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Performance of dual purpose pearl millet as influenced by different cutting management practices and nitrogen levels

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Abstract
An investigation was undertaken to study the performance of dual purpose pearl millet as influenced by different cutting management practices and nitrogen levels at Main Forage Research Station, Anand Agricultural University, Anand during the *kharif* season of the year 2012-14. The highest green forage (370 q ha^{-1}), dry matter (53.32 q ha^{-1}) and crude protein (5.97 q ha^{-1}) yields were recorded under variety GFB-1 over the other varieties BAIF *Bajra* and AVKB 19. Seed and stover yield were also recorded higher under the same variety. Treatment C_3 (Two cuts for green fodder 1st at 50 DAS, 2nd 40 days after 1st cut & leave for grain production) was significantly superior in recording the highest green forage, dry matter and crude protein yields of 419, 58.34 and 6.39 q ha^{-1}, respectively. Whereas treatment C_1 (no cutting) was found significantly superior in recording the highest seed yield (1025 kg ha^{-1}) and stover yield of 16669 kg $ha^{-1.}$ Application of 150 kg N ha^{-1} (N_2) recorded significantly the highest green forage and dry matter yields.

Keywords: crude protein, dry matter, green forage, seed yield, stover yield, variety

Introduction
Dual-purpose crops offer the opportunity of significant profitably of mixed-farming enterprises but they require strategic management to achieve optimal grazing and grain yield. It is important for growers to select the variety according to environments and establish crops early to maximize forage and grain yield potential. Forages are the mainstay of animal wealth and their production is the backbone of livestock industry. Obviously, there is a huge gap between demand and supply of feed and fodder in India, the present feed and fodder resources of the country can meet only 48 per cent of the live stock requirement, with a vast deficit of 35.6 per cent green fodder, 10.95 per cent dry fodder and 44 percent concentrate. This deficit may be due to non-availability of quality seeds of improved forage varieties and lack of improved cultivation techniques for enhancing the average commercial forage and seed yields.
Pearl millet is a high nutritive-value rainy season annual forage crop having the quick growing ability with large number of tillers, leaves and ear heads. It produces green fodder in short duration hence becomes popular among livestock producers for grazing, silage, hay, and green chop. Pearl millet can also be utilized as emergency forage that regularly performs well as an economical one-year forage crop option. Recently the dual purpose nature of pearl millet has identified due to its profuse tillering, repeated harvesting and absence of anti-nutritional factor. The development of quality fodder cultivars and management to meet out the fodder requirement for ever increasing livestock population is imperative, as the quality of the fodder is very important issue with respect to the livestock health status as well as to maximize the animal production of milk and meat. In fodder crops, the production potential can be manipulated by fertilizer management and time of harvest. In this regard, peal millet no exception, scientific study on cutting and nitrogen management on green fodder yield, quality and grain yield is meager. Therefore, the present research was under taken to study the influence of cutting management and nitrogen levels on green forage and grain yield of dual purpose pearl millet.

Materials and Methods
The field experiment was conducted during *kharif* season of 2012-2014 at the Main Forage Research Station Farm of Anand Agricultural University, Anand to assess the green fodder yield and quality of dual purpose pearl millet varieties as influenced by different cutting and

nitrogen management. The soil was loamy sand with low available N (172.48 kg ha^{-1}), medium in available P (33.92 kg ha^{-1}) and K (214.30 kg ha^{-1}). The experiment was laid out in a random block design (factorial) comprising of three variety (V_1: BAIF Bajra-1, V_2: AVKB 19, V_3: GFB-1), three cutting management (C_1: No cutting, C_2: First cut (50 DAS) for green fodder & leave for grain production, C_3: Two cuts for green fodder (1^{st} at 50 DAS, 2^{nd} 40 days after 1^{st} cut) & leave for grain production) and two levels of nitrogen (N_1: 100 kg N ha^{-1}, N_2: 150 kg N ha^{-1}) with three replications. The 15 kg ha^{-1} of seeds was treated with thirum before sowing. Furrows were opened at 30 cm apart and half dose of nitrogen (through urea) according to treatments was applied at the time of sowing. The fertilizers were applied in furrows and mixed properly. Remaining nitrogen was top dressed in two equal split at 40 and 80 DAS. Recommended dose of P_2O_5 @ 40 kg ha^{-1} was applied through single super phosphate. The crop was sown at onset of monsoon and harvested when crop attained full maturity. Five plants were randomly selected in each net plot area for taking observations on growth characters**,** green forage and dry matter yields as well as yield attributing parameters were recorded at each harvest of the crop.

Table 1: Yield and quality as influenced of dual purpose pearl millet as influenced by different cutting management practices and nitrogen levels

Treatments	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	Grain Yield (kg/ha)	Stover Yield (kg/ha)	Plant height at harvest (cm)	No. of tillers/ m row length
Variety (V) :							
V_1	346	41.51	4.65	554	11723	184.1	20.0
V_2	316	45.06	5.10	437	7953	174.3	18.6
V_3	370	53.32	5.97	629	10411	186.9	21.0
S.Em.±	5.24	1.34	0.19	20	185	1.67	0.29
C.D. at 5 %	14.80	5.27	0.75	79	519	4.69	0.80
Cutting Management (C)							
C_1:	-	-	-	1025	16669	204.3	20.5
C_2:	269	34.92	4.09	492	9593	189.2	20.0
C_3:	419	58.34	6.39	104	3824	151.9	19.2
S.Em.±	13.33	2.94	0.27	31	1132	7.82	1.95
C.D. at 5 %	81.13	17.90	1.63	121	4446	30.68	NS
Nitrogen levels (N)							
N_1	323	42.85	4.71	489	9187	177.8	18.9
N_2	365	50.42	5.77	591	10871	185.8	20.8
S.Em.±	4.28	1.82	0.22	10	151	1.36	0.51
C.D. at 5 %	12.08	NS	NS	28	423	3.83	NS
C.V. %	9.13	10.50	10.43	14.76	13.53	6.75	10.56

V_1: BAIF *Bajra*-, V_2: AVKB 19, V_3: GFB-1
C_1: No cutting,
C_2: First cut (50 DAS) for green fodder & leave for grain production,
C_3: Two cuts for green fodder (1^{st} at 50 DAS, 2^{nd} 40 days after 1^{st} cut) & leave for grain production
N_1: 100 kg N N_2: 150 kg N

Results and Discussion

Effect of variety

Among the different varieties significantly the highest green forage, dry matter and crude protein yields of 370, 53.32 and 5.97 q ha^{-1}, respectively were recorded under variety GFB-1 over the other varieties BAIF *Bajra* and AVKB 19. The increase in green forage yield by variety GFB-1 was achieved may due to significantly higher plant height number of tillers per meter row length and leaf:stem ratio. As the plant height is a significant growth attribute directly linked with the productive prospective of plant in terms of forage yield. Statistically analyzed data presented in revealed that all pearl millet varieties differ significantly regarding plant height in which pearl millet variety GFB-1 recorded maximum plant height of 186.9 cm followed by BAIF *Bajra* (184.1 cm). The lowest plant height of 174.3 cm was observed in AVKB 19. The variation in plant height in different pearl millet varieties may be due to disparity in genetic makeup of these varieties. Significantly higher number of tillers per plant was also observed in the same variety which helps to increase the higher green forage yield. Similar trend was observed for dry matter and crude protein yield, variety V_3 recorded the highest dry matter yield of 53.32 q ha^{-1} and 5.97 q ha^{-1} of crude protein yield.

As regard to grain and straw yield, significantly the higher grain yield of 629 kg ha^{-1} was recorded with variety V_3 however it did not showed its significant superiority with variety V_1 was produced 554 kg ha^{-1} of grain yield. Variety V_1 yielded maximum stover yield was compare to others varieties.

Effect of cutting management

Favorable effect of cutting management had resulted in significantly higher green forage yield, dry matter and crude protein yields of pearl millet. Two cuts for green fodder (1^{st} at 50 DAS, 2^{nd} 40 days after 1^{st} cut & leave for grain production (C_3)) was significantly superior in recording the highest green forage, dry matter and crude protein yields of 419, 58.34 and 6.39 q ha^{-1}, respectively. The increase in yield of green forage was proportionate to level of cutting as in treatment C_3 two cut was taken for green forage followed by harvest for grain purpose. It is fact that number of cutting will increase the green biomass therefore appreciable amount of green forage was produced after each and every cutting. These results were in conformity of Manjanagouda *et al*. (2016) [7], Kumawat *et al*. (2016) [6].

Different levels of cutting management exerted their significant influence on seed and stover yield. The treatment C_1 (no cutting) was found significantly superior in recording

the highest seed yield and stover yield of 1025 and 16669 kg $ha^{-1,}$ respectively. Significantly the lowest yield was shown by C_3 treatments (Two cuts for green fodder (1^{st} at 50 DAS, 2^{nd} 40 days after 1^{st} cut) & leave for grain production) with 104 kg seed yield and 3824 kg stover per hector. The drastic reduction in seed yield was observed in two cutting treatment may be due to the photosynthetic energy is utilized for regrowth. These findings were in agreement with that of Sannagoudar (2017) [8]. Patil and Merwade (2016) [2], Kumawat *et al.* (2016) [6].

Effect of nitrogen levels

Favorable effect of nitrogen application on yield attributes had resulted in significantly higher green forage and dry matter yields. Application of 150 kg N ha^{-1} (N_2) recorded significantly the highest green forage and dry matter yields. Treatment N_2 recorded 13 and 17.7 per cent higher green forage and dry forage yield, respectively over N_1. However application of 150 kg N ha (N_2) did not showed significant superiority over $N_1$with respect to dry matter yield and crude protein yield. The highest seed and stover yield of 591 and 10871 kg ha^{-1}, respectively were also recorded in treatment N_2 (150 kg ha^{-1}). Similar findings were earlier reported by Gupta *et al.* (2008) [5], Ayub *et al.* (2009) [1], Bhuva and Sharma (2015) [3], Choudhary and Prabhu (2014) [10].

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