Studies on Conservation of Some Genetic Resources of Plum in Punjab Sub-tropics

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The root propensity of the four elite varieties identified plum genotypes viz., Kalanoki, Manaka, Dhariwala and Alu Bokhara Peshawari from Punjab sub-tropics was assessed with the use of varying levels of IBA. The different genotypes showed a varying response to the different levels of IBA in respect to the sprouting and survival success, root count and shoot growth. Highest success was achieved through the use of IBA 200 ppm in all the four varieties. The representative plants propagated through this studies have been conserved in the departmental plum collection block for the future evaluation.

Key words: Elite varieties, Plum, Punjab Subtropics, Rooting IBA

Plum is a temperate fruit and in India, it is primarily grown in the north-west Himalayan region comprising the states of Jammu and Kashmir, Himachal Pradesh and Uttrakhand. Some low chilling types of plum are also successfully growing in the northern plains of India particularly the states of Punjab, Haryana and Uttar Pradesh where some local cultivars are of quite prominence like Kala Amritsari in Punjab and Titron in Uttar Pradesh The plum produced in sub-tropics comes in the market much earlier than the temperate plum and thereby find a ready market. However, the fruits produced in the plains are of small size and seriously confronted with the problem of sourness, which necessitates a viable breeding programme for the development of acceptable plum cultivars. In Punjab the major plum production centres are Gurdaspur, Amritsar and Ferozpur, where a wide range of variability had been reported (Bal and Sandhawalia, 2000; Bal, 2003). Enormous varietal wealth of plum is facing serious threat of extinction, due to shrinkage of natural habitat and fast urbanization of the production centres particularly around big cities like Amritsar. The present study is an endeavour to take up the *ex-situ* for conservation of some promising genetic resources known for their particular desirable traits, through cuttings treated with varying levels of IBA. These resources can be of great help as donor parents for launching a viable plum breeding programme in the sub-tropics.

Materials and Methods

The experiment was conducted in the fruit nursery of Khalsa College, Amritsar during 1995-96 to examine the rooting behaviour of four elite selections of plum locally named as Kala Noki, Manaka, Dhariwala and Alu Bokhara Peshawari in relation to varying levels of IBA. The cuttings of all the four genotypes were taken from the dormant season's wood in first week of December. Uniform cuttings (20 cm length) with 3 buds were made from middle portinons of shoots. The cuttings taken from four genotypes were treated with varying levels of IBA (0, 100, 500, 2000, 3000 and 4000ppm). The treated cuttings were labeled properly and kept for callusing in wet sand for 20 days and planted thereafter in the well prepared nursery beds. The trial was laid out by using RBD factorial design. The observation in respect of rooting propensity and shoot growth were recorded after 90 days of planting.

Results and Discussion

The data predicted a highly variable trend in different genotypes under observations, in respect of sprouting and survival success (Table 1 and 2). The highest sprouting success was noticed in Alu Bokhara Peshawari and lowest in Manaka when the cuttings were treated with IBA. The differences in rooting behaviour of different genotypes can be attributed to the difference in the anatomy of different genotypes (Rana and Sharma, 1999; Bal and Sandhawalia, 2000; Bal 2003). The IBA treatments exerted a significant effect on sprouting and survival success in all the four genotypes. An overall examination of data showed that a fast rise in rooting success with the increasing level of IBA from 100 ppm to 2000 ppm and registered a negative trend with the further increase in the level of IBA. The IBA treatment 2000 ppm proved to be most efficacious in improving the rooting success. The increased survival rate of cuttings with the use of IBA at 2000 ppm may be attributed to fast regulation of cell division and differentiation of root initials by the catalysing effect of IBA (Hartman, 1982). The different genotypes responded differently to the varying levels of IBA. In the genotype Kala Noki (Selection 1) a fast upsurge

Table 1. Effect of different concentrations of IBA on sprouting percentage of different varieties of plum

Varieties	Concentration of IBA						
	Control	100 ppm	500 ppm	2000 ppm	3000 ppm	4000 ppm	Mean
Kalanoki (Section 1)	34.66	86.66	80.33	92.00	85.33	64.00	73.83
Manaka (Section 2)	40.00	51.66	49.33	85.33	61.33	60.00	58.44
Dhariwala (Section 3)	16.00	36.00	93.33	90.66	84.00	78.66	64.44
Alu Bokhara Peshwari (Section 4)	60.00	64.00	84.00	98.66	80.00	61.33	74.66
Mean	37.50	60.33	76.74	91.86	77.66	65.99	

CD at 5% level of significance
Varieties : 2.35
Concentrations : 3.40
Interaction (V x C) : 2.01

Table 2. Effect of different concentrations of IBA on survival percentage of different plum varieties

Varieties	Concentration of IBA						
	Control	100 ppm	500 ppm	2000 ppm	3000 ppm	4000 ppm	Mean
Kalanoki (Section 1)	30.00	62.66	70.66	76.33	72.00	37.66	58.21
Manaka (Section 2)	28.00	46.66	45.33	73.33	50.66	22.66	44.44
Dhariwala (Section 3)	16.00	32.00	74.66	81.33	64.00	50.66	52.99
Alu Bokhara Peshwari (Section 4)	52.00	61.33	80.00	94.66	73.33	54.66	69.33
Mean	33.33	50.66	67.66	81.33	64.99	41.41	

CD at 5% level of significance
Varieties : 8.41
Concentrations : 10.50
Interaction (V x C) : 3.53

of rooting success was achieved with the lowest concentration of IBA 100 ppm which continued with the increases in IBA concentration upto 2000 ppm but the magnitude of increase was very low. Genotype Manaka registered a significant increase in rooting success with 100 ppm. IBA, remained almost static in 500 ppm and registered a fast increase with 2000 ppm. Dhariwala plum experienced a high success percentage with the IBA 500 ppm and remained statistically as such with the 2000 ppm, whereas Alu Bokhara Peshawari registered much high sprouting success (60.00 %) as compared to the other genotypes without the aid of IBA. It experienced a rise in sprouting with IBA 100 ppm. The sprouting was fastly increased to (84.00 %) with IBA 500 ppm. The highest sprouting (98.99 %) was achieved with IBA 2000 ppm but declined sharply with the further increasing levels of IBA. The decline in rooting success with the higher levels of IBA 3000 and 4000 ppm in all the four genotypes could be attributed to inhibiting effect of IBA after threshold level. The results of present studies are in conformity with the earlier findings (Sharma *et al.*, 1988; Rana and Sharma, 1999. Bal and Sandhawalia, 2000) have reported a variable trend of different genotypes towards varying concentration of the auxins.

The data presented that the root number and root weight was significantly variable in different genotypes (Table 3 and 4). The maximum number of roots (55.00) and root weight (630.00 mg) was recorded in Kala Noki cuttings when treated with IBA 2000 ppm, which was significantly highest as compared to other varieties of plum. The number of roots and root weight per cutting experienced the increase with the increased level of IBA upto 2000 ppm. The higher level of IBA 3000

Table 3. Effect of different concentrations of IBA on number of roots of different varieties of plum

Varieties	Concentrations of IBA						
	Control	100 ppm	500 ppm	2000 ppm	3000 ppm	4000 ppm	Mean
Kaianoki (Section 1)	10.33	9.00	22.34	55.00	31.00	42.16	28.47
Manaka (Section 2)	11.00	7.33	18.00	27.33	25.67	18.66	18.00
Dhariwala (Section 3)	6.33	13.34	18.66	20.00	30.33	16.00	17.44
Alu Bokhara Peshwari (Section 4)	9.34	11.00	15.00	41.34	31.67	25.00	22.22
Mean	9.25	10.16	18.50	35.91	29.67	25.45	

CD at 5% level of significance
Varieties : 0.61
Concentrations : 0.74
Interaction (V x C) : 1.49

Table 4. Effect of different concentrations of IBA on root weight (mg) of different varieties of plum

Varieties	Concentrations of IBA						
	Control	100 ppm	500 ppm	2000 ppm	3000 ppm	4000 ppm	Mean
Kaianoki (Section 1)	202	250	500	630	550	430	427.00
Manaka (Section 2)	200	218	411	450	430	311	333.66
Dhariwala (Section 3)	150	320	350	400	350	300	311.66
Alu Bokhara Peshwari (Section 4)	250	300	320	550	430	358	364.42
Mean	200.50	267.50	390.40	507.50	444.00	350.00	

CD at 5% level of significance
Varieties : 12.57
Concentrations : 14.35
Interaction (V x C) : 21.33

ppm and 4000 ppm showed decline in root number and root weight. The IBA significantly helped to boost the root growth in all the four genotypes. The results are in agreement with the previous findings that IBA at certain threshold levels trigger the rooting propensity of cuttings (Hartman, 1982). IBA 2000 ppm proved to be the best treatment to increase number of roots and root weight in plum genotypes except the genotype Dhariwala (Selection 3) where highest root number (30.33 %) was achieved in this genotypes with IBA 3000 ppm.

Maximum shoot length (7.07 cm) was observed in cuttings of Kala Noki followed by Alu Bokhara Peshawari (7.03 cm) which was significantly higher than the shoot length recorded in Manaka (Selection 2) to be 5.96 cm and 5.25 cm Dhariwala (Selection 3) (Table 5). The shoot length of the different plum selections responded variably to the different level of IBA 100 ppm. The shoot length experienced a significant increase with the IBA 500 ppm. The higher level of IBA could not exert significant influence on shoot length and followed a decrease in shoot length with the highest level of IBA 4000 ppm. The selections

Table 5. Effect of different concentrations of IBA on shoot length (cm) of different plum varieties.

	Concentrations of IBA						
Varieties	Control	100 ppm	500 ppm	2000 ppm	3000 ppm	4000 ppm	Mean
Kalanoki (Section 1)	5.28	5.94	7.78	7.84	8.50	7.05	7.07
Manaka (Section 2)	5.77	5.42	6.02	6.05	6.60	5.87	5.96
Dhariwala (Section 3)	5.86	5.45	5.35	5.68	5.53	3.60	5.25
Alu Bokhara Peshwari (Section 4)	4.96	5.29	6.57	8.85	7.13	7.00	7.03
Mean	5.47	5.53	6.43	7.10	6.95	6.48	

CD at 5% level of significance
Varieties : 0.89
Concentrations : 1.09
Interaction (V x C) : NS

Manaka and Dhariwala responded non significantly to different levels of IBA. The plum selection Alu Bokhara Peshawai experienced increased shoot length significantly in the IBA treatment 500 ppm, their after with the further increasing level of IBA 2000 ppm, the shoot length was recorded the highest (8.85 cm). Shoot length was noticed to be significantly low with the further increasing level of IBA. The variable response of different genotype to the different level of IBA can be attributed to the genetic make up of the different cultivars. The promotion of shoot length in variety Kala Noki might be the resultant of more number of roots and root length produced by its cuttings. The meagre root growth in plum genotypes Manaka and Dharivala plum may be responsible for lesser shoot growth. The increased number of roots per cuttings under the treatments IBA 2000 ppm might have enhanced the uptake of water and nutrients resulting in higher growth of rooted cuttings.

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