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ORIGINAL ARTICLES

Effects of Salicylic Acid and Methyl Jasmunat hormones on dry Bean (*Phaseolus vulgaris* L.) seedgermination indexes

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ABSTRACT

Dry bean (*Phaseolus vulgaris* L.) is one of the main alimentary sources all over the word which having protein, fiber and vitamins in seeds increase its nurture values. Present experiment was conducted to evaluate Methyl Jasmunat(MJA) and salicylic acid (SA) hormones on seed germination indexes of dry bean. It was done in two factorial experiments on the base of completely randomized design with 3 replications. Experimental factors consisted of 4 MethylJasmunatlevels (0,2,6 and 10 ppm) and 4 salicylic acid levels as (2, 0, 0.6 and 1 mM). Table of variance analysis showed that the main effects of SA and MJA and interaction effects of these two hormones in all concentrations had significant effect on germination indexes (α=0.01). Increasing SA concentration, germination percent, means of velocity of germination and seed vigor decrease away and the best results for these traits was earn in none application of SA treatment. But in MJA 2-6 ppm concentrations showed the best results for these traits. Means time to germination was the best in 1-0.6 mM of SA and cause precipitate germination.

Key words: MethylJasmonate, SalicylicAcid, Bean seed germination

Introduction

Bean (*Phaseolus vulgaris* L.) as a source of protein, fiber and vitamin is an important concern in many developing countries. Producing more than 19.5 million ton bean yearly it has the first station between grain legumes in the word (Dursum, A., 2007). SA is one of the well-known phenolic compositions in plants which had shown also allopathic effects. External use of SA on plant cause yield increase, closure stomata, seedling growth and seed germination (Chandra, A., 2007). Salicylicacids induce Arabidopsis seed germination improves significantly in salinity stress. There are adverse reports about SA effects on seed germination and establishment. These results state that SA not only prevent seed germination in some species (corn), but also cause increase germination vigor in many seeds like chick pea and wheat. In an experiment concentrations higher than 1 mM prevent germination. As sample 3-5 mM ofSalicylic acid prevent corn seed germination comprehensively but in regarded experiment concentrations lower than 1 mM improve germination rate, uniformity and final germination percent of Arabidopsis. An experimental research showed that lower concentration of SA induced germination vigor in stress condition constantly (Rajjou, L., 2006). Germination percent and rate in 15 in common bean which treated with different SA concentration showed better results in contrast with control treatment in 25 ^{o}c. untreated SA seeds put in 15 ^{o}c. in present study observed that SA cause incitement and promotion of different aspects of germination and seedling growth of common bean in cold stress conditions. However SA usage induced increase growth indexes in faba bean but decreased seed germination and seedling growth of corn (Gharib, F.A., A.Z. Hegazi, 2010). But something that should be regarded is that, SA and its analogs may be inducing harmful effects on natural plants. Corn treatment with SA and Banzaldehyde or aspirin after 1 day expiry decrease net photosynthesis in normal growth condition therefor could be results that SA just can improve plant condition and process in environmental stress (Hayat, Q., 2010). Jasmonic acid and it's derivate as molecular signatures affected growth and gene expression. Jasmunatshad different physiological and biochemical effects on plants, instantly preventing root and shoot growth, prohibit chlorophyll and carotenoid formation, induce leaf senescence that results decreased in plant photosynthesis and respiration activities (Rajjou, L., 2006). One of the primitive and known effect of JA is it influence on seed germination and plant decay (Norastehnia, A., 2007). Experimental studies showed anomalous results that states MethylJasmonat is preventing and in some cases is a promoting of germination (Preston, C.A., 2002). Primary

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seedling growth of *Arabidopsis thaliana* decreased 50% because of 0.1 mM of MJ in seed bead (Stawaswick, P.E., 1992). MJ prevented seed germination and primary root elongation in corn seeds, also applied concentrations of MJ had adverse effects on germination percent and root length. A-amylase activity and its content decreased in the presence of MJ. All of these facts can be a good reason for decline corn seed germination vigor (Norastehnia, A., 2007).

Material and Methods

This experiment was conducted in agronomy laboratory of Mohaghegh Ardabili University in 2×2 factorial experiment in the base of completely randomized design in 3 replications. First factor was 4 levels of MJA (consist of 0, 2, 6 and 10 ppm) and second factor was 4 levels of SA (0, 0.2, 0.6 and 1Mm). After stabilized germinated number germination percent, means germination rate and means time of germination and seedling vigor was measured. Data was analyzed with SAS software and means were compared with LSD test in 1 and 5 percent.

Results and Discussion

Table of variance analysis showed that the main effects oh Salicylic acid (SA) and Methyl Jasmonate (MJA) and their interactions were significant in 1% on germination indexes in all applied concentrations. Studying means comparison table of interactions using 0 for SA with all MJA concentrations showed that accompany of 0 Mm from SA with 6-10 ppm of MJA had better results than 2ppm applying of MJA in means germination time (0.16) means germination rate (0.7) and seed vigor (93.09). The assessments of second concentration of SA (0.2 mM) with all MJA concentrations revealed that 6ppm of MJA had the best results in germination percent (85), means time to germination (5.5) seed vigor (880.3). applying 0.6 mM of SA with 2ppm of MJA for germination percent (80) means time to germination (5.7) and seed vigor (69.73) and 10 ppm of MJA in means time to germination the best results was earned. Means compression table about forth concentration of SA (1 mM) showed that accompanying with 6 ppm of MJA had the best results in germination percent (45), means germination rate (30.8) and seed vigor (9.3) and 0 ppm of MJA for means germination time (0.34). raju et al (2006) found that all SA concentrations prevent corn seed germination thoroughly (Rajjou, L., 2006). In other research done with Zhang *et al* (2006) showed that limited application of MJA concentration from 0.2-2 mg/dm^3 in tissue culture of potato cause significant increase in root number and length (Zhang, Z.J., 2006).

Table 1: Analysis of variance effectof Salicylic Acid and MethylJasmunat hormones on dryBean (*Phaseolus vulgaris* L.) seed germination indexes.

S.O.V	DF	GP	MTG	MRG	SV
Hormon Sa	2	48.81**	0.52**	3.51**	0.31**
HormonJa	3	16.45**	0.23**	1.32**	0.10**
Sa×Ja	3	15.14**	0.19**	1.19**	0.10**
Error Experimental	9	0.83	0.01	0.07	0.01
CV(%)	-	12.37	7.87	14.48	23.93

* and ** significant difference at P<0.05 and 0.01, respectively.
Germination percent=GP, Means time of germination=MTG, Means rate of germination, seed vigour=SV
Salicylic Acid= Sa , Methyl Jasmunat= Ja

Table 2: Interaction between of Salicylic Acid and MethylJasmunat hormones on dryBean (*Phaseolus vulgaris* L.) seed germination indexes

	GP (%)	MTG	MRG	SV
Sa 0 mM ×JA 0 PPM	88.33 a	0.15 b	6.64 a	62.71 a.d
JA 2 PPM	88.33 a	0.14 b	7.00 a	93.09 a
JA 6 PPM	86.67 a	0.16 b	6.21 ab	80.91 ab
JA 10 PPM	88.33 a	0.16 b	6.12 ab	37.43 c.f
Sa 0.2mM ×JA 0 PPM	61.67 bc	0.27 b	3.67 cde	36.86 c.f
JA 2 PPM	70.00 ab	0.23 b	4.73 bcd	32.33 c.f
JA 6 PPM	85.00 a	0.19 b	5.50 abc	88.30 ab
JA 10 PPM	70.00 ab	0.20 b	5.20 abc	52.37 b.e
Sa 0.6mM ×JA 0 PPM	10.00 d	2.15 a	0.65 g	3.36 f
JA 2 PPM	80.00 ab	0.18 b	5.70 ab	69.73 abc
JA 6 PPM	75.00 ab	0.19 b	5.30 abc	28.94 def
JA 10 PPM	45.00 c	0.42 b	2.65 ef	16.86 ef
Sa 1mM ×JA 0 PPM	13.33 d	1.77 a	0.69 g	2.78 f
JA 2 PPM	41.67 c	0.41 b	2.75 ef	7.96 f
JA 6 PPM	45.00 c	0.34 b	3.08 de	9.30 f
JA 10 PPM	13.33 d	1.36 a	0.94 fg	3.19 f

Conclusion:

Generally the best results for germination percent, means germination rate seed vigor was earn in none application of SA and the best results for MJA was 2-6 ppm in these traits. Means germination time in 0.6-1Mm of SA and none application of MJA induce seed germination.

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