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Innovative technologies for enhanced availability of Bajra-Napier hybrid rooted slips

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Introduction:

Livestock occupies a crucial position in Indian agriculture and directly contributing 4.1% of total GDP of the country. India, with 2.29% of the world land area, is maintaining about 10.71% of the world's livestock population. To sustain the present milk growth rate of 4.04% and for further expansion to meet the demands of ever growing human population, livestock needs sustainable supply of feed material. The area under fodder cultivation is estimated to be about 4% of the gross cropped area which remained static for the last four decades.The traditional grazing lands are gradually diminishing because of urbanization, expansion of cultivable area, grazing pressure and industrialization etc. These factors resulted in severe shortage of feed and fodder to the extent of 26% in dry-crop residues, 35.6% in green fodder and 41% of concentrates (Anon, 2013). To reduce the demand and supply gap, the production and productivity of fodder crops needs to be enhanced. The utilization of non-cultivable space *viz.,* field bunds, common grazing lands, backyards apart from regular cultivation of high biomass species like Bajra-Napier hybrid (BN hybrid), guinea grass, Trispecific hybrid helps in enhanced production of green fodder.

Bajra-Napier hybrid is one of the high biomass grasses with fodder potential of 300 tons/ha/year. However, this grass can be propagated only through rooted slips as it does not form any viable seed. Several varieties suitable to different agro-climatic zones were released for the successful cultivation of this grass throughout India. Due to increasing demand both from small and marginal farmers as well as well-structured large scale diary industry, there is severe shortage of rooted slips of this grass. The traditional uprooting of tussocks not only destructs the mother tussock but also highly labour intensive and difficult to transport to long distances. Keeping in view of all these constraints, two novel technologies were developed for the large scale multiplication of BN hybrid rooted slips.

Materials and Methods

In-vitro rooting technology in BN hybrid: The BN hybrid stem cuttings of one, two and three node length were obtained from the existing tussocks of one year old. The stem cuttings were wrapped in layers of newspaper in such a way that a total of 50 stem cuttings comes in one bundle of 6 layers. The bundles were kept under ambient temperature (max. 30°C and min.15°C) as well as constant temperature (25°C) for one week. The stem cutting bundles were dipped in water bowl for providing constant moisture.

High density nursery technology for NB hybrid: The BN hybrid stem cuttings with one, one, two and three node length having slant basal cut were obtained from the existing tussocks of one year old. The stem cuttings were transplanted in the well prepared soil bed of 2m x 3m at a spacing of 5 x 5 cm. The stem cuttings were placed in up right direction and watered regularly.

Statistical analysis: The data was analyzed using analysis of variance with completely randomized block design for laboratory experiment as per Snedecor and Cochran (1994). Multiple comparison of means were done based on Duncuns Multiple Range Test (DMRT).

Results and Discussion

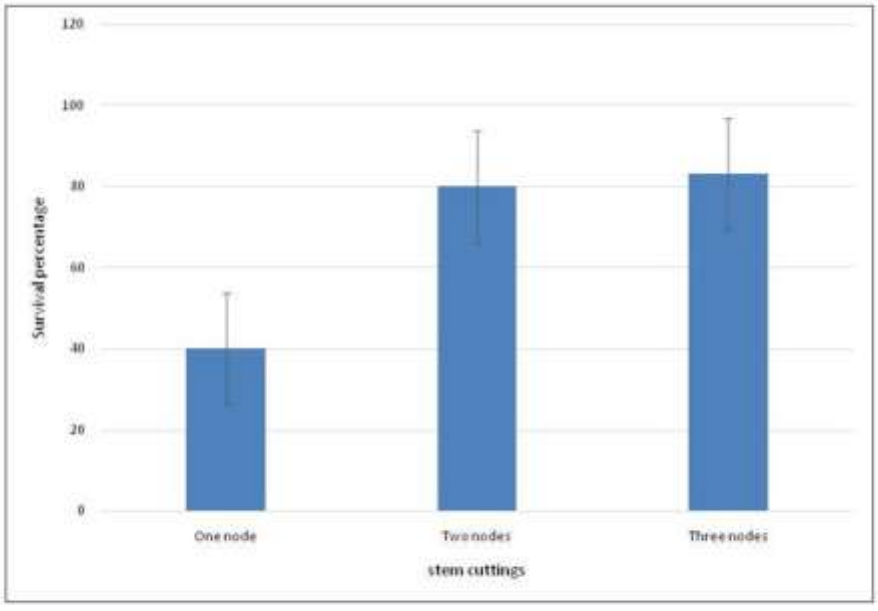
The stem cuttings of BN hybrid started rooting within a week and were ready for transplanting. The stem cuttings with one, two and three nodes were subjected to in-vitro rooting showed no significant ($p > 0.05$) difference between ambient room temperature and constant temperature in germinator (Table 1). This indicated that under ideal season with moderate temperature, in-vitro rooting can be attempted even under ambient conditions. Among different treatments, the stem cuttings with three nodes recorded highest rooting and shooting (94.16%) compared to two and one node slips. However, since there is no significant difference between two and three node stem cuttings (Table 1), it is better to use two nodes as more number of stem cuttings can be managed with two nodes than three nodes from the same stem. The in-vitro rooting

of BN hybrid helps in preparation of proper packing for long distance transport. The auxiliary bud of grasses has the ability to regenerate (Krishna *et al*., 1984) which was proved in BN hybrid through tissue culture techniques (Bhat and Kuruvinashetti, 2000). In the present study also this ability of regeneration resulted in the development of shoot from the upper auxiliary buds and roots from the lower buds ofstem cuttings.

The high density nursery with closed spacing (5 cm) of stem cuttings with different nodes, the survival percent varied among different treatments (stem cuttings with different nodes). Even though highest survival was recorded in three node cutting, it is statistically at par with two node cutting (Fig.1). Thus, two node cuttings helps in better utilization of the available stem for high density nursery. In this method, the shoot buds started transforming into leafy shoots within 10 days and roots were emerged after 15 days. The stem cuttings were ready for transplanting by 3 weeks with proper root and shoot. Since cuttings were closely planted, they occupy less space and it is easy to uproot them compared to old tussocks. It is also easy to count and maintain with limited resources. The potentiality of two bud setts of BN hybrid for better planting with one bud outside the soil was reported by Khan and Syed (1970).

Table1: Rooting percentage of Bajra-Napier hybrid stem cuttings with different nodes

Treatment	**Rooting percentage**		**Mean**
	Ambient temperature	**Constant temperature (25°C)**	
One node	70.36 (57.02[b])	73.05 (58.73[b])	71.72 (57.87)
Two node	91.84 (73.40[a])	92.08 (73.65[a])	91.96 (73.53)
Three node	93.79 (75.57[a])	94.53 (76.47[a])	94.16 (76.02)
Mean	86.76 (68.66)	87.87 (69.62)	87.32 (69.14)
	Treatment (Tr)	**Temperature (T)**	**Tr × T**
SEM±	1.07	0.88	1.52
LSD (p≤ 0.05)	3.31	NS	NS
CV%	3.81		



Conclusion

The experiments resulted in the development of two novel technologies for the enhanced multiplication of BN hybrid without disturbing the mother tussocks. The two node stem cuttings are the best one both for high density nursery and in-vitro rooting. The high density nursery not only helps in faster multiplication but also easy to handle with limited resources. The in-vitro rooting being packing and transport friendly, is suitable for supplying rooted slips to long distances.

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