International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(3): 2098-2100

Received: 01-03-2018
Accepted: 06-04-2018

BK Baladaniya
Department of Agronomy, College of Agriculture, JAU, Junagadh, Gujarat, India

PD Vekariya
Main Dry Farming Research Station, JAU, Targhadia, Gujarat, India

TD Vaghela
Department of Agronomy, College of Agriculture, JAU, Junagadh, Gujarat, India

BK Dharaiya
Department of Agronomy, College of Agriculture, JAU, Junagadh, Gujarat, India

Correspondence
BK Baladaniya
Department of Agronomy, College of Agriculture, JAU, Junagadh, Gujarat, India

Nitrogen scheduling in summer pearl millet [*Pennisetum glaucum* (L.) R. Br. emend. Stuntz]

BK Baladaniya, PD Vekariya, TD Vaghela and BK Dharaiya

Abstract
A field experiment was conducted on clayey soil at the Instructional Farm, Junagadh Agricultural University, Junagadh (Gujarat) during the summer season of 2015 in a factorial randomized block design with three replications, comprised with three nitrogen levels (90, 120 and 150 kg ha^{-1}) and three application schedules (50% as basal + 50% as top dressing, 40% as basal + 60% as top dressing and 30% as basal + 70% as top dressing). Nitrogen applied as basal at time of sowing and as top dressing in two equal splits at 30 & 45 DAS.

Application of nitrogen up to 120 kg ha^{-1} remarkably increased plant height, number of total tillers and dry matter per plant at 30 & 45 DAS and at harvest, nitrogen content in plant at 30 & 45 DAS and number of effective tillers per plant, length and girth of earhead, test weight at harvest and consequently recorded significantly higher grain and stover yield along with protein content of grain, nitrogen content and uptake by grain and stover as well as obtained higher net return and B: C ratio as compared to 90 kg ha^{-1}.

Application schedules of nitrogen 30% as basal at sowing + 70% as top dressing in two equal splits at 30 & 45 DAS significantly enhanced plant height and number of total tillers per plant at 30 & 45 DAS and at harvest and number of effective tillers per plant, length and girth of earhead, test weight at harvest and subsequently recorded higher grain and stover yield along with protein content of grain and nitrogen content and uptake by grain and stover as well as obtained higher net return and B:C ratio in comparison to 50% as basal + 50% as top dressing.

Interaction effect of nitrogen levels and application schedules was found significant in respect of number of total tillers per plant at 30 DAS, protein and nitrogen content in grain and they were significantly higher under application of 120 kg N ha^{-1} with 30% basal at sowing + 70% top dressing in two equal splits at 30 & 45 DAS as compared to rest of treatment combinations.

Keywords: Application schedules & nitrogen levels, economics, pearl millet, yield

Introduction
Pearl millet is an indispensable arid and semi arid crop of India ranks first under the category of millets in terms of area (7.89 million ha), production (9.18 million tonnes), productivity (1164 kg ha^{-1}) and contributing 21.32% to total production of coarse cereals in the year of 2013-14. Pearl millet is mostly cultivated as food and feed crop in north western part of the country in the state of Rajasthan, Gujarat, Maharashtra, Uttar Pradesh and Haryana account for more than 90 per cent of total area and annual production and Gujarat ranks third and fourth in contributing 8.79 and 14.11 % to total area and annual production of pearl millet, respectively in India (Anon, 2015a) [1].

Nitrogen is the major nutrient required by pearl millet and has shown variable growth and yield response to nitrogen application (Gascho *et al.*, 1995) [2]. Generally, pearl millet has been known for growing under low nitrogen management but, several studies showed that nitrogen application can increase millet production efficiency (Singh *et al.*, 2010) [5] which positively increase the growth attributes, length and girth of panicle, test weight, number grain/panicle and finally improve the yield, uptake of nitrogen and protein content of grain and stover up to 120 kg N ha^{-1} (Prasad *et al.*, 2014a) [4]. The improvement of yield attributes with progressive increase of nitrogen levels was also reported by Ali, (2010) [3]. The maximum grain yield and nitrogen uptake by grain was recorded when pearl millet fertilized with nitrogen @120 kg ha^{-1} as 50% basal +25% top dressing at 30 DAS +25% foliar spray at 45 DAS or at 60 DAS (Jakhar *et al.*, 2011).

Methodology

A field experiment entitled "Nitrogen scheduling in summer pearl millet [*Pennisetum glaucum* (L.) R. Br. emend. Stuntz]" was conducted during summer season of the year 2015. GHB-732 was developed by a cross between ICMA 96222 and J-2340 at the Millet Research Station, Junagadh Agriculture University, Jamnagar (Gujarat) in the year 2007 and was recommended across the country for *kharif* cultivation. It takes about 75-80 days to mature. The experiment comprising of total nine treatment combinations in which three levels of nitrogen and three application schedules of nitrogen with their symbol as described below:

Treatment No.	Treatment Symbol	Treatment Details
T_1	N_1S_1	90 kg N ha^{-1} Applied 50 % as Basal + 50 % as Top dressing
T_2	N_1S_2	90 kg N ha^{-1} Applied 40 % as Basal + 60 % as Top dressing
T_3	N_1S_3	90 kg N ha^{-1} Applied 30 % as Basal + 70 % as Top dressing
T_4	N_2S_1	120 kg N ha^{-1} Applied 50 % as Basal + 50 % as Top dressing
T_5	N_2S_2	120 kg N ha^{-1} Applied 40 % as Basal + 60 % as Top dressing
T_6	N_2S_3	120 kg N ha^{-1} Applied 30 % as Basal + 70 % as Top dressing
T_7	N_3S_1	150 kg N ha^{-1} Applied 50 % as Basal + 50 % as Top dressing
T_8	N_3S_2	150 kg N ha^{-1} Applied 40 % as Basal + 60 % as Top dressing
T_9	N_3S_3	150 kg N ha^{-1} Applied 30 % as Basal + 70 % as Top dressing

Factorial Randomized Block Design (FRBD) with three replications was used to carry out the investigation. Gross and net plot size was 5.0 m X 3.6 m and 4.0 m X 2.4 m, respectively. Pearl millet variety GHB-732 recommended across the country for *kharif* cultivation. Fertilizers were applied As per treatments

Results

Nitrogen application schedules recorded significant variation in grain, stover and biological yields of pearl millet (Table 4.8). The significant response in grain (4317 kg ha^{-1}), stover (7971 kg ha^{-1}) and biological (12288 kg ha^{-1}) yields of pearl millet were obtained under application schedules of nitrogen at 30% as basal + 70% as top dressing (S_3) as compared to application schedules of nitrogen at 50% as basal + 50% as top dressing (S_1), but it remained at par with an application schedules of nitrogen at 40% as basal + 60% as top dressing (S_2). The magnitudes of increase in grain, stover and biological yields were in order of 15.67, 15.73 and 15.71 per cent by application schedules of nitrogen at 30% as basal + 70% as top dressing (S_3) over application schedules of nitrogen 50% as basal + 50% as top dressing (S_1), respectively. The increase in grain and stover yields with these treatments might be due to better nutritional status of soil

The data on economics of different application schedules of nitrogen are presented. The data revealed that treatment S_3 (30% as basal + 70% as top dressing) recorded maximum net return (₹ 42375 ha^{-1}) with B: C ratio (2.67) followed by treatment S_2 (40% as basal + 60% as top dressing) with net realization of (₹ 38476 ha^{-1}) and B: C ratio of (2.51). The treatment S_1 (50% as basal + 50% as top dressing) showed the lowest value of net return (₹ 33190 ha^{-1}) with B: C ratio (2.30). The increase in net return under treatment S_3 was 27.67 per cent over treatment S_1. The results of present investigation are in close agreements with the findings of Reager *et al.* (2014) [7] and Mathukia *et al.* (2014) [6].

Table 1: Nitrogen uptake in grain and stover of pearl millet as influenced by different levels and application schedules of nitrogen

Treatments	Nitrogen uptake (kg ha^{-1})	
	Grain	Stover
Levels of nitrogen (N)		
N_1 : 90 kg ha^{-1}	57.01	34.39
N_2 : 120 kg ha^{-1}	74.20	45.41
N_3 : 150 kg ha^{-1}	64.62	39.33
S.Em.±	2.91	1.56
C.D. at 5 %	8.75	4.69
Application schedules of nitrogen (S)		
S_1 : 50% as basal + 50% as top dressing	56.84	34.01
S_2 : 40% as basal + 60% as top dressing	66.00	40.16
S_3 : 30% as basal + 70% as top dressing	72.99	44.96
S.Em.±	2.92	1.56
C.D. at 5 %	8.75	4.69
Interaction (N X S)		
S.Em.±	5.10	2.81
C.D. at 5 %	NS	NS
C.V. %	13.5	12.14

Table 2: Economics of different treatments

Treatments	Gross return (₹ ha^{-1})	Cost of cultivation (₹ha^{-1})	Net return (₹ha^{-1})	B: C ratio
Levels of nitrogen (N)				
N_1 : 90 kg ha^{-1}	58580	24905	33675	2.35
N_2 : 120 kg ha^{-1}	68741	25370	43371	2.70
N_3 : 150 kg ha^{-1}	62831	25836	36995	2.43
Application schedules of nitrogen (S)				

S1 : 50% as basal +50% as top dressing	58561	25370	33190	2.30
S_2 : 40% as basal +60% as top dressing	63846	25370	38476	2.51
S_3 : 30% as basal +60% as top dressing	67746	25370	42375	2.67

Conclusion

On the basis of the results of the one year field study, it can be concluded that higher production and net returns from summer pearl millet (GHB-732) can be secured by application of nitrogen 120 kg N ha^{-1} with its scheduling of 30% as basal + 70% as top dressing in two equal splits at 30 and 45 day after sowing in the medium black calcareous soil of South Saurasatra Agro-climatic zone.

References

1. Anonymous. Agricultural Statistics at a Glance 2014. Directorate of Economics and Statistics, Department of Agriculture and Co-operation, Ministry of Agriculture, Government of India. New Delhi. 2015a, 85-87.
2. Gascho GJ, Menezes RSC, Hanna WW, Hubbed RK, Wilson JP. Nutrient requirements of pearl millet. In Proc. National grain pearl millet symp.1st, Tifton, GA. University of Georgia, Tifton, 1995, 92-97.
3. Ali. Grain yield and nitrogen use efficiency of pearl millet as affected by plant density, nitrogen rate and splitting in sandy soil. American-Eurasian Journal of Agriculture and Environment Science. 2010; 7(3):327-355.
4. Prasad SK, Samota A, Singh MK, Verma SK. Cultivars and nitrogen levels influence on yield attributes, yield and protein content of pearl millet under semi-arid condition of vindhyan region. The Bioscan. 2014a; 6(sp):47-50.
5. Singh RK, Chakraborty D, Garg RN, Sharmay PK, Sharma UC. Effect of different water regimes and nitrogen application on growth, yield, water use and nitrogen uptake by pearl millet (*Pennisetum glaucum*). Indian Journal of Agricultural Sciences. 2010; 80(3):213-216.
6. Mathukia RK, Kapadiya JK, Panara DM. Scheduling of nitrogen and potash application in irrigated wheat (*Triticum aestivum*L.). Journal of Wheat Research. 2014; 6(2):171-172.
7. Reager ML, Sharma SK, Narolia GP, Sanwal RC. Residual effect of nitrogen levels and split application on fodder pearl millet [*Pennisetum glaucum* (L.) R. Br. Emend Stuntz] in arid western Rajasthan. International Journal of Agricultural Sciences. 2014; 10(2):634-637.