Studies on Growth and Yield of Forage Pearl millet (*Pennisetum glaucum* L.) var. GAFB-4as influenced by Nitrogen and Weed management

ABSTRACT

Background Pearl millet is an important staple food in arid and semi-arid tropics of Asia and Africa. Low productivity and susceptibility due to weed population are the major causes for declining a productivity of millets in India. As the pearl millet is grown predominantly in the hot and humid rainy season, weeds deprive these crops of vital nutrients and moisture and bring down the production

Objective -. study the impact of nitrogen and weed management on the growth, yield, and quality of Forage Pearl millet (Pennisetum glaucum L.) Var. GAFB-4.

Methods -A field experiment was conducted during kharif season of 2021, at crop research farm of Department of Agronomy at Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj in North Eastern plains of Eastern Uttar Pradesh . under Randomized block design comprising of 9 treatments of which treatments (T1-T9) with different combination of nitrogen along with weed management which are replicated thrice.

Conclusion- The treatment of 80 kg/ha nitrogen+ atrazine was recorded. Plant height (200.52 cm), plant dry weight (51.59gm), weed density (6.00), green fodder yield (28.42 t/ha) Because the findings are based on research conducted during a single season, they may be repeated for further confirmation.

Key words- Pearl millet, Nitrogen, Pendimethalin, Atrazine, Halosulfuron, Growth, Yield.

INTRODUCTION

"Pearl millet [Pennisetum glaucum (L.) R.BR.] is the most important cereal crop subsequent to rice, wheat, maize and sorghum.It is well adapted to drought, poor soil fertility, and saline-alkali soils, and it reacts well to irrigation and increased fertility levels. Because it contains less hydrocyanic acid than sorghum, pearl millet is a great pasture crop, and its green fodder is high in protein, calcium, phosphorus, and other minerals, with oxalic acid levels that are below safe limits" **(8).** Out of the total fodder crops area of 8.47 million hectares, forage pearl millet accounts for 0.9 million hectares **(1)**. "Among the many factors that contribute to low productivity, the lack of proper seed production agronomy is regarded as the most important factor in the success of the bajra fodder crop. Based on the area under cultivation (8.3 m ha) and the availability of quality seed for fodder crops, the current demand for seeds of grown fodder is estimated to be 355000 tonnes annum-1" **(2)**. Lack of breeder seed production farms, lack of better variety of fodder for seed production, and lack of seed production agronomy for particular crop/variety are among the several obstacles that are combining to provide appropriate quantity of quality seed. The commercial part of forage seed production is not seed, and the fodder crop is frequently taken before seed set, posing a unique dilemma. Nitrogen and weed management have been found as a major contributory factor for the production of forage bajra seed, among other reasons restricting bajra productivity.Nitrogen is a crucial ingredient and a major constituent of protein and nucleic

acid, which increases protoplasm production in plant bodies, photosynthesis, plant size, yield contributing features, and crop yield **(9)**.

"Weed control is also a significant component for boosting the productivity of pearl millet, as weeds compete for nutrients, water, light and space with crop plants during early growth period" **(4)**. According to **Banga et al., (2000)(3),** a 55 percent yield drop in the pearl millet crop was reported due to high weed infestation. Due to the presence of weed flushes in bajra, postemergence herbicides must be examined for broader spectrum weed control. Only using pre-emergence herbicides (atrazine, pendimethalin, etc.) results in the emergence of weeds that are resistant to these herbicides because they are only effective for the first 35-40 days, resulting in a significant infestation of late-emerging weeds. As a result, a comparative study of various weed management techniques in bajra is required, as well as the development of an integrated weed management strategy that is both efficient and cost effective.

Effective control of weeds with post-emergence application of herbicide may help in kharif pearl millet when spraying of pre-emergence herbicide or hand weeding and interculture operations are not feasible due to congenial conditions. However, it is an essential to find out its appropriate dose and time of application by considering soil and climatic conditions for effective weed control in pearl millet.

MATERIALS AND METHODS

A field experiment was conducted during kharif season of 2021, at Crop research farm of Department of Agronomy at Sam Higginbottom University of Agriculture, Technology, and Sciences, Prayagraj which is located at 25^{o} 24' 42" N latitude, 81^{o} 50' 56" E longitude and 98 m altitude above the mean sea level (MSL). To assess the effect of Nitrogen and Weed management on growth and yield of Pearl millet (*Pennisetum glaucum* L.). The experiment was laid out in Randomized Block Design comprising of 9 treatments which are replicated thrice. Each treatment net plot size is 3m × 3m. The treatment are categorized as with recommended dose of Phosphorus through DAP and Potash through Muriate of Potash, in addition with Nitrogen when applied in combinations as follows, T1 – 50 kg N/ha + Pendimethalin, T2 – 50 kg N/ha + Atrazine, T3 – 50 kg N/ha + Halosulfron, T4 –65 kg N/ha + Pendimethalin, T5 – 65 kg N/ha + Atrazine, T6 – 65 kg N/ha + Halosulfuron, T7 – 80 kg N/ha + Pendimethalin, T8- 80 kg N/ha + Atrazine, T9 – 80 kg N/ha + Halosulfron.. The pearl millet crop was harvested treatment wise at harvesting maturity stage. Plant height (cm) and dry matter (gm) were manually recorded on five randomly selected sample plants from each plot of each replication separately, and seeds were isolated from each net plot and dried under the sun for three days after harvesting. After that, the seeds were winnowed and cleaned, and the seed yield per hectare was calculated and expressed in tonnes per hectare. Each net plot's stover yield was measured and expressed in tonnes per hectare after complete drying in the sun for 10 days. The data was generated and analyzed using the Gomez and Gomez (1984) statistical approach (7). The benefit: cost ratio was worked out after price value of seed with straw and total cost included in crop cultivation.

RESULTS AND DISSCUSIONS

Effect on growth parameters:

Plant height

Plant height measurements increased as crop growth progressed, as seen in Table 1. The maximum plant height (200.52 cm) was recorded with treatment 80 kg/ha nitrogen+atrazine, whereas treatment 65 kg/ha nitrogen+atrazine, 80 kg/ha nitrogen+pendimethalin, 80 kg/ha nitrogen+halosulfuron are statistically at par with treatment 80 kg/ha nitrogen+atrazine. Nitrogen is the main component of the protoplasm involves in various metabolic processes viz. photosynthesis, stimulation of cell division and elongation .Plant height of pearl millet was significantly reported to increase with application of Atrazine @ 0.5 kg ai/ha as pre-emergence followed by one hand weeding in kharif season and application of Pendimethalin @ 1.0 kg ai/ha followed by 1 hand weeding at 25 DAS in rabi season over a weedy check both in kharif and rabi, respectively under sandy clay loam soil at Gwalior, Madhya Pradesh. This result was in conformity with the findings of **(11),** (12).

Dry weight

At harvest maximum dry weight was observed in treatment 80 kg/ha nitrogen + atrazine, (51.59 g/plant) whereas treatment 80 kg/ha nitrogen + halosulfuron is found to be statistically at par with treatment 80 kg/ha nitrogen + atrazine. The increase in Plant dry weight of forge pearl millet is due to Nitrogen is the main component of the protoplasm involves in various metabolic processes viz. photosynthesis, stimulation of cell division and elongation. Dry matter accumulation was maximum when both pre and post-emergent control of weeds was practiced such that sole hand weeding at 25 DAS or sole application of herbicides viz. Atrazine @ 500 g/ha, Alachlor @ 1000 g/ha, and Oxyflurofen @ 200 g/ha reported to accumulate significantly low crop dry matter compared with Atrazine @ 500 g/ ha, Alachlor @ 1000 g/ha, and Oxyflurofen @ 200 g/ha added up by hand weeding at 25 DAS under sandy loam at Kumher, Rajasthan.The result was in conformity with the findings of **(11), (6).**

Weed Density

At harvest maximum Weed density was observed in treatment 50 kg/ha nitrogen + halosulfuron, whereas minimum weed density was observed in treatment 50 kg/ha nitrogen+atrazine, 65 kg/ha nitrogen+atrazine, 80 kg/ha nitrogen+atrazine. Kumar *et al.,* (2011) also reported "higher total weed density in pearl millet in control and observed that weed density reduced with each increased fertilizer dose and concluded that weed density might have been decreased with increase in nitrogen levels due to faster initial crop growth in these treatments. At present atrazine is the only herbicide most commonly used as pre-emergence for weed control in millets at various doses". Similar results were also reported by **Munde *et al.*, (2013)(10)**.

Yield:

Green Fodder yield

It was found that 80 kg/ha nitrogen + atrazine caused the highest green fodder production (28.42 t/ha), however, 65 kg/ha nitrogen + atrazine, 80 kg/ha nitrogen + pendimethalin, & 80 kg/ha nitrogen + halosulfuron were statistically on par with 80 kg/ha nitrogen + atrazine.. As nitrogen is applied to many physiological stages of plant growth, such as photosynthesis, root growth and development, as well as more dry matter and its distribution, the sink capacity of the crop is increased and the green fodder production. It can also be concluded that effective management of

weeds with profitable seed yield of forage pearl millet can be obtained with 100 kg N ha with the application of atrazine (PE) at 25 DAS. In the areas of dominance of Cyprus rotundus presence, the application of atrazine (PE) fb halosulfuron (POE) at 25 DAS would be the better option Also in **2018, Choudary et al (5).** reported parallel findings**.**

CONCLUSION

Treatment 80 kg/ha nitrogen+ atrazine recorded Maximum plant height (200.52 cm), Highest plant dry weight (51.59gm), Weed density (6.00), Green Fodder yield (28.42 t/ha). Since the findings are based on the research done in one season it may be repeated for further confirmation.

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Table 1. Effect of Nitrogen and Weed Management on growth parameters of Forage pearl millet var. 'GAFB-4'at harvest

S.No	T.No.	Treatments	Plant height (cm)	Dry weight (g/plant)	Weed dens
1	T_1	50 kg/ha nitrogen+pendimethalin	153.14	41.70	6.70
2	T_2	50 kg/ha nitrogen+atrazine	170.16	42.05	6.00
3	T_3	50 kg/ha nitrogen+halosulfuron	172.26	39.80	7.50
4	T_4	65 kg/ha nitrogen+pendimethalin	183.27	43.97	6.60
5	T_5	65 kg/ha nitrogen+atrazine	185.34	44.13	6.00
6	T_6	65 kg/ha nitrogen+halosulfuron	172.26	42.68	7.10
7	T_7	80 kg/ha nitrogen+pendimethalin	197.45	45.77	6.10
8	T_8	80 kg/ha nitrogen+atrazine	200.52	51.59	6.00
9	T_9	80 kg/ha nitrogen+halosulfuron	199.13	48.69	7.14
		SEm (±)	5.42	1.23	0.28
		CD (P 0.05)	16.11	3.65	0.83

Table 2. Effect of Nitrogen and Weed Management on yield characters of Forage pearl millet var. 'GAFB-4'

S. No	T. No	Treatments	Green Fodder Yield (t/ha)
1	T_1	50 kg/ha nitrogen+pendimethalin	24.28
2	T_2	50 kg/ha nitrogen+atrazine	24.41
3	T_3	50 kg/ha nitrogen+halosulfuron	22.00
4	T_4	65 kg/ha nitrogen+pendimethalin	25.70
5	T_5	65 kg/ha nitrogen+atrazine	26.46
6	T_6	65 kg/ha nitrogen+halosulfuron	25.47
7	T_7	80 kg/ha nitrogen+pendimethalin	27.87
8	T_8	80 kg/ha nitrogen+atrazine	28.42
9	T_9	80 kg/ha nitrogen+halosulfuron	26.84
		SEm (±)	0.67
		CD (P 0.05)	1.99