytophthora* disease induced *citrophthora*.

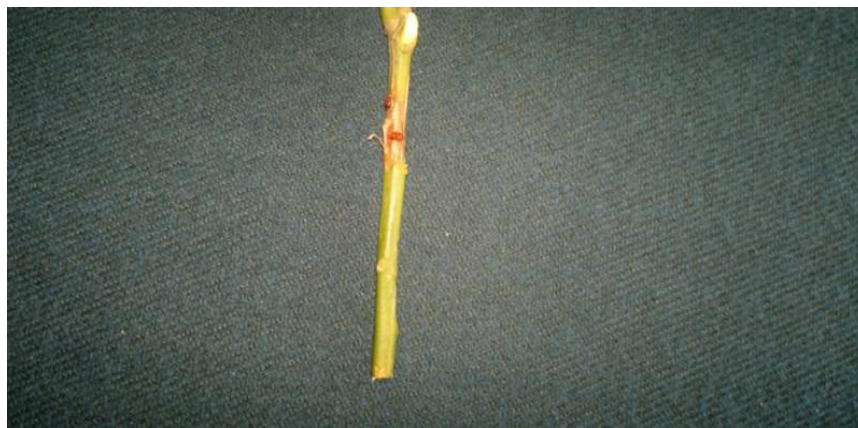


Figure 7. Gum secretion in infected kumquat Branch

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The disease agent

The disease agent of root and rot, branch and ornamental (citrus fruit decay) was earth fungi such as *Phytophthora citrophthora*. The fungi roots were without transverse walls on the medium, and this fungus can produce pear sporangium of the spherical papillae and can also produce a lot of flagellate zoospores.

IV. DISCUSSION

The ornamental citrus producers are a problem with root and rot, body and fruit decay. This problem resulted from *Phytophthora* spp. fungi. This disease in most cases can bring a lot of damage to the products. The most important and common products of *Phytophthora* species which can damage ornamental citrus are *P. citrophthora* species. This species was separated from the soil of polluted ornamental citrus and decayed stem and fruit. The results showed that *P. citrophthora* in Tonekabon in the north of Iran is the fungus of root and rot, stem and fruit decay agent of kumquat. The obtained *P. citrophthora* species in this study was similar with the study which is done in Italia, Taiwan, China, Iran and Turkey. This *Phytophthora* species is very aggressive and is a threatening agent in ornamental citrus products in Iran especially in the soils with very humid and a weak drainage. The survey results from the citrus areas in the north of Iran separated two *P. citrophthora* and *P. nicotianae* species from citrus and described them as damaging [8-16]. The morphological characters of *Phytophthora* species correspond with the descriptions which are given in literature review.

VI. CONCLUSION

The most obvious sign is in woody stems and branches are severe gum on the skin surface. The disease agent of root and rot, branch and ornamental citrus fruit decay was earth fungi such as *Phytophthora citrophthora*.

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