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Hybrid napier grass a potential asset for livestock production

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Abstract

This review paper aims at an in-depth analysis of the package of practices, the challenges & opportunities in hybrid napier grass production. A comprehensive review of available literature and various reports by govt. as well as non govt. organizations have been done as part of the methodology for preparing the manuscript. Napier grass is a native of tropical Africa and introduced in India in 1912. After two to three decades of its cultivation in India, Napier grass (*Pennisetum purpureum*) was intercrossed with African Bajra (*Pennisetum typhoidium*) to form Pusa Giant Napier which combines some qualities of bajra like succulency, leafiness, fine texture, palatability, fast growing and drought resistant ability with outstanding yield potential and perennial nature of napier grass. It is comparatively less hairy, less fibrous and grows faster producing more tillers, numerous large greener leaves with less serrated leaf margins, softer leaf sheaths. It contains 25% more crude protein and 12% more sugar than napier grass resulted into less wastage occurs while it's cutting and feeding to the animal. Hybrid napier cuttings can be delayed longer than napier grass without any loss to its feeding value. In addition the crop has comparatively high leaf to stem ratio and is almost free from pest and diseases.

Keywords: Hybrid napier grass, potential asset, livestock production

Introduction

Napier grass or elephant grass (*Pennisetum purpureum*) is a widely distributed perennial grass grown in tropical and subtropical regions of Asia, Africa, southern Europe and America. It is adaptable to wide range of agro ecological conditions and has vigorous vegetative growth, high biomass production and deep rooted system to survive under adverse climatic conditions. The hybrid napier grass can be maintained as a productive fodder crop for 3 to 4 years on same field. Whereas, the other forage crops are seasonal in nature and scarcity of fodder may occur during off seasons and also seasonal crops require repeated tillage operations for sowing which adds to the cost of cultivation.

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Climate and soil requirements

Similar to other grasses, hybrid napier grass grows well in warm and moist climate like tropical and subtropical regions with high rainfall (100 cm). It prefers a light fertile loam and sandy soil of nearby neutral reaction and can grow under sewage dairy farming conditions. The crop is susceptible to waterlogging, and also very acidic and high salts containing soils should be avoided. It can grow well in a soil having pH range of 6-8. Crop remains dormant if temperature is below 15 °C and optimum temperature for its growth is 31 °C. The grass is very susceptible to frost. It can be cultivated in the dry region if irrigation facilities are available. Usually, the grass is not recommended for hilly areas due to its susceptibility to frost and limitations of sunlight as well as of optimum temperature.

Planting material

This inter-specific hybrid is sterile and does not produce viable seeds although it could initiate an inflorescence or spike. It is propagated vegetatively by stem cutting or root slips (rhizome and root stalks can also be used). Root slips generally give best result. Approximately 30,000 rooted slips are required for planting one hectare with row to row spacing of 90cm and plant to plant spacing of 60-90 cm at a 20-25 cm depth, it also depends on the soil fertility status and other external inputs used. Another option is to use stem cuttings of 45-60 cm length having 2-3 nodes for planting. Planting should be done in slanting position (45° angle) with 5-7.5cm below the soil to ensure maximum establishment with row spacing of 60-90 cm and plant spacing of 60 cm.

Time of planting

In general, the grass is planted in *kharif*, it could be also planted after commencement of monsoon. In north Indian conditions planting can be done from February to the end of August whereas in central, south and east India planting can be done throughout the year except during December-January (cold) and May- June (hot) months. Generally spring planting gives best stand establishment.

Method of planting

Usually one deep ploughing followed by 2 harrowing and cross planking is recommended. Ridges and furrows should be made in field and 3 budded setts are planted end to end in these furrows. The 3 budded setts will obtain from healthy crop. Shallow trench planting is better in comparison to flat planting. Cutting should be taken from moderately mature stem (3 months old) and from lower two third of the length as it sprouts better than older stem.

Varieties/Hybrids

- Pusa Giant Napier - Suitable for summer and monsoon seasons. Rich in protein, sugar and low water requirement than napier grass. Suitable for growing in entire country and it was developed by IARI.
- Hybrid - 4 and EB-4 – Both were developed by IARI and cultivated mainly in Karnataka and Mumbai and Deccan plateau area respectively. Grow in warmer condition under better soil and moisture.

- Pusa Napier-1 and Pusa Napier-2 Hybrids –Developed by IARI New Delhi. Give 25-40% more fodder than Pusa Giant Napier and thrive best in winter. Both can be cultivated in marginal lands. Comparatively free from oxalate content and good for all milch cattle. Pusa Napier 1 can be used for soil conservation and grazing unlike other napier. Pusa Napier 2 has more juicy and sweeter stem than that of napier grass.
- NB 21, BN 2, CO 1, CO 2 and CO 3 – developed at TNAU
- Other varieties - Gajraj, NB 393, PBN 83, RBN 9, IGFRI 3, 6, 7 and 10.

Intercropping

Hybrid Napier and leguminous crop can be planted in 1:3 ratio, to take 4-5 cuttings of napier and 1-2 cuttings of leguminous crop. During winter as napier remains dormant so intercropping with lucerne or *berseem* can be done to regulate continuous fodder supply and nurse the napier plants by protecting them from frost and also improves soil fertility. In winter, intercropping is done with *berseem*, oats, barley, chinese cabbage and japanese rape. In summer generally cowpea, *moong* and *guar* are used but in severe drought susceptible areas sweet sudan, M P Chari and *bajra* (multicut crops) are used.

Nutrient management

Hybrid napier grass is highly nutrient exhaustive crop. To manage high yield of forages without fertilizer application is extremely difficult, even in normal soil and good rainfall conditions. Since this grass has high yield potential, it requires higher dose of nutrients. Hybrid napier responds very quickly to inorganic fertilizers, these materials also help to improve soil physical properties and increase the activity of beneficial soil microbes. Application of 20-25 t/ha (2 kg/plant) of well decomposed farmyard manure should be done 15-20 days before planting. Crop requires 150 Kg nitrogen; 50 Kg phosphorus and 50 Kg potassium 50 Kg nitrogen and whole quantity of phosphorus and potassium should be applied at planting whereas the rest of 100 Kg nitrogen is applied as top dressing in two splits (first during monsoon period i.e. July and another towards end of winter i.e. February). After each cutting Urea should be applied @ 110 Kg/ha and to balance the effect of nitrogen, the phosphorus and potassium, @ 40 Kg each should be repeated every year with the first monsoon showers. Application of T2 (75% RDF+5t/ha Vermi-compost + B.F.) and with 5t/ha FYM + B.F. recorded significantly higher values of plant height, dry matter and yield of green fodder (Om Singh *et al.*, 2018) [6]. The basal application of FYM @105 t/ha+ 2 kg Azospirillum+2 kg Phosphobacteria may be recommended for highest green fodder yield and crude protein yield and soil fertility (K Sathiyama, 2017) [3]. Integration of various sources of nitrogenous (organic and inorganic) fertilizers is more suitable because it reduces the application of chemical fertilizers and cost of cultivation, besides it is an environment friendly approach too (Sharma *et al.*, 2007) [4].

Table 1: Effect of source of nutrients on nutrient uptake of Cumbu Napier hybrid grass

Treatments	Nutrient uptake(kg/ha/yr)									
	N	P	K	Ca	Mg	S	Fe	Zn	Mn	Cu
S1-FYM	1215	518	1476	967	328	95	176	15.9	23.0	4.83
S2-PM	1074	502	1383	825	324	88	165	14.9	21.5	4.53
S3-INM	975	451	1286	842	271	82	153	13.8	20.0	4.21
S4-Inorganics	721	332	1014	664	213	65	121	10.9	15.8	3.32
CD (5 %)	102	56	152	96	35	9	19	1.8	2.0	Ns

Water management

This grass is very hardy in nature and does not require irrigation during monsoon season if rains are normal and well distributed. The crop generally requires 3-4 irrigation at 10-12 days interval in summer and less frequently in winter at 15-20 days interval. Waterlogging is very harmful for the crop, should be avoided.

Pest management

Crop is highly tolerant to insect pest and diseases. However, stem borer is major insect and if it shows infestation, use endosulfan @ 0.05% twice at least 30 days before cutting of fodder.

Weed management

Crop gets seriously affected with weed infestation in early growth stages. Mainly baru (*Sorghum halepense*), swank (*Echinochloa colonum*) and nut grass (*Cyperus rotundus*) infests the napier grass field. Intercultivation should be done in the initial stage to suppress the emerging weed population. Intercropping with legumes also help in weed control. For chemical control, spray 2, 4-D @ 1kg/ha at 5 to 6 weeks after planting in broad leaf weed infested crop. Considering the weed control efficiency, weed index, net returns and B: C ratio, treatment oxadiargyl@ 90 g ha⁻¹ on 3-5 DAP followed by hand weeding on 25-30 DAP could be adjudged as the economic weed management practice in Bajra Napier hybrid (Swathy AH and Usha C Thomas, 2020) [2]. Maximum weed biomass reduction was observed with the sequential application of oxadiargyl 0.09 kg ha⁻¹ followed by 2, 4 D EE 1 kg ha⁻¹ which gave 36% higher fodder yield of Bajra Napier hybrid. Therefore, the sequential application of these herbicides could be a better option under semiarid agro-climatic condition. (G. Prabhu and D. R. Palsaniya, 2016) [5]

Quartering

After 2 years of growth due to increase in number of tillers, including dead tillers clump size increases enormously and become unmanageable, so for thinning of tillers and making the crop more economical, quartering has to be done every year or whenever the clumps become profound and large. It is then split into four quarters and three of them are removed. This operation is known as quartering.

Oxalate content

Napier grass contains 3-6% oxalate. It can damage the kidney of animals and depletion of body calcium. Therefore, to take precaution and to balance the calcium losses from body, animal should be fed with dicalcium phosphate along with mineral mixture or fed the animal with leguminous fodder along with napier grass and groundnut cake which contains calcium. Calcium can also be supplemented through drinking

water, ½ liter supernatant of lime water can be given or it can be sprinkled on feed daily to minimize the oxalate contains. Longer interval of harvesting should be made in fodder.

Harvesting and yield

For efficient management and utilization of the crop, timely harvesting is important. In a well established crop, the first cut is ready in 60-65 days after planting and subsequent cuttings are taken approximately at an interval of 40-45 days depending on vegetative growth of crop i.e. when crop attains height of 1.5m. Over mature crop become lignified resulted into lower palatability, digestibility and nutritive value. Therefore, it is recommended to harvest the crop at right stage to feed animals and, make silage if in excess. Harvesting should be done at close to the ground or the stubble height should not be more than 5-8 cm in most for good branching and ratooning. In a one crop cycle 8-10 cuttings can be taken giving fodder yield about 100-200 t/ha/year. With heavy manuring yield up to 200-350 t/ha/year can be taken. It can be maintained in a good condition for 5- 6 years. In north India 5 cuts up to end of November whereas in South India 7-10 cuts can be taken. Stubble of 5-8 cm is left out at harvest to prevent the damage to immature growing buds near the base of the plant but the first cut after winter is taken close to the ground to remove the decayed tillers.

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