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EFFECT OF GROWTH REGULATORS ON ROOTING OF CUTTINGS IN PLUM CV. KALA AMRITSARI

Shagufi Narula

Department of Agriculture, Khalsa College Amritsar

Abstract

1200 cuttings made from the trees of Plum cv. Kala Amritsariwere planted in 60 beds of size 1×1m., with 20 cuttings on each bed. Uniform sized 40 cuttings per replication were treated with ten treatments of IBA and PHB growth regulators by slow dip (24 hours) and quick dip (2 minutes) method before planting along with control.Results showed that IBA@2000ppm quick dip was found to be significant in improving the shoot and root characters in cuttings with maximum shoot length (16.87cm), average shoot girth (0.46cm), shoot number (4.22), fresh weight of shoots (6.82), dry weight of shoots (1.43g), leaf number (154.28), average leaf area (305.79 cm^2), root number (44.90), average root length (10.88cm), length of longest root (13.5cm), fresh weight of roots (1.52g), dry weight of roots (1.09). While the cuttings treated with slow dip of IBA 150 ppm exhibited significant survival percentage (81.00%), percentage of rooted cuttings (74.33%) and sprouting percent (75.17%).

***Keywords**: Plum, Kala Amritsari, Cuttings, IBA, PHB, Root development, Shoot development, Survival.*

INTRODUCTION

Plum is an important stone fruit, native to China, grown under temperate and sub-tropical areas of the world belonging to family Rosaceae. American Plum (*Prunusamericana*) and Damson Plum (*Prunusinsititia*) had gained commercial importance in the world. Although the cultivation of plum under Indian condition is not very old but it is gaining considerable popularity and occupying an important position as a commercial crop because of its great acceptance to the consumer either as fresh form or its various products China is the leading plum producing country in the world (Jabeen and Aslam 2011). In India, it occupies an area of 25.50 thousand ha with total production of 42.34 mT.The total area under Japanese plum in Punjab is 225 ha with an annual production of 40.22 mT (Anon 2016). The districts of Gurdaspur, Amritsar, Ferozepur and Patiala are well known for its cultivation.Plums are commercially propagated by grafting on seedling rootsock of peach, plum and apricot in the hills (Ananda 1993). Whereas in Punjab, peach seedlings and Kabul Green Gage are the common used rootstocks. However, this method is laborious and time consuming.

Propagation of subtropical plum can also be carried out successfully by means of stem cuttings. Rooting of stem cuttings is one of the easiest and economical method of propagation, however many woody plants are often difficult to root and this difficulty is still one of the major obstacles to economical propagation. There are several factors known to effect rooting in woody species such as substrate, wounding of cuttings, air environment, genotype and season and plant growth regulators. Among these factors, application of synthetic auxins to shoot cuttings may be very effective in promoting root formation in plum species (Canli and Bozkurt2009). Effect of indole butyric acid (IBA) on root formation from different types of cuttings have been reported in several prunes species such as GF677 (Peach× Almond hybrid), plum and Japanese plum. Application of IBA @3000 ppm for 1-2 min significantly reduced the minimum number of days to sprouting with the highest sprouting percentage, survival percentage, average number of roots, length of main root, root girth, root weight, plant height, plant girth, number of branches, number of leaves and leaf area (Kaur 2015). Now-a-days the use of phenolic compounds to enhance the rooting of difficult to root plants is not an uncommon practice. PHB (p-hydroxybenzoic acid) a non-auxinic compound, has the capacity to synergize the root promoting action of endogenous auxins (Kumar *et al* 1995).Therefore, keeping the above factors in view, the present study was planned to check the performance of growth regulators (IBA and PHB) in plum cuttings for having true-to-type plants**.**

MATERIALS AND METHODS

The present investigationwas carried out in the nursery of Department of Horticulture, Khalsa College, Amritsar during the year 2016-2017. The healthy and disease free cuttings of 20 cm length having 3-6 buds with preferably pencil thickness were taken from healthy uniform sized branches of plum cv. Kala Amritsari, growing in the orchard of same department during the middle of December. A slanting cut was given at the lower side and a round cut was given at the upper end of the cutting. Tentreatments comprising of IBA (50, 100, 150 ppm) by slow dip and IBA (1000, 1500, 2000 ppm) by quick dip method and PHB (500, 1000 and 1500 ppm) by quick dip were used along with control. For preparation of stock solution one gram of growth regulator was weighed and dissolved in absolute ethyl alcohol and the final volume was made to 100 ml using distilled water (1 per cent concentration). From the stock solution the desired concentration was made with the help of following formula:

$$\frac{\text{Ratio of stock solution}}{\text{Ratio of distilled water}} = \frac{\text{Concentration required}}{\text{Concentration of stock solution} - \text{concentration required}}$$

1000 ml growth regulator solution of appropriate concentration was taken in beaker and a unit of 40 cuttings was placed in each approximately $1\frac{1}{2}$ inch of the basal ends of cuttings dipped in solution for 2 minutes in quick dip while in slow dip treatment, the time was extended up to 24 hrs. In case of control, the cuttings were immersed in distilled water for the same period of time. The various observations regardingsprouting percentage, survival percentage, root, shoot and leaf formation were recorded.Field observations were statistically analyzed by Randomized Block Design.

RESULTS AND DISCUSSION

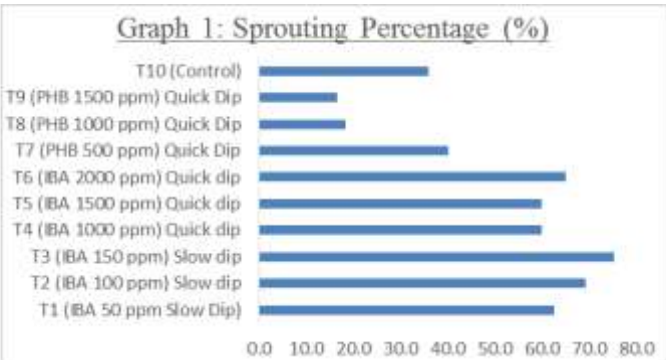
Table 1: Effect of growth regulators on sprouting, survival and shoot characters of plum cuttings cv. Kala Amritsari

Treatments	Sprouting percentage (%)	Survival percentage (%)	Rooting percentage (%)	Average shoot length(cm)	Number of shoots per cutting	Number of roots per cutting	Fresh weight of roots (g)	Dry weight of roots (g)
T_1 (IBA 50 ppm Slow Dip)	62.5	63.2	54.17	14.4	3.6	21.4	0.8	0.5
T_2 (IBA 100 ppm) Slow dip	69.2	70.5	60.83	15.6	3.7	26.3	0.9	0.6
T_3 (IBA 150 ppm) Slow dip	75.2	81.0	74.33	16.7	4.1	38.8	1.1	0.7
T_4 (IBA 1000 ppm) Quick dip	60.0	63.3	51.83	14.0	3.8	27.2	0.8	0.4
T_5 (IBA 1500 ppm) Quick dip	60.0	65.8	58.67	15.5	4.1	34.2	0.9	0.6
T_6 (IBA 2000 ppm) Quick dip	65.0	66.7	67.17	16.9	4.2	44.9	1.5	1.1

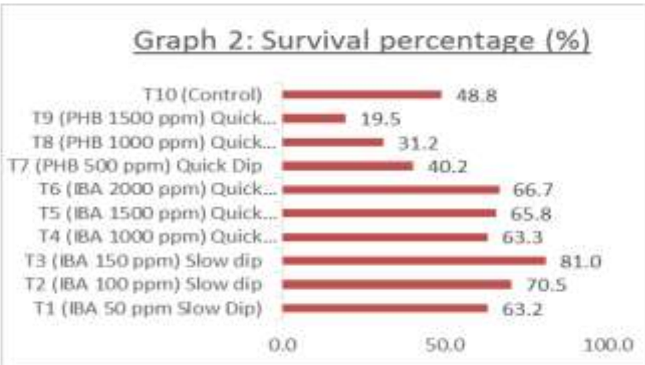
T_7 (PHB 500 ppm) Quick Dip	40.0	40.2	29.83	13.1	3.5	25.0	0.7	0.2
T_8 (PHB 1000 ppm) Quick Dip	18.3	31.2	14.83	9.1	3.1	21.9	0.6	0.2
T_9 (PHB 1500 ppm) Quick Dip	16.7	19.5	12.17	7.1	2.7	15.7	0.4	0.1
T_{10} (Control)	35.8	48.8	36.67	13.3	3.4	10.2	0.6	0.3
Mean	50.3	55.0	46.05	13.6	3.6	26.6	0.8	0.5
C.D (0.05%)	10.2	6.6	5.12	3.1	NS	6.0	0.2	0.1

Values of CD from table 1 clearly shows that effect of growth regulators had significant effect on all the parameters except number of shoots per cutting.

Graph 1 shows, maximum sprouting percentage (75.17%) was recorded in cuttings treated with treatment T_3 (IBA 150 ppm slow dip) which was found to be 110% more w.r.t control.It might be due to the increased level of auxin which results in earlier completion of physiological processes in rooting and sprouting of cuttings. Jawanda*et al* (1990) in plum and Gorecka (1979) in Ericaceae plants had similar findings.

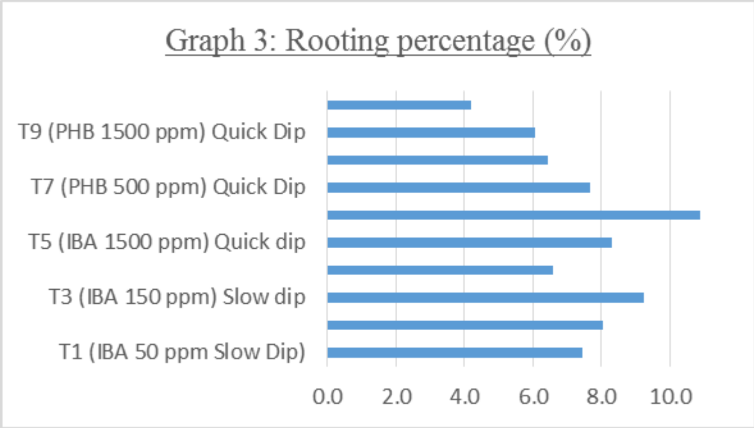


Graph 2 shows that highestsurvival percentage of rooted cuttings (81%) was found in T3 (IBA 150 ppm slow dip) treated cuttings which were66% w.r.t control. The better rooting in cuttings treated with auxin might be due to the

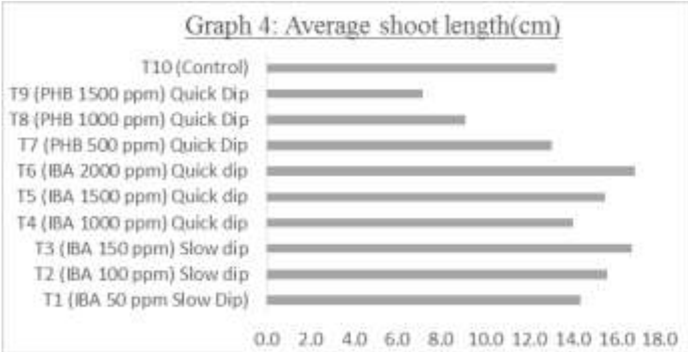


enhancement in hydrolysis activity which favours the formation of high carbohydrate and low nitrogen, and leads to the increment in root formation (Carlson, 1929).

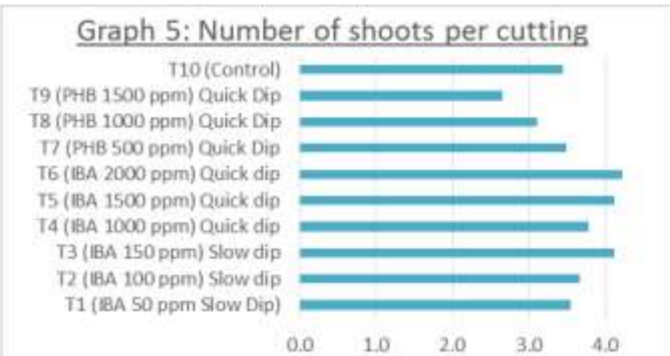
Graph 3 shows highest rooting percentage(74.33%) was found in IBA 150 ppm slow dip treated cuttings which were 103% more w.r.t control. The better rooting in cuttings treated with auxin might be due to the enhancement in hydrolysis activity which favours the formation of high carbohydrate and low nitrogen, and leads to the increment in root formation (Carlson, 1929).



Graph 4 shows that maximum average shoot length (16.87cm) was observed in IBA 2000 ppm quick dip and was found to be 27% more w.r.t control.The emergence of longest shoots on cuttings treated with IBA may be attributed to the well developed root system in such cuttings which might have enhanced the nutrient uptake and resulted in more photosynthate production. The food in the form of photosynthate provides required energy for cell division and cell elongation which results in maximum shoot length (Shahab*et al* 2013). The above findings are in accordance with the findings of Shahab*et al* (2013) in alstonia, Swathi (2013) in pomegranate, Bhatt and Tomar (2010) in lime.

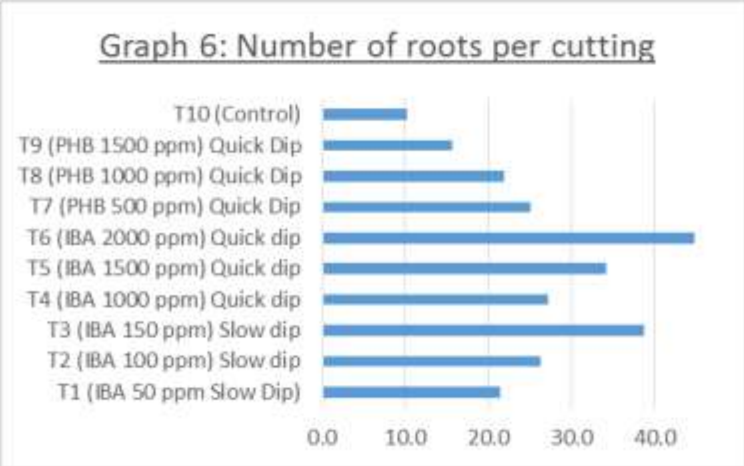


Graph 5 shows that maximum number of shoots (4.22)were registered from the cuttings treated with T6 (IBA 2000 ppm quick dip) which were 23% more w.r.t control. The research findings of Ismail and Hussain (2007) in fig and Damar (2013) in pomegranate are in support with the present

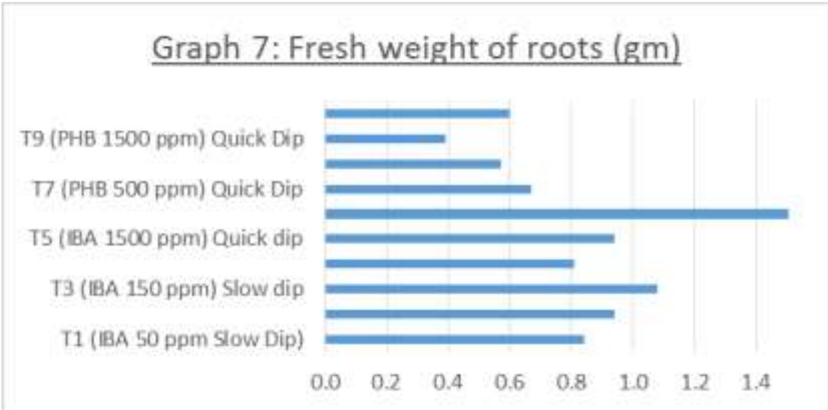


findings. The more number of shoot formation with the growth regulators might be due to the vigorous root system which increased nutrient uptake. It affected the cell division in the vascular cambium, cell expansion and control of differentiation into different types of cambial resulting in increase in number of shoots (Devi *et al*. 2016).

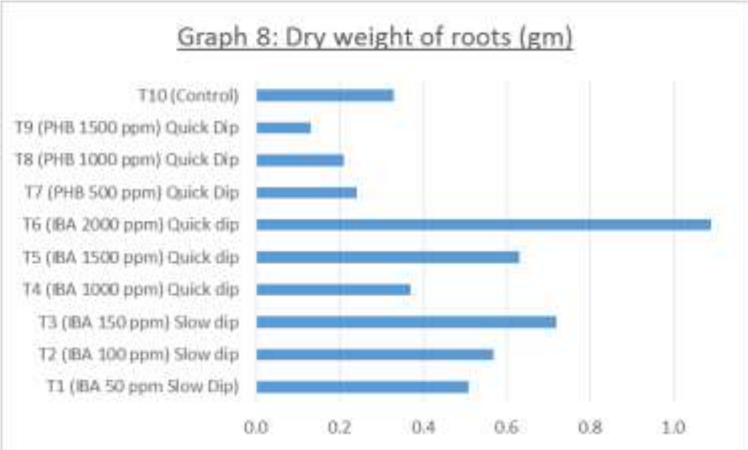
Graph 6 shows thatthe highest number of roots per cutting (44.90) was recorded in cuttings treated with IBA 2000 ppm quick dip which were 341% more w.r.t. control. This pertains to the fact that the auxin promotes the differentiation of cambial initials into rootprimordia and increases the mobilization of reserve food material to sites of root initiation thereby giving higher number of roots per cutting (Kaur and Kaur, 2016). The present investigation reveals that cuttings with higher auxin concentration produced more number of roots. These findings are agreed with the finding of Singh *et al.* (2013) and Ismail and AsgharHussain (2007) in fig.



Graph 7 shows thatcuttings treated with IBA 2000 ppm quick dip registered maximum fresh weight of roots i.e. 1.52 gm and it was 153% more w.r.t. control. Maximum root weight was attributed to the fact that auxins significantly induced the rooting in cuttings and thereby increasing the fresh weight of roots (Singh *et al* 2015). These findings are in support with the findings of Singh *et al* (2015) in phalsa and Verma (2013) in apple.



Graph 8 shows thatmaximum dry weight of roots (1.09 g) was found in cuttings treated with IBA 2000 ppm quick dip and it was found to be at 230% more w.r.t. control. This may be attributed to higher metabolic reserves for root initiation and growth as well as higher rooting potential of such cuttings (Singh *et al* 2015). The present results are in positive correlation with Singh *et al* (2015) in phalsa and Verma (2015) in apple.



From the results it can be safely deduced that treatment T3(IBA @150 ppm,slow dip) improved

sprouting,survival and rooting percentage very significantly with respect to control, whereas treatment T6 (IBA 2000 ppm,quick dip) made significant difference in average shoot length, number of roots per cutting, fresh weight of roots and dry weight of roots.

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