International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(5): 2679-2681

Received: 04-07-2018
Accepted: 08-08-2018

Ziaurrahman Hejazi
Department of Horticulture, Faculty of Agriculture, Nangarhar University, Afghanistan

Mohammad Ismail Sadat
Department of Horticulture, Faculty of Agriculture, Nangarhar University, Afghanistan

Mohammad Ghani Raghib
Department of Horticulture, Faculty of Agriculture, Nangarhar University, Afghanistan

Anwar-ul-Haq Zerak
Laboratory of Agriculture Faculty, Nangarhar University, Afghanistan

Khalil Fitrat
Directorate of Agriculture, Irrigation and livestock (DAIL), Nangarhar, Afghanistan

Correspondence
Ziaurrahman Hejazi
Department of Horticulture, Faculty of Agriculture, Nangarhar University, Afghanistan

Effect of different concentrations of GA_3, H_2O_2 and bleach solutions on seed germination of guava (*Psidium guajava* L.)

Ziaurrahman Hejazi, Mohammad Ismail Sadat, Mohammad Ghani Raghib, Anwar-ul-Haq Zerak and Khalil Fitrat

Abstract
Germination of the guava seeds is almost poor, uneven and takes a long time because of the hard seed coats. The effect of different concentrations of gibberellic acid, hydrogen peroxide and bleach solution on guava (*Psidium gujava* L) seeds were therefore investigated to hasten and enhance this process. The seeds were extracted from the guava fruits and were soaked in 100, 300, 500 ppm GA_3 concentrations, H_2O_2, bleach solution and a control treatment (distilled water) for 24 hrs. Germination was earlier (20 days after sowing) and higher in the GA_3 concentrations than the seeds received any other treatments. After final measurement, the highest percent germination (40%) occurred in 300 ppm GA_3 while the lowest (22%) noticed in the bleach solution. The seedlings of the bleach treatment didn't have primary leaves and died soon after they emerged.

Keywords: gibberellic acid, hydrogen per oxide, scarification, Afghanistan

Introduction
Guava (*Psidium guajava* L.) is one of the fruits cultivated in the East of Afghanistan. The eastern zone encompasses Nangarhar, Laghman, Kunar, and Nuristan provinces. The subtropical climate of this region, specifically plain lands provide a favorable environment for the guava production. Most parts of these provinces are under the effect of Indian monsoon climate (Samadi *et al*., 2009) [12] which guarantees successful growth of the guava. In Afghanistan, the demand is always high for the consumption of guava juice, fresh fruits and as well as for the saplings. Yet, commercial orchards of this fruit are not established, but planting of guava in home gardens is getting popularity day by day.

Today different techniques are used for the guava multiplication (Pereira *et al*., 2016; Hartmann & Kester's, 2014) [11, 5]. Propagation through seed is an easy and cheap method particularly for the rootstock production. However, due to hard seed coat there are some difficulties in the germination of this fruit. In order to enhance this process, different chemicals, plant growth regulators and other scarified agents have been practiced (Jholgiker *et al*., 2017; Kalyani *et al*., 2014) [7, 8]. In this regard, the results have been reported are varied and mainly dependent to cultivar type, chemicals and methods. To the best of our knowledge no research has been conducted to assess success rate of the guava seed germination in Afghanistan condition. Therefore, the present study was conducted to elucidate these effects and optimize guava seed germination.

Materials and Methods
The experiment was carried out during June 2018 at the facility of agriculture faculty, Nangarhar University, Afghanistan. The guava fruits were bought from a local bazaar, then the pulp was removed and seeds were extracted with the help of tap water. The seeds were put on white papers in order to lose exceeded moisture and air dry. Afterward, one hundred seeds were employed to each of the following treatments. These comprised three GA_3 concentrations (100, 300, 500 ppm), Hydrogen peroxide (Reshad G. Pharmacy, Kabul, Afghanistan), local available bleach liquid (comm. name; Mayamay, Kafsaz co., Iran) and distilled water used as control treatment of the experiment. The GA_3 powder once dissolved in 10 ml ethanol and then the required amount of distilled water was added. The 10 ml of hydrogen peroxide and bleach solution were diluted in 100 ml of distilled water. The seeds were soaked for 24 hrs in the

prepared solutions and then sowed at proper depth and distance in the wooden trays, filled with a pre-soaked medium of peat. The experiment was placed to a building shade in the open condition and watered as per need. Daily inspection was conducted in order to trace seed germination, pest and disease symptoms. The seed was counted as germinated when it fully emerged and shed off the coat. After 20 days of sowing, data on germination percentage were recorded at 5 days interval for the period of one and half months.

The collected data were subjected to ANOVA and means separation was conducted using Tukey's (HSD) at $P \leq 0.05$.

Results and Discussion

The cultivar of the guava seeds used in the present study was unknown, but we have tried to collect uniform seeds from similar fruits. During whole period of the experiment, no symptom of the pest or disease were traced on the seedlings except of the weeds which regularly uprooted.

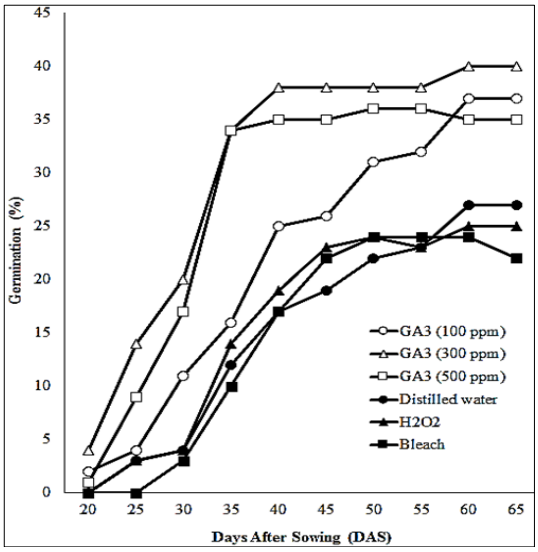

Fig 1. Guava seed germination percentage in different GA_3 concentrations, distilled water (control), H_2O_2 and bleach solutions. There were significant differences ($P \leq 0.05$) between the treatments measured subsequently 25, 30, 35, 40, and 45 days after sowing, but not in the rest of other late days including the first twenty.

The germination percentage of the guava seeds were significantly affected by the treatments (Fig.1). The first and quick seed germination occurred in the GA_3 treatments while H_2O_2, bleach and distilled water slowly induced this process (Fig.1). After 20 days of sowing, 1- 4% seeds were germinated in all GA_3 treatments, but none of the seeds soaked in H_2O_2, bleach or control solutions were emerged. Significant differences between the treatments were observed 25, 30, 35, 40 and 45 days after sowing, whereas equal effect ($P \leq 0.05$) of these treatments were evident 50, 55, 60, 65 and 20 days after sowing (DAS). After 25 days of sowing, germination percentage was sharply increased in the seeds treated with GA_3 300 ppm and 500 ppm solution; however they had the same germination percentage (34%) 35 DAS and then steadily raised in the later days. Although there was no significant difference between the treatments at last reading (65 DAS), the highest percent germination (40%) was obtained by 300 ppm GA_3 concentration while the lowest (22%) recorded in the bleach solution. The seedlings that emerged from the bleach treated seeds didn't have primary leaves and contained only embryonic stems (Fig. 2). Consequently, those were all died and no one survived shortly after they germinated. Probably it is due to high dose of the bleach solution which may exert a toxic effect and killed minute leaves initials in the seeds. Our results are in agreement with the previous studies where gibberellic acid found most effective to early and optimum seed germination in different fruit crops (Jholgiker *et al*., 2017; Patel *et al*., 2016; Parvin *et al*., 2015; Kalyani *et al*., 2014; Shah *et al*., 2013; Al-Hawezy, 2013; Çalişkan *et al*., 2012) [7, 10, 9, 8, 13, 1, 3]. The guava seeds immersed in 1000 ppm or 500 ppm GA_3 solutions promoted earlier (19 days) and maximum seed germination (>80%) than of Thiourea, HCL, H_2SO_4, hot and tap water (Kalyani *et al*., 2014) [8]. In one another study, these couple of GA_3 concentrations (500 ppm and 1000 ppm) achieved 100% germination and significantly reduced time of the seedling emergence in the figs (Çalişkan *et al*., 2012) [3]. Patel *et al*. (2016) [10] concluded that soaking mangoes stones in aqueous solution of 100 ppm GA_3 for 24 hours was the best treatment for ensuring early and higher germination. On the other hand, literatures showed that the influence of PGRs and other scarified agents on seed germination is cultivar and as well as genotype dependent (Imani *et al*., 2011; Shah *et al*., 2013; Jholgiker *et al*., 2017) [6, 13, 7]. Among sixteen guava cultivars, maximum percent germination (88%) was noted in cv. SR-4 while the minimum (35%) recorded in cv. GR-2 (Jholgiker *et al*., 2017) [7]. Shah *et al*. (2013) [13] reported that the highest germination percentage in peach, plum and apricot was respectively 31%, 75%, and 73%, when soaked in water for 9 days followed by treating with GA_3 2000 ppm for 24 hrs. Thus, low percentage of the seed germination, in general of this study, will be referred to the nature of the cultivar used. Although we didn't measure other attributes of the seedling, studies revealed that those might also be affected by the pre-sowing treatment (Brijwal *et al*., 2013; Shah *et al*., 2013; Jholgiker *et al*., 2017) [2, 13, 7] . The shoot length, root length, fresh and dry weights of guava cv. SR-4 seedlings were highest when treated with 250 ppm GA_3 solution (Jholgiker *et al*., 2017) [7]. Similarly, seeds soaked in water for 9 days and treated with 2000 ppm GA_3 for 24 hrs recorded the maximum seedling height and girth in peach, plum and apricot, while the minimum of these parameters was resulted for the seeds received no treatment (Shah *et al*., 2013) [13]. Physiological and biochemical studies have been confirmed that gibberellic acid increases growth potential of the embryo, induces hydrolytic enzymes and weakening endospermic cap of the seeds (Gupta and Chakrabarty, 2013) [4]. Application of the exogenous GA_3 further enhances this process which could be a reason of partially good result of the GA_3 treatment in our study. Future investigations may work on local available materials to find a cheap and effective substitute for the GA_3 solution.

Fig 2: Abnormal and leafless seedlings produced by the bleach treatment. White circles show tip of the seedlings.

Conclusion

The present study suggests that the guava seeds should be soaked in 300 ppm GA_3 solution for 24 hrs in order to stimulate quick emergence and assure the highest percent germination. However, using the available bleach liquid, as specified in the materials, should be avoided, because it produced abnormal seedlings which finally died.

References

1. Al-Hawezy SMN. The role of the different concentrations of GA_3 on seed germination and seedling growth of loquat (*Eriobotrya japonica* L.). Journal of Agriculture and Veterinary Science. 2013; 4(5):3-6.
2. Brijwal M, Kumar R, Mishra DS. Effect of pre-sowing treatments on seed germination of guava (*Psidium guajava* L.) under Tarai region of Uttarakhand. Progressive Horticulture. 2013; 45(1):63-68.
3. Çalişkan O, Mavi K, Polat A. Influences of presowing treatments on the germination and emergence of fig seeds (*Ficus carica* L.). Acta Scientiarum. 2012; 34(3):293-297.
4. Gupta R, Chakrabarty SK. Gibberellic acid in plant. Plant Signaling and Behavior. 2013; 8(9):e25504.
5. Hartmann HTK, Hartmann, Kester's. plant propagation, principles and practices, Hudson T. Hartmann, Dale E. Kester, Fred T. Davies, Robert L. Genève, 2014-435.
6. Imani A, Rasouli M, Tavakoli R, Zarifi E, Fatahi R, Barba-Espín G *et al*. Optimization of seed germination in *Prunus* species combining hydrogen peroxide or gibberellic acid pre-treatment with stratification. Seed Science and Technology, 39:204-207.
7. Jholgiker P, Bade M, Sabard A. Germination studies in different guava (*Psidium guajava* L.) cultivars. International Journal of Current Microbiology and Applied Sciences. 2017; 6(5):2826-2829.
8. Kalyani M, Bharad SG, Polu. Parameshwar. Effect of growth regulators on seed germination in guava. International Journal on Biological Sciences. 2014; 5(2):81-91.
9. Parvin P, Khezri M, Tavasolian I, Hosseini H. The effect of gibberellic acid and chilling stratification on seed germination of eastern black walnut (*Juglans nigra* L.). Journal of Nuts. 2015; 6(1):67-76.
10. Patel RJ, Ahlawat TR, Alka S, Momin SK, Gavri C. Effect of pre-sowing treatments on stone germination and shoot growth of mango (*Mangifera indica* L.) seedlings. International Journal of Agriculture Sciences. 8(52):2437-2440.
11. Pereira FM, Usman M, Mayer NA, Nachtigal JC, Maphanga ORM, Willemes S. Advances in guava propagation. Revista Brasileira de Fruticultura. 2016; 39(4):e-358.
12. Samadi GR, Miakhel IM, Abdiani SA. Status of persimmon cultivation in Afghanistan. Acta Horticulturae. 2009; 833:31-34.
13. Shah RA, Sharma A, Wali VK, Jasrotia A, Plathia M. Effect of seed priming on peach, plum and apricot germination and subsequent seedling growth. Indian Journal of Horticulture. 2013; 70(4):591-594.