The Bioscan 9(3): 1157-1159, 2014 (Supplement on Plant Pathology)
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

EFFECT OF DISEASE (*ALTERNARIA* LEAF BLIGHT) RESISTANCE ELICITORS ON GROWTH PARAMETERS OF TOMATO PLANT

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KEYWORDS
Tomato
Growth parameters
Resistance elicitors

Received on :
31.03.2014

Accepted on :
10.07.2014

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ABSTRACT
Effect of *Alternaria* leaf blight disease resistance elicitors (chemicals) viz. salicylic acid (1.0 and 1.5 mM conc.), β-aminobutyric acid (10.0 and 15.0 mM conc.), chitosan (15.0 mM conc.) and 2,6 dichloroisonicotinic acid (10.0 mM conc.) as seed treatment was studied on the growth parameters of tomato plants viz. germination percentage, shoot length, root length, seedling vigor index and dry matter weight. The maximum per cent increase in seed germination (17.33%), shoot length (20.27 %), root length (17.19%) and seedling vigor index (39.44 %) was obtained with seed treatment of β-aminobutyric acid @ 15.0 mM concentration over control. However the maximum increase (21.05 %) in dry matter weight was obtained with chitosan @ 15.0 mM concentration over control. These results are conclusive that the disease resistance chemical elicitor β-aminobutyric acid also increases the tomato plant growth parameters.

INTRODUCTION

Tomato (*Solanum lycopersicum* L.) crop is infected by several diseases, among which early blight caused by *Alternaria solani* (Elli. and Mart.; Jones and Grout) is the most important one, causing damping off at seedling stage, blight on the foliage and stem canker at later growth stage and fruit decay of mature fruits. In India this disease is most important. Datar and Mayee (1981) observed 78.51 per cent fruit yield reduction due to *Alternaria* blight in Marathwada region of Maharashtra. The pathogen is seed borne in nature, so to avoid infection by seed, seed treatment of various fungicides were given, but these traditional fungicides had their residues on tomato fruits and thus harmful to human health. Hence an alternative approach needs to work out with seed treatment of different disease resistance chemicals.

Disease resistance inducing chemicals *viz*. salicylic acid, β-aminobutyric acid, chitosan and 2, 6 dichloroisonicotinic acid are known to elicit resistance in crop plants (Tosun *et al.*, 2006; Jakab *et al.*, 2001; Ton *et al.*, 2005; Benhamou and Theriault, 1992; Friedrich *et al.*, 1996; Worrall *et al.*, 2012). Some of these resistance inducing chemicals are also known to enhance the seed germination (Ruan and Xue, 2002; Zhou *et al.*, 2002; Shao *et al.*, 2005; Rajjou et al., 2006; Rajaei and Mohamad. 2013; Jayalakshmi *et al.*, 2010) and per cent dry matter (Guan *et al.*, 2009; Hodge *et al.*, 2004). The review shows that there was no work done on this resistance elicitor on tomato crop in respect of disease resistance induction and on growth parameters. Therefore resistance elicitors *viz*. salicylic acid, β-aminobutyric acid, chitosan and 2,6 dichloroisonicotinic acid was used to study their effect on growth parameters of tomato particularly seed germination, root length, shoot length, seedling vigor index and dry matter weight in comparision to untreated tomato plants.

MATERIALS AND METHODS

The tomato seeds were first surface sterilized with 0.1% $HgCl_2$ for 30 sec. followed by three washings with the sterile distilled water. The seed lot of 400 sterilized seed were dipped individually in 1.0 and 1.5 mM conc. of salicylic acid; 10.0 and 15.0 mM conc of β-aminobutyric acid; 15.0 mM conc. of chitosan and 10.0 mM conc. of 2, 6 dichloroisonicotinic acid solutions for 8h and were placed on a towel paper to study their effect on seed germination and seedling vigor index of tomato. For each treatment eight towel papers having fifty seeds (400 seeds) were used. The rolled towel papers were kept in a seed germinator in slanting position and incubated at 24^{0}C with relative humidity above 85 per cent. A germination count was recorded after 14 days and mean seed germination was calculated. Then germinated seed with full growth of plumule and radical was considered as normal (Anonymous, 1985). The root and shoot length (cm) of randomly selected 10 normal seedlings from each towel paper was measured and seedling vigor index was calculated (Abdul-Baki and Anderson, 1973).

RESULTS AND DISCUSSION

On an average the per cent increase in seed germination by

Table 1: Effect of different RIC's as seed treatment on seed germination, root and shoot length, seedling vigor index and dry matter weight of tomato

Treatment	Conc. (mM)	% seed germination	% increase in seed germination over control	Shoot length (cm)	% increase in shoot length over control	Root length (cm)	% increase in root length over control	Seedling vigor index	% increase in seedling vogor index over control	Dry matter (g)	% increase in dry matter over control
Salicylic acid	1.0	81	8.00	7.5	1.35	6.8	6.25	1158.30	11.91	0.021	10.53
Salicylic acid	1.5	82	9.33	8.5	14.86	7.4	15.63	1256.10	21.36	0.021	10.53
β-amino butyric acid	10.0	85	13.33	8.4	13.51	7.3	14.06	1334.45	28.93	0.022	15.79
β-amino butyric acid	15.0	88	17.33	8.9	20.27	7.5	17.19	1443.20	39.44	0.0225	18.42
Chitosan	15.0	85	13.33	8.5	14.86	7.4	15.63	1351.50	30.58	0.023	21.05
2,6-dichloroisonicotinic acid	10.0	76	1.33	8.9	20.27	7.5	17.19	1213.60	17.26	0.020	5.26
Control(Non treated)	-	75	-	7.4	-	6.4	-	1035.00	-	0.019	-
SE (±)		2.06		0.20		0.19		45.05		0.0007	
CD (p=0.01)		6.19		0.60		0.55		133.51		0.002	

resistance elicitor was 8.00 to 17.33 per cent. The per cent increase in shoot length and root length was 1.35 to 30.27 per cent and 6.25 tyo 17.19 per cent respectively over control. The per cent increase in seedling vigor index and dry matter weight was 11.91 to 39.44 per cent and 5.26 to 21.05 per cent respectively over control (Table 1) and was dependent on the resistant inducing chemicals and their concentrations used.

The highest per cent increase in germination was observed for β–aminobutyric acid @ 15.0 mM concentration whereas the minimum per cent increase was observed for 2, 6-dichloroisonicotinic acid @ 10.0 mM. The increase in shoot length was highest for β–aminobutyric acid @ 15.0mM concentration and lowest for salicylic acid @ 1.0 mM concentration. The increase in root length was highest for β-aminobutyric acid @ 15.0 mM concentration and lowest for salicylic acid @ 1.0 mM concentration. The increase in seedling vigor index was highest for β-aminobutyric acid @ 15.00 mM concentration. The per cent increase in dry matter was highest for chitosan @ 15.00 mM concentration.

In general, the per cent increase in seed germination, shoot length, root length and seedling vigor index was maximum for β-aminobutyric acid @ 15.0 mM concentration.

These results are in confirmation with those of Ruan and Xue (2002). They showed accelerated germination of rice seed coated with chitosan. Zhou *et al.* (2002) also reported that peanut seeds when treated with chitosan exhibited an increased rate of germination. Rajjou *et al.* (2006) reported enhanced seed germination in *Arabidopsis*. Hogde *et al.* (2009) reported that application of β-amino butyric acid increased the shoot length and per cent dry matter.

It is thus evident from these results that resistance elicitors or resistance inducing chemicals particularly β-aminobutyric acid @ 15.0 mM concentration was found to increase all the plant growth parameters in tomato. This chemical elicitor is also known to induce disease resistance (Ton *et al.*, 2005 and Polyakovskii *et al.*, 2008) and therefore seems to be important in plant health and disease management.

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