

Host Suitability of Some Potato Cultivars to *Meloidogyne javanica*

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Abstract. Fourteen imported potato cultivars (Agria, Ajax, Ariane, Atica, Cozmos, Draga, Escort, Ilona, Lesita, Mirka, Mondial, Morene, Planta and Spunta), grown in Saudi potato fields, were evaluated for their host suitability to *Meloidogyne javanica* in greenhouse tests. The standards and parameters adopted by the International *Meloidogyne* Project were followed. All tested cultivars were found to be susceptible and good hosts to *M. javanica*. Values of gall index GI (0-5) ranged from 3.3 for cv. Planta to 5.0 for cvs. Agria, Mondial and Morene. Reproduction factor RF ranged from 4.1 for cv. Lesita to 94.7 for cv. Mondial. Although all cultivars were designated as susceptible, they differed ($P \leq 0.05$) with respect to GI, RF and number of eggs per gram fresh root. Development or introduction of resistant cultivars is essential for the management of *M. javanica* in our potato fields.

Introduction

Interest in growing potato (*Solanum tuberosum*) in Saudi Arabia has increased in recent years. The crop is grown in the spring and fall seasons. Potato production has increased from only 20 tons in 1976 to about 60,000 tons in 1990 [1]. Productivity has also increased from 9.9 tons/ha in the years 1979-1981 to 20 tons/ha in 1989. For spring crop, farmers depend on imported seed tubers mainly from the Netherlands and France. Tubers produced in the spring are usually used for planting in the next fall season.

A recent survey of nematodes associated with potato was conducted in the country during 1989-1991 [2]. *Meloidogyne* spp., mainly *M. javanica* (Treub) Chitwood were by far the most prominent and damaging plant-parasitic nematodes in Saudi potato fields. Crop losses, although not experimentally determined, reached up to 50% in some heavily *M. javanica*-infested fields. Plants were severely stunted, and roots and tubers were heavily galled and deformed [2].

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Information on host suitability of potato cultivars grown in our potato fields to *M. javanica* is not available. However, the reaction of some other potato cultivars and clones to some *Meloidogyne* spp. has been reported [3-7]. The purpose of this study was to determine the host suitability (degrees of resistance) of 14 potato cultivars, the most commonly cultivated in Saudi fields, to the root-knot nematode, *M. javanica*.

Results and Discussion

All tested cultivars were moderately to highly damaged ($GI > 3$) by *M. javanica*, and were good hosts ($RF > 4.1$) for this nematode (Table 1). Mean GI values ranged from 3.3 for cv. planta to 5 for cvs. Agria, Mondial and Morene. RF values ranged from 4.1 to 94.69 for cvs. Lesita and Mondial, respectively. Number of eggs per gram fresh root varied from 1877 for cv. Lesita to 13984 for cv. Spunta.

Meloidogyne javanica was isolated from a potato field in Al-Kharj, Saudi Arabia in the previous season, and reared in the greenhouse on tomato (*Lycopersicon esculentum* Mill) cv. Rutgers. Once potato seedlings were well-established, three seedlings (replicates) of each cultivar were selected for plant uniformity, and each was inoculated with 5,000 eggs of *M. javanica*. Inoculum was prepared by extracting

Table 1. Host suitability of 14 potato cultivars to *Meloidogyne javanica*, 55 days after inoculation.

Cultivar	Plant damage (GI)*	Host efficiency (RF)**	Suitability designation	Eggs/g fresh root
Agria	5 a	61.79 abc	Susceptible	6,248 ab
Ajax	4.3 abc	29.71 cd	"	6,294 ab
Ariane	4.0 bcd	18.73 cd	"	11,496 ab
Atica	4.0 bcd	21.96 cd	"	5,883 ab
Cozmos	4.7 abc	34.03 bcd	"	7,351 ab
Draga	4.3 abc	46.69 abcd	"	8,659 ab
Escort	3.8 cd	10.81 cd	"	9,606 ab
Ilona	4.8 ab	27.73 cd	"	4,177 ab
Lesita	4.2 abcd	4.10 d	"	1,877 b
Mirka	3.8 cd	84.80 ab	"	7,623 ab
Mondial	5.0 a	94.69 a	"	7,321 ab
Morene	5.0 a	46.39 abcd	"	3,915 b
Planta	3.3 d	7.97 cd	"	3,099 b
Spunta	4.0 bcd	26.96 cd	"	13,984 a

Values are means of 6 replications from two experiments, means followed by the same letter within a column are not significantly ($p \leq 0.05$) different according to FLSD.

* GI = Gall index where, 0= no galls; 1=1-2; 2=3-10; 3=11- 30; 4=31-100; 5=100 + galls.

** RF = Reproduction factor = final egg count/initial egg inoculum.

eggs from the tomato roots by the NaOCl method [8] and added by pipetting the egg suspension into three small holes in the soil around each seedling. Inoculated seedlings were arranged in a complete randomized design on a greenhouse bench ($24 \pm 3^\circ\text{C}$).

Fifty-five days after inoculation, each plant was carefully removed from the soil, and its roots were washed free of soil, weighed, and number of galls was counted. Gall index (GI) was determined on a 0-5 scale [9]. Each root system was then cut into 1-cm segments and blended in a 1% NaOCl solution [8] in a Waring Blender to extract eggs. The eggs per plant (Pf) were counted, and Oostenbrink's reproduction factor (RF) was then calculated according to the formula $RF = Pf/Pi$ [10], where Pf represent the average final egg counts and Pi the initial egg number of 5,000 eggs.

Based on GI and RF values, the host suitability (designation of resistance) of each cultivar was determined according to the scheme of Canto-Saenz [11] which was modified by Sasser *et al.* [12]. Cultivars with $GI \leq 2$ and $RF \leq 1$ are designated as resistant (insignificant damage to plant and inefficient for nematode reproduction). Cultivars with $GI \leq 2$ and $RF > 1$ are termed tolerant (insignificant damage but efficient for nematode reproduction). Cultivars with $GI > 2$ and $RF \leq 1$ are designated as hypersusceptible (significant damage but inefficient for nematode reproduction). Cultivars with $GI > 2$ and $RF > 1$ are classified as susceptible (significant damage and efficient for nematode reproduction).

Data of eggs per gram fresh root, GI and RF were also subjected to analysis of variance (ANOVA), and means were separated with Fisher's protected LSD. The experiment was repeated once, and data from both experiments were combined for analyses.

Results and Discussion

All tested cultivars were moderately to highly damaged ($GI > 3$) by *M. javanica*, and were good hosts ($RF > 4.1$) for this nematode (Table 1). Mean GI values ranged from 3.3 for cv. planta to 5 for cvs. Agria, Mondial and Morene. RF values ranged from 4.1 to 94.69 for cvs. Lesita and Mondial, respectively. Number of eggs per gram fresh root varied from 1877 for cv. Lesita to 13984 for cv. Spunta.

According to the modified scheme of Canto-Saenz [11,12] all tested cultivars were classified as susceptible to *M. javanica* ($GI > 2$ and $RF > 1$). The cultivars used in this study may react differently to other geographical isolates of *M. javanica*. Since these cultivars were damaged and efficient hosts for *M. javanica* they should be eliminated from a field screening program. Furthermore, the usefulness of these cultivars in crop rotation schemes for control of *M. javanica* in our potato fields is very limited because none of the tested cultivars showed resistance. Information is not available

on the response of these cultivars to *M. javanica* under uniform test conditions. However, resistance or susceptibility of other potato cultivars or clones to some species of root-knot nematodes, including *M. javanica* has been documented [4-7].

Data of eggs per gram fresh root were used to examine the relative efficiency of the tested cultivars for the nematode reproduction. Spunta was the most efficient host among the tested cultivars, whereas Lesita and Planta were the least efficient hosts (Table 1). Since rate of the nematode population increase would be lower on Lesita and Planta than on all other cultivars, these two cultivars may be relatively more suitable for growing in fields with low levels of *M. javanica* infestation. The development or introduction of suitable resistant cultivars of potato is essential for the management of *M. javanica* in our potato fields.

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مدى قابلية بعض أصناف البطاطس للإصابة بنيماتودا *Meloidogyne javanica*

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ملخص البحث. تمت هذه الدراسة تحت ظروف البيت الزجاجي، وذلك لتقدير مدى قابلية ١٤ صنفاً من أصناف البطاطس (أجريا، أجاكس، أريان، أتیکا، كوزموس، دراجا، اسكورت، ايلونا، ليزيتا، ميركا، مونديال، مورين، بلانتا، سبونت)، والتي تزرع في المملكة العربية السعودية، للإصابة بنيماتودا تعقد الجذور *Meloidogyne javanica*. وقد استخدمت في هذه الدراسة الطرق والمعايير المتبعة في البرنامج الدولي لنيماتودا تعقد الجذور. أوضحت الدراسة أن جميع الأصناف المختبرة كانت قابلة للإصابة. وقد تضررت جميع الأصناف نتيجة للإصابة، كما تبين أنها عوائل جيدة لتكاثر النيماتودا عليها. تراوحت قيم دليل تعقد الجذور (صفر- ٥) بين ٣,٣ للصنف بلانتا إلى ٥,٠ للأصناف أجريا ومونديال ومورين. وبالرغم من أن جميع الأصناف المختبرة كانت قابلة للإصابة إلا أن قيم دليل تعقد الجذور، ومعدل تكاثر النيماتودا، وكذلك عدد البيض في الجرام الواحد من الجذور كانت مختلفة معنوياً بين الأصناف المختبرة.