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THE ROLE OF PRIMING TECHNIQUE WITH SALICYLIC ACID IN THE VIABILITY OF MELON (*CUCUMIS MELO* L.) SEEDS STORED FOR TWO YEARS

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Abstract

The current investigation was performed to know the role of priming techniques with different concentrations of Salicylic acid on the viability of melon seeds stored for two years, melon seeds collected directly from the melon fruits in Hillah city during the season of (2014) and stored until 2016. Seeds were primed for 6 hours at 30 Cº with different concentrations of salicylic acid (25, 50, and 100 mg/L) and hydro-priming. Maximum viability parameters like seed germination percentage, germination speed index (GSI), seedling vigor index (SVI), root length, shoot length, seedling length, seedling fresh and dry weights were observed when the seeds treatedwith100 mg/L of salicylic acid compared with seed stored for two years. Salicylic acid in different concentrations like (25, 50, and 100 mg/L) may be effective for improving the viability of melon seeds stored for two years and improving negative impacts of aging.

***Keywords*:** Seed priming; Seed viability; Salicylic acid; Melon seeds.

Introduction

One of the most difficult problems facing developing countries isDeteriorationof Seed because of storage of seeds under uncontrolled conditions of temperature and humidity. The moisture content of seeds and Temperature or both are the principle reason effecting in the viability of seeds and increasing deterioration of seeds during storage (James, 1967). Seed deterioration might be characterized as the decline in seed quality with the time because of the impact of aging and also antagonistic ecological factors especially higher temperature, relative air humidity and oxygen (O_2)/carbon dioxide (CO_2) proportion during field weathering, handling and storage periods (Kapoor *et al.*, 2010; Farhadi *et al*., 2012; Jyoti and Malik, 2013). On the other hand, the flower seed deterioration can be characterized as deteriorative changes happening with the time that expansion the seed's helplessness to outside difficulties and diminishing the capacity of the seed to permanence (McDonald and Nelson, 1986). Numerous speculations have been proposed with respect to reasons for the aging of seed, for example, lipid impairment intervened by free radicals, inhibition of enzymes or abatement in proteins, the breaking down in components of cell membranes and deterioration in genetic materials (McDonald, 1999; Murthy *et al.*, 2003). However, McDonald and Kwong (2005) reported several mechanisms to explain the reasons of seed deterioration can be summarized in four mechanisms: (i) changes in Enzyme activities, for example, increase in the activity of amylase enzymes or disturbance in antioxidant enzymes that responsible for free radical cleaning like catalase, peroxidase, and superoxide dismutase, (ii) Nucleic acids, the aging of seeds causes diminish DNA amalgamation and expanded DNA corruption (iii) Changes in the content of proteins and amino acids associated with aging of seeds, (iv) Disturbance in Membrane permeability associated with increasing seed deterioration. Seed priming is controlled hydration systems, in this process seeds are incompletely hydrated to enable biochemical processes of metabolism to happen without germination occurs and is then re-dried to allow routine taking care of (Bradford, 1986). Priming technique was used to increase the viability of maize seeds stored for five years (Hussein, 2016) and okra seeds stored for three years (Hussein, 2017). Because of, the economic importance of melon plant in Iraq and the large losses caused by bad storage of seeds and to improve seed viability in order to extend the governmental strategic food storage. The aimed of the current investigation was directed to explore the role of hormonal priming representative with salicylic acid in different concentrations to minimize and recover the deterioration of melon seeds stored to two years in room temperature.

Materials and Methods

Plant Material: One Iraqi local cultivar (*Cucumis melo* L.) seed were collected directly from the fruits in the season of (2014);seeds were sterilized and dried as described in (**Khan *et al*., 2003**). Seeds material was put away in dim plastic holders at room temperature for two years until used in 2016.

Seed Priming Protocol: Melon seeds were subjected to hydro-priming and preparing with (25, 50, and 100 mg\L) of salicylic acid for 6hr at 30ºC. The proportion of the heaviness of seeds to the volume of the priming solution was 1:5w/v (**Farooq *et al.*, 2006**).

Germination Test: Germination test was performed according to (**Al-Maskri *et al.*, 2002**). The time between initial and maximum emergence was calculated after 10 days.

The Germination Index (G.S.I.): was computed by the Association of official Seed Analysts (A.O.S.A.) (A.O.S.A., 1983) by the followingthe formula:

$$G.S.I." \frac{\text{Number of germinated seeds}}{\text{Days of the first count}} + \ldots + \ldots + \frac{\text{Number of germinated seeds}}{\text{Days of the final count}}"$$

Seedling vigor index (S.V.I.): Seedling vigor index (S.V.I.) was figured by the accompanying altered equation of (**Abdul Baki and Anderson, 1973**):

S.V.I. = [germination percentage × seedling length (cm)]/100

Relative Growth Rate (R.G.R.): Seeds of Melon cultivar were transplanted into plastic plate loaded up with clean sawdust. Water was beaten following 10 days of planting; seedlings were gathered from the plate. Root and shoot were isolated, fresh and dry weights were resolved, and shoot: root lengths were figured days (**Al-Maskri *et al.*, 2002**).

Statistical analysis: All data of treatments were dictated by three reproduces. Data were subjected to an analysis of variance by using SPSS 16.0 program, a completely randomized design was used and L.S.D (least significant difference) was performed at $P \leq 0.05$.

Results

Germination Test: The technique by using Seed priming had a noteworthy beneficial outcome on the percentage of germination. The results in Fig (1) shown that hydro-priming and hormonal priming with different concentrations of salicylic acid such as (25, 50, and 100 mg/L) caused a significant increase in seeds germination percentage compared with seeds stored for two years. The highest germination percentage was observed in 100 mg/L of salicylic acid was 94.33% and least percentage of germination was seen in putting away seed for a long time (two years) was 39.33%.

Germination speed index: The technique by using Seed priming had a noteworthy beneficial outcome on the index of germination. The highest index of germination speed (G.S.I.) was seen in seeds socked with 100 mg/L of salicylic acid. Results in Fig. (2) showed that significantly increased in (G.S.I.) from 14.95 in seed stored for two years, 21.14 in hydro-priming, and 42.93 in 100 mg/L of salicylic acid treatments.

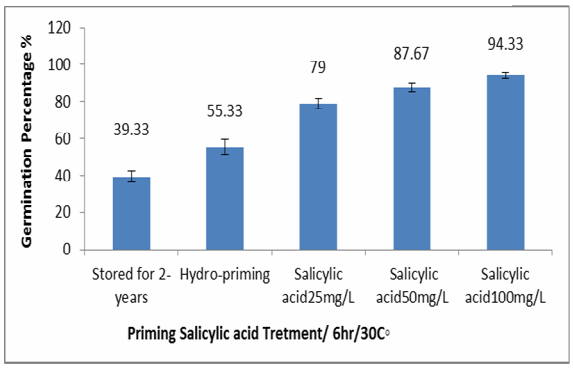

Fig. 1 : The role of priming technique with salicylic acid in different concentrations at 30ºC in seed germination% L.S.D=1.53

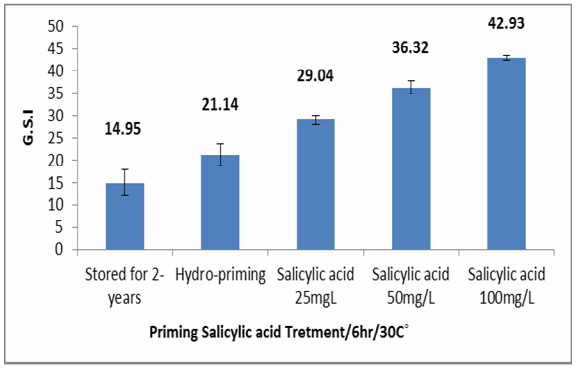

Fig. 2 : The role of priming technique with salicylic acid in different concentrations at 30 ºC in Germination speed index L.S.D= 1.3

Seedling vigor index (S.V.I): The maximum index of seedling vigor was seen in seeds soaked in 100 mg/L of salicylic acid at 30 ºC for six hours. Results in Fig. (3) showed the high value of (S.V.I.) reached 25.48 in salicylic acid compared with stored seed for two years that gave 3.33.

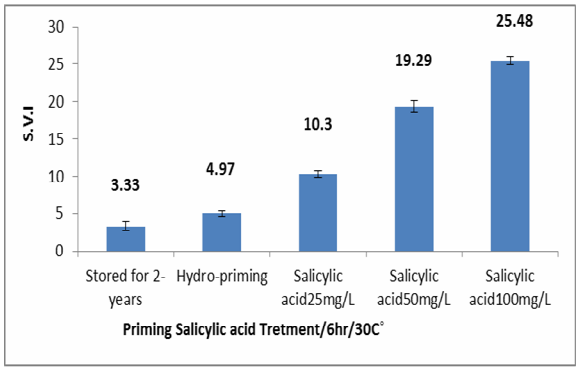

Fig. 3 : The role of priming technique with salicylic acid in different concentrations at 30 ºC in seedling vigor index, L.S.D = 0.66

Relative Growth Rate (R.G.R.): Seed priming technique with hydro-priming and different concentrations of salicylic acid like (25, 50, and 100 mg/L) increased relative growth rate at 30 ºC for six hours. Figs. (4 and 5) present that shoot and root length had been significantly increased, the highest shoot and root length were seen in seeds socked with 100 mg/L of salicylic acid, they were 14 and 9cm respectively compared to the seed stored for two years, they were 2.67 and 3cm respectively.

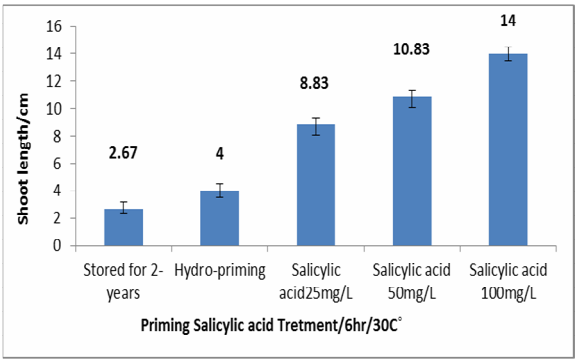

Fig. 4 : The role of priming technique with salicylic acid in different concentrations at 30ºC in shoot length L.S.D= 1.584

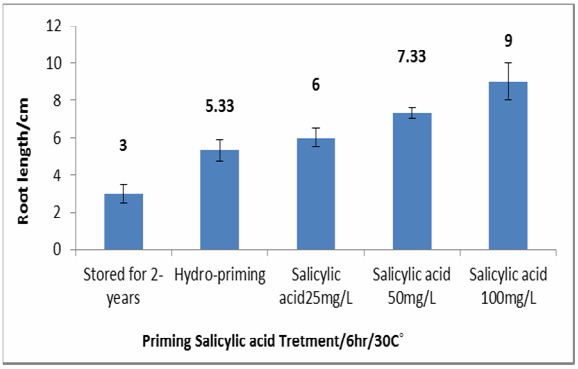

Fig. 5 : the role of priming technique with salicylic acid in different concentrations at 30ºC in root length L.S.D=0.33

Seed priming caused a significant increase in seedling growth, Fig. (6). Analyzing of the cultivar in the different treatment of preparing uncovered that the most extreme impact of preparing was gained with 100 mg/L of salicylic acid (23.0 cm\seedling), compared to the seed stored for two years which gave (5.50 cm\seedling).

Results in Fig. (7), indicates that priming treatments of the melon seeds with 100 mg/L of salicylic acid at 30 ºC for six hours caused significantly increased fresh weight of seedling (0.8116g/seedling), compared to the seed stored for two years which gave (0.2045g/seedling).

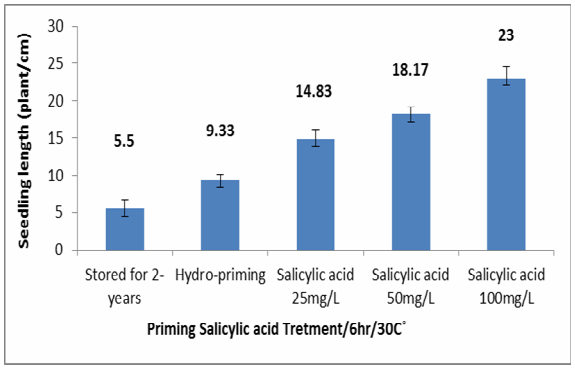

Fig. 6 : The role of priming technique with salicylic acid in different concentrations at 30ºC in seedling length L.S.D=0.14

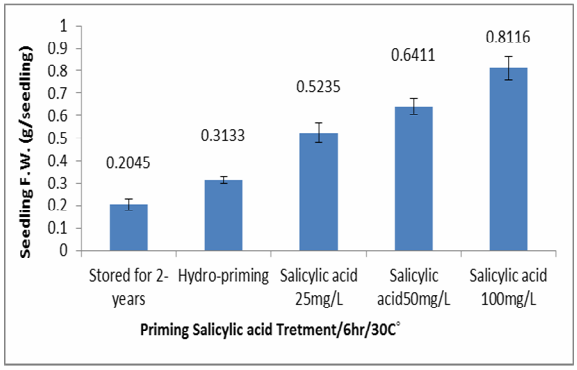

Fig. 7 : The role of priming technique with salicylic acid in different concentrations at 30ºC in seedling fresh weight L.S.D=0.0184

Likewise, the greatest dry weight was picked up in seedling under the priming by 100 mg/L of salicylic acid (0.0321g/seedling) at 30 ºC for six hours compared to the seed stored for two years (0.0082g/seedling).

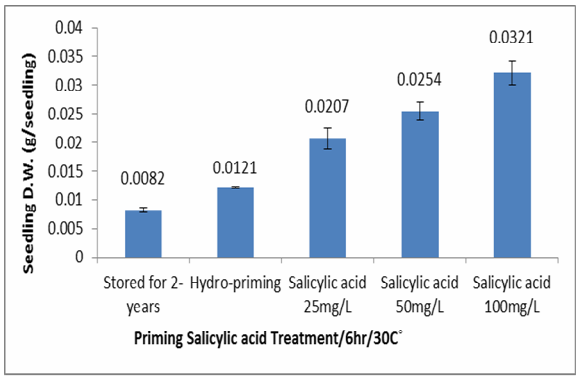

Fig. 8 : The role of priming technique with salicylic acid in different concentrations at 30 ºC in seedling dry weight L.S.D= 0.0058

Discussion

Oxidative processes were increased during aging. Increase in aging period lead to losses in seed viability and caused an increased in solute leakage and a decrease in germination percentage in maize seeds subjected to accelerated aging conditions (Hussein *et al*., 2012a). The decreases in seed viability representative in seed vigor index, germination speed index, seedling length, and seedling fresh and dry weight in sunflower and cucumber seeds (Hussein *et al*., 2011; Sahib and Hussein, 2014). Seeds subjected to accelerated aging conditions up to three days had a noteworthy impact on Amadori products and glutathione reductase and peroxidase activity in maize and sunflower seeds (Hussein *et al*., 2012b;Hussein *et al*., 2012c).The results of the current investigation uncovered that hormonal priming with (25, 50, and100 mg/L) of salicylic acid at30 Cº for six hours enhanced the viability of storage melon seeds for two years. Pre-treatment with salicylic in different concentrations at30 Cº increased the viability of seeds representative in seedling vigor index, germination percentage, and germination speed index compared with the seeds stored for two years Figs. (1, 2 and 3). Similarly, these outcomes were in concurrence with the outcomes which notice by (Rehman *et al*., 2011) on the cucumber seeds and with (Khan *et al*., 2011) on the wheat seeds and with (Sahib *et al*., 2014) on the okra seeds and with (Hussein, 2016) on the maize seeds stored for five years and with (Hussein, 2017) on the okra seeds stored for three years. Hussein (2015) reported that seed viability representative in the seedling vigor index, germination percentage, and germination speed index was increased in okra seeds priming with different concentrations of salicylic acid solution. Enhancement in viability parameters like seedling vigor index, germination percentage, and germination speed index may be because of that Priming of seed enhances germination of seeds by fix of DNA, RNA, and proteins harm (Koehler *et al*., 1997). Alternatively, enhancement in seed viability under storage conditions may be credited to the enhanced metabolic activities in primed seeds (Shakirova *et al*., 2003), or increment in activities of antioxidant enzymes. Seed priming technique increases enzymes of antioxidants like ascorbate and glutathione in seed, these enzymes decrease peroxidation of lipids in a period of germination (Sharafizad *et al*., 2013). Seed preparing is a compelling technique for extending seed life and synchronization of germination and furthermore the seedlings development of numerous yields under upsetting conditions (Carvalho *et al*., 2011). Hormonalpriming with (25, 50, and100 mg/L) of salicylic acid at 30 ºC for six hours increased growth parameters (Fig 4, 5, 6, 7 and 8). These outcomes support the discoveries of the prior work on improved germination rate and percentage by hormonal treatment in wheat by (Al-Hakimi and Hamada, 2001), also, are in concurrence with the outcomes which notice by (Rehman *et al*., 2011) on the cucumber seeds and with (Hussein, 2017) on the okra seeds stored for three years. The possible reason for this increment maybe because of expanded cell division inside the roots and shoots apex of seedling, which caused an expansion in plant development and growth. Salicylicacid treatments keep up thecytokinin and IAA levels in the plant tissues, which enhanced the cell division (Sakhabutdinova *et al*., 2003). Hence, seed priming with salicylic acid in different concentrations such as (25, 50, and 100mg/L) can be successfully used to improve the viability parameters in melon seeds storage for two years. Enhancement in growth parameters maybe because of that seed priming could improve the negative impacts of aging (Abdolahi *et al*., 2012).

Conclusion

Salicylic acid in different concentrations like (25, 50, and 100mg/L) may be effective for enhanced germination and seeds viability of melon seeds stored for two years and increase positive effects in aged seeds.

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References

Abdolahi, M.; Babak, A.; Esmaeil, Z.; Farid, S. and Shahzad, J. (2012). Effect of accelerated aging and priming on seed germination of rapeseed (*Brassica napus* L.) cultivars. International Research Journal of Applied and Basic Sciences, 3 (3): 499-508.

Abdul-Baki, A.A. and Anderson, J.D. (1973). Vigor determinations in soybean seed multiple criteria. Crop Sci., 13: 630-633.

Al-Hakimi, A.M.A. and A.M. Hamada. (2001). Counteraction of salinity stress on wheat plants by grain soaking in ascorbic acid, thiamin or sodium salicylate. Biol. Plant, 44: 253-261.

Al-Maskri, A.; Khan, M.M.; Al-Manthery, O. and Al-Habsi, K. (2002). Effect of accelerated aging on lipid peroxidation, leakage and seedling vigor (RGR) in cucumber (*Cucumis sativus* L.) seeds. *Pakistan J. Agri. Sci.,* 39: 330–337.

Association of Official Seed Analysts (AOSA). (1983). Seed Vigour testing handbook. Contribution 32, Handbook on Seed Testing, AOSA, Lincoln, NE, USA.

Bradford, K.J. (1986). Manipulation of seed water relations via osmotic priming to improve germination under stress condition. Horticultural Science, 21: 1105-1112.

Carvalho, R.F.; Piotto, F.A.; Schmid, D.; Peters, L.P.; Monteiro, C.C. and Azevedo, R.A. (2011). Seed priming with hormones does not alleviate induced oxidative stress in maize seedlings subjected to salt stress. *Sci. Agri*., 68: 598-602.

Farhadi, R.; Rahmani, M.R.; Salehi, B.M. and Sadeghi, M. (2012). The effect of artificial ageing on germination components and seedling growth of basil (*Ociumum basilicm* L.) seeds. Journal of Agriculture and Food Technology, 2: 69-72.

Farooq, M.; Basra, S.M.A. and Hafeez, K. (2006). Seed invigoration by osmo hardening in coarse and fine rice, Seed Science and Technology. 34: 181-187.

Hussein, H.J.; Shaheed, A.I. and Yasser, O.M. (2011).Effect of Accelerated Aging Conditions on Viability of Sunflower (*Helianthus annus* L.) Seeds, Euphrates Journal of Agriculture Science, 3(3): 1-9.

Hussein, H.J.; Yasser, O.M.; Shaheed, A.I. and Abidi, A.B. (2012c). Effect of Accelerated Ageing Conditions on Physiological and Biochemical Changes of Sunflower (*Helianthus annus* L.) Seeds, Advances in Life Sciences, 1(1): 20-24.

Hussein, H.J. (2017). The Effect of Seed Priming with Salicylic Acid and Ascorbic Acid on Viability of Local Okra (*Abelmoschus esculentus* L.) Seeds Stored for Three Years, Journal of Global Pharma Technology, 8(9): 110-115.

Hussein, H.J.; Yasser, O.M.; Shaheed, A.I.; Abidi, A.B. and Tiwari, B.K. (2012b). Physiological and Biochemical Changes Induced by Accelerated Ageing of Maize Seeds (*Zea mays* L.), Indian Journal of Agricultural Biochemistry, 25(2): 116-120.

Hussein, H.J.; Shaheed, A.I. and Yasser, O.M. (2012a). Effect of Accelerated Aging on Vigor of Local Maize Seeds in Term of Electrical Conductivity and Relative Growth Rate (RGR), Iraqi Journal of Science, 53(2): 285-291.

Hussein, H.J. (2016). Effect of Seed Priming with $ZnSO_4$ and KH_2PO_4 on Seed Viability of Local Maize (*Zea mays* L) Seeds Stored for Five Years in Iraq. Al-Kufa University Journal for Biology, 8(2): 39-47.

Hussein, H.J. (2015). Effect of Seed Priming treatment with Salicylic Acid on Viability of Okra (*Abelmoschus esculentus* L.) Seeds. Euphrates Journal of Agriculture Science, 7(2): 1-9.

James, E. (1967). Preservation and seed stocks. Adv. Agron. 19: 87-106.

Jyoti, and Malik, C.P. (2013). Seed deterioration: a review. International Journal of Life Science Botany and Pharmacy Research, 2: 374-85.

Kapoor, N.; Arya, A.; Siddiqui, M.A.; Amir, A. and Kumar, H. (2010). Seed deterioration in chickpea (*Cicer arietinum* L.) under accelerated ageing. Asian Journal of Plant Science, 9: 158-162.

Khan, M.B.; Gurchani, M.A. and Hussein, M. (2011).Wheat seed enhancement by vitamin and hormonal priming. Pak. J. Bot., 43(3): 1495-1499.

Khan, M.M.; Iqbal, M.J.; Abbas, M. and Usman, M. (2003). Effect of accelerated aging on viability, vigour and chromosomal damage in pea (*Pisum sativum* L.) seeds. *Pakistan J. Agri. Sci*. 40: 50–4.

Koehler, K.H.; Voigt, B.; Spittler, H. and Schelenz, M. (1997). Biochemical events after priming and priming of seeds In: Elis, R.H.; Black, M.; Murdoch A.J. and Hong, T.D. (Eds.), Basic and Applied Aspects of Seed Biology, Proc. 5th Int. Workshop on Seeds Reading, pp: 531-536.

McDonald, M.B. and Nelson, C.J. (1986). Physiology of Seed Deterioration. CSSA Spec. Publ. No. 11, Crop Science Society of America, Madison, WIS.

McDonald, M.B. (1999). Seed deterioration physiology, repair and assessment. Seed Sci. and Technol., 27: 177-237.

McDonald, M.B. and Kwong, F.Y. (2005). Flower seeds biology and technology. CABI publishing, p.p. 176.

Murthy, U.M.N.; Kumar, P. and Sun, W.Q. (2003). Mechanisms of seed ageing under different storage conditions for (*Vigna radiata* L.) Wilczek: lipid peroxidation, sugar hydrolysis, Maillard reactions and their relationship to glass state transition J. Exp. Bot., 54: 1057-1067.

Rehman, H.; Farooq, M.; Basra, S.M.A. and Afzal, I. (2011). Hormonal priming with salicylic acid improves the emergence and early seedling growth in cucumber. J. Agric. Soc. Sci., 7: 109–113.

Sahib, M.M. and Hussein, H.J. (2014). Relative Growth Rate (RGR) and Electrical Conductivity changes in snake cucumber (*Cucumis melovar.flexuoses* Naud.) seeds under Accelerated Ageing conditions, Journal of Kerbala University, 12(4): 13-20.

Sahib, M.M.; Hamza, N.A. and Hussein, H.J. (2014). Effect of Seed Priming by KH_2PO_4 and Different Temperature on Seeds Germination Behavior of Okra (*Abelmoschus esculentus* L.), Journal of Al-Qadisiyah of pure science, 19(1): 1-11

Sakhabutdinova, A.R.; Fatkhutdinova, D.R.; Bezrukova, M.V. and Shakirova, F.M. (2003). Salicylic acid prevents damaging action of stress factors on wheat plants. Bulgerian J. Plant Physiol. Special Issue: 314–319.

Shakirova, F.M.; Sakhabutdinova, A.R.; Bezrukova, M.V.; Fatkhutdinova, R.A. and Fatkhutdinova D.R. (2003). Changes in the hormonal status of wheat seedlings induced by salicylic acid and salinity. Plant Sci., 164: 317–322.

Sharafizad, M.; Naderi, A.; Siadat, S.A.; Sakinejad, T. and Lak, S.H. (2013). Effect of Salicylic Acid Pretreatment on Germination of Wheat under Drought Stress. Journal of Agricultural Science, 5(3): 179-199.