

THE RESPONSE OF ROOT - KNOT NEMATODE *MELOIDOGYEN JAVANICA* INFECTING TOMATO PLANTS TO FOLIAR APPLICATIONS OF CERTAIN PLANT GROWTH REGULATORS.

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ABSTRACT

Effect of plant growth regulators, CCC, 800 IAA, and IBA at rates of 200, 400, 600 and ppm applied as foliar spray in controlling the root-knot nematode, Meloidogyne javanica infecting tomato plants were studied under greenhouse conditions. All tested concentrations of CCC and IBA greatly reduced the nematode reproduction especially the application of such chemicals at the two higher concentrations. On the other hand, all tested concentrations of IAA encouraged nematode infectivity and accelerated the nematode reproduction especially at the two higher concentrations. However, the values of nematode reproduction at all tested concentrations of IAA were more or less around the untreated plants. CCC, and IBA at the two higher concentrations significantly increased both shoots and roots fresh weights when compared with those of untreated ones.

INTRODUCTION

Changes in plant growth following the applications of plant growth regulators draw the attention of nematologists. However the attempts to prevent the development, growth, fecundity, and reproduction of plant parasitic nematodes by using such chemicals of various physiological activities on various plant species were studied by many workers (Peacock 1963; Kochba & Samish 1971; Sawhney & Webster 1975; Matsui & Nakagawa 1977, and Farahat & Osman 1988).

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Morphactin, phosphon - D, and Cycocel (CCC) slowed development of *M. incognita*, *M. Javanica* and *M. hapla* on tobacco and tomato plants (Orion & Minz 1971 ; Orion 1973, 1974; Prasad & Govindu 1976; Salem & Midan 1980, and Abo-Korah & Salem 1981). Similar results were obtained by (Nusbaum 1958; Peacock 1960, 1961 Davide & Triantaphyllou 1968; Prasad & Setty 1974, and Mjuge & Viglierchio 1975). They reported that Maleic hydrazide reduced the development and reproduction of the root - knot nematodes. In contrast, Ethrel, Cytokinin, Gibberellic acid, and Daminozid increased galling and numbers of nematodes of *M. Javanica* . *M. incognitea* and *Tylenchorhynchus microdorus* on tomato and guava plants (Dropkin *et al*, 1969; Orion & Minz 1969; Mukhopadhyaya & Krishnamoorthy 1971; kochba & Samish 1972; Orion 1973; Badra *et al* 1980, and Osman *et al* 1984).

Also, the multiplication of *Aphelenchoides ritzemabosi* on lucerne seedlings growing specially on agar medium was significantly increased by kinetin, Gibberellic acid(GA). and Indol -3 acetic acid (IAA). Webster (1967).

The aim of this work was to determine the effect of three plant growth regulators applied as foliar spray, in controlling the root - knot nematode, *M. Javanica* and in improving plant growth.

MATERIALS AND METHODS

Three- week-old seedlings of tomato cultivars Ace were planted separately in 15 - cm. diameter clay pots filled with loamy sand. Ten days later, each pot was inoculated with 3000 newly - hatched larvae of *M. Javanica*. Seven days after inoculation, aqueous solutions of cycocel, Indol -3 acetic acid, and Indol-3 butyric

acid at four concentration levels 200, 400, 600, and 800 ppm. were uniformly sprayed over the plant foliage until running off, using a plastic atomizer. Soil contamination by the chemicals foliar was prevented by aluminum foil covers fitted on pots. Checkpots were inoculated with nematodes and kept without plant growth regulators treatments. All pots as well as the check were replicated four times. pots were arranged in a greenhouse at 32 ± 5 °C in a randomized block design. After 45 days from inoculation, the experiment was ended, and the plants were harvested. Numbers of galls, eggs per egg mass and nematode final population were counted. Rates of nematode reproduction were then calculated. Data on plant growth based on shoot and root fresh weights were recorded.

RESULTS AND DISCUSSION

Data presented table (1) indicate that the application of IBA and CCC with four concentrations as foliar spray on *M. Javanica* inoculated tomato plants more reduced the values of egg masses, eggs per egg mass, nematode reproduction as well as the number of galls than those in untreated inoculated plants. It is evident that the reduction in the number of galls and nematode reproduction was negatively correlated with the increase in the concentration of levels of such employed chemicals. However, the maximum suppression in root galling and nematode reproduction values occurred at the concentration levels of 800, and 600 ppm. of IBA, and CCC respectively, while the minimum suppression of those values occurred at the concentration levels of 400, and 200 ppm. of IBA and CCC. On the other hand, the application of IAA as foliar spray encouraged nematode infectivity and accelerated its life cycle. Therefore, the values of, number of galls, egg masses per root, eggs per egg mass, and nematode reproduction at all tested concentrations of

Table (1) : Effect of foliar spray with three plant growth regulators at various concentrations on reproduction of *M. javanica* and tomato growth.

Treatments	Concentration in ppm	No. of galls / root	No. of egg masses / root	No. of eggs / egg mass	Nematode final population P	Nematode reproduction P ₂ /P ₁	Plant growth			
							Shoot fresh weight	% increase	Root fresh weight (gr.)	% increase (gr.)
CCC	0	209	153	268	41004	13.66	23.70	--	10.23	--
	200	132	139	195	27105	9.03	31.30	32.1	11.43	11.7
	400	143	123	181	22263	7.42	31.86	34.4	12.46	21.5
	600	113	88	148	13024	4.34	32.46	36.9	14.73	43.9
	800	108	95	129	12255	4.08	32.46	36.9	15.36	50.2
	L.S.D. 0.05	33.27	41.65	29.51			6.89		3.68	
L.S.D. 0.01	48.41	66.84	45.22			10.56		5.65		
IAA	0	209	153	268	41004	13.66	23.70	--	10.23	--
	200	196	146	273	39858	13.28	27.46	15.9	12.66	23.8
	400	199	161	239	38479	12.82	26.06	9.9	11.26	10.1
	600	208	196	264	51744	17.24	24.81	4.7	12.16	19.8
	800	226	198	296	58608	19.53	24.22	2.2	11.90	16.3
	L.S.D. 0.05	35.11	32.05	34.74			4.15		5.99	
L.S.D. 0.01	51.08	43.91	47.97			6.35		9.18		
IBA	0	209	153	268	41004	13.66	23.70	--	10.23	--
	200	121	135	168	22680	7.56	28.63	20.8	12.16	18.9
	400	131	113	151	17063	5.68	30.60	29.1	13.40	30.9
	600	101	78	111	8658	2.88	34.23	44.4	14.80	44.7
	800	61	42	93	3906	1.30	36.40	53.6	16.33	59.6
	L.S.D. 0.05	26.47	26.47	24.09	29.70		6.45		4.54	
L.S.D. 0.01	38.52	35.05	45.50			9.89		6.96		

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IAA were more or less around the untreated plants. No significant differences were observed in such values. Also, the nematode reproduction in plants treated with 600 and 800 ppm. was about 17 and 19 folds which was 1.2 and 1.4 times more that of the check.

The influence of the tested concentrations of the three growth regulators on plant growth is summarized in table (1). In general, all concentrations of the tested plant growth regulators succeeded in improving plant growth when compared with those of untreated plants. It is noteworthy that the increment in plant growth was more pronounced in shoots, than in roots fresh weights of all treatments. Also, the progressive increase in plant growth was positively correlated with the increase in concentration of the tested chemicals except of the treatments of IAA. Thus, the shoots fresh weights of the treated plants increased significantly more than those of untreated ones, except of IBA at level of 200 ppm. Although the root fresh weight of tested plants with different concentrations of the tested chemicals, remarkably more increased than those of the untreated ones; the difference, however, were not statistically significant except of the treatment of 600 and 800 ppm of CCC and IBA. Accordingly, the highest percentages of increase in shoots and roots fresh weights were obtained by the two higher concentrations of IBA, and CCC, respectively. On the other hand, the fresh weights of both shoots and roots of all treatments of IAA were more slightly increased than the untreated ones. Therefore, no significant increase in such criteria was observed in all treatments of the IAA when compared with those of untreated.

In general, we postulate that the discontinuation of giant cells growth within

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galls of treated inoculated plants may be caused by the failure of maturation of nematode as evidence of the reduction of the numbers of galls, egg masses, and eggs per egg mass in plants treated with CCC and IBA.

Present results agreed with Davide & Triantaphyllou (1968), Mjuge & Viglierchio (1975), and Osman *et al* (1984) who suggested that the reduction in nematode multiplication after foliar application of Maleic cydrazide and CCC on tomato and tobacco might be due to the physiological and / or biochemical changes within gall tissue induced by those chemicals on host plant. Nevertheless, it is possible that such chemicals may act as chemosterilants. Orion (1973,1974) recorded drastic decrease in nematode population of *M. Javanica* on tomato plants treated with phosfon -D and Morphactin. He stated that such chemicals indirectly retarded nematode development and reproduction through the inhibition of giant cells formation within the gall tissue. On the other hand, Bird (1962), Dropkin *et al.* (1969), Kochba and Samish (1971), and Mjuge & Viglierchio (1975), did not find any effect on development of *M. Javanica*, *M. incognita* and *M. hapla* when Indoleacetic acid (IAA) was supplied to the host plant.

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تأثير بعض منظمات النمو النباتيه على نيماتودا تعقد الجذور
ميلودوجيني جافانكا التي تصيب نباتات الطماطم

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أستهدف إجراء البحث دراسة تأثير كل من السيكوسيل وحمض الخليك الاندولي وحمض البيوتريك الاندولي بتركيزات ٢٠٠ ؛ ٤٠٠ ؛ ٦٠٠ ؛ ٨٠٠ جزء فى المليون عند إستخدامها رشا على المجموع الخضرى لنباتات الطماطم المصابه بنيماتودا الجذور ميلودوجيني جافانكا.

ولقد أوضحت النتائج أن جميع معاملات السكوسيل وحمض البيوتريك الاندولى أدت الى إنخفاض عدد العقد وتكاثر الافه على جذور النباتات المصابه؛ كما لوحظ أن إعداد العقد النيماتوديہ وكذلك معدل تكاثر الافه يتناسب سلبيا مع تركيزات المركبين المختبرين.

كما أوضحت النتائج أن معاملات حمض الخليك الاندولى أدت الى زيادة معدل تكاثر الافه على الجذور المصابه وخاصة عند المعاملات ٦٠٠ ؛ ٨٠٠ جزء فى المليون.

كما أوضحت النتائج أن جميع المعاملات بمنظمات النمو النباتيه أدت الى زيادة نمو المجموع الخضرى والمجموع الجذرى للنباتات وإن اختلفت درجة الزيادة تبعا لاختلاف نوع المنظم الناتى المختبر وكذلك قوة تركيزه حيث إتضح أن إستخدام مركب السيكوسيل وحمض البيوتريك الاندولى عند تركيز ٦٠٠ ؛ ٨٠٠ جزء فى المليون أدى الى حدوث زيادة معنويه فى نمو كلا المجموع الخضرى والجذرى للنباتات المعامله.

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