Original Research Article

Effect of potassium and plant growth regulators of Economics and yield of Pearl Millet

(Pennisetumglaucum L.)

- Abstract: A research trail was conducted in *Zaid*2022, at Crop research form, SHUATS, Prayagraj. To study the effect of potassium and plant growth regulators oneconomics and yield of Pearl millet. The treatments consist of three levels of potassium (40, 50 and 60 kg/ha) and plant growth regulators(NAA-100ppm, Traicontonol-500ppm, NAA-100ppm,+Traicontonol-500ppm) are included. Experiment was laid out in randomized block design with nine treatments each replicated thrice. The result showed that *viz*: significantly higher number of pods per plant, seed yield, haulm yield, net returns and B:C ratio recorded in (T_9) Potassium 60 kg/ha + NAA 100 ppm + Triacontanol 500 ppm

- ***Key words:***Pearl millet**,**Potassium, Plant growth regulators, NAA, Triacontanol, yield, economics ,attributes, net return, B:C ratio.

Introduction: Pearl millet (*Pennisetumglaucum)* is the fifth most important cereal crop in the world after rice, wheat, maize and sorghum. It is widely grown in rainfed cereal crop in the arid and semi-arid regions of Africa and Southern Asia, and can be grown in areas where rainfall is not enough (200 ta 600 mm/yr) for cultivation of maize and sorghum (Reddy *et al.*, 2016). In India Pearl millet occupies 4th position among cereals crops next to rice, wheat and sorghum. Pearl millet may be an alternative crop that exhibits excessive valuable in physiological characteristics when compared to other cereals as it is resistant to drought, low fertility, high salinity and high temperature tolerance (Chaudhary*et al.*, 2014).. Pearl millet occupies 6.93 million ha with the production of 8.61 million tonnes and the productivity of 1243 ka/ha (Anonymous, 2018-19). Rajasthan occupied 42.49 lakh ha area with the total production of 50.59 lakh tonnes and average productivity of 1190 kg ha-1 (Anonymous, 2019- 20).

Potassium is an essential major plant nutrient with numerous functions. It involves enzyme activation which are necessary in many metabolic activities and translocation of photosynthesis and also contributed to drought tolerance and quality improvement, plant ability to stand extreme cold and hot temperatures, pests and lodging.It plays a major role in activating enzymes, regulating stomatal function, controlling water relations especially under rainfed crop production, influencing the water balance of the plant system, and underpinning agronomic productivity and sustainability.

The plant growth regulators (PGRs) have potential for increasing crop productivity underenvironmental stress. Growth regulators are chemical substances which can alter the growth and developmental processes leading to increased yield, improved grain quality or facilitated harvesting (Espindula et al., 2009). Nutrient levels and plant growth

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regulators application had significant influence on growth parameters of Pearl millet.The exogenous applications of NAA to improve growth and yield under various stress conditions including drought, salinity, extreme temperatures,and heavy metal toxicity. They are also involved in developmental processes such as seed germination, leaf angle, flowering time, and seed yield, which are of great agronomic importance.

2. MATERIALS & METHODS:

During the Zaidseasonseason of 2022, a field experiment was conducted out at the C.R.F of the wing of Agronomy in ShuatsPrayagraj, which is located at 25o 24' 42" N latitude, 81o 50' 56" E longitude, and 98 m altitude over the mean sea degree (MSL). to see how potassium and plant growth regulators effect the growth and yield of Pearl millet (Pennisetumglaucum 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) Potassium 40 kg/ha +NAA 100 ppm (T2) a Potassium 40 kg/ha + Triacontanol 500 ppm, (T3) Potassium 40 kg/ha + NAA 100 ppm + Triacontanol 500 ppm, (T4) Potassium 50 kg/ha + NAA 100 ppm, (T5) Potassium 50 kg/ha + Triacontanol 500 ppm, (T6) Potassium 50 kg/ha +NAA 100 ppm + Triacontanol 500 ppm, (T7) Potassium 60 kg/ha + NAA 100 ppm, (T8) Potassium 60 kg/ha + Triacontanol 500 ppm, Treatment (T9) Potassium 60 kg/ha + NAA 100 ppm + Triacontanol 500 ppm , (T10) control. 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. 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.

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List 1: Details of treatment combinations

Sr.No	Treatment Combination

1.	Potassium 40 kg/ha +NAA 100 ppm
2.	Potassium 40 kg/ha + Triacontanol 500 ppm
3.	Potassium 40 kg/ha + NAA 100 ppm + Triacontanol 500 ppm
4.	Potassium 50 kg/ha + NAA 100 ppm
5.	Potassium 50 kg/ha + Triacontanol 500 ppm
6.	Potassium 50 kg/ha +NAA 100 ppm + Triacontanol 500 ppm
7.	Potassium 60 kg/ha + NAA 100 ppm
8.	Potassium 60 kg/ha + Triacontanol 500 ppm
9.	Potassium 60 kg/ha + NAA 100 ppm + Triacontanol 500 ppm
10	Control

3. RESULTS & DISSCUSIONS

3.1 Effect on Growth Parameters

3.2 Yield and Yield Attributes

3.2.1 Ear head length

The statistical analysis of ear head length revealed the enormous impact of ear head period. The treatment of 60 kg K/ha+100 PPM NAA + 500 PPM Triacontanol /ha.resulted in a significant and maximal ear head length (20.50 cm). However, with 60 kg K/ha+100 PPM NAA + 500 PPM Triacontanol /ha., no other treatment achieved statistical parity. Potassium is one of the chief plant nutrients for the growth and development of plants in pearl millets potassium plays vital role in enzyme activates water and energy metabolism translocation of assimilation, photo synthesis protein and starch synthesis (mengal et al ., 1996). The application of triacontanol and NAA was attribute to an increased rate of photo synthetic activity accelerated transport and efficiency of utilization photosyntheticproducts thus result resulting cell elongation and rapid cell growing portion the plant. Sharma et al.

3.2.2 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 60 kg K/ha+100 PPM NAA + 500 PPM. The statistical parity between Potassium 60 kg/ha + Triacontanol 500 ppm and 60 kg K/ha+100 PPM NAA + Triacontanol500 PPM was achieved, however. Cell division and elongation are boosted as a result of the increased activity of cytokinin in plants, which are activated by potassium. 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,, and Reddy et al., 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 PGR and other nutrient supplies to plants, the overall improvement in plant development can be linked to 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. Sagar et al. , Sharma et al., and others have found similar results (2012).

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Fig 1:Yield of Pearl Millet

3.2.3 Grain yield

Different combinations of Potassium & PGR can have a significant effect on grain production. A grain yield of 2.72 ta/ha was obtained with a treatment of Potassium 60 kg/ha + NAA 100 ppm + Triacontanol 500 ppm however, Potassium 60 kg/ha + NAA 100 ppm + Triacontanol 500 ppm yielded results statistically equivalent to those of (Potassium 60 kg/ha + NAA 100 ppm + Triacontanol 500 ppm). Increasing the amount of nitrogen and phosphorus applied greatly boosted pearl millet grain yields. This suggests that rising the potassium 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, Sharma et al.

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3.2.4 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 (3.78 ta/ha), the highest was observed,Potassium 60 kg/ha + NAA 100 ppm + Triacontanol 500 ppm. however, (Potassium 60 kg/ha + Triacontanol 500 ppm) was shown to be statistically equivalent to , Potassium 60 kg/ha + NAA 100 ppm + Triacontanol 500 ppm) With the addition of potassium and PGR , pearl millet yielded substantially more stover yield than it did without them. Growth of plant & dry matter production may have increased because of greater photosynthesis. In this way, rise of potassium 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 potassium supply could have resulted in a higher stover yield because of increased growth parameters and yield related features. Stover yield was increased by adjusting nutrient levels in Munirathnam and Gautam, Guggari and Kalaghatagi, , and Singh et al.,

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Table:1Effect of potassium and plant growth regulators on yield attributes of pearl millet.

TreatmentNo	Treatment	Earhead length (cm)	No.ofgrains/ear head	Testweight(g)
1.	40kgk/ha+100 ppm NAA/ha	16.15	1621.00	7.90
2.	40kg K/ha+ 500 ppm Triacontanol/ha	16.77	1681.00	8.00
3.	40kg K/ha+ 100 ppm NAA/ha+ 500 ppm Triacontanol/ha	17.53	1759.00	8.17
4.	50kgk/ha+100 ppm NAA/ha	17.10	1783.00	8.07
5.	50kgk/ha+ 500 ppm Triacontanol/ha	18.30	1856.00	8.40
6.	50kgk/ha+ 100 ppm NAA/ha+500 ppm Triacontanol/ha	19.60	1868.00	8.43
7.	60kgk/ha+100 ppm NAA/ha	18.20	1945.00	8.30
8.	60kgk/ha500 ppm Triacontanol/ha	20.40	1964.00	8.50
9.	60kgk//ha+ 100 ppm NAA/ha+500 ppm Triacontanol/ha	20.50	1970.00	8.53
10	ControL	15.91	1521.00	7.69
	Ftest	S	S	S
	SEm±	0.061	5.163	0.148
	CD(P=0.05)	0.18	14.9	0.44

Table 2.Effect of potassium and plant growth regulators on economics of pearl millet.

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Treatments	Total cost of cultivation (INR/ha)	Gross return (INR/ha)	Net return (INR/ha)	B:C Ratio
potassium 40 kg/ha + NAA 100 ppm/ha	42,790.00	1,16,500.00*	73,710.00	1.72
potassium 40 kg/ha + Triacontanol 500 ppm/ha	42,840.00	1,09,000.00	66,160.00	1.54
potassium 40 kg/ha + NAA 100 ppm/ha+ Triacontanol500 ppm/ha	42,940.00	1,12,000.00	69,060.00	1.60
potassium 40 kg/ha + NAA 100 ppm/ha	42,950.00	1,20,000.00	77,050.00	1.79
potassium 40 kg/ha + Triacontanol 500 ppm/ha	43,000.00	1,28,000.00	85,000.00	1.97
potassium 40 kg/ha + NAA 100 ppm/ha+ Triacontanol500 ppm/ha	43,100.00	1,21,000.00	77,900.00	1.80
potassium 40 kg/ha + NAA 100 ppm/ha	42,950.00	1,33,500.00	90,400.00	2.10
potassium 40 kg/ha + Triacontanol 500 ppm/ha	43,160.00	1,34,500.00	91,550.00	2.12
potassium 40 kg/ha + NAA 100 ppm/ha+ Triacontanol500 ppm/ha	43,260.00	1,36,000.00	92,840.00	2.14
Control	42,050.00	1,10,000.00*	66,740.00*	0.58

4. CONCLUSION

It was concluded that application of 60 kg K/ha + 100 ppm NAA/ha+Traicontonol 500 ppm Triacontanol/ha /ha has maximum seed yield (2.72t/ha), gross return (1,36,000.00 INR/ha), net return (92,840.00 INR/ha) and B:C ratio (2.14) was recorded. These findings are based on one season therefore, further trail may be required for further confirmation.

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Fig 2:Field experiment

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