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EFFECT OF SALICYLIC ACID ON GERMINATION PERFORMANCE IN GROUNDNUT

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ABSTRACT: The present investigation has been carried out on the influence of various concentrations of salicylic acid (SA) on the germination performance of groundnut seeds of cv. W-55, W-44, TAG and SB-11. The groundnut cultivars W-44, TAG and SB-11 showed significant germination by SA application over control. In cv. W-55 all the imposed SA concentrations increased germination except 10 ppm SA particularly after 48 hrs of germination. In general Salicylic acid with 50 ppm concentration showed significant germination in all groundnut cultivars. SA also showed positive impact on root and shoot growth in W-44, TAG and SB-11 cultivars whereas opposite trend was noticed in W-55. These findings clearly indicated that the cv. SB-11 was the best performer to salicylic acid among the studied cultivars of groundnut.

Key words: Salicyclic acid, Germination, Groundnut

INTRODUCTION:

Salicylic acid is a signaling molecule, naturally occurs in plants and plays a major role in regulating plant growth and development (Khodary, 2004 and Huang *et al*., 2008). Salicylic acid is mediated in photosynthesis (Khan *et al*., 2003 and Cag *et al*., 2009), transpiration, stomatal regulation, nutrient uptake and transport (Gunes *et al*., 2005), flowering, inhibition of fruit ripening (Srivastava and Dwivedi, 2000). Salicylic acid has drawn the great attention of researchers due to its ability to induce systemic acquired resistance (SAR) in plants leading to defense mechanism against various biotic and abiotic stresses (Radhakrishnan and Balasubramanian, 2009; Zhao *et al*., 2009; Syeed *et al*., 2011 and Idress *et al*., 2011). Seed imbibition with SA leads to an activation of germination and seedling growth (Shakirova *et al*., 2003 and Singh *et al*., 2010). Several workers reported that stimulating effects of SA on germination are concentration dependent (Rajjou *et al*., 2006 and Singh *et al*., 2010). SA significantly stimulated the activities of enzymes involved in germination such as transkelolase, enolase, malate dehydrogenase, phosphoglycerate kinase, glyceraldehyde 3-phosphate, dehydrogenase, fructose 1,6-diphosphatase, and pyruvate decarboxylase. In addition to it seeds germinated in SA supplemented media showed abundant levels of isocitrate lyase and malate synthase (key enzymes of glyoxylate cycle) (Eastmond and Graham, 2001 and Rajjou *et al.*, 2006). Rajjou *et al*., (2006) hypothesized that detoxification mechanism in germinating seeds counteract by exogenous SA treatments. Thus the present work has been conducted to investigate the response of different groundnut cultivars to salicylic acid.

MATERIALS AND METHODS:

Seeds of groundnut cultivars viz., W-55, W-44, TAG and SB-11 were collected from Agricultural Research Station, Karad. These seeds were first surface sterilized with 1% sodium hypochloride for two mins. Petri-plates were sterilized with absolute alcohol and lined with filter paper at bottom.

Twenty healthy and uniform seeds were placed in each Petri-plate. The desired treatments were given by adding 15cm^3 of aqueous treatment solutions (water-control, 5 ppm, 10 ppm, 25 ppm and 50 ppm of Salicylic acid). Petri plates were incubated in a BOD incubator at 26±2^{0}c in dark and investigations were covered at different stages of germination from 24 to 120 hrs. The emergence of radical from seed coat was acknowledged as criterion for germination and accordingly germination percentage and seedling growth (root length and shoot length) were analyzed.

RESULTS AND DISCUSSION:

The results are recorded in Table 1 and 2. The results revealed that in cv. W-55, SA applied seeds initially indicated less percent germination than control but after 2 days percent germination was increased by all SA treatments except 10 ppm. In contrast to it in cv. TAG and SB-11 at initial stage of germination (24 hrs) percent seed germination was more than control. Some reports are available showing stimulatory effect of salicylic acid on germination. SA stimulated seed germination in *Arabidopsis* under salt stress (Rajjou *et al*., 2006). Kaydan *et al*., (2007) has been found that presowing soaking treatments of wheat seeds with SA increased the emergence percentage under saline conditions. SA has been reported to enhance seed vigor in wheat (Shakirova *et al*., 2003). Among the studied cultivars, W-55, TAG and SB-11 indicated inhibitory effect of SA at 10 ppm concentration on germination while in cv. W-44, less germination percent was recorded at 5 ppm and 25 ppm . Similarly Asthana and Srivastava, (1978), Anandhi and Ramanujam, (1997), Negi and Prasad, (2001), Chandra *et al.,* (2007) have also reported an inhibitory effects of SA on germination in maize, black gram, soybean and cowpea respectively. Cultivar W-44 and SB-11 showed enhanced pattern of root and shoot growth to SA treatments. Although cv. TAG showed positive pattern of germination to SA treatments, the inhibitory effects of SA found on further seedling establishment in respect to root and shoot length. Thus the present work signifies the better performance of cultivar SB-11 to salicylic acid. As the groundnut is cash crop such screening of groundnut cultivars to salicylic acid can be beneficial for obtaining the higher yield.

Table 1: Effect of salicylic acid on germination percentage in Groundnut cultivars

Variety	SA (ppm)	% Germination				
		24 hrs	48 hrs	72 hrs	96 hrs	120 hrs
W-55	Control	90	100	100	100	100
	5	60	100	100	100	100
	10	70	80	80	80	80
	25	80	100	100	100	100
	50	70	100	100	100	100
W-44	Control	60	90	100	100	100
	5	70	80	80	80	80
	10	80	90	100	100	100
	25	80	90	90	90	90
	50	100	100	100	100	100
TAG	Control	30	60	60	60	60
	5	50	80	80	80	80
	10	-	60	60	70	70
	25	40	70	90	90	90
	50	30	90	90	100	100
SB-11	Control	60	90	100	100	100
	5	60	100	100	100	100
	10	60	70	70	80	80
	25	70	100	100	100	100
	50	60	100	100	100	100

Table 2: Effect of salicylic acid on root and shoot length of germinating groundnut seeds

Variety	SA (ppm)	24 hrs		48 hrs		72 hrs		96 hrs		120 hrs	
		Root length (cm)	Shoot length (cm)	Root length (cm)	Shoot length (cm)	Root length (cm)	Shoot length (cm)	Root length (cm)	Shoot length (cm)	Root length (cm)	Shoot length (cm)
W-55	Control	-	-	2.7	-	3.6	-	6.1	1.07	8.0	1.6
	5	-	-	2.2	-	3.0	-	4.6	1.4	6.4	1.4
	10	-	-	1.7	-	2.7	-	4.2	0.6	6.5	0.9
	25	-	-	1.9	-	2.9	-	4.7	-	6.6	-
	50	-	-	2.8	-	3.56	-	4.7	1.1	6.5	1.4
W-44	Control	-	-	1.5	-	2.3	-	4.2	0.9	5.8	1.2
	5	-	-	1.9	-	3.5	-	5.7	1.0	7.5	1.4
	10	-	-	2.0	-	3.6	-	5.8	1.1	7.5	1.6
	25	-	-	2.1	-	3.6	-	5.9	0.9	7.7	1.7
	50	-	-	1.7	-	2.7	-	4.9	1.0	6.4	1.5
TAG	Control	-	-	0.86	-	0.9	-	1.9	-	3.2	-
	5	-	-	1.4	-	1.6	-	3.1	0.4	5.3	1.0
	10	-	-	0.0	-	0.58	-	0.9	-	1.9	-
	25	-	-	1.1	-	1.5	-	2.3	-	4.5	-
	50	-	-	0.36	-	0.6	-	1.1	-	3.0	-
SB-11	Control	-	-	1.5	-	2.4	-	3.4	0.5	5.0	1.3
	5	-	-	1.7	-	3.3	-	6.3	0.9	8.6	2.1
	10	-	-	1.7	-	3.0	-	4.2	0.4	7.0	1.5
	25	-	-	1.4	-	2.3	-	4.1	0.8	5.6	1.4
	50	-	-	1.5	-	2.5	-	4.3	0.7	6.4	1.5

Each value is a mean of three replications containing 20 seeds per plate.
Due to poor performance data are left unexpressed where the mark (-) is given.

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