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Research Article

THE HOST STATUS OF SOME COMMERCIAL POTATO CULTIVARS AND LOCAL GENOTYPES TO *MELOIDOGYNE INCOGNITA* INFECTION

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ABSTRACT. Root-knot nematodes (*Meloidogyne* spp.) can cause significant yield losses depending on the species in the Potato. The objectives of this study were thus to examine the host status of the commercially cultivated some cultivars in Turkey and regionally cultivated potato genotypes in Ordu province to the most common species *Meloidogyne incognita* present in the production areas. For this purpose, local genotypes Kadıoglu, Aybastı beyazı and Aybastı sarısı, commercially produced Agria, Melody, Nectar varieties were selected. Each potato cultivars and genotypes were planted in 1lt plastic pots filled with sand, soil and organic matter (1:1:1). Ten days after emergence, each pote was inoculated with approximately 250 infective scond stage juveniles (IJ2) by pipetting 2 ml of a water suspension containing the IJ2 onto the root system of each seedling. The experiment was conducted under greenhouse conditions at temperature of 25±2 °C and a 16:8 h light-dark photoperiod. Every two day after inoculation, two pots potato seedlings were removed from each cultivar and genotype pots. Root systems were stained with fuchsin acid. The number of nematodes that remained inside the roots and soil were counted. After inoculation 4th days, IJs were seemed entered inside the roots in all cultivars and genotypes. At the end of the 14-days period, differentiated larval stages and mature female individuals were encountered in the all-root tissue. This implies that *M. incognita* reproduced well in all potato cultivars and local genotypes tested. The results of the study showed that; all potato cultivars and genotypes are a suitable host for *M. incognita* to feed on and complete its development.

***Keywords**: Host, Meloidogyne incognita, Potato, Root-knot nematode*

INTRODUCTION

Potato is one of the most important agricultural products all over the world and is one of the major food sources in many countries. China is the world's leading producer of potatoes, growing 22% of all potatoes [8]. In Turkey, potato is the fourth most important food crop after wheat, maize, and rice [3]. Niğde, Konya and Afyonkarahisar are first three important provinces in potato production. These three provinces account for approximately 40% of the production.

Nematodes have been known to affect the potato plant for the last 125 years, and it is currently reported that approximately 156 species belonging to 52 genera are associated with the potato plant around the world. Especially after cyst nematodes, root knot nematodes are one of the most important pests in commercial potato cultivation. Root-knot nematodes (*Meloidogyne* spp.) widespread all over the world and affect almost all agricultural products, including potatoes, especially in semi-temperate, tropical, and subtropical regions and cause serious problems to potato (*Solanum tuberosum*) production [13]. These nematodes which cause galls on the roots of plants. In addition to direct losses from reduced tuber yields, it can cause quality defects because of gall formation on the tuber surface [5]. This situation results in a significant decrease in the market value of the products [12]. There is a 35% loss in world production for potato,

which is important for human nutrition, and 11% of this loss is composed of nematodes. In addition, when *M. incognita* is found on potatoes, the disease caused by bacterial disease agents such as *Rolstonia solanecearum* is around 20% when the bacterium is found alone, while the damage caused by the disease agent with the nematode in question increases to 86%.

In Turkey, *M. chitwoodi, M. hapla, M. incognita, and M. javanica* have been found in potato-growing areas [10]. Commonly, *Meloidogyne* spp. are managed by chemical fumigants or nematicides [4]. Nematicides are being phased out due to their harmful effects on human health and the environment. Because of this, it is important to know the host status of many plant varieties in order to rotate them with non-host plants as an alternative method of controlling root knot nematodes.

The objectives of this study were to determine the host status of the commercially cultivated some cultivars in Turkey and regionally cultivated some potato genotypes to the most common species *Meloidogyne incognita* present in the production areas.

MATERIALS AND METHODS

Nematode Cultures and Extraction

As inoculum, the root-knot nematode species *M. incognita* was used in this study. Pure populations of *M. incognita* confirmed using the molecular identification method. Nematode cultures were multiplied in 'Rutgers' tomato plants (*Solanum licopersycum* L.). For this purpose, four leaf stage tomato seedlings were inoculated with egg masses and allowed to multiply for 8 weeks. The nematode inoculum was obtained from the root system of tomato plants using the method of Hussey and Barker [7]. Nematode eggs were extracted from roots with 0.5% NaOCl, using a blender. Infective second stage juveniles (IJ2s) were obtained using a Petri dish method at 23ºC. IJ2s that hatched within 72 h were collected and used for inoculation [13].

Plant Material

Three potato cultivars, commonly cultivated in Turkey and three local genotypes from Ordu province were used in this study (Table 1). Seeds belonging to the commercial varieties were obtained as certified seeds, while other genotypes were obtained from the local farmers. Tubers were sprouted to about 1 cm long before planting, with excess sprouts removed to obtain tubers with single sprout for planting. One week after emergence of potato seedlings were transplanted to plastic pots containing in 1lt filled with sand, soil, and organic matter (1:1:1).

Table 1. *Commercial potato cultivars and local genotypes used in this study*

Commercial cultivars	Genotypes
Agria	Aybastı beyazı
Melody	Aybastı sarısı
Nectar	Kadıoğlu

Nematode Infection Assay

The experiment potato plants were inoculated three days after transplantation with 2ml. of suspension containing 250 second juvenile (J2) per plant in three holes approximately two cm deep around the plant. The experiment was conducted under

greenhouse conditions at temperature of 25±2 °C and a 16:8 h light-dark photoperiod. The roots of each potato plant roots were removed from pots and washed individually 2, 4, 6, 8, 10, 12, 14 days after inoculation. Two roots from each variety were randomly selected and washed then stained in acid fuchsin lactophenol for 1 minutes [2] and observed under the microscope to count the juveniles that penetrated the root system. Also, to determine the presence of *M. incognnita* juveniles in the soil, the J2 were extracted by centrifugal flotation [9]. The number of J2 was counted using an inverted light microscope at 20X magnification (Zaiss, Primo-vert, DM2500).

RESULTS AND DISCUSSION

In this study, the effects of root knot nematode *Meloidogyne incognita* on 3 local genotypes (Kadıoğlu, Aybastı beyazı, Aybastı sarısı) grown in Ordu Province and 3 commercial potato cultivars (Agria, Melodi, Nektar) grown in Turkey were investigated.

According to the research results, It was observed that infective scond stage larvae of *M. incognita* entered the root tissue on the 2nd day after penetration. The first root entry was in Agria as commercial variety and Aybastı sarısı as local genotype. In general, in terms of most cultivars and genotypes, it was observed that the most entry into the root tissue occurred on the 10th and 12th days. In the counting of nematodes in the root tissue 10 days after penetration, the highest value was observed in Agria variety with 216 individual Fig. 1. This was followed by Aybastı Beyazı with 200 individual, Aybastı Sarısı with 169 individual and with Kadıoğlu 113 individual. In the 12th day counts after penetration, the commercial variety Nectar with the highest entry was determined.
In general, a small number of infective juveniles have been observed in all cultivars and genotypes root tissue even 14 days after penetration.

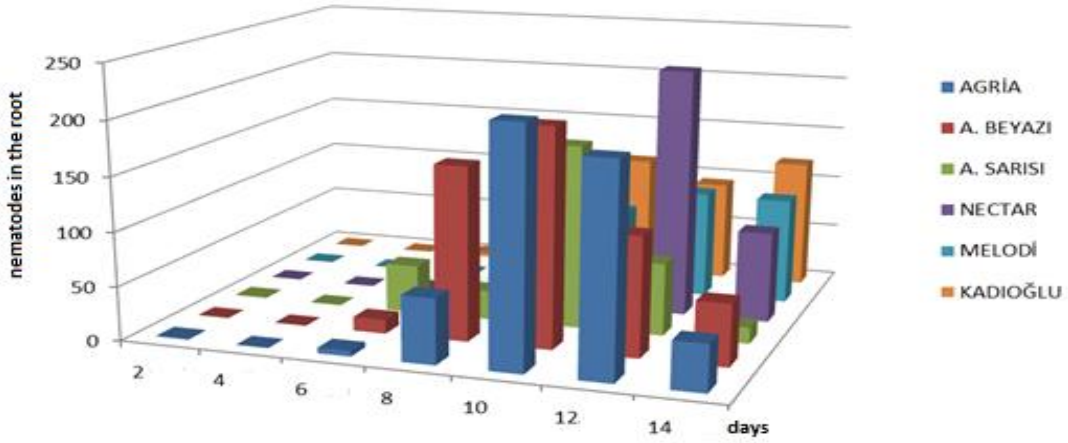

Fig. 1. *The number of nematodes that entered the root of commercial potato varieties and local genotypes*

Monitoring the developmental stages of nematodes in plant tissues reveals the pathogenic potential of the nematode. The biology of this group of nematodes provides convenience in demonstrating the pathogenic potential of root knot nematodes. Root knot nematode *M. incognita* juvenile (J2), which has penetrated the root tissue, feeds on protoxylem and protophloem cells. With the advancing periods of development, it has been observed that the thread-form juveniles, which have entered the root tissue, have begun to take the form of a sac. In a very short period (4-6 days) transitions between

juvenile periods were achieved, and shape change took place. In this respect, it was concluded that the nematode feeds and develops in plant tissues. In addition, because of feeding, the nourished cells were become differentiated and enlarged, which is an indication of the destruction of plant tissues Fig. 2.

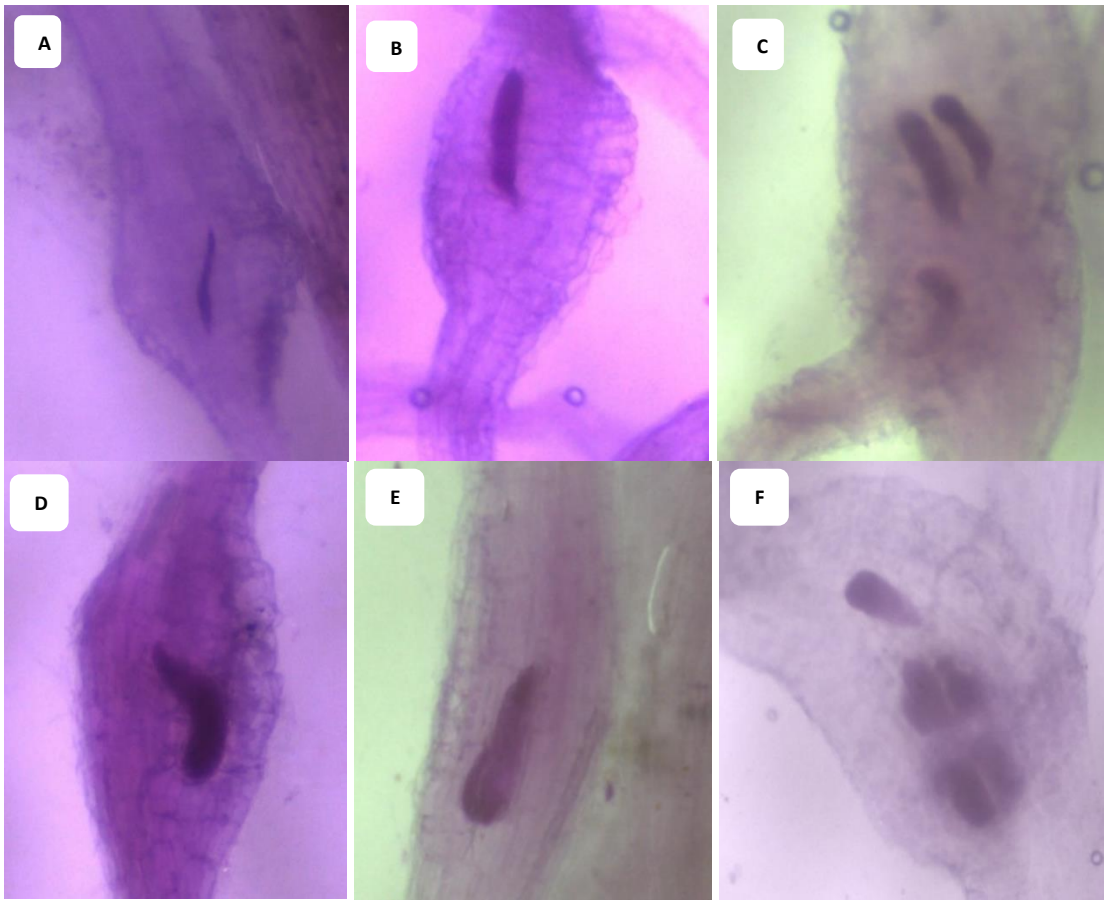

Fig. 2. *Development of stages of Meloidogyne incognita in commercial potato cultivars and local genotypes. A) Agria, B) Melody, C) Nectar, D) Aybastı Beyazı, E) Aybastı sarısı, F) Kadıoğlu*

In this study, when the pathogenicity of *M. incognita*, one of the root knot nematodes, in different potato genotypes and cultivars is evaluated, it is seen that it is compatible with the typical biology of root knot nematodes. In a short time, shape change was observed as a sign of transition from juvenile to adult female period. In this respect, it is seen that all potato genotypes and varieties allow nematode development. In addition, gall-like swellings caused by root gall nematodes in plant root tissues are also observed in all genotypes and cultivars studied within a 14-day period. Similar results were also observed in the study conducted by Abd-Elgawad et al., [1]. Accordingly, at the end of the 10-day period, differentiated and maturing female individuals were encountered in the tissue. Considering the feeding region in the plant tissue, this region can be occupied by more than one female individual or by a single female individual. Vovlas et al. [15] stated that they encountered up to four female individuals in a certain feeding region in their study on potatoes. In our study with these aspects, it is seen that *M. incognita* juveniles pass through the developmental stages required for reproduction in a short time. In addition, structures similar to gall formation in the root, which is a measure of the preference of

plants as hosts, were also encountered. In this respect, the criteria for gall formation in terms of host suitability stated by Osunlola and Fawole [10] were also met for our study. Considering all the criteria mentioned above, it is seen that all potato cultivars and genotypes within the scope of the study are suitable for entry and development of *M. incognita*. Gondal et al. [6] investigated the effects of *M. incognita* on thirty-six potato cultivars and found that all cultivars were susceptible. Therefore, if these cultivars and genotypes are grown in field conditions, they will be preferred by *M. incognita*. However, as Osunlola and Fawole [10] stated, another measure that higher plants are preferred as suitable hosts following development is the high reproduction rate of the nematode. In this respect, it is necessary to examine the relationship between the reproductive status of the nematode in the later biological periods and the yield losses in the plant in the mentioned varieties and genotypes with longer-term studies.

CONCLUSION

Root knot nematodes feeding reduces the vigour of potato plants and causes blemishes on tubers. It can also lead to a severe reduction in tuber quality and as a result, affected potatoes become unmarketable. This study shows that *M. incognita* is aggressive all potato cultivars and genotypes used in this study and can severely impair potato growth. Among different potato cultivars and genotypes tested against root knot nematode *M.incognita* infection has not been observed.

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