

Root knot nematode in ornamental plants of Mazandaran Province North of Iran

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Abstract

170 samples of soil, root and standing parts of ornamental greenhouses plant collected from different city of Mazandaran province which included Amol (7 samples), Tonekaboon (23 samples), Ramsar (21 samples), Salmanshahr (9 samples), KelarAbad (24 samples), AbasAbad (34 samples), Nashtarood (9 samples), Nowshahr (34 samples), Hachirood (9 samples). These samples collected from 74 flowers and ornamental plants that belong to the 50 different groups of plant and collected between the years of 2012-2015 and then investigated. From 170 collected samples of soil and roots, *Meloidogyne javanica* nematode that produce knots roots have 28.5 frequency percent and it was the most popular species in ornamental greenhouse of Mazandaran. *Meloidogyne javanica* has 43 frequency percent in Amol and 117 nematodes, in Abas-abad it has 18 frequency percent and 670 nematodes, in Salmanshahr it has 25 frequency percent and maximum population of 1140, in Kelar-abad it has 10 frequency percent and 40 nematodes, in Hachirood it has 33 frequency percent 170 nematodes, in Nowshahr it has 57 frequency percent and maximum nematodes of 2520, in Abas-abad it has 42 frequency percent and maximum population of 110 nematodes, in Ramsar it has 52.4 frequency percent and its maximum percent was 1560 nematode that is separated from 250 cm³ of soil.

Introduction

The area under cultivation of ornamental plants in Mazandaran province is 615 hectares which include 232 hectares of indoor ornamental plants and 383 hectares of outdoor plants. The average greenhouse area is varied between 250 to 1000 square meters. The total area under cultivation of apartment buildings is 1326625 square meters with the production of 12350671 pots and the major products of Philodendron, Peace lily, Dumb canes, Geranium, all types of Fig trees, Benjamin, Dracaena and others Cordyline. The total area under cultivation of cut flowers is

2121578 square meter and its production are 108902565 branches and its main products consist of Roses, Bird of paradise flower, Peruvian Lily, Liliun, Gerbera, Anthurium, Gladiolus, chrysanthemum and Narcissus. The total amount of flower production and ornamental plants in the province is about 180 Million (Elder, Pot, Branch, Bulb and Onion) with economic value of 1,700 billion Rial. Amol city 1587458, Ramsar with 1116121 and Tonekabon 1105800 square meters, respectively, have the highest cultivation area (Unknown, 2010). Considering the high production potential of ornamental plants of the province, due to lack of knowledge of various issues such as weakness in recognizing the disease and management, plant parasite nematodes is just an influence on 3% of the province's exports of flower. Parasite nematode is one of the limiting factors in the production of ornamental plants of all around the world and Iran is no exception.

Root knot nematode, root lesion nematode, nematodes of the stem, leaf and bud are the most important nematode which influence on ornamental greenhouse production. Like other products, ornamental plants that grow in the greenhouse have a large variety of nematodes that cause damage. Saser & Ferkman (1987) stated that 11.1% of damage to ornamental plants around the world is due to parasitic nematodes. Considering the importance of ornamental plants, the study of parasite nematodes is an important contributor against the release, damage of nematodes to other areas of the province; while at the same time paying attention the effect of these factors on the quality and market power of ornamental artifacts and evaluation of nematode has an important share in quality of products. Parasite nematodes on some ornamental plants in Pakistan investigated and reported (Begum, 1997). Costa et, al (2001) studied the nematodes on the roots of ornamental plant and reported that *M. incognita* and *M.javanica* can cause damage 9.17, 18.7, respectively (Costa et al., 2001). In 2002, 2001, 2004, the problems of root knot nematode on a number of ornamental plants in Pakistan were studied (Khan et, al, 2007). Hagan (2005) tried to separating the root canal nematodes on ornamental one year plant and reported this process (Hagan, 2005). In the United States, sensitivity of seven branch cut ornamental plant against root knot nematode was studied (Wang & McSorely, 2005). In Pakistan 6 species of nematodes: *M. javanica*, *M. incognita*, *Trichodorus* and *Xiphinema brevicolle*, *Helicotylenchus dihystra*, *Hoplolaimus galeatus christiei* separated from soil and roots of different ornamental plant and reported (Goswami et al, 2008). Anwar et. al studied nematode which produce root knots on ornamental plant (Anwar et al.,2009). Pakistan has done research about parasitic nematodes in

ornamental plants. The results of study showed that Jasmine ornamental plant and *Clitoria ternatea* Infected to *Meloidogyne incognita* and *M. javanica* nematodes. This was the first infected report of these plants to the *Meloidogyne incognita* and *M. javanica* nematodes (Zarina B, Shahina F. 2010). Brito et, al (2010) reported six species of nematode which produce root knots on ornamental plants of Florida (Brito et al, 2010). In Negeria, resistance of 16 ornamental plants against nematodes which produce root knots on *M. incognita* species was investigated (Salawu et al., 2010). During a 2-year period (2012-2013), some research was done for identify the occurrence and density of parasite nematodes in relation to various host ornament plants (vegetables, fruit trees and ornamental plants) in Jazan province that is located in southwest of Saudi, and sixteen genus of nematode was investigated in relation to soil Rhizosphere and plants roots; four important species consisted of *Meloidogyne*, *Aphelenchoides*, *Ditylenchus*, *Pratylenchus* (Mokbel A.A 2014). Some important commercial ornamental plant of like Iris, lily flower, Clove, Chrysanthemum, Gerbera flower and rose was studied and different nematodes of *Meloidogyne*, *Aphelenchoides*, *Ditylenchus*, *Pratylenchus* identified; these nematodes can cause damage on ornamental plants (Borgohain,N. 2016). Some arenaria *Meloidogyne*, *M. hapla*, *Meloidogyne javanica* , *M. incognita*, *Ditylenchus dipsaci*, *D.trifolii*, *Aphelenchoides ritzemabosi* nematode reported in Italy that has produce knots of roots on ornamental plant ((Lamberti, et al., 1987).

Parasite nematodes are responsible for serious damage to the root and air organs of ornamental plants, reduction of beauty, and finally its economic value. *Aphelenchoides* sp. was existed on dieffenbachia, Fig trees, Benjamin; *Ditylenchus* SP. Reported on Peace lily *Pratylenchus brachyurus* (Bidi zebrine); but parasite nematodes was not reported on , Bird of paradise plant (Gimenes,et al.,2010). Ornamental plants that infected by nematodes and flowers in the Minas Gerais of Brazil was investigated by using the Jenkins method. *Meloidogyne incognita* (16.7%) nematode, *Meloidogyne* SPP. Nematode (9.09%), *M. javanica* (7.58%), and *Ditylenchus* SP. (1.52%) nematode investigated (Costa, et al2003). Some research in relation to parasitic nematodes of ornamental plants was done in Iran. Hosni Mehraban & Tanha Moafy (2000) reported existence of nematodes that produce knots roots in cultivated greenhouses of Mahalat. Mohammad Deimy (2004,2008) research about plant parasite nematodes of branch flower in Mahalat and reported that 22 nematodes belongs to 13 genera of Tylenchida type.

Material and Method

Green house ornamental and outdoor plant in the province was survey different samples of soil and root collected from different region soil that has depth of 10-30 cm. Ornamental and outdoor plant selected randomly. Three subsamples provided for each 1000m greenhouse and subsample of each plant mix together and one total sample achieved. Nematodes of each soil sample separated by Jenkins (1964) method after transferring these samples to laboratory. Inner root nematodes separated by Blender and Centrifuge method (Colon and D, Hered, 1972) from each 5 grams of each sample root. After the extraction of nematodes in a specific volume of soil and root, counting and number of each nematode determine by using counting slide in a suspension that obtained from certain volume of soil. Worm-shaped nematodes fixed by using De Grisse method (1969) and transferred to pure glycerin and permanent slides were provided and then identified with measure of morphometric and their morphological characteristics. After examining the samples, the infected areas to nematodes identified and their frequency percentage determined based on ratio of the samples number that have desired species to whole samples.

Results:

From 171 collected samples of soil and roots, *Meloidogyne javanica* nematode that produce knots roots have 28.5 frequency percent and it was the most popular species in ornamental greenhouse of Mazandaran. *Meloidogyne javanica* has 43 frequency percent in Amol and 117 nematodes, in Abas-abad it has 18 frequency percent and 670 nematodes, in Salmanshahr it has 25 frequency percent and maximum population of 1140, in Kelar-abad it has 10 frequency percent and 40 nematodes, in Hachirood it has 33 frequency percent 170 nematodes, in Nowshahr it has 57 frequency percent and maximum nematodes of 2520, in Abas-abad it has 42 frequency percent and maximum population of 110 nematodes, in Ramsar it has 52.4 frequency percent and its maximum percent was 1560 nematode that is separated from 250 cm³ of soil. Ornamental plant like *Iris sibirica*, *Cycas revolute*, *Lilium longiflorum*, *Canna Wyoming* reproduction onion, rhizome and transfer by pot; these plants infected to *Meloidogyne javanica* and some preventive activity must done for transferring pot, rhizome and onion to other side of country. *Meloidogyne javanica* nematode which produce knot roots in Devil's ivy ornamental plant separated from 250 g soil with maximum 2520 nematodes. In Nowshahr in seedlings

greenhouse region, the most infected were parasitic nematodes. Numbers of nematodes in some greenhouse was low, because of disinfection of soil in greenhouses; infected and population of nematodes in outdoor plants was different with greenhouse plants. Because temperature, moisture and light of plant can be provided for plant that is in the greenhouse; while, outdoor plant in autumn and winter are inactive.

Discussion

Among nematodes of the parasite species, *M. javanica* with 15 frequency percent was common species with 43 infected samples and maximum population of 2520 nematodes that was located on Devil's ivy plant and related to the Araceae family in Nowshahr. 32 out of 72 ornamental plants were host for *M. javanica*; 43 infected sample to this nematodes identified from these 9 regions. Nowshahr with 15 samples was a place which has the most infected samples to *M. javanica* nematodes; maximum population related to the Devil's ivy plant with 2520 population of nematodes, and minimum population related to Nashtarood and Tonekabon with no infected samples. Maximum population of *M. javanica* with 52 frequency percent was determined in Ramsar. In Ramsar, Nowshahr, Amol, Salmanshahr, Hachirood, Abas-abad, Kelar-abad respectively, has 52, 44, 43, 33, 33, 24, 4 frequency percent in *M. javanica* which separated from greenhouse; Tonekabon has no infected samples. Given that nematode which produce root knot is isolated from the ornamental plant of this area. Therefore, it is necessary to investigate the pathogenicity and the amount of damage to this ornamental plants. Activity of root nematode and *Furarium* fungus on *Gerbera* plant can produce knots which is due to hypertrophy, hyperplasia and root spoil (Sankari Meena et. al 2011). Since most of the ornamental plants in the province are infected with decay and root knots and these root nematode can increased disease rates (Mir-abolfathy, 2002). Some research must do about interaction of these two soil fungus and root nematodes. Iris, Cycas, Lily, must proliferation with onion and rhizome and transfer with pot and these plant are pollute to the *M. javanica* nematode and some preventive activity must done for transferring these pots, rhizome and onions to other sides of country. In the greenhouse of the Nowshahr, the most contaminated related to the parasite nematodes. Numbers of nematodes in some greenhouse was low, because of disinfection of soil in greenhouses; infected and population of nematodes in outdoor plants was different with greenhouse plants. Because temperature, moisture and light of plant can be provided for plant that is in the greenhouse;

while, outdoor plant in autumn and winter are inactive. In some sampling nematode contamination and root rot were observed and some interaction study offered, but it has not investigated in culture of laboratory.

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