



ISSN : 2350-0743

www.ijramr.com



International Journal of Recent Advances in Multidisciplinary Research

Vol. 09, Issue 11, pp.8195-8198, November, 2022

RESEARCH ARTICLE

EFFECT OF SEED TREATMENT USING GIBBERELIC ACID (GA₃) AND KNO₃ ON SEED GERMINATION AND GROWTH OF CUSTARD APPLE (*ANNONA SQUAMOSAL.*) CVS. BALANAGAR AND WASHINGTON

Sidhant*, Jaismeen Kaur, Dr. Pushpinder Singh Aulakh

Department of Fruit science,UCoA, Guru Kashi University, Talwandi Sabo, Bathinda, Punjab, India

ARTICLE INFO

Article History:

Received 28th August, 2022
Received in revised form
19th September, 2022
Accepted 25th October, 2022
Published online 30th November, 2022

Key words:

Gibberellic acid (GA₃), Potassium Nitrate (KNO₃), Custard Apple, Balanagar, Washington.

ABSTRACT

Custard apple (*Annona squamosa* L.) belongs to family annonaceae is a tropical and subtropical delicious fruits grown in Bahamas, Bermuda, Brazil, Egypt, Florida, Malaysia, Peru, Mexico, Philippines, India, Thailand, West Indies and America. The present investigation for studying the effect of Seed treatment using Gibberellic acid (GA₃) and KNO₃ on seed germination and growth of custard apple (*Annona squamosa* L.) cvs. Balanagar and Washington were conducted at Guru Kashi University, Talwandi Sabo, Punjab, India during 2021-2022. For present study fifteen different treatments of GA₃ and KNO₃ i.e. T₀ to T₁₄ was used on two different cultivars of custard apple. The result revealed that in custard apple cv. Balanagar and Washington at T₁₄: GA₃@ 1000 ppm + KNO₃ 2 % reported minimum numbers of days taken for first emergence of nodes (8.95 days, 10.44 days). Whereas the maximum number of days taken for first emergence of nodes was recorded in T₀: Control (24.64, 25.80 days) respectively. The maximum germination percentage was recorded in both cvs. Balanagar and Washington at T₁₄ (78.76, 76.67 per cent) in both Balanagar and Washington respectively. The result revealed that the maximum survival percentage was recorded in both cvs. Balanagar and Washington at T₁₄ (86.96, 84.93 per cent). The result revealed that the maximum plant height, number of leaves at 45 and 90 DAS was recorded with T₁₄: GA₃@ 1000 ppm + KNO₃ 2 % treatment. Therefore the use of GA₃ and KNO₃ as seed treatment should be recommended as it is showing significant positive results on growth parameters of custard apple crops.

INTRODUCTION

Custard apple (*Annona squamosa* L.) belongs to family annonaceae is a tropical and subtropical delicious fruits grown in Bahamas, Bermuda, Brazil, Egypt, Florida, Malaysia, Peru, Mexico, Philippines, India, Thailand, West Indies and America (El-Chaghaby *et al.* 2014; Kalidindiet *et al.* 2015). In India, custard apple commonly known as Sitaphal introduced from tropical America (Sharma *et al.* 2020). It is cultivated in Assam, Andhra Pradesh, Gujarat, Bihar, Karnataka, Madhy Pradesh, Maharashtra, Orissa, Chhattisgarh, Tamil Nadu, Uttar Pradesh and Rajasthan (Haral and Pawar 2013; Sravanthiet *et al.* 2014). In India 387.49 MT production was estimated from 44 thousand hectare by National Horticulture Board in current year. It is having good nutritional value, where every 100g contains 70.5 g moisture, 23.5 g carbohydrate, 1.6 g protein, 1.5 mg iron, 17 mg calcium, 47 mg phosphorus, magnesium, copper and 35-42 mg vitamin C, vitamin A, vitamin E, vitamin B₁, B₂, B₃, B₆ and B₉ and 3.1 per cent dietary fibre (Dashora *et al.*, 2004; Zahid *et al.* 2018; Nair and Aggarwal 2017).

Its bark, roots, leaf, stem, fruit, peel, and seeds, are having medicinal value. Custard apple is commonly propagated using seeds facing following limitation i.e. germination of seed is very poor, takes long time or very slow growth of seedlings causes constraint to meet the growing demands. To improve these problems motivated many researchers to work with various hormones, fertilizers, etc. for increasing seed germination percentage and healthy seedlings. So, for present study the pre sowing treatment i.e. custard apple seeds treatment was done by using plant growth regulators as gibberellic acid (GA₃) and Chemical fertilizer as KNO₃. The Gibberellic Acid (GA₃) is a tetracyclic di-terpenoid compound and a plant hormone. It stimulates seed germination, rapid stem and root growth, vegetative to flowering, determines sex expression along with an interaction of different environmental factors i.e. light, temperature and water (Gupta and Chakrabarty 2013; Desai *et al.* 2017; Thongsri *et al.* 2021). It also helps in temperature tolerance (Li *et al.* 2013). It also improves the quality of seeds (Kumar *et al.* 2018).

MATERIALS AND METHODS

The present study entitled "Effect of Seed treatment using Gibberellic acid (GA₃) and KNO₃ on seed germination and growth of custard apple (*Annona squamosa* L.) cvs. Balanagar and Washington" at Guru Kashi University, Talwandi Sabo, Punjab, India during 2021-2022.

*Corresponding author: Sidhant,

Department of Fruit science,UCoA, Guru Kashi University, Talwandi Sabo, Bathinda, Punjab, India.

The details of materials used, experiment procedures followed and statistical techniques adopted during the course of investigation were as follows:

Experimental site and climatic condition: Current investigation was conducted at, Guru Kashi University, Talwandi Sabo, Bathinda, Punjab, India, during 2021-2022 on different dosage of Gibberellic acid (GA₃) and Potassium nitrate (KNO₃) under open green shade condition to observe the effect on germination and growth parameters of Custard apple cvs. Balanagar and Washington. The experiment site is located at latitude 29°59'0" N and longitude 75°5'0" East, has semiarid climate with wide variations of summer and winter temperatures. During study period the maximum summer temperature reached 49°C and the winter temperature was recorded as low as 2°C. The rainfall concentrated in July to September.

RESULTS AND DISCUSSION

The present study entitled “Effect of Seed treatment using Gibberellic acid (GA₃) and KNO₃ on seed germination and growth of custard apple (*Annona squamosa* L.) cvs. Balanagar and Washington” at Guru Kashi University, Talwandi Sabo, Punjab, India during 2021-2022 results was mentioned below:

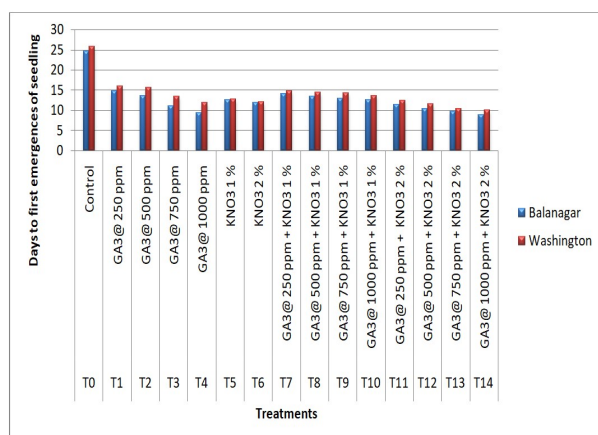


Fig 4.1. Effect of GA₃ and KNO₃ treatments on Number of days taken for first emergences in different cultivars of Custard apple

Number of Days to first emergences of seedling: The data given in Table 4.1 revealed that in custard apple cv. Balanagar at T14: GA₃@ 1000 ppm + KNO₃ 2 % minimum numbers of days taken for first emergence of nodes (8.95 days). In both cultivars the maximum number of days taken for first emergence of nodes was recorded in T0: Control (24.64, 25.80 days) respectively (Table 4.1). Out of both cultivars the Balanagar is showing relatively more effectiveness of GA₃ and KNO₃ as it is taking comparatively less number of days for first emergence of nodes then Washington (Graph 4.1). Similar type of experiment conducted by Vasanthaet al. (2014) reported at GA₃ 200 ppm seed treatment decreases the number of days taken for germination (5.33 days). Mane et al. (2018) reported 37.97 days for first germination in pretreated seeds with KNO₃ (0.1%).

Germination Percentage: The result revealed that the maximum germination percentage was recorded in both cvs. Balanagar and Washington at T14: GA₃@ 1000 ppm + KNO₃ 2 % (78.76, 76.67 percent) respectively. In both cultivars the minimum germination percentage was recorded in T0: Control

(59.17, 58.67 per cent) respectively (Table 4.2). Out of both cultivars the Balanagar is showing relatively more effectiveness of GA₃ and KNO₃ as it is showing higher germination percentage then Washington (Graph 4.2). In similar type of experiment Ratan and Reddy (2003) reported the 64 percent seed germination when custard apple seed soaking at 1% sodium nitrate.

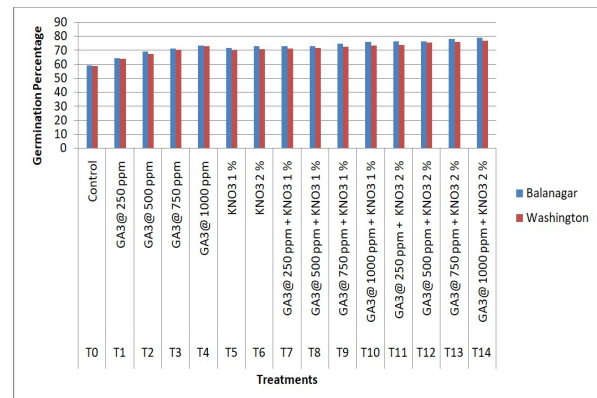


Fig 4.2. Effect of GA₃ and KNO₃ treatments on Germination Percentage in different cultivars of Custard apple

Survival percentage: The result revealed that the maximum survival percentage was recorded in both cvs. Balanagar and Washington at T14: GA₃@ 1000 ppm + KNO₃ 2 % (86.96, 84.93 per cent) respectively. In both cultivars the minimum survival percentage was recorded in T0: Control (50.95, 50.85 per cent) respectively (Table 4.3). Out of both cultivars the Balanagar is showing higher survival percentage after using GA₃ and KNO₃ then Washington (Graph 4.3). Similarly Patel et al. (2016) reported the survival percentage (75.97 percent) when custard apple seed was pre-soaked in GA₃ @ 150 mg/litre. Mane et al. in 2018 also reported the 90.90 percent survival percentage when seeds are treatment of KNO₃ (0.1%). Jain et al. reported the significant effect on survival percentage and maximum survival percentage (83.75) was recorded with GA₃ 200ppm.

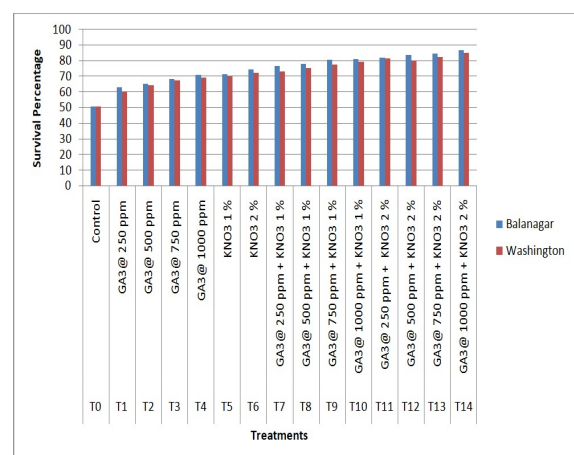


Fig 4.3. Effect of GA₃ and KNO₃ treatments on Survival percentage in different cultivars of Custard apple

Plant height (cm) at 45 DAS: The result revealed that the maximum plant height at 45 DAS was recorded in both cvs. In both cultivars the minimum height of plant after 45 DAS was recorded in T0: Control (14.50, 13.85 cm) respectively (Table 4.4).

Out of both cultivars the Balanagar is showing higher plant height after using GA₃ and KNO₃ then Washington (Graph 4.4).

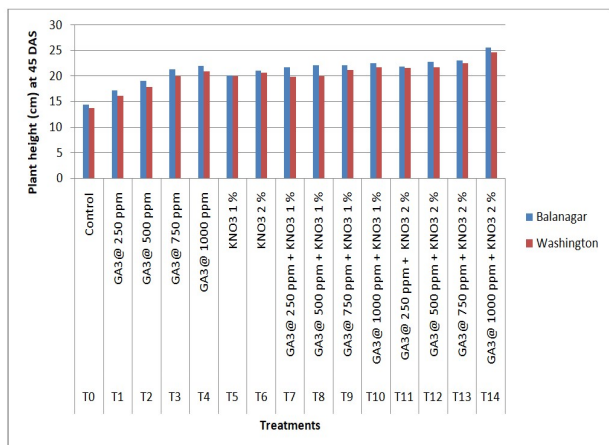


Fig 4.4. Effect of GA₃ and KNO₃ treatments on Plant height (cm) at 45 DAS in different cultivars of Custard apple

Plant height (cm) at 90 DAS: The result revealed that the maximum plant height at 90 DAS was recorded in both cvs. In both cultivars the minimum height of plant after 90 DAS was recorded in T0: Control (24.99, 23.98 cm) respectively (Table 4.5). Out of both cultivars the Balanagar is showing higher plant height after using GA₃ and KNO₃ then Washington (Graph 4.5). Rahangdaleet al. (2019) reported increased in the height of the plants (4.24, 5.64, 9.79 and 12.86cm) at 30, 60, 90 and 120 DAS using 500ppm GA₃ treated seeds.

Number of leaves at 45 DAS: The result revealed that the number of leaves at 45 DAS was recorded in both cvs. In both cultivars the number of leaves at 45 DAS was recorded in T0: Control (10.78, 10.49) respectively (Table 4.6). Out of both cultivars the Balanagar is showing higher number of leaves after using GA₃ and KNO₃ then Washington (Graph 4.6).

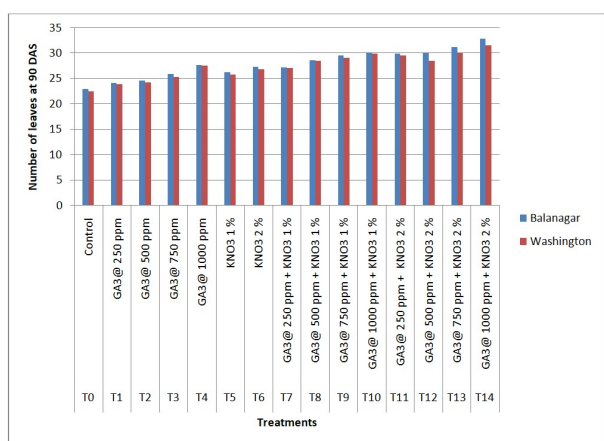


Fig 4.5. Effect of GA₃ and KNO₃ treatments on Plant height (cm) at 90 DAS in different cultivars of Custard apple

Number of leaves at 90 DAS: The result revealed that the number of leaves at 90 DAS was recorded in both cvs. In both cultivars the number of leaves at 90 DAS was recorded in T0: Control (23.00, 22.47) respectively (Table 4.7).



Fig 4.6. Effect of GA₃ and KNO₃ treatments on Number of leaves at 45 DAS in different cultivars of Custard apple

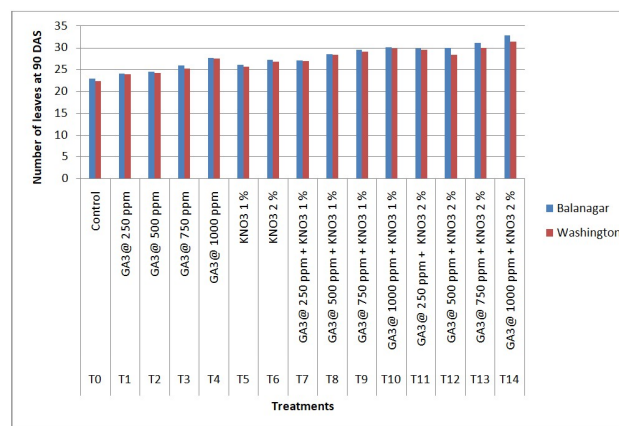


Fig 4.7. Effect of GA₃ and KNO₃ treatments on Number of leaves at 90 DAS in different cultivars of Custard apple

Out of both cultivars the Balanagar is showing higher number of leaves after using GA₃ and KNO₃ then Washington (Graph 4.7). Rajput and Sharma (2020) also reported the plant height (11.63cm) and number of leaves per seedling (11.87) with treatment of GA₃.

CONCLUSION

The present investigation for studying the effect of Seed treatment using Gibberellic acid (GA₃) and KNO₃ on seed germination and growth of custard apple (*Annona squamosa* L.) cvs. Balanagar and Washington were conducted at Guru Kashi University, Talwandi Sabo, Punjab, India during 2021-2022. For present study fifteen different treatments of GA₃ and KNO₃ i.e. T0: Control, T1: GA₃@ 250 ppm, T2: GA₃@ 500 ppm, T3: GA₃@ 750 ppm, T4: GA₃@ 1000 ppm, T5: KNO₃ 1%, T6: KNO₃ 2%, T7: GA₃@ 250 ppm + KNO₃ 1%, T8: GA₃@ 500 ppm + KNO₃ 1%, T9: GA₃@ 750 ppm + KNO₃ 1%, T10: GA₃@ 1000 ppm + KNO₃ 1%, T11: GA₃@ 250 ppm + KNO₃ 2%, T12: GA₃@ 500 ppm + KNO₃ 2%, T13: GA₃@ 750 ppm + KNO₃ 2% and T14: GA₃@ 1000 ppm + KNO₃ 2% was used on two different cultivars of custard apple. The result revealed that in custard apple cv. Balanagar and Washington at T14: GA₃@ 1000 ppm + KNO₃ 2% reported minimum numbers of days taken for first emergence of nodes (8.95 days, 10.44days). Whereas the maximum number of days taken for first emergence of nodes was recorded in T0: Control (24.64, 25.80 days) respectively. The maximum germination percentage was recorded in both cvs.

Balanagar and Washington at T14 (78.76, 76.67 per cent) > T13 (77.91, 75.92 per cent) > T12 (76.43, 75.41 per cent) > T11 (76.19, 73.76 per cent) > T10 (75.59, 73.05 per cent) > T9 (74.59, 72.26 per cent) > T4 (73.21, 72.73 per cent) > T8 (72.98, 71.34 per cent), T7 (72.77, 70.93 per cent), T6, T5 (71.64, 69.81 per cent), T3 (70.91, 69.98 per cent), T2 (69.06, 67.24 per cent) in both Balanagar and Washington respectively. The result revealed that the maximum survival percentage was recorded in both cvs. Balanagar and Washington at T14 (86.96, 84.93 per cent). The result revealed that the maximum plant height, number of leaves at 45 and 90 DAS was recorded with T14: GA₃@ 1000 ppm + KNO₃ 2 % treatment. Therefore the use of GA₃ and KNO₃ as seed treatment should be recommended as it is showing significant positive results on growth parameters of custard apple crops.

ACKNOWLEDGEMENT

The authors acknowledge Dr. Pushpinder Singh Aulakh (Major advisor) and Ms. Jaismeen Kaur, (Asst. Prof), Department of Fruit science (UCoA), Guru Kashi University, Talwandi sabo, Bathinda for the facilities provided to carry out this work.

REFERENCES

- Dashora L.K., Senand N.L. and Maurya I.B. 2004. Production technology of underutilized fruit crops. Yash Publishing House, Bikaner, Pp.92.
- Ratan P.B and Reddy Y.N. 2004. Influence of gibberellic acid on custard apple (*Annona squamosa* L.) seed germination and subsequent seedling growth. Journal of Research ANGRAU 32(2): 93-95.
- Gupta R. and Chakrabarty S. K. 2013. Gibberellic acid in plant. Plant Signaling & Behavior, 8(9): e25504.
- Haral Y.R. and Pawar B.R. 2013. Economics of custard apple production in Maharashtra. International Research Journal of Agricultural Economics and Statistics, 4 (2): 193-195.
- Li X., Cai J., Jiang D., Jiang H., Dai T., Liu F. and Cao W. 2013. Induction of chilling tolerance in wheat during germination by pre-soaking seed with nitric oxide and gibberellin. Plant Growth Regulation, 71, 31- 40
- Vasanth P. T., Vijendrakumar R. C., Guruprasad T. R., Mahadevamma M. and Santhosh K. V. 2014. Studies on effect of growth regulators and biofertilizers on seed germination and seedling growth of Tamarind (*Tamarindus indica* L.). Plant Archives, 14 (1): 55-160.
- Sravanthi T., Waghrey K. and Dadda J. R. 2014. Studies on preservation and processing of custard apple (*Annona squamosa* L.) pulp. International Journal of Plant, Animal and Environmental Sciences, 4 (3): 676-682.
- El-Chaghaby G. A., Ahmad A. F. and Ramis E. S. 2014. Evaluation of the antioxidant and antibacterial properties of various solvents extracts of *Annona squamosa* L. leaves. Arabian Journal of Chemistry, 7 (2): 227-233.
- Kalidindi N., Thimmaiah N. V., Jagadeesh N.V., Nandeep R., Swetha S. and Kalidindi B. 2015. Antifungal and antioxidant activities of organic and aqueous extracts of *Annona squamosa* Linn. Leaves. Journal of Food and Drug Analysis, 23(4): 795-802.
- Patel D. D., Gaikwad S. S. and Patel K. D. 2016. Effect of seed priming treatments on germination and seedling vigour of custard apple (*Annona squamosa*). Current Horticulture, 4(2): 21- 24.
- Nair R. and Agrawal V. 2017. A Review on the Nutritional Quality and Medicinal Value of Custard Apple – An Under Utilised Crop of Madhya Pradesh, India. International Journal of Current Microbiology and Applied Sciences, 6(9): 1126-1132
- Desai A., Panchal B., Trivedi A. and Prajapati D. 2017. Studies on seed germination and seedling growth of papaya (*Carica papaya* L.) CV. madhubindu as influenced by media, GA₃ and cow urine under net house condition. Journal of Pharmacognosy and Phytochemistry, 6(4): 1448-1451.
- Jain S., Sharma T.R., Narayan Lal, Rangare N.R., Kumar B. and Shiurkar G. B. 2017. Effect of GA₃ and Growing Media on Seedling Vigour and Physiological Parameter of Custard Apple (*Annona squamosa* L.). International Journal of Current Microbiology and Applied Sciences, 6(8): 606-615
- Kumar S., Malik T.P., Mor V.S. and Kumar P. 2018. Effect of gibberellic acid on seed quality of coriander (*Coriandrum sativum* L.). Journal of Pharmacognosy and Phytochemistry, 7: 830-832.
- Zahid M., Mujahid M., Singh P. K., Farooqui S., Singh K., Parveen S., and Arif M. 2018. *Annona squamosa* Linn. (custard apple): An aromatic medicinal plant fruit with immense nutraceutical and therapeutic potentials. International journal of pharmaceutical sciences and research, 9: 1745-1759.
- Mane S.B., Jaiswal S.B., Parse R.N. and Naglot U.M. 2018. Effect of Different Pre- Sowing Treatment on Seed Germination and Growth in Custard Apple (*Annona squamosa*). International Journal of Current Microbiology and Applied Sciences, Special Issue-6: 1744-1748
- Rahangdale P., Pandey S.K. and Jayswal D.K. 2019. Influence of GA₃ and Date of Sowing on Growth and Development of Custard Apple Seedlings. International Journal of Current Microbiology and Applied Sciences, 8(01): 1813-1821.
- Rajput K. and Sharma T.R. 2020. Effect of organic and inorganic sources on seed germination, growth and survival of Custard apple (*Annona squamosa* L.) seedlings Journal of Pharmacognosy and Phytochemistry, 9(6): 552-556.
- Thongsri K., Teingtham K., Duangpatra J. and Romkaew J. 2021. Effects of brassinosteroids and gibberellin on water uptake and performance of soya bean seeds under different temperatures. Seed Science and Technology, 49, 2, 141-157.
