Original Research Article

Pearl millet (*Pennisetum glaucum L.*) var ABV-04 as influenced by Nitrogen & Phosphorus effects on growth parameters and Yield.

ABSTRACT

Background:-Pearl millet can grow in a variety of environments. Pearl millet is a viable alternative to sorghum in areas where it cannot thrive. When it comes to soil moisture utilisation and heat tolerance, sorghum and maize cannot compete with pearl millet.

Objectives:-Effects of nitrogen and phosphorus on growth parameters and yield of pearl millet

Methods:-With the goal of studying the effect of nitrogen and phosphorus on growth and yield of Pearl millet (Pennisetum glaucum L.) Var. ABV - 04 under a Randomized block design with 9 treatments (T1-T9) The experimental results revealed that 120 kg N/ha + 60 kg P/ha produced maximum plant height (214.37), plant dry weight (46.74) and yield parameters ear head length (20.77 cm), number of grains/ear head (1972.0), grain yield (2.68 t/ha), and stover yield (3.77).

Conclusion:- The combination of 120 kg nitrogen/ha and 60 kg phosphorus/ha proved to be the most advantageous to farmers, resulting in 214.37-cm plant height, 46.74-gm plant dry weight, 1972 grains per ear head, and 2.68 ta grain and 3.26 ta stover yields, respectively**.**

Key words- Growth, Pearl millet, Phosphorus, Nitrogen Yield,

INTRODUCTION

Pearl millet [Pennisetum glaucum (L.) R.BR.] is the most important cereal crop subsequent to rice, wheat, maize and sorghum. It is staple food of 90 million poor people and widely grown on 30 million ha in the arid and semi-arid tropical region of asia and Africa accounting for half of global millet production. In India fourth most cultivated crop after rice, wheat and maize. The bajra crop is used by some rural populations for thatching rooftops and as a feed grain for their cows. Bajra is mostly grown in arid and dry areas. Bajra is planted on more than 260,000 square kilometres around the world, and it produces half of the world's millet. The optimal temperature range for this crop is between 25 and 31 degrees Celsius, and it grows best in drier sections of the country. It requires 40-50 cm of rainfall per year to thrive. India is largest producer of pearl millets covering about 8.75 million ha of marginal and sub marginal lands primarily in the states of Rajasthan, Gujarat, Haryana, Uttar Pradesh and Maharashtra and ranking 3rd after rice and wheat in acreage [1] Pearl millet production in India is the largest in the world, with an area of 95.96 million hectares and a total output of 77.02 million tonnes. Pearl millet productivity per hectare is 803 kilograms.(12) Pearl millet is grown on 0.150 million hectares in Gujarat and produces 0.252 million tonnes, with a yield of 1680 kg per hectare.(11)

Crop plants depend heavily on the nutrient nitrogen (N). Growth, leaf area expansion, and biomass yield production are all aided by this compound. Excess Nutrient use efficiency an help plants function better and produce more food. Increasing the amount of nitrogen in the soil improves the quality and yield of crops as well as their tolerance to environmental challenges, such as water scarcity and saline soil. Plant growth and development can be impeded by a lack of nitrogen (N). Root growth, volume, area, diameter, total and main root lengths, dry mass, and nutrient uptake can all be improved by nitrogen, as can nutritional balance and the generation of dry mass itself. However, several studies have shown that nitrogen application can boost millet production efficiency [2]. Ali also noticed an increase in yield associated with an increase in nitrogen levels [3]

Phosphorus is one of the most important major nutrients required for the growth and development of crop plants. Deficiencies in other nutrients, such as phosphorus, are more readily apparent in plants. Stunted, thin-stemmed, and spindly plants with dark, almost blue-green leaves are common signs of phosphorus deficiency. As a result, phosphorus-deficient plants often appear to be completely normal unless there are many larger, healthy plants present to make a comparison. Deficiency of soil phosphorus is one of the important chemical factors restricting plant growth in soils Azad (5) It is possible for leaves to become yellowed and shrivelled in the most severe phosphorus shortage conditions. Although other stresses, such as cold temperatures, can also induce purple pigmentation, certain plants' leaves and stems develop purple hues as a result of phosphorus deficiency.

MATERIALS & METHODS

During the kharif season of 2021, a field experiment was conducted out at the C.R.F of the wing of Agronomy in Shaits Prayagraj, which is located at 25^{o} 24' 42" N latitude, 81^{o} 50' 56" E longitude, and 98 m altitude over the mean sea degree (MSL). to see how phosphorus and nitrogen affect the growth and output of Pearl millet (*Pennisetum glaucum* L.). The trial was set up in a Randomized Block design with nine treatments that were reproduced three times. The length of each online plot for each therapy is 3m 3m. When given in combination, the treatment is classified as having a recommended dose of Potash via Muriate of Potash, as well as Nitrogen via Urea and Phosphorus via DAP. (T1) 80 kg N/ha + 20 kg P (T2) a 100 kg N/ha + 20 kg P/ha, (T3) 120 kg N/ha + 20 kg P/ha, (T4) 80 kg N/ha + 40 kg P/ha, (T5) 100 kg N/ha + 40 kg P/ha, (T6) 120 kg N/ha + 40 kg P/ha, (T7) 80 kg N/ha + 60 kg P/ha, (T8) 100 kg N/ha + 60 At harvesting maturity, the pearl millet crop was harvested smartly. Plant height (cm) and dry rely accumulation g plant were manually recorded on five randomly selected consultant plants from each plot of each replication one at a time, and seeds were isolated from each internet plot and dried under solar for three days after harvesting. Later, the seeds were winnowed, washed, and the seed yield per hectare was calculated and expressed in tonnes per hectare. After 10 days of thorough drying in the sun, the Stover production from each online plot was measured and expressed in tonnes per hectare. The statistics were calculated and analysed using the Gomez and Gomez statistical approach [4]. The benefit: cost ratio was reworked after the fee value of seed was replaced with straw and the general value of crop cultivation was protected.

RESULTS & DISSCUSIONS

Effect on growth parameters:

Plant height

Height of the plant rise as crop growth progressed, as shown in Table 1. The maximum height measured at harvest for treatment T9 (120N+60N kg/ha) was 214.37cmPlant tallness was assessed at harvest in T9 and treatments T8 were found statistically equal to those of T9. Due to the constant provision of nutrients throughout all growth stages, as well as the positive relationship between Nitrogen and Phosphorus along with Potassium, the highest plant height was found in treatment T9. Increased plant height is a result of nitrogen's effect on the plant's vegetative growth. In cells, phosphorus is a structural component and metabolically active molecule, is likely responsible for the rise in Plant tallness in the appliance of 60 kg/ha Phosphorus. Phosphorus plays a critical role in various physiological and biochemical processes essential to plant growth and development, which may explain why higher phosphorus levels boost pearl millet growth. According to Sharma et al. (6), (2012) the same results were found.

Dry matter of plant

Maximum accumulation of dry matter was 46.74 (g) at harvesting for the treatment T9 (60P+120N kg/ha) and for the treatment T8 (60 kg P/ha). Since the other vegetative features dry matter build-up, it is more significant. Due to the addition of nitrogen & phosphorus, pearl millet's dry weight rose considerably. Singh (2) found rise of the same kind in dry matter production with increasing N levels in Pearl millet crop growth at all stages. Presence of phosphorus in the soil may have supplied the plants with a more favourable nutritional environment. According to assessments of nutrient concentration, pearl millet plant sections had a considerable increase in the nitrogen and phosphorus amount. An increase in meristematic activity and applied growth led to an increase in dry matter accumulation, the plant's photosynthetic surface increased as a result. They found the same results as Sharma (6) & co-worker's (2012).

Yield and Yield Attributes:

Ear head length

The statistical analysis of ear head length revealed the enormous impact of ear head period. The treatment of 120 kg N/ha + 60 kg P/ha resulted in a significant and maximal ear head length (20.77). However, with 120 kg N/ha + 60 kg P/ha, no other treatment achieved statistical parity. Nitrogen utilisation increases the cytokines' activity in plants, resulting in increased cellular division and elongation. Because nitrogen is a component of chloroplast porphyrins, increased nitrogen fertilisation increased crop ear head length due to increased photosynthates synthesis. Phosphorus treatment will be attributed to a general improvement in plant growth as measured by increased dry count number accumulation, which could be due to quicker phosphorus and other nutrient delivery to plants. improved food availability to plants at the flower primordial initiation stage, which may have aided in the production of more robust tillers and, as a result, increased ear head length These findings are also consistent with those of Azad [5], Sharma et al. [6].

Number of grains in the ear

The statistical analysis of the amount of grains per ear head revealed a significant influence. Significant and the largest number of grains per ear head were recorded in the treatment of 120 kg N/ha + 60 kg P/ha (1972). The statistical parity between 100 kg

N/ha + 60 kg P/ha and 120 kg N/ha + 60 kg P/ha was achieved, however. Cell division and elongation are boosted as a result of the increased activity of cytokinin in plants, which are activated by nitrogen. For this reason, enhanced nitrogen fertilisation boosted grain and ear head production via increasing photosynthate production, because porphyrins in chloroplasts contain nitrogen. Munirathnam and Gautam, [7], and Reddy et al., [8], have also found that the quantity of grains per ear head might vary depending on the amount of nutrients in the soil. As a result of increased phosphorus and other nutrient supplies to plants, the overall improvement in plant development can be linked to phosphorus application. Plants may have benefited from an earlier supply of nutrients during the floral primordial initiation stage, resulting in a greater number of functional tillers and ultimately more grains/ear heads. Azad [5], Sharma et al. [6], and others have found similar results (2012).

Grain yield

Different combinations of Nitrogen, Phosphorus & Potassium can have a significant effect on grain production. A grain yield of 2.68 ta/ha was obtained with a treatment of (60P+120N kg/ha) however, (60P+100N kg/ha) yielded results statistically equivalent to those of (60P+120N kg/ha). Increasing the amount of nitrogen and phosphorus applied greatly boosted pearl millet grain yields. This suggests that rising the nitrogen supply may have enhanced all growth indices, yield-related features Biological yield affects grain yield. A significant improvement in biological yield can therefore be attributed to the better grain production characteristics. These findings are also consistent with those of Azad [5], Sharma et al. [6].

Stover yield

The stover yield output of the pearl millet crop had also been greatly altered by the treatment of Nitrogen & Phosphorus. In terms of stover yield (3.77 ta/ha), the highest was observed at (60P+120N kg/ha); however, (60P+100N kg/ha) was shown to be statistically equivalent to (60P+120N kg/ha) With the addition of nitrogen and phosphorus, pearl millet yielded substantially more stover yield than it did without them. Growth of plant & dry matter production may have increased as a result of greater photosynthesis. In this way, rise of nitrogen supply may have boosted all growth metrics and yield features, which finally contributed to rise of stover production. Straw production affects biological yield. As a result, enhanced straw yield qualities might be blamed for a large rise in biological yields following the addition of phosphorus. A higher nitrogen supply could have resulted in a higher stover yield as a result of increased growth parameters and yield-related features. Stover yield was increased by adjusting nutrient levels in Munirathnam and Gautam, [7], Guggari and Kalaghatagi, [9], and Singh et al., [10].

CONCLUSION

120 kg nitrogen/ha + 60 kg phosphorus/ha was determined to be the most beneficial to farmers, resulting in 214.37-cm plant height, 46.74-gm plant dry weight, 1972 grains per ear head, and 2.68 ta grain and 3.26 ta stover yields, respectively.

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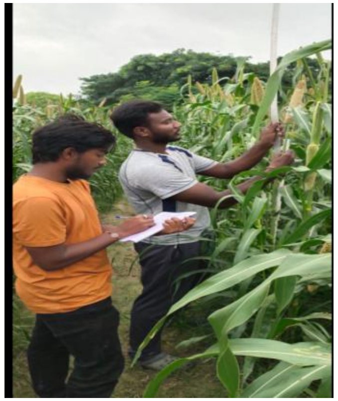
PICTURE WITH RESPECTED **DR. RAJESH SINGH** SIR (ASSISTANT PROFESSOR)

AT THE TIME OF SOWING

AT THE TIME OF RECORDING READINGS



AT THE TIME OF HARVEST

SOME PICTURES OF EAR HEAD

Table 1. Effect of Nitrogen and Phosphorus on growth parameters of pearl millet at harvest

T.No.	Treatments	Plant height (cm)	Dry Weight(gm)
T_1	80 kg N/ha +20Kg P/ha	202.57	36.62
T_2	100 kg N/ha+20Kg P/ha	204.64	37.37
T_3	120 kg N/ha+20Kg P/ha	207.05	40.26
T_4	80 kg N/ha+40 kg P/ha	206.51	39.66
T_5	100 kg N/ha+40 kg P/ha	209.19	42.50
T_6	120 kg N/ha+40 kg P/ha	210.26	43.37
T_7	80 kg N/ha+60 kg P/ha	208.47	41.23
T_8	100 kg N/ha+60 kg P/ha	213.69	44.37
T_9	120 kg N/ha+60 kg P/ha	214.37	46.74
	SEm (±)	1.28	1.02
	CD (P 0.05)	3.78	3.02

Table2. Nitrogen & Phosphorus influence on Cumbu Yield and Characteristics

T. No	Treatments	Ear head length (cm)	No. of grains/ear head	Grain Yield (ta ha)	Stover Yield (ta ha)
T_1	80 kg N/ha +20Kg P/ha	16.13	1671	2.21	3.26
T_2	100 kg N/ha+20Kg P/ha	16.87	1699	2.28	3.36
T_3	120 kg N/ha+20Kg P/ha	17.50	1784	2.42	3.51
T_4	80 kg N/ha+40 kg P/ha	17.20	1747	2.36	3.44
T_5	100 kg N/ha+40 kg P/ha	18.70	1861	2.51	3.60
T_6	120 kg N/ha+40 kg P/ha	19.37	1885	2.55	3.64
T_7	80 kg N/ha+60 kg P/ha	18.33	1833	2.47	3.56
T_8	100 kg N/ha+60 kg P/ha	20.19	1942	2.65	3.742
T_9	120 kg N/ha+60 kg P/ha	20.77	1972	2.68	3.77
	SEm (±)	0.18	14.56	0.03	0.024
	CD (P 0.05)	0.53	43.27	0.07	0.07