10	2, 4 – D + TDZ - 1.0	90%	Whitish yellow Fragile Callus
11	2, 4 – D + TDZ - 1.0		Whitish yellow Fragile Callus
12	2, 4 – D + TDZ - 1.0		Whitish green Friable Callus
13	2, 4 – D + TDZ – 1.5		Whitish green Friable Callus
14	2, 4 – D + TDZ - 1.5		Whitish green Friable Callus
15	2, 4 – D + TDZ - 1.5		Whitish Fragile Callus
16	2, 4 – D + TDZ - 1.5	100%	Whitish Friable Callus
17	2, 4 – D + TDZ - 1.5		Whitish yellow Fragile Callus
18	2, 4 – D + TDZ – 1.5		Whitish yellow Fragile Callus
19	2, 4 – D + TDZ - 2.0		Whitish green Fragile Callus
20	2, 4 – D + TDZ - 2.0		Whitish green Fragile Callus
21	2, 4 – D + TDZ - 2.0		Whitish yellow Fragile Callus
22	2, 4 – D + TDZ - 2.0		Whitish yellow Fragile Callus
23	2, 4 – D + TDZ – 2.0	100%	Whitish green Friable Callus
24	2, 4 – D + TDZ - 2.0		Whitish green Friable Callus
25	2, 4 – D + TDZ - 2.5		Whitish green Friable Callus
26	2, 4 – D + TDZ - 2.5		Whitish green Fragile Callus
27	2, 4 – D + TDZ - 2.5	100%	Whitish yellow Fragile Callus
28	2, 4 – D + TDZ - 2.5		Whitish yellow Fragile Callus
29	2, 4 – D + TDZ - 2.5		Whitish yellow Fragile Callus
30	2, 4 – D + TDZ - 2.5		Whitish yellow Fragile Callus

Table 2: Effect of different concentrations and combinations of growth regulators on Shoot induction from inter nodal explants of *Luffa amara*.

	Inter Node			
S. No	**Hormone Concentration(µM/L)**	**Percentage of Culture Response**	**Maximum No. of Shoots/Explants(X±S.E)**	**Shoot length in Cm (X±S.E)**
1.	0.5	26 %	0.42±0.20	2.57±0.29
2.	1.0	46 %	0.60±0.20	2.71±0.42
3.	1.5	86 %	0.85±0.14	3.00±0.30
4.	Kin2.0	80 %	1.57±0.20	3.42±0.42
5.	2.5	58 %	1.57±0.20	3.28±0.28
6.	3.0	72 %	1.28±0.18	2.71±0.35
7.	3.5	72 %	1.78±0.28	3.14±0.40
8.	0.5	57 %	1.78±0.28	3.71±0.35
9.	1.0	86 %	1.28±0.28	4.14±0.40
10.	1.5	71 %	1.40±0.20	3.71±0.42
11.	2, 4 – D 2.0	72 %	1.40±0.20	3.57±0.36
12.	2.5	72 %	1.57±0.20	3.57±0.29
13.	3.0	70 %	1.71±0.18	3.57±0.48
14.	3.5	71 %	1.71±0.18	3.28±0.42
15.	0.5	72 %	2.00±0.30	6.00±0.37
16.	1.0	72 %	3.42±0.42	7.57±0.48
17.	1.5	86 %	3.71±0.35	12.28±0.83
18.	BAP 2.0	100 %	4.85±0.40	17.28±0.42
19.	2.5	86 %	1.28±0.18	13.71±0.52
20.	3.0	72 %	1.14±0.14	14.42±0.48
21.	3.5	71 %	1.28±0.18	12.85±0.34
22.	0.5	45 %	1.14±0.14	9.14±0.98
23.	1.0	50 %	1.42±0.20	5.14±0.63
24.	1.5	65 %	1.14±0.14	3.00±0.53
25.	TDZ 2.0	72 %	1.57±0.20	3.57±0.42
26.	2.5	71 %	1.14±0.14	3.57±0.36
27.	3.0	71 %	1.28±0.18	3.42±0.57
28.	3.5	72 %	1.14±0.14	4.14±0.40
29.	0.5	29 %	1.85±0.26	4.71±0.42

30.	1.0	48 %	1.28±0.18	4.71±0.28
31.	1.5	57 %	1.28±0.18	5.00±0.46
32.	GA_3 2.0	68 %	1.14±0.14	4.14±0.34
33.	2.5	70 %	1.14±0.14	4.14±0.40
34.	3.0	72 %	1.28±0.18	3.85±0.73
35.	3.5	71 %	1.14±0.14	3.57±0.36

Table 3: Effect of different concentrations and combinations of growth regulators on Multiple Shoot Induction from inter nodal explants of *Luffa amara*.

Inter Node				
S. No	Hormone Concentration(µM/L)	Maximum No. of Shoots/Explants(x±S.E)	Percentage of Culture Response %	Shoot length in Cm (x±S.E)
1.	0.5	1.57±0.20	31%	1.14±0.14
2.	1.0	2.57±0.20	45%	1.57±0.20
3.	BAP + Kin 1.5	2.42±0.20	52%	1.85±0.26
4.	2.0	5.37±0.32	90%	1.57±0.20
5.	2.5	2.85±0.26	85%	1.85±0.34
6.	3.0	1.85±0.26	70%	1.71±0.28
7.	0.5	2.71±0.28	29%	1.57±0.20
8.	1.0	2.42±0.20	35%	2.28±0.28
9.	BAP + TDZ 1.5	2.42±0.20	48%	2.14±0.34
10.	2.0	2.42±0.20	78%	2.00±0.30
11.	2.5	2.00±0.30	70%	2.00±0.30
12.	3.0	1.85±0.34	70%	2.00±0.30

Table: 4. Effect of different concentrations and combinations of growth regulators on Root Induction from Inter Nodal explants of *Luffa amara*.

	Inter Node			
S. No.	*Hormone Concentration (µM/L)*	*Percentage of Culture Response%*	*Maximum No. of roots/Explants (X±S.E)*	*Root length in Cm (X±S.E)*
1	0.5	43%	1.28±0.18	1.57±0.20
2	1	54%	1.71±0.28	1.85±0.26
3	IAA 1.5	57%	1.57±0.20	2.57±0.20
4	2	82%	2.00±0.30	2.28±0.28
5	2.5	71%	2.00±0.30	2.42±0.29
6	3	72%	2.00±0.37	3.00±0.30
7	0.5	44%	2.28±0.28	2.85±0.26
8	1	60%	2.57±0.29	2.57±0.29
9	IBA 1.5	68%	2.28±0.42	2.85±0.26
10	2	85%	2.42±0.29	2.85±0.26
11	2.5	82%	2.71±0.42	3.00±0.30
12	3	76%	2.71±0.42	2.85±0.34
13	0.5	40%	3.00±0.37	3.00±0.37
14	1	49%	2.71±0.46	2.71±0.42
15	NAA 1.5	56%	2.14±0.34	2.14±0.34
16	2	84%	2.42±0.36	2.42±0.36
17	2.5	78%	2.85±0.34	2.85±0.30
18	3	70%	2.57±0.36	2.57±0.36
19	0.5	54%	2.71±0.28	2.71±0.28
20	1	54%	2.00±0.30	3.00±0.30
21	IAA + IBA 1.5	65%	3.14±0.50	4.28±0.28
22	2	95%	4.28±0.42	10.28±1.12
23	2.5	80%	4.28±0.42	5.00±0.30
24	3	76%	5.00±0.30	3.57±0.36

12. Conclusion

In this present study, an effective *in vitro*shoots and root regeneration protocol was achieved using internodal explants of *L. amara* via indirect organogenesis. The higher percentage callus induction in MS medium was observed in the concentration of TDZ + 2, 4 – D - 1.5 mg/$L^{-1}$and 2.0mg/L. BAP is induced adventitious shoots from organogenic callus. About **4.85 ± 0.40** shoots were produced per tube from internodal explants. Additionally, the effectiveness of a combined rooting and hardening protocol for producing shoots, capable of high survival in field sites has been demonstrated. This protocol proves the targets for conservation strategy and for future phyotomedicine production. In our knowledge, the present study of regeneration system could be used in the production of more plantlets.

13. Acknowledgement

The Author are thanks to Help of UGC-BSR India having given facilities to carry out my Research Work as for the financial support.

References

[1] Abu-Rabia, A. Urinary diseases and ethno botany among pastoral nomads in theMiddle East. Journal of Ethno biology and Ethno medicine, 1:4-6, (2005).
[2] Agarwal, M. and R. Kamal, 2004. *In vitro* clonal propagation of *Memordica charantia* L. Indian J. of Biotechnology., 3: 2426-430.
[3] Amarinin: A new growth inhibitor from *Luffa amara*. S. Mukherjee, T. Ganguly, A. K. Shaw, S. N. Ganguly and P. K. Saha. Plant & Cell Physiology.27(5): 935-938 (1986).
[4] Ammirata P. V., 1987. Organizational Events During Somatic Embryogenesis. In Plant Tissue and Cell Culture. Green, C.E., D.A. Somers, W.P. Hackett and D.D. Briesboer (Eds.), New York, pp: 57-81.
[5] Badgujar S B and Patil M B, Estimation of the chemical constituents of *L. acutangula* Var. *amara*. (Roxb). Natural Product Radiance, 7(1): 79-81, (2008).
[6] Bardford, K.J. and A.J. Trewaves, 1994. Sensitivity threshold and variable time scale in plant hormone action. Plant Physiol., 105: 1029-1036.
[7] Berg, A.J.W., X.P. Zhang and B.B. Rhodes, 1997. Micropropagation of *Citrullus lanatus* (Thumb.) Matsum and Nakai (Water Melon) Biotechnology in Agriculture and forestry. High-Tech and Micropropagation. Bajaj, V.Y.P.S. (Ed), Vol. 39. Springer Verlag Berlin Heidlberg.
[8] Chan, J.C.; Chiu, M.C.; Nie, R.L.; Cordell, G.A.; Qiu, S.X. (2005) Cucurbitacins and cucurbitane glycosides: structures and biological activities. *Natural Product Report*,**22**:386-399. Atta– Ur – Rahman (2005) Studies in Natural Products Chemistry: Bioactive Natural Products, Elsevier, Karachi, Pakistan, V. 32. (Part L).
[9] Deshpande A I, Rande S and Jawalkar R R. Dravyagunavidnyan, Anmol Prakashan, Pune, 2001, 5, 843-844.
[10] Hartmann, T.H., E.K. Dale, T.D. Fred and L.G. Robert, 1997. Plant Propagation Principles and Practices. Prentice Hall International. 6th Edn, Inc., New Jersey.
[11] Kirtikar K.R., Basu B.D, Ed. Indian Medicinal Plant, 2nd Edn, Vol 4 International Book Distributers, Dehradun, India: 2315-2316. (1987).
[12] Manye, Y., Z. Maojun, Z. Yu, L. Liquong and C. Fang, 2004. Establishment of In vitro regeneration system of Bitter Melon (*Memordica charantia* L.). High Technol. Lett., 10: 44p-48.
[13] T. Murashige and F. Skoog, "A Revised Medium for Rapid Growth and Bioassays with Tobacco Tissue Cultures," Physiologia Plantarum, Vol. 15, No. 43, 1962, pp. 473-497. doi:10.1111/j.1399-3054.1962.tb08052.
[14] Nabi, S.A., M.M. Rashid, M. Al-Amin and M.G. Rasul, 2002. Organogenesis in Teasle Gourd (*Memordica diocia* Roxb.). Plant Tiss. Cult. 12: 173-180.
[15] Quak, F., 1997. Meristem Culture and Virus Free Plants. In: Applied and Organ Culture. Reinert, J. and Y.P.S. Bajaj (Eds.), New York, pp: 598-615.
[16] Rastogi R P and Mehrotra B N, Ed. Compendium of Indian medicinal plant, 5th Edn. CSIR, Lukhnow: 503-504, (2001).
[17] Samvatsar, S., and V. B. Diwanji. 2000. Plant Sources for the treatment of Jaundice in the Tribals of Western Madhya Pradesh of India. Journal of Ethanopharmocolgy, 73: 313 – 316.
[18] Smith, M.A.L. and A.A. Obeidy, 1991. Micropropagation of a mature male Kentucky coffee tree. Hortic. Sci., 26: 14-26.
[19] Sultana, R.S. and M.A.M. Bari, 2003. In vitro propagation of Karalla (*Memordica charantia* L.). from nodal segment and shoot tip. J. Biol. Sci., 3: 1134-1139.
[20] Thiruvengadam, M., S. Varisai Mohamed, C.H. Yang and N. Jayabalan, 2006. Development of an embriyogenic suspension culture of bitter melon (*Memordica charantia* L.). Sci. Hortic., 109: 123-129.

Author Profile

A. Lakshmi Prabha Associate Professor, Dept. of Plant Science, School of Life Sciences, Bharathidasan University, Trichirappalli – 620 024. Tamilnadu. India.