Rai University
EVOLVING THINKING MINDS
NAAC ACCREDITED
RISING
A journal of researchers

EFFECT OF LEVELS AND SPLIT APPLICATION OF NITROGEN ON PROTEIN CONTENT (%) IN GRAIN OF SUMMER PEARLMILLET (*Pennisetum glaucum* L.)

PRAJAPATI[1] A.S., KALAL[2] P.H. & PATEL[3] P.P.

1. Assistant Professor in Agronomy, Rai School of Agriculture, Ahmedabad, Gujarat,
2. Assistant Professor in Agronomy, Rai School of Agriculture, Ahmedabad, Gujarat,
3. Dean, Rai School of Agriculture, Ahmedabad, Gujarat.

Corresponding author: archana.prajapati@raiuniversity.edu

Abstract—

A field experiment was conducted at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar during summer season of 2022 on "Effect of split application of nitrogen levels in summer pearlmillet (Pennisetum glaucum L.)" in loamy sand soil. There were nine treatment combinations comprising of three nitrogen levels (90, 120 and 150 kg N/ha) and three splits of nitrogen (50% as basal + 50% as top dressing, 40% as basal + 60% as top dressing and 25% as basal + 75% as top dressing) tested in a randomized block design with factorial concept and replicated three times. Based on results of experiment, it was concluded that the application of 120 kg N/ha produced a higher protein content (11.30%) in summer pearlmillet. Among the nitrogen split schedules, applying 25% of the nitrogen as a basal dose and the remaining 75% in two equal top dressings at 20 and 40 days after sowing resulted in the highest protein content (11.31%). Therefore, for improving the protein content of summer pearlmillet, it is recommended to apply 120 kg N/ha with 25% as a basal dose and 75% in two equal split applications at 20 and 40 days after sowing, along with the recommended basal application of 60 kg P_2O_5/ha.

Keywords— *Summer pearlmillet1, Pennisetum glaucum L.2, nitrogen levels3, split nitrogen application4, protein content5, grain quality6*

I. INTRODUCTION

Pearlmillet (*Pennisetum glaucum* L.) is an annual cereal crop belonging to the family Poaceae (Gramineae). Commonly known as bajra or bajri, it is cultivated during the kharif and summer seasons. Pearlmillet is highly tolerant to drought and high temperatures and possesses a remarkable ability to grow and produce satisfactory yields under arid and semi-arid conditions, particularly in poor, sandy, and saline soils.

Pearlmillet is an important multipurpose crop grown for both human consumption and livestock fodder. In addition to its use as food and forage, it is utilized for grazing, hay, silage, construction material, and as a source of fuel. Pearlmillet forage is highly digestible during the vegetative stage and is free from hydrogen cyanide (HCN), making it a safe and nutritious fodder. It is rich in protein, energy, and essential amino acids, although it is relatively low in sulfur-containing amino acids (Sowjanya *et al*., 2021).

Pearlmillet is also recognized for its high nutritional value. The grains contain approximately 12.4% moisture, 11.6% protein, 5.0% fat, 67.0% carbohydrates, and 2.7% minerals (Malik, 2015). Furthermore, they are a good source of vitamins, particularly thiamine and riboflavin, which contribute to energy metabolism and are easily digestible. Owing to its rich nutritional composition and health-promoting properties, pearlmillet is considered beneficial for individuals with conditions such as diabetes, cancer, and asthma.

II. MATERIALS AND METHODS

A field experiment was conducted on plot number C-1 at Agronomy Instructional Farm, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar during summer season of the year 2022. Geographicall, The experimental site is situated at 24°19' North latitude and 72°19' East longitude with an elevation of 154.52 metres above the mean sea level.

The experiment consisted of three nitrogen levels (90, 120, and 150 kg N ha^{-1}) and three nitrogen split application schedules: 50% as basal + 50% as top dressing, 40% as basal + 60% as top dressing, and 25% as basal + 75% as top dressing. Thus, the experiment comprised nine treatment combinations arranged in a Factorial Randomized Block Design (FRBD) with three replications. The experimental field had loamy sand soil, light brown in colour, well-drained, and moderately moisture-retentive. The soil was low in available nitrogen (153.71 kg ha^{-1}), medium in available phosphorus (31.69 kg ha^{-1}), and high in available potassium (274.37 kg ha^{-1}). The pearlmillet variety 'GHB 1129' was sown at a row spacing of 45 cm using a seed rate of 3.75 kg ha^{-1}. Fertilizers were applied according to the respective treatment combinations. The entire recommended dose of phosphorus was applied as a basal application through diammonium phosphate (DAP). Nitrogen was applied as per the treatment schedule, with the designated basal dose applied at sowing and the remaining quantity top-dressed in two equal splits at 20 and 40 days after sowing (DAS).

IV. RESULTS AND DISCUSSION

Effect on nitrogen content (%) in grain

The effect of nitrogen levels on nitrogen content in grain and straw of pearlmillet was significant. The highest nitrogen content in grain (1.98%) and straw (0.849%) was recorded with the application of 120 kg N ha^{-1} (N_2), which was statistically at par with 150 kg N ha^{-1} (1.94% and 0.826%, respectively), but significantly higher than 90 kg N ha^{-1}. The lowest nitrogen content in grain (1.88%) and straw (0.774%) was recorded under 90 kg N ha^{-1}. The increase in nitrogen content with higher nitrogen application may be attributed to enhanced nitrogen availability, uptake, and assimilation by the crop. These findings are in agreement with those reported by Joshi et al. (2020), Gautam et al. (2020), and Reddy *et al*. (2020).The results are in agreement with those of Joshi *et al.* (2020), Gautam *et al.* (2020) and Reddy *et al*. (2020).

The effect of different nitrogen split applications on nitrogen content in grain and straw of summer pearlmillet was significant. Application of 25% N as basal + 75% N as top dressing recorded the highest nitrogen content in grain (1.98%) and straw (0.848%), which was statistically at par with 40% N as basal + 60% N as top dressing (1.94% and 0.815%, respectively), but significantly higher than 50% N as basal + 50% N as top dressing. The lowest nitrogen content in grain (1.88%) and straw (0.785%) was observed under 50% N as basal + 50% N as top dressing. The higher nitrogen content under split application may be attributed to improved nitrogen availability, reduced leaching losses, and enhanced nitrogen uptake and utilization throughout the crop growth period. These findings are in close agreement with those of Reager *et al.* (2014) and Joshi *et al.* (2020).

The interaction between nitrogen levels and split application schedules did not significantly influence the nitrogen content of grain in summer pearlmillet. These results are consistent with the findings of Baladaniya (2018) in pearlmillet.

Effect on Protein content (%)

The effect of different nitrogen levels on the protein content of summer pearlmillet was found to be significant. Application of 120 kg N ha^{-1} recorded the highest protein content (11.30%), which was statistically at par with 150 kg N ha^{-1} (11.06%), but significantly higher than 90 kg N ha^{-1} (10.74%). The increase in protein content with higher nitrogen application may be attributed to enhanced nitrogen uptake and assimilation, as nitrogen is a major constituent of amino acids required for protein synthesis. Adequate nitrogen availability also increases nitrogen accumulation in the grain, resulting in higher protein content. These findings are in close agreement with those reported by Jakhar *et al.* (2013) and Prasad *et al.* (2014).

The effect of different nitrogen split applications on the protein content of summer pearlmillet was found to be significant. Application of 25% N as basal + 75% N as top dressing recorded the highest protein content (11.31%), which was statistically at par with 40% N as basal + 60% N as top dressing (11.06%), but significantly higher than 50% N as basal + 50% N as top dressing (10.74%). The higher protein content under split nitrogen application may be attributed to a continuous supply of nitrogen during critical growth stages, which enhanced nitrogen uptake, assimilation, and protein synthesis in the grain. These findings are in close agreement with those reported by Jakhar *et al.* (2013).

The interaction effect between nitrogen levels and nitrogen split application schedules on the protein content of summer pearlmillet grain was found to be non-significant. Similar findings were reported by Baladaniya (2018).

V. CONCLUSION AND FUTURE SCOPE

Based on the results of the present investigation, it can be concluded that application of 120 kg N ha^{-1}, with 25% nitrogen applied as basal and the remaining 75% applied in two equal top dressings at 20 and 40 days after sowing (DAS), along with the recommended dose of phosphorus (60 kg P_2O_5 ha^{-1}) as basal, is the most suitable nutrient management practice for achieving higher protein content in summer pearlmillet.

ACKNOWLEDGEMENT *(Optional)*

The authors would like to thank SADU Dantiwada and colleagues who technically supported this work, from conducting field experiment to data analysis. The authors also would

like to express their gratitude and thanks to his guide K. I. Patel and department of agronomy for him honestly support during experiment.

REFERENCES

[1] Baladaniya, B. K. (2018). Nitrogen scheduling in summer pearlmillet [*Pennisetum glaucum* (L.) R. Br. emend. Stuntz]. M.Sc. Thesis submitted to Junagadh Agricultural University, Junagadh (Unpublished).

[2] Gautam, S. A.; Singh, D. K.; Kumar, V.; Ramand, S. and Babu, A. (2020). Effect of nitrogen and phosphorus levels on growth, yield and nutrient uptake of pearlmillet (*Pennisetum glaucum* L). *International Archive of Applied Sciences and Technology*. **11**(1): 101-105.

[3] Jakhar, G. R.; Sadhu, A. C. and Suryawanshi, P. K. (2013). Influence of levels and methods of nitrogen application on growth and yield of summer pearlmillet (*Pennisetum glaucum* L.). *International Journal of Agricultural Sciences.* **9**(2): 821-822.

[4] Joshi, M. P.; Pankhaniya, R. M. and Parmar S. K. (2020). Effect of levels and scheduling of nitrogen on economic, quality, nutrient content, uptake and soil status of pearlmillet. *International Journal of Chemical Studies.* **8**(6): 128-131.

[5] Malik, S. (2015). Pearlmillet nutritional value and medicinal uses. *International Journal for Research Trends and Innovation.* **1**(3): 414-418.

[6] Prasad, S. K.; Samota, A.; Singh, M. K. and Verma, S. K. (2014). Cultivars and nitrogen levels influence on yield attributes, yield and protein content of pearl millet under semi-arid condition of vindhyan region. *The Ecoscan.* **6**: 47-50.

[7] Reager, M. L.; Sharma, S. K.; Narolia, G. P. and Sanwal, R. C. (2014). Residual effect of nitrogen levels and its split application on fodder pearlmillet (*Pennisetum glaucum* L.) in arid western Rajasthan. *International Journal of Agricultural Sciences*. **10**(2): 634-637.

[8] Reddy, S. B. P.; Madhuri, K. N.; Venkaiah, K.and Prathima, T. (2020) Influence of nitrogen and potassium application on yield and nutrient uptake in pearlmillet. *Andhra Pradesh Journal of Agricultural Sciences*. **6**(4): 166-173.

[9] Sowjanya, A.; Rao, C. H. and Rao, C. H. (2021). Response of phosphorus on growth and yield of pearlmillet, microbial population and system productivity in pearlmillet based cropping systems. *Journal of Experimental Agriculture International.* **43**(3): 113-124.

Table 1: Effect of levels and split application of nitrogen on protein content (%) in grain of summer pearlmillet

Treatment	N content (%)	Protein content (%)
Nitrogen level (N)		
N_1 : 90 kg N/ha	1.88	10.74
N_2 : 120 kg N/ha	1.98	11.30
N_3 : 150 kg N/ha	1.94	11.06
S.Em.±	0.02	0.13
C.D. (P=0.05)	0.07	0.39
Splits of nitrogen (S)		
S_1 : 50% as basal + 50% as top dressing	1.88	10.74
S_2 : 40% as basal + 60% as top dressing	1.94	11.06
S_3 : 25% as basal + 75% as top dressing	1.98	11.31
S.Em.±	0.02	0.13
C.D. (P=0.05)	0.07	0.39
Interaction (N × P)		
C.D. (P=0.05)	NS	NS
C.V. %	3.55	3.55

ISSN 2456-7752

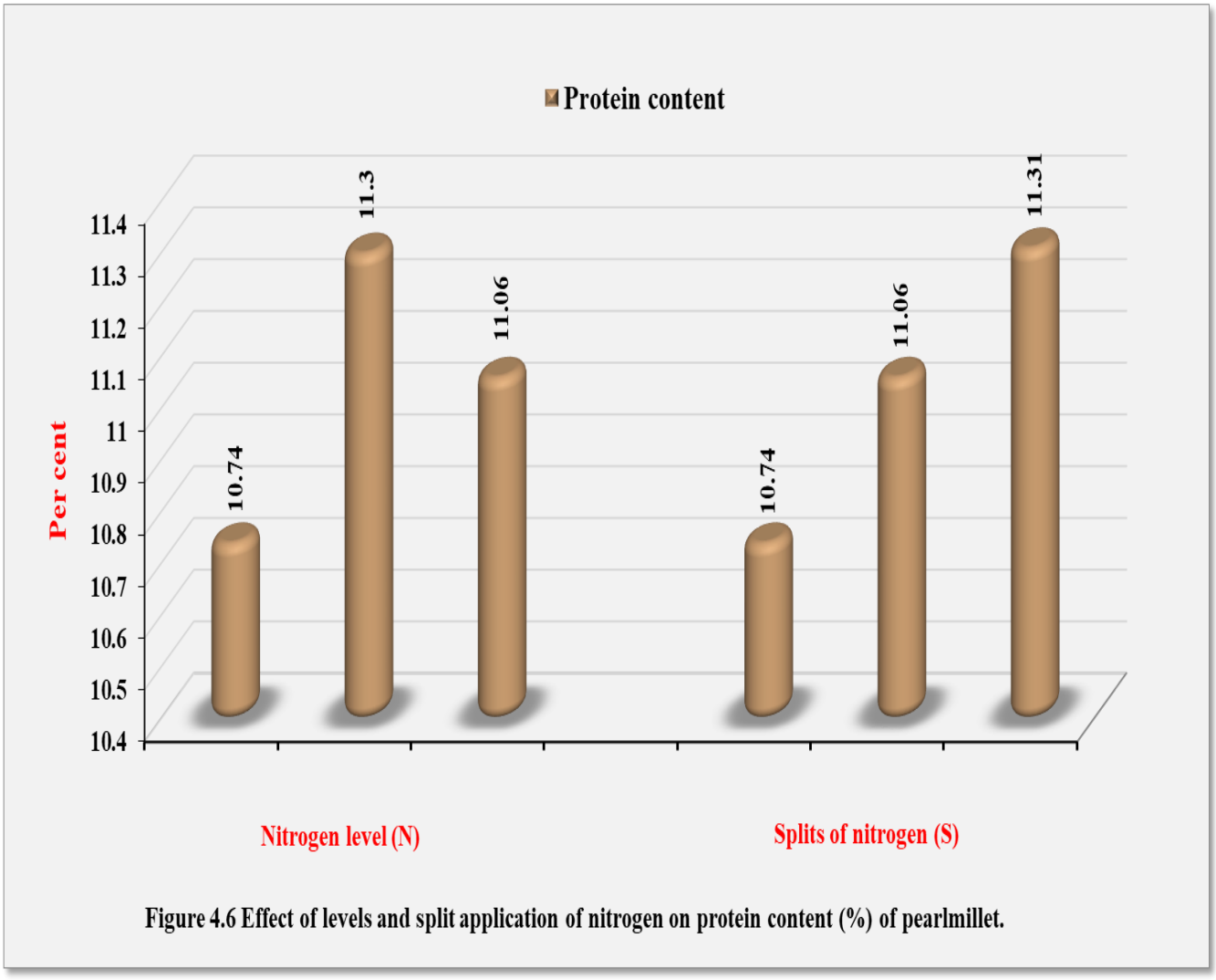

Figure 4.6 Effect of levels and split application of nitrogen on protein content (%) of pearlmillet.

Fig.1 Effect of levels and split application of nitrogen on protein content (%) of pearlmillet.

ISSN 2456-7752