Madras Agric. J., 2019; doi:10.29321/MAJ 2019.000316

RESEARCH ARTICLE

Effect of Crop Establishment on The Performance of Bajra Napier Hybrid Grass CO (BN) 5

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Received : 05th December, 2019
Revised : 09th December, 2019
Accepted : 17th December, 2019

ABSTRACT

A field experiment was conducted in Tamil Nadu Agricultural University to explore possibilities of addressing key issues in bajra napier. CO (BN) 5 in single budded planting, on FRBD. Main plot experimented with suitable planting methods *viz.,* vertical (M_1), horizontal planting (M_2) and sub plot with 13 sett treatments. The results showed, vertical planting (M1) had higher sprouting (44%, 57%, 65% respectively on 10, 15, 20 DAP), establishment percentage (64%), higher green (42.2 t/ha/cut) and dry fodder yields (8.9 t/ha/cut), taller plant height (198.6 cm) and more stem girth (middle 7.29 cm). Among sett treatments, water soaking for 12 hours and 24 hours incubation (S_1) had distinctive dominance over others treatments in spouting and establishment percentage, growth parameters *viz.*, plant height (198.6 cm), number of tillers per clump (25.2), number of nodes per tiller (9.8), tussock perimeter (155.85 cm), number of leaves per clump (309), leaf area index (24.72), stem girth (7.29cm). Vertical planting with water soaking for 12 hours and 24 hours incubation (M_1S_1) had better interaction effect on sprouting percentage (10 DAP 79%, 15 DAP 79%, 20 DAP 87%), establishment percentage (87%), green (61.1 t/ha/cut) and dry fodder yields (13.2 t /ha/cut. The economics was in favour with M_1S_1 having low cost of cultivation (Rs.37794), high gross return (Rs.122203) and net return (Rs.84409). Based on the experimentation single budded setts planting with water soaking for 12 hours and 24 hours incubation is effective for achieving better establishment, higher green fodder yield and net return or CO (BN)5.

Keywords: *Planting methods, Sett treatment, Single budded setts, Green fodder yield.*

INTRODUCTION

Livestock plays an important role in agriculture, especially in country like India where in most places they are considered as sacred animals. They are the major sources of economy of rural India by providing employment and income (Chellamuthu *et al.* 2011). It has a contribution of around 21 percentage of total agricultural income. Based on 19th livestock census the country has about 512.05 million livestock population. But the country faces a net deficit of 63.5% green fodder, 23.5% dry crop residues and 64% feeds (2002-2007, Govt. of India, Planning Commission, August -2001). This is mainly due to the limited cultivation of fodder crops (GoI, 2009). Hence, the supply of feed has always remained short of normative requirement (Singh and Mujumdar, 1992; Ramachandra *et al*., 2007). We have achieved horizontal growth in terms of animal numbers and there is a need to achieve vertical growth in terms of improving productivity.

When compared to productivity in other parts of the world, India's livestock sector offers considerable scope for enhancement. Therefore more emphasis has to be made on area-specific new crops that can break the yield barriers and meet the challenges of fodder deficits. Bajra × Napier is an inter - specific hybrid (2n=3x=21) between bajra or pearl millet (*Pennisetum glaucum*) and napier grass (*Pennisetum purpureum*) which can perform this task. (Pathan *et al*., 2014). But the issue with bajra napier is that it behaves more like sugarcane and not cost effective. The availability of quality setts in huge quantity is also a major problem (Tudu *et al*. 2007). Further the current method of planting double budded setts not only increases the cost but also consume resources. With the deficit in fodder increasing every year, it is essential to develop efficient crop establishment methods on growth yield of bajra napier grass. With this in mind this study was constructed to address the issues in the cultivation of bajra napier hybrid grass.

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MATERIALS AND METHODS

A field experiment to study the effect of planting methods and sett treatments on the performance of bajra napier hybrid grass CO (BN) 5 was conducted during February, 2019 in Field No. 75 at the Eastern block of Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore. The experimental field was sandy clay loam texture. Climatic conditions were with a rainfall of about 23.60 mm, maximum minimum temperatures of 35.79˚C and 23.43˚C respectively and relative humidity 62.25%. The chemical composition of the soil comprised of pH 8.56, EC 0.38 dS/m, organic carbon 0.67%, available nitrogen 230 kg/ha, available phosphorus 15 kg/ha and available potassium 442 kg/ha.

The experiment was laid out in a factorial randomized block design (FRBD) with two replications. Main plot comprised of planting methods with vertical (M_1) and horizontal planting (M_2) and sub plot with thirteen sett treatments viz, water soaking for 12 hours and 24 hours incubation(S_1), water soaking for 30 minutes (S_2), hot water soaking at 40°C for 20 minutes (S_3), cowdung slurry (1:1) soaking for 30 minutes (S_4), panchagavya (3%) soaking for 30 minutes (S_5), panchagavya (5 %) soaking for 30 minutes (S_6), beejamruth (soaking concentrated solution for 30 minutes) (S_7), beejamruth (50% dilution) soaking for 30 minutes (S_8), GA3 (5 ppm) soaking for 15 minutes (S_9), GA3 (10 ppm) soaking for 15 minutes (S_{10}), ethrel (50 ppm) soaking for 15 minutes (S_{11}), ethrel (100 ppm) soaking for 15 minutes (S_{12}), control (without sett treatment) (S_{13}). The field was thoroughly ploughed and applied with recommended dose of NPK 75:50:40 kg/ha at basal, subsequently 75 kg/ha of nitrogen was applied at 30 DAP.

The single budded setts were treated as per treatment schedule and planted vertically and horizontally in their respective plots with a spacing of 60 cm X 50 cm. First irrigation was given at the time of planting and life irrigation was provided on 3 DAP. Subsequent irrigations were given at 10 days interval. Hand weeding was done on 20 DAP. Observations were taken on spouting percentage at 10,15,20 DAP establishment percentage at 30 DAP, plant height (cm), number of tillers, number of leaves per clump, tussock perimeter (cm), leaf area index, stem girth (cm), leaf stem ratio, green fodder and dry fodder yields (t/ha/cut) at the time of harvest.

RESULT AND DISCUSSION

Sprouting and establishment

Sprouting percentage on 10, 15 and 20 DAP (Fig. 3) showed a significant difference among the two planting methods and sett treatments. The vertically planted setts (M_1) showed significantly higher sprouting percentage of 44%, 57%, 65% respectively on 10, 15, 20 DAP than the horizontal planting, which has a sprouting percentage of 35%, 49%, 52%. These results confirmed with the findings of Ssekabembe (1998). The treatment with water soaking for 12 hours and 24 hours incubation(S_1) showed significantly higher sprouting percentage of 68%, 75%, 79% respectively on 10, 15, 20 DAP than the other treatments, this was followed by the treatment S_7 (beejamruth)and S_8 (beejamruth 50% dilution). This might be due to improved metabolic activity with water soaking. The high water content in setts will promote conversion of carbohydrates into reducing sugars, the higher concentration of reducing sugars might be the reason for the high sprouting percentage observed, since hydrolysis of sugar from complex into simple form helps to readily utilize in the synthesis of auxins and proteins (Sabongari *et al.,* 2004). The auxins thus produced helps to soften cell walls which in turn facilitate the growth and readily utilize the proteins for the production of new tissues.

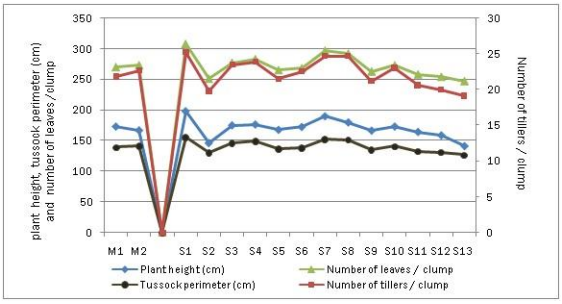

Figure 1. Effect of planting methods and sett treatments on plant height, number of tillers, number of leaves and tussock perimeter of B. N. hybrid grass

The treatment control (S_{13}) has the lowest sprouting percentage of 20%, 41%, 45% respectively and it was comparable with water soaking for 30 minutes (S_2).Interaction effect was significant. Vertical planting with water soaking for 12 hours and 24 hours incubation (M_1S_1) recorded higher sprouting percentage of 79%, 79%, 87% respectively on 10, 15, 20 DAP. The lowest sprouting percentage of 18%, 39%, 42% respectively on 10, 15, 20 DAP was recorded in horizontal planting with control (without sett treatment) M_2S_{13}.

Establishment percentage recorded significant difference among different planting methods and sett treatments (Fig. 3). For planting methods, vertical planting (M_1) recorded the highest establishment percentage of 64% and the lowest value of 52% was observed with horizontal planting (M_2). The reason being that vertical planting has their shoots sprouted sooner than that of the

horizontally planted setts, thus able to produce more photosynthate for the developing roots which in turn might be resulted in higher establishment percentage. This was supported by the findings of Knoll and Anderson (2012).

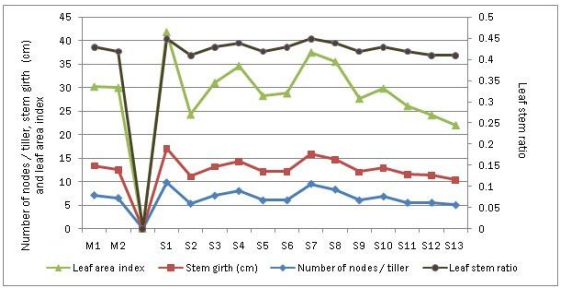

Figure 2. Effect of planting methods and sett treatments on leaf area index, stem girth, number of nodes/ tiller and leaf stem ratio of B. N. hybrid grass

Likewise for sett treatments, treatment with water soaking for 12 hours and 24 hours incubation (S_1) has the highest establishment percentage of 79%, this was followed by the treatment S_7, S_8 and the lowest establishment percentage of 43% was associated with control (S_{13}). The establishment percentage showed a significant interaction. Treatment M_1S_1 (vertical planting with water soaking for 12 hours and 24 hours incubation) registered the highest establishment percentage 87. The lowest interaction was with M_2S_{13} (horizontal planting with control), which was comparable with M_2S_2 and M_2S_{12}.

Growth parameters

The growth parameters observed were plant height (cm), number of tillers per clump, numbers of leaves per clump, tussock perimeter (cm) (Fig. 1), number of nodes per tiller, stem girth (cm) , leaf area index and leaf stem ratio (Fig. 2). These observations revealed that there is no significant difference among the vertical and horizontally planted setts, but sett treatments showed significant difference. The interaction effect was non-significant. Water treatment (12 hours and 24 hours incubation) (S_1) recorded higher plant height (198.6 cm), number of tillers per clump (25.2), number of leaves per clump (309), tussock perimeter (155.85 cm), number of nodes per tiller (9.8), stem girth (7.29 cm) and leaf area index (24.72). The lower plant height (131.4 cm), tillers per clump (19.1), number of nodes per tiller (5), tussock perimeter (126.75 cm), number of leaves per clump (248), leaf area index (11.6), stem girth (5.34 cm)were observed with control (S_{13}).

Green and dry fodder yields

Green fodder and dry fodder yields showed a significant difference among the planting methods and sett treatments. The interaction effect was significant (Fig. 3). The setts planted vertically (M_1) recorded significantly higher green fodder yield of 42.2 t/ha/cut and dry fodder yield of 8.9 t/ha/cut than the horizontal planting, which recorded the lowest green yield of 37.2 t/ha/cut and dry yield of 8.1 t/ha/cut

Among the sett treatments, the highest green fodder yield (58.4 t /ha/cut) and dry fodder yield of 12.4 t/ha/cut were observed with water soaking for 12 hours and 24 hours incubation (S_1). This was on par with the treatment S_7 (beejamruth), with green yield of 54.9 t/ha/cut and dry yield of 12.1 t/ha/cut followed by S_8 (beejamruth 50% dilution) with green yield of 50.8 t ha/cut and dry yield of 11 t/ha/cut respectively. Lower green fodder yield of 24.8 t/ha/cut and dry fodder yield of 5.6 t/ha/cut were with no sett treatment (S_{13}) and was on par with S_2 (water soaking for 30 minutes).

Significantly higher interaction was with M_1S_1 (vertical planting with water soaking for 12 hours and 24 hours incubation), which registered 61.1 t/ha/cut of green fodder and 13.2 t/ha/cut of dry fodder yields. This was on par with M_1S_7 with 59.7 t/ha/cut green fodder and 12.7 t/ha/cut dry fodder yields. The lowest green fodder yield of 24.3 t/ha/cut and dry fodder yield of 5.5 t/ha/cut were recorded with M_2S_{13}, which was at par with M_2S_2 and M_1S_{13}. The green and dry fodder yield were found to be higher with vertical planting (Fig. 3).

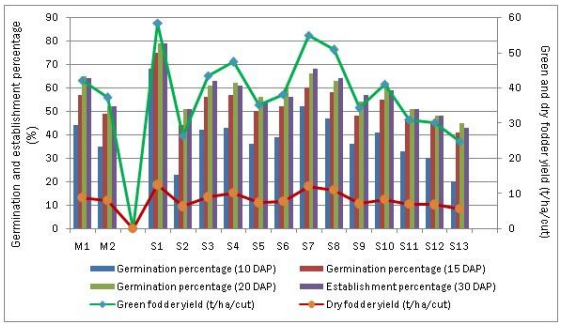

Figure 3. Effect of planting methods and sett treatments on sprouting, establishment percentage, and green and dry fodder yields of B. N. hybrid grass

This is mainly because the yield was calculated based on the plant population in which vertical planting had higher population. But growth parameters observed showed a different trend, in which horizontal planting has a slight edge over the other since bajra napier grass starts its vegetative reproduction from the buds in the ground, aerial buds often shrivel and are not part of the reproduction physiology. The higher green and dry fodder yields associated with the sett treatment water soaking for 12 hours and 24 hours incubation (S_1) might be due to soaking the setts in water increases the growth promoting effect on the plant at the initial and later developmental stages. This is due to alteration

in various metabolic phenomena responsible for enhanced yield (Ashraf and Foolad., 2005).

Economics

The cost of cultivation computed from the study is furnished in Figure 4, which revealed the highest cost of cultivation (Rs.56195) was associated with the treatment M_2S_6 (horizontal planting with panchagavya 5%).

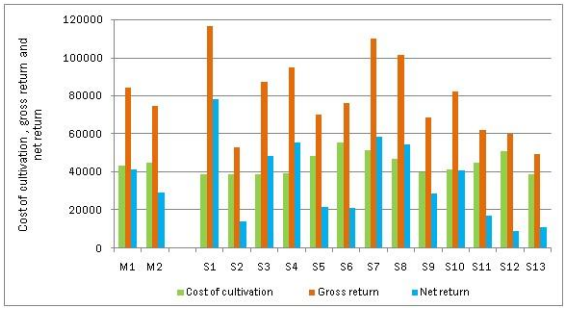

Figure 4. Effect of planting methods and sett treatments on cost of cultivation (₹ /ha), gross return (₹ /ha) and net return (₹ /ha) of B. N. Hybrid grass

The treatments M_1S_1 (vertical planting with water soaking for 12 hours and 24 hours incubation, M_1S_2 (vertical planting with water soaking for 30 minutes), M_1S_3 (vertical planting with hot water) and M_1S_{13} (vertical planting with control) recorded the lowest cost of cultivation of Rs.37794. Similarly higher gross return of Rs.122203 was recorded from vertical planting with water soaking for 12 hours and 24 hours incubation M_1S_1 (Fig. 4). The lower gross return of Rs.38510 was recorded with horizontal planting with control (M_2S_{13}). Net return was observed to be higher (Rs.84409) in M_1S_1 (vertical planting with water soaking for 12 hours and 24 hours incubation) (Fig. 4). The lower net return of Rs.8915 was recorded with M_2S_{13} (horizontal planting with control).

CONCLUSION

From the study it can be concluded that the planting methods and sett treatments had a direct impact on the growth and yield of bajra napier hybrid grass. From the results it is clearly evident that vertical planting with water soaking for 12 hours and 24 hours incubation gave better sprouting, establishment, growth yield and economics of B. N. hybrid grass. For achieving better sprouting, establishment, growth and yield combined with higher net return, reduced cost of cultivation on bajra napier hybrid grass. Vertical planting with water soaking for 12 hours and 24 hours incubation is recommended.

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