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RESEARCH ARTICLE

Physiological and bio chemical modification through bio inducer in tube rose infected with root knot nematode (*Meloidogyne incognita)*

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SUMMARY

The main aim for this study is to investigate on physiological and bio chemical modification through bio inducer in tube rose infected with root knot nematode, *Meloidogyne incognita*. Two pot culture experiments was carried out during 2015-2018 for assessment of bio chemicals changes induced by selected bio stimulant in tube rose infected with root knot nematode, *M. incognita*. In this study bulbs of tuberose var. prajwalwas planted at the rate of 1 bulb/pot with three replications and each replication consist of two pots. The juveniles (1juvinile/g of soil) was inoculated under controlled condition. The pots wastreated with ascorbic acid - corm soaking (24hrs)+ foliar spray (45 and 90 DAP) with various concentration viz.,250 ppm,500 ppm and 1000 ppm, Humic Acid - corm Soaking (24hrs)+ foliar spray (45 and 90 DAP) 1,2 and 3 per cent, salicylic acid - corm soaking (24hrs)+ foliar spray (45 and 90 DAP) 50 ppm, 100ppm and200 ppm, monocrotophos 0.2% - corm soaking (24hrs)+ foliar spray (45 & 90 DAP). Field experiments was conducted at farm of RRS, Paiyur during the period of 2016-2017. The best performed five treatments were callout from pot culture experiments I and II and further experiment was conducted at field conditions in split plot (3mX3m) with three replications. The standard cultural practices were followed as recommended by Tamil Nadu Agricultural University,Coimbatore. The observation viz., Stalk length (Cm), Inflorescences length (cm), Stalk weight (g), Total number of florets, Nematode population in root(5g), Nematode population in soil (200cc), gall index and yield were recorded.

Key Words : Physiology, Biochemical modification, Bioinducer, Root knot nematode, Tuberose

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Tuberose (*Polianthes tuberosa* L.) is one of the ornamental bulbous flowering plants cultivated for production of long lasting flower spikes. They are valued much by the aesthetic world for their beauty and fragrance. In Tamil Nadu, commercial cultivation of tuberose is popular in Coimbatore, Madurai and Tirunelveli districts of Tamil Nadu; As per area and production statistics of National Horticulture Board (2013), the total area under tuberose cultivation in the country is about 7. 95 lakh hectare. The production of

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loose and cut flowers is estimated to be 27.71 '000 MT and 1560.70 lakh No's respectively. root-knot nematode (*Meloidogyne incognita)*, is the major problem is reported to cause damage to the crop, which is characterized by the stunted growth of the plants and resulting in extensive yield losses. The leaf size is reduced and the flowers look sickly and, ultimately, the roots rot. Hence, The present investigation was designed in a view to quantify the bio chemicals variation in tube rose treated with bio inducer under controlled condition and to standardize the effective inducer for the management of root knot nematode through field studies in tube rose.

MATERIAL AND METHODS

Pot culture experiments :

Two experiments was conducted at RRS, Paiyur for assessment of bio chemicals changes induced by selected bio stimulant in tube rose infected with root knot nematode, *M. incognita*. In this study bulbs of tuberose var.prajwalwas planted at the rate of 1 bulb/pot with three replications and each replication consist of two pots. The juveniles (1juvinile/g of soil) was inoculated under controlled condition. The pots wastreated with ascorbic acid - corm soaking (24hrs)+ foliar spray (45 and 90 DAP) with various concentration viz.,250 ppm,500 ppm and 1000 ppm, Humic Acid - corm Soaking (24hrs)+ foliar spray (45 and 90 DAP) 1,2 and 3 per cent, salicylic acid - corm soaking (24hrs)+ foliar spray (45 and 90 DAP) 50 ppm, 100ppm and 200 ppm, monocrotophos 0.2% - corm soaking (24hrs)+ foliar spray (45 and 90 DAP).

Field experiment :

The field experiment was conducted at farm of RRS, Paiyur during the period of 2016-2017. The best performed five treatments were callout from pot culture experiments I and II and further experiment was conducted at field conditions in split plot (3mX3m) with three replications. The standard cultural practices were followed as recommended by Tamil Nadu Agricultural University, Coimbatore. The observation viz., Stalk length (Cm), Inflorescences length (cm), Stalk weight (g), Total number of florets, Nematode population in root(5g), Nematode population in soil (200cc), gall index and yield were recorded.

RESULTS AND DISCUSSION

The effect of various inducer salicylic acid and humic acid in different concentration were tested against the root knot nematode, *Meloidogyne incognita* in tube rose under pot culture and field conditions at Regional research Station, Tamil Nadu Agricultural University, Paiyur.

The result on peroxidase and polyphenol oxidase enzyme activity highly induced in tube rose treated with humic acid 3 per cent over control (Table 1). Goodmann and Novacky (1994), who reported that, Humic Acid presently lead to an enhance in peroxidase and polyphenol oxidase activity, dependable with the previous demonstration that the expression of resistance is often accompanied by the inauguration of phenol-oxidizing enzymes such as PO, PPO, and PAL. Increased PO and PPO activity may contribute to defense through the production of oxidized forms of quinones, which can inactivate pectinolytic enzymes produced by pathogens.

Nematode infection reduced chlorophyll a, b and total chlorophyll (a+b) contents in the leaves. Chlorophyll a and total chlorophyll (a+b) showed a significant increase in chlorophyll a, b and total chlorophyll (a+b) content treated with 3percent humic acid, while the chlorophyll a/b ratio significantly increased in humic acid 3 per cent treatment. Leaf pigment composition is sensitive to plant stress and nematode infection causes either a loss of photosynthetic pigments higher levels of photoprotective pigments, such as zeaxanthin or â-carotene (Demming-Adams and Adams, 1992). The chlorophyll released from damaged chloroplasts has to be degraded rapidly to avoid cellular damage owing to its high reactivity (Takamiya*et al*., 2000). Failure to degrade the chlorophyll may cause an accumulation of reactive oxygen species (ROS) that can easily damage the cellular organelles (Foyer *et al.,* 1994; Wojtaszek, 1997). That is why chlorophyll must be degraded rapidly following nematode and pathogen attack (Kariola *et al.,* 2005).

The lowest nematode population was recorded both root and soil. Among the eleven treatments, 3 per cent humic acid registered lowest nematode population in root and soil (97.6 and 137.7), which was followed by salicylic acid 100ppm (101.5 and 151.7). The highest nematode population was notified in ascorbic acid 1000 ppm treated plants (272.3 and 212.3). The minimum gall index were observed in the treatment of 100ppm salicylic acid (1.10) followed by 3 per cent humic acid (1.29).

In the field experiment, the yield and yield attributes characters were recorded. Among the six treatments 3% humic acid maintained its superiority in increasing stalk length, length of inflorescences, stalk weight and

Table 1: Induction of resistant enzymes induced by various inducers in tuberose infected with root knot nematodes,*M.incognita* under pot culture conditions

Treatments	soluble protein (mg/g)	PO (changes in absorbance $min^{-1}g^{-1}$) Leaf)	PPO (changes in absorbance $min^{-1}g^{-1}$) Leaf)	PAL (changes in cinnamic acid $min^{-1}g^{-1}$) Leaf	chlorophyll a (mg/g)	chlorophyll b (mg/g)	chlorophyll a/b ratio	total chlorophyll (mg/g)	Nematode population in root (5g)	Nematode population in soil (200cc)	Gall index%	Per cent decrees (-) over control
Ascorbic acid T_1 : 250ppm	11.8	2.24	0.82	0.066	0.93	0.19	1.50	1.55	106.7	290.3	2.67	46.6
T_2 :500ppm	10.8	2.31	0.86	0.064	0.44	0.39	1.56	1.26	231.7	263.7	2.90	42.0
T_3: 1000ppm	11.5	4.35	1.17	0.057	0.93	0.50	1.86	1.43	272.3	212.3	3.03	39.4
Humic acid T_4 : 1%	9.20	3.32	0.93	0.078	0.30	0.41	1.94	1.25	194.2	182.3	3.12	37.6
T_5: 2%	10.8	2.85	0.88	0.056	0.91	0.45	1.93	1.38	159.3	181.3	2.11	57.8
T_6: 3%	17.6	6.28	1.31	0.077	1.92	0.91	2.23	2.10	97.6	137.7	1.29	74.2
Salicylic acid T_7 :50ppm	13.9	2.28	0.82	0.051	0.96	0.41	1.53	1.55	209.6	168.2	3.11	37.8
T_8 :100ppm	14.6	5.29	1.19	0.075	1.45	0.52	2.05	1.96	101.5	151.7	1.10	78.0
T_9 : 200ppm	09.0	1.65	0.77	0.052	0.89	0.31	1.59	1.45	163.3	210.2	2.33	53.4
T_{10}: Monocrotophos 2ml/lit bulb dipping	11.7	0.77	0.74	0.017	0.60	0.44	1.62	1.39	253.7	244.5	3.33	33.4
T_{11} : control	8.7	0.70	0.71	0.030	0.29	0.31	0.53	1.32	600.2	385.3	5.00	
CD (P=0.05)	0.81	0.27	0.03	0.0017	0.14	0.02	0.03	0.014	80.96	38.39	0.48	
S.E.±	0.41	0.13	0.01	0.007	0.07	0.01	0.01	0.006	39.55	18.99	0.23	

Table 2 : Assessment of yield attributes in tube rose induced by various selected inducers against root knot nematodes, *M. incognita* under field condition at RRS, Paiyur

Treatments	Stalk length (cm)	Inflorescences length (cm)	Stalk weight (g)	Total number of florets	Per cent increase over control	Nematode population in root(5g)	Per cent decrees (-) over control	Nematode population in soil (200cc)	Per cent decrees (-) over control	Gall index	Per cent decrees (-) over control	Yield (kg/ha/Yr)	Per cent increase over control	B:C:R
Humic acid T_1 : 2%	61.12	17.00	38.5	12.21	9.09	302.5	49.07	341.0	17.99	2.7	44.90	9318.75	30.33	1:10.60
T_2 : 3%	69.24	25.20	45.6	23.45	109.09	191.0	67.85	181.0	56.47	1.1	77.55	11637.5	62.76	1:17.90
Salicylic acid T_3 :50ppm	63.02	20.12	28.2	15.12	36.36	355.3	40.19	283.9	31.72	3.0	38.78	9710.0	35.80	1:12.24
T_4 :100ppm	67.11	23.14	41.8	20.32	81.82	227.5	61.70	220.3	47.02	1.8	63.27	10225.0	43.01	1:14.30
T_5: Monocrotophos 2ml/lit bulb dipping	51.24	14.21	25.5	13.14	18.18	429.4	27.71	318.2	23.47	2.1	57.14	8068.5	12.85	1:7.67
T_6 : Untreated control	41.23	11.41	22.0	11.24	9.09	594.0		415.8		4.9		7150.0		
C.D. (P=0.05)	2.19	3.49	4.01	2.91		88.54		60.65		0.7		442.07		
S.E.±	4.47	1.56	2.98	1.30		39.74		31.71		0.3		346.51		

total number of florets in the value of 69.24cm, 25.20cm, 45.6g and 23.45 followed by 100ppm salicylic acid treated plants (67.11cm, 23.14cm, 41.8g and 20.32) (Table 2).

In field experiments, the lowest nematode population was recorded both root and soil. Among the six treatments, 3 per cent humic acid registered lowest nematode population in root and soil (191.0 and 181.0), which was followed by salicylic acid 100ppm (227.5 and 220.3). The highest nematode population was notified in untreated control plants (594.0 and 415.8). The minimum gall index were observed in the treatment of 3 per cent humic acid (1.1) followed by 100ppm salicylic acid (1.8) (Table 2).

The result on yield of tube rose induced by various inducer against root knot nematodes under field conditions. Among the six treatments, 3 per cent humic acid registered highest yield (11637.5 kg^{-1} ha^{-1} $year^{-1}$). The lowest yield was recorded in the treatment of untreated control (7150.0kg^{-1} ha^{-1} $year^{-1}$) (Table 2).

REFERENCES

Demmig-Adams B. and Adams, W.W. (1992). Carotenoid composition in sun and shade leaves of plants with different life forms. *Plant Cell and Environment,* **15** : 411–419.

Faize, M., Faize, L., Koike, N., Ishizaka, M. and Ishii, H. (2004). AcibenzolarS-methyl-induced resistance to Japanese pear scab is associated with potentiation of multiple defense responses. *Phytopathology,* **94** : 604-612.

Foyer C.H., Lelandais, M. and Kunert, K.J. (1994). Photo-oxidative stress in plants. *Physiologia Plantarum,* **92** : 696–717.

Goodmann, R.N. and Novacky, A.J. (1994). The bacteria-induced hypersensitive reaction. In: Goodman RN, Novacky AJ, editors, The hypersensitive reaction in plants to pathogens. St. Paul: *American Phytopathological Society;* pp. 117- 173.

Kariola, T., Brader, G., Li, J. and Tapio Palva, E. (2005). Chlorophyllase 1, a damage control enzyme, affects the balance between defense pathways in plants. *Plant Cell,* **17** : 282–294.

Karpinski, S., Gabrys, H., Mateo, A., Karpinska, B. and Mullineaux, P.M. (2003). Light perception in plant disease defense signalling. *Current Opinion in Plant Biology,* **6** : 390 – 396.

Takamiya, K.I., Tsuchiya, T. and Ohta, H. (2000). Degradation pathway (s) of chlorophyll: what has gene cloning revealed? *Trends in Plant Science,* **5** : 426–431.

Wojtaszek, P. (1997). Oxidative burst: an early plant response to pathogen infection. *Biochemical Journal,* 322.