

## Impact of Natural and Synthetic Growth Hormones on Shooting of Grape Hardwood Cuttings (*Vitis vinifera* L) cv. Punjab Macs Purple

Naveen Kumar<sup>1\*</sup>, Homraj Sahare<sup>2</sup> and Bhavana Beniwal<sup>3</sup>

<sup>1</sup>Masters in Fruit Science, Department of Horticulture, School of Agriculture, Lovely Professional University (Punjab), India.

<sup>2</sup>Assistant Professor, Department of Horticulture, School of Agriculture, Lovely Professional University (Punjab), India.

<sup>3</sup>Masters in Fruit Science, Department of Horticulture, School of Agriculture, Lovely Professional University (Punjab), India.

(Corresponding author: Naveen Kumar\*)

(Received 17 May 2022, Accepted 13 July, 2022)

(Published by Research Trend, Website: [www.researchtrend.net](http://www.researchtrend.net))

**ABSTRACT:** The current study was conducted in the agriculture research farm of Lovely Professional University, Punjab during the year of 2021-2022, to assess the Impact of natural and synthetic hormones on rooting of grape cutting (*Vitis vinifera* L) cv. Punjab Macs Purple. For this experiment, different types of natural and synthetic hormones were used. Disease-free and healthy, seedlings of grapes variety *i.e.*, Punjab Mac Purple were obtained from the Regional Research Station, Bathinda (Punjab). This variety of grapes is commonly used by local farmers. The aloe vera, cinnamon powder, apple cider, honey, IAA, IBA and GA<sub>3</sub> used in the experiment. The maximum number of leaves (17.33, 28.66 and 118.33) were found in treatment T<sub>9</sub> which is the application of 2000 ppm IBA however in natural growth hormone *i.e.*, 100% aloe vera give maximum number of leaves 16.00, 26.66 and 112.33 at 30, 60 and 90DAP. The maximum leaf length (4.20 cm, 4.43 cm and 7.53 cm) was found in treatment T<sub>9</sub> which is the application of 2000 ppm IBA. The application of 100% aloe vera with however in natural growth hormone *i.e.*, 100% aloe vera give maximum length of leaves 4.00 cm, 4.26 cm and 6.03 cm at 30, 60 and 90DAP. The highest fresh weight (52 gm) and dry weight (6.02 gm) were found in treatment T<sub>9</sub>, which is the application of 2000 ppm IBA.

**Keywords:** Grape, Hormone, Maximum, IBA, Aloe vera, Punjab Mac Purple.

### INTRODUCTION

The grape (*Vitis vinifera* L.) is a fruit crop that belongs to the family *Vitaceae*, which is related to the northern temperate zone. It is one of the most commercially vital crops in the world. The grape is a woody vine in nature and can grow up to 17m or more. The fruits that plants produce is known as grapes (Kaur, 2017). Grapes contain a very good number of vitamins, minerals and other beneficial elements such as Ca, P, K and sugar. These sugars are basically present in the form of glucose and fructose. The amount of sugar content in grapes varies according to the variety. Grapes are used for various purposes such as for salad, jam & jelly and vinegar preparation. The domesticated type of grape is mostly utilized for selling purposes either for the production of processed products or for wine preparation. European grapes are considered the best ones for raisins, which are categorized according to size, shape and grape color. If we talk about its cultivation, India comes in the first ten countries that produce grapes (Wang *et al.*, 2011). The global production of grapes is estimated at 78,034,332 metric tonnes (FAO, 2020). China, Italy, the USA, France, Spain, Turkey and Argentina are the countries that are the major producers of grapes globally. The leading

country is China, with the production of 14,769,088 tonnes (FAO, 2020). In India, production of grapes is 31, 25, 000 MT (FAO, 2020). In India, among all fruits, grapes come in the 7<sup>th</sup> position and contribute up to 2% of the total production of grapes worldwide (Kaur, 2017). In India, 80% of production is given by Maharashtra and after that by Karnataka and Tamil Nadu. Grapes are one of the flexible crops which can tolerate any type of climate, but the climate of the Mediterranean region is most suitable for its production. In Punjab, around 777 hectares of land are used to cultivate grapes. There are several varieties that have been released and found suitable for Punjab conditions and give maximum productivity, such as Punjab MACS Purple, Perlette, Beauty seedless, etc.

To fulfill the research gap, shoot and leaves initiation in grape cutting can be achieved by using various hormones and other treatments, including cinnamon powder, aloe vera, apple cider and honey, because they are the cheapest way to propagate and enhance the rooting quality. These growth hormones are easy to use, sustainable and cost effective. By incorporating these, it makes the soil more productive and, as a natural substance, it increases the growth and shoot of cuttings so increase their fresh and dry weight. Cinnamon is a

kind of spice that belongs to the *Lauraceae* family. It is made from the bark of a cinnamon tree. It is mostly used as an aromatic condiment for culinary purposes, especially to enhance the flavor of dishes. It contains the essential oil component cinnamaldehyde along with eugenol, which gives a specific aroma to the dishes. Although it is used as a natural hormone, it also acts as a natural antibacterial and antimicrobial agent (Rajan *et al.*, 2021).

## MATERIALS AND METHOD

The current study was conducted in the agriculture research farm of Lovely Professional University, Punjab during the year of 2021-2022, to assess the Effect of natural and synthetic hormones on rooting of grape cutting (*Vitis vinifera* L) cv. Punjab Macs Purple. For this experiment, different types of natural and synthetic hormones were used. Materials and methods used in the present experiment have been illustrated in this segment. Disease-free and healthy, seedlings of grapes variety *i.e.*, Punjab Mac Purple were obtained from the Regional Research Station, Bathinda (Punjab). This variety of grapes is commonly used by local farmers. The aloe vera, cinnamon powder, apple cider, honey, IAA, IBA and GA<sub>3</sub> (Fig. 1) used in the experiment. Cuttings were quickly planted in plant trainers (after treatment) at 7.5cm deep up to the surface within rooting media. Studies are also operated upon to observe the effect of natural and synthetic growth hormones on rooting of grape cutting e.g. number of leaves, leaf length, fresh weight and dry weight. Find

that which concentration or plant growth regulator is responsible for good shooting and others.

**Method of preparation of solution:** T<sub>9</sub> - IBA 2000 ppm (2 min) – Two gram of balanced IBA was taken in 1000 ml beaker and 1 to 2 drops of ethyl alcohol was added to dissolve the IBA properly. Slowly added distilled water with the help of glass rod IBA was dissolved to make final volume of 1 liter. T<sub>1</sub> - Aloe Vera 100% –

1. Harvest aloe vera leaf (2kg for 500ml) after selecting healthy plant.
2. Extract aloe vera gel.a. Cut at harvested point using sharp knife. Keep this part in a beaker. Gel was extracted by cutting the cuticle with a knife. Cuticle was then grinded and added to the beaker. The green rind or cuticle of aloe vera plant and aloe vera outer leaf pulp contains latex was peeled with knife, grinded and put it in the beaker. c. Collect aloe vera gel and put in a beaker. Mix these three parts inside a beaker. Kept it in a refrigerator or kept outside after wrapping with aluminium foil. Kept in a cool place where the sunlight was not directly falling on it.3. Take 100 ml of aloe vera gel in a container or beaker at the time of treatment. T<sub>14</sub> - Control - dipping in distilled water – Distilled water was taken in 500 ml beaker. The observations were recorded at three stages such as 30 DAPS, 60 DAP and 90 DAP. The recorded observations of morphological and biochemical parameters and the standard procedure adopted during the course of study are given Plate 1.



**Plate 1.** Hardwood cuttings cv. Punjab Macs Purple.

## RESULT AND DISCUSSION

**Number of leaves (no.).** Data regards to the impact of natural and synthetic growth hormones on number of leaves, and survival percentage of cuttings was showed in table 1. The data on number of leaves was recorded and showed that the treatment T<sub>9</sub> with the application of 2000 ppm IBA shows a maximum no. of leaves (17.33) followed by the treatment T<sub>1</sub> which is the application

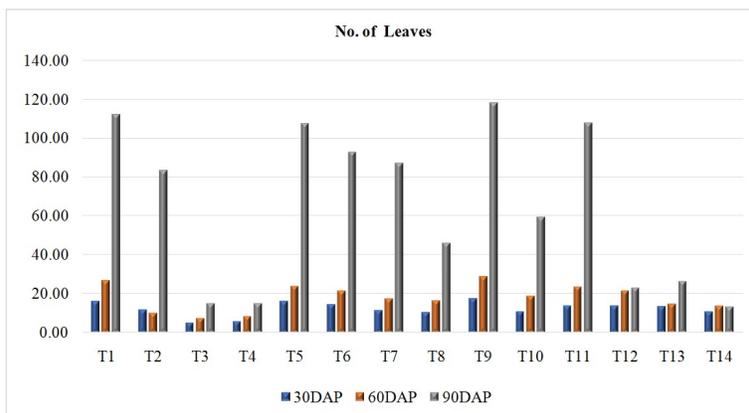
100% aloe vera with (16). The least no. of leaves was found in the treatment T<sub>3</sub> which is the application of 100% apple cider with (5.00) at 30DAP. At 60DAP, the maximum no. of leaves (28.66) was found in the treatment T<sub>9</sub> with the application of 2000 ppm IBA followed by the treatment T<sub>1</sub> (26.66) with the application of 100% aloe vera. The least no. of leaves was found in the treatment T<sub>3</sub> which is the application

of 100% apple cider with (7.33). At, 90DAP, the maximum no. of leaves was found in the treatment T<sub>9</sub> (118.33) with the application of 2000 ppm IBA followed by the treatment T<sub>1</sub> (112.33) with the application of 100% aloe vera as compared to control (13.33). The number of leaves increased in treatment T<sub>9</sub> (2000 ppm IBA) might be due to the in development of root IBA plays an important role and automatically this

effect is shown in leaf length and leaf number and an increase in number of shoots due to IBA application may necessitate the increased activity of photosynthesis, transpiration and respiration in leaves and thus may result in the increase in number of leaves this result was supported by Jan *et al.* (2015); Wahab *et al.* (2001); Muttulani *et al.*, (2022).

**Table 1: Effect of natural and synthetic hormones on number of leaves of grape.**

TREATMENTS	30 DAP	60 DAP	90 DAP
T <sub>1</sub> - (Aloe Vera 100% -12 hours)	16.00	26.66	112.33
T <sub>2</sub> - (Cinnamon Powder 100% -12 hours)	11.66	10.00	83.66
T <sub>3</sub> - (Apple Cider 100% -12 hours)	5.00	7.33	15.00
T <sub>4</sub> - (Honey 100% -12 hours)	5.66	8.33	15.00
T <sub>5</sub> - (IAA 100 ppm -12 hours)	16.00	23.66	107.66
T <sub>6</sub> - (IAA 300 ppm -12 hours)	14.33	21.33	93.00
T <sub>7</sub> - (IAA 500 ppm -12 hours)	11.33	17.33	87.33
T <sub>8</sub> - (IBA 1000 ppm -2 minutes)	10.33	16.33	46.00
T <sub>9</sub> - (IBA 2000 ppm -2 minutes)	17.33	28.66	118.33
T <sub>10</sub> - (IBA 3000 ppm -2 minutes)	10.66	18.66	59.33
T <sub>11</sub> - (GA <sub>3</sub> 50 ppm -12 hours)	13.66	23.33	108.00
T <sub>12</sub> - (GA <sub>3</sub> 100 ppm -12hours)	13.66	21.33	23.00
T <sub>13</sub> - (GA <sub>3</sub> 150 ppm -12hours)	13.33	14.66	26.33
T <sub>14</sub> - (Control Dipping in water - 12 hours)	10.66	13.66	13.33
CD	1.40	2.34	6.24
SE(m)	0.48	0.80	2.13
SE(d)	0.67	1.13	3.02
C.V	6.86	7.72	5.70



**Fig. 1.** Effect of natural and synthetic hormones on number of leaves of grape.

**Leaf length (cm).** Data on leaf length is presented in Table 2 indicating that the treatments significantly control the leaf length over the control. Treatment T<sub>9</sub> with the application of 2000 ppm IBA shows maximum leaf length (4.20 cm) followed by the treatment T<sub>1</sub> (Aloe vera, 4 cm). Moreover, the least leaf length (2.36 cm) was found in the treatment T<sub>3</sub> (Apple Cider) at 30DAP. At 60DAP, the maximum leaf length (4.43 cm) was found in the treatment T<sub>9</sub> with the application of 2000 ppm IBA followed by the treatment T<sub>1</sub> (Aloe vera, 4.26cm). Moreover, the least leaf length (2.00 cm) was found in the treatment T<sub>3</sub> (Apple Cider). At, 90DAP, the maximum leaf length (7.53 cm) was found in the treatment T<sub>9</sub> with the application of 2000 ppm IBA followed by the treatment T<sub>1</sub> (Aloe vera, 6.03cm).

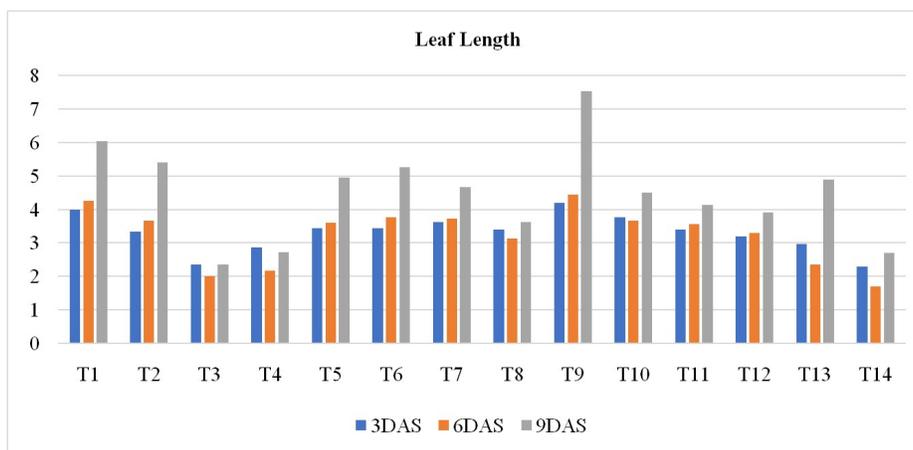
Moreover, the least leaf length (2.36 cm) was found in the treatment T<sub>3</sub> (Apple Cider). An increasing trend in length of leaves were observed from 30, 60 and 90 DAP respectively. The length of leaves increased in treatment T<sub>9</sub> (2000 ppm IBA) might be due to the development of root IBA plays an important role and automatically this effect is shown in leaf length and leaf number and an increase in number of shoots due to IBA application may necessitate the increased activity of photosynthesis, transpiration and respiration in leaves and thus may result in the increase in length of leaves by (Wahab *et al.*, 2001) in Guava. Similar results also recorded by (Jan *et al.*, 2015) in olive cuttings. Length of leaves also increased in Aloe Vera gel treated grape cuttings, it might be due to Aloe Vera contains very

essential number of macronutrients, micronutrients, vitamins, gibberellins and salicylic acid and has a stimulating effect on plant growth and development.

Aloe Vera gel contains IAA which could be the alternative root hormone (Uddin *et al.*, 2020). Similar results also recorded by (Hamouda *et al.*, 2012).

**Table 2: Effect of natural and synthetic hormones on leaf length of grape cutting (cm).**

Treatments	30DAP	60DAP	90DAP
T <sub>1</sub> - (Aloe Vera 100% -12 hours)	4.00	4.26	6.03
T <sub>2</sub> - (Cinnamon Powder 100% -12 hours)	3.33	3.66	5.40
T <sub>3</sub> - (Apple Cider 100% -12 hours)	2.36	2.00	2.36
T <sub>4</sub> - (Honey 100% -12 hours)	2.86	2.16	2.73
T <sub>5</sub> - (IAA 100 ppm -12 hours)	3.43	3.60	4.96
T <sub>6</sub> - (IAA 300 ppm -12 hours)	3.43	3.76	5.26
T <sub>7</sub> - (IAA 500 ppm -12 hours)	3.63	3.73	4.66
T <sub>8</sub> - (IBA 1000 ppm -2 minutes)	3.40	3.13	3.63
T <sub>9</sub> - (IBA 2000 ppm -2 minutes)	4.20	4.43	7.53
T <sub>10</sub> - (IBA 3000 ppm -2 minutes)	3.76	3.66	4.50
T <sub>11</sub> - (GA <sub>3</sub> 50 ppm -12 hours)	3.40	3.56	4.13
T <sub>12</sub> - (GA <sub>3</sub> 100 ppm -12hours)	3.20	3.30	3.90
T <sub>13</sub> - (GA <sub>3</sub> 150 ppm -12hours)	2.96	2.36	4.90
T <sub>14</sub> - (Control Dipping in water - 12 hours)	2.30	1.70	2.70
CD	0.54	0.37	0.71
SE(m)	0.18	0.12	0.24
SE(d)	0.26	0.18	0.34
C.V	9.69	6.84	9.49



**Fig. 2.** Effect of natural and synthetic hormones on leaf length of grape cutting (cm).

**Fresh weight and Dry weight (gm).** Data on fresh weight is presented in Table 3 indicated that the treatments significantly control the fresh weight over the control. The data on fresh weight showed that the maximum fresh weight was observed in the treatment T<sub>9</sub> which is the application of 2000 ppm IBA with (52 gm) followed by the treatment T<sub>1</sub> which is the application of 100% of aloe vera juice with 45.33 gm. The least fresh weight was found in the treatment T<sub>3</sub> with the application of 100% apple cider vinegar with 10.66 gm as compared to control. This result was supported by Galavi *et al.* (2013) as they stated that fresh weight was increased by the application of IBA

@400g/ml. Data on dry weight is presented in Table 3 indicated that the treatments significantly control the dry weight over the control. The data on dry weight showed that the maximum dry weight was observed in the treatment T<sub>9</sub> which is the application of 2000 ppm IBA with (6.02 gm) followed by the treatment T<sub>1</sub> which is the application of 100% of aloe vera juice with 5.30 gm. The least dry weight was found in the treatment T<sub>8</sub> with the application of 1000 ppm IBA with 2.30 gm as compared to control. This result was supported by Galavi *et al.* (2013) as they stated that fresh weight was increased by the application of IBA @600g/ml.

**Table 3: Effect of natural and synthetic hormones on Fresh weight and Dry weight of grape cutting (gm).**

Treatments	Fresh weight (gm)	Dry weight(gm)
T <sub>1</sub> - (Aloe Vera 100% -12 hours)	45.33	5.30
T <sub>2</sub> - (Cinnamon Powder 100% -12 hours)	27.00	4.86
T <sub>3</sub> - (Apple Cider 100% -12 hours)	10.66	4.46
T <sub>4</sub> - (Honey 100% -12 hours)	14.66	4.36
T <sub>5</sub> - (IAA 100 ppm -12 hours)	38.33	3.20
T <sub>6</sub> - (IAA 300 ppm -12 hours)	42.33	2.46
T <sub>7</sub> - (IAA 500 ppm -12 hours)	35.33	5.26
T <sub>8</sub> - (IBA 1000 ppm -2 minutes)	43.33	2.30
T <sub>9</sub> - (IBA 2000 ppm -2 minutes)	52.00	6.03
T <sub>10</sub> - (IBA 3000 ppm -2 minutes)	16.66	2.80
T <sub>11</sub> - (GA <sub>3</sub> 50 ppm -12 hours)	33.33	2.30
T <sub>12</sub> - (GA <sub>3</sub> 100 ppm -12hours)	31.33	2.73
T <sub>13</sub> - (GA <sub>3</sub> 150 ppm -12hours)	20.33	2.83
T <sub>14</sub> - (Control Dipping in water - 12 hours)	20.66	2.66
CD	3.68	0.69
SE(m)	1.25	0.23
SE(d)	1.78	0.33
C.V	7.07	11.10

## CONCLUSION

In this study, impact of 14 different treatments of natural (aloe vera, cinnamon powder, honey and apple cider) and synthetic hormone (IBA, IAA and GA<sub>3</sub>) plant growth regulators in various concentrations was observed on the growth of cuttings of grape (*Vitis vinifera* L.) cv. Punjab Macs Purple. In the present research, most of the shoot parameters characters of cuttings were significantly influenced by the different treatments of growth regulator as compared to control. But the treatment of 2000 ppm IBA was found best for maximum rooting, growth and success of grapes cuttings. In natural hormone aloe vera treatment gives best result.

**Acknowledgement.** Research is limited in natural and synthetic use of hormones on grapes. Long-term research should be conducted to get a comprehensive understanding of natural and as well as synthetic effect on grapes (shoot). Disease-free and healthy, seedlings of grapes variety should be grown for better and healthy production. There is a need to investigate the factors influencing farmer adoption and acceptance of use of natural and synthetic hormones for production.

**Conflict of Interest.** None.

## REFERENCES

- Galavi, M., Karimian, M. A., & Mousavi, S. R. (2013). Effects of different auxin (IBA) concentrations and planting-beds on rooting grape cuttings (*Vitis vinifera* L.). *Annual Research & Review in Biology*, 517-523.
- Hamouda, A. M. A., Hendi, D. M. G. and Abu-El-Leel, O. F. A. (2012). Improving basil growth, yield and oil

- production by Aloe vera extract and active dry yeast. *Egypt Journal Horticulture*, 39: 45-71.
- Jan, I., Sajid, M., Rab, A., Iqbal, A., Khan, O., Jamal, Y., & Shah, S. T. (2015). Effect of various concentrations of in-dole butyric acid (IBA) on olive cuttings.
- Kaur, M., Kalia, A., & Thakur, A. (2017). Effect of biodegradable chitosan-rice starch non composite films on post-harvest quality of stored peach fruit. *Starch-Stärke*, 69(1-2), 1600208.
- Kaur, S. (2017). Evaluation of different doses of indole-3-butyric acid (IBA) on the rooting, survival and vegetative growth performance of hardwood cuttings of Flordaguard peach (*Prunus persica* L. Batch). *Journal of Applied and Natural Science*, 9(1), 173-180.
- Muttulani, M. A. J. (2022). Grape (*Vitis vinefera* L.) propagation using different types of cuttings and root-initiating substances. *Journal of Agricultural Research, Development, Extension and Technology*, 4(1), 1-9.
- Rajan, R. P., & Singh, G. (2021). A review on the use of organic rooting substances for propagation of horticulture crops. *Plant Archives*, 21(1), 685-692.
- Uddin, A. J., Rakibuzzaman, M., Raisa, I., Maliha, M., & Husna, M. A. (2020). Impact of natural substances and synthetic hormone on grapevine cutting. *Journal of Bioscience and Agriculture Research*, 25(01), 2069-2074.
- Wahab, F., Nabi, G., Ali, N., & Shah, M. (2001). Rooting response of semi-hardwood cuttings of guava (*Psidium guajava* L.) to various concentrations of different auxins. *Online Journal of Biological Sciences*, 1(4), 184-187.
- Wang, Y., Li, L., Ye, T., Zhao, S., Liu, Z., Feng, Y. Q., & Wu, Y. (2011). Cytokinin antagonizes ABA suppression to seed germination of Arabidopsis by down regulating ABI5 expression. *The Plant Journal*, 68(2), 249-261.

**How to cite this article:** Naveen Kumar, Homraj Sahare and Bhavana Beniwal (2022). Impact of Natural and Synthetic Growth Hormones on Shooting of Grape Hardwood Cuttings (*Vitis vinifera* L.) cv. Punjab Macs Purple. *Biological Forum – An International Journal*, 14(3): 490-494.