

## Original Research Article

### Effect of potassium and plant growth regulators ~~of on~~ Economics and yield of Pearl Millet (*Pennisetum glaucum* L.)

- **Abstract** :A research trail was conducted in Zaid2022, at Crop research form, SHUATS, Prayagraj-~~To to~~ study the effect of potassium and plant growth regulators on~~the~~economics and yield of Pearl millet. The treatments consist~~ed~~ of three levels of potassium (40, 50 and 60 kg/ha) and plant growth regulators(NAA-100ppm, Traicontanol-500ppm, NAA-100ppm+Traicontanol-500ppm) and their combinations are included.~~Experiment-~~The experiment was laid out in a randomized block design with nine treatments each replicated thrice. The result showed that viz: significantly higher number of seeds per earhead, seed yield, haulm yield, net returns and B:C ratio were recorded in (T<sub>9</sub>) Potassium 60 kg/ha + NAA 100 ppm + Triacantanol 500 ppm.
- **Key words**:Pearl millet,Potassium, Plant growth regulators, NAA, Triacantanol,yield, economics-Economics, attributes, net return, B:C ratio.

#### 1. INTRODUCTION

Pearl millet (*Pennisetum glaucum* (L.) R. Br.) is the fifth most important cereal crop in the world after rice, wheat, maize, and sorghum. It is widely grown ~~in~~asa 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 ~~to to~~600 mm/year) for ~~the~~ cultivation of maize and sorghum (Reddy *et al.*, 2016). In India, Pearl millet occupies 4<sup>th</sup> 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-high~~ temperature tolerance (Chaudhary *et al.*, 2014). Pearl millet occupies 6.93 million ha with ~~the a~~production of 8.61 million tonnes and ~~the a~~productivity of 1243 ka/ha (Anonymous, 2018-19). Rajasthan occupied 42.49 lakh ha area with ~~the a~~total production of 50.59 lakh tonnes and average productivity of 1190 kg/ha~~+~~ (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 p~~Plant growth regulators (PGRs) have ~~the~~ potential for increasing crop productivity under environmental stress. Growth regulators are chemical substances ~~which that~~can

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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 regulators application had a significant influence on the 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.

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## 2. MATERIALS & METHODS

During the Zaid season of 2022, a field experiment was conducted out at the C.R.F of the wing of Agronomy in SHUAT Prayagraj, which is located at 25° 24' 42" N latitude, 81° 50' 56" E longitude, and 98 m altitude over the above mean sea level (MSL) to see how potassium and plant growth regulators affect the growth and yield 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 plot size for each treatment was 3m x 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) Potassium 40 kg/ha + Triacantanol 500 ppm, (T3) Potassium 40 kg/ha + NAA 100 ppm + Triacantanol 500 ppm, (T4) Potassium 50 kg/ha + NAA 100 ppm, (T5) Potassium 50 kg/ha + Triacantanol 500 ppm, (T6) Potassium 50 kg/ha + NAA 100 ppm + Triacantanol 500 ppm, (T7) Potassium 60 kg/ha + NAA 100 ppm, (T8) Potassium 60 kg/ha + Triacantanol 500 ppm, (T9) Potassium 60 kg/ha + NAA 100 ppm + Triacantanol 500 ppm and (T10) control. At physiological maturity, the pearl millet crop was harvested smartly. Plant Earhead length (cm), number of seeds per earhead and dry weight (g) per 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 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 plot was measured and expressed in tonnes per hectare. The statistics were calculated and data were analysed statistically. The benefit: cost ratio was reworked after the value of seed was replaced with straw and the general value of crop cultivation was protected. The economics of each treatment was also worked out.

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

### 3. RESULTS & ANDDISCUSSIONS

#### 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 ppm NAA + 500 PPM ppm Triaccontanol/ha. resulted in a significant and maximal ear head length (20.50 cm) compared to all other treatments. However, with 60 kg K/ha+100 PPM NAA + 500 PPM Triaccontanol /ha., no other treatment achieved statistical parity. Potassium is one of the chief plant nutrients for the growth and development of plants in pearl millet, potassium Potassium plays a vital role in enzyme activates water and energy metabolism translocation of assimilation, photosynthesis protein and starch synthesis (mengal-Mengal *et al.*., 1996). The application of triaccontanol and NAA was attribute attributed to an increased rate of photosynthetic activity, accelerated transport and efficiency of utilization of photosynthetic products thus result-resulting in cell elongation and rapid cell growing growth portion the plant.(Sharma et al.

##### 3.2.2 Number of grains in the ear

The statistical analysis of the amount-number 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 ppm NAA + Triaccontanol 500 PPM ppm. The statistical parity between Potassium 60 kg/ha + Triaccontanol 500 ppm and 60 kg K/ha+100 PPM NAA + Triaccontanol 500 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-fertilization 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-number 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

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improvement in plant development can be linked to [the](#) 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 [&and](#) 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 + Triacantanol 500 ppm. [howeverHowever](#), Potassium 60 kg/ha + NAA 100 ppm + Triacantanol 500 ppm yielded results statistically equivalent to those of [Potassium 60 kg/ha + NAA 100 ppm + Triacantanol 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 of biological yield [that](#) 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 treatments of Nitrogen & Phosphorus. In terms of stover yield [\(3.78 ta/ha\)](#), the highest [\(3.78 ta/ha\)](#) was observed [in](#) Potassium 60 kg/ha + NAA 100 ppm + Triacantanol 500 ppm. however, (Potassium 60 kg/ha + Triacantanol 500 ppm) was shown to be statistically equivalent to [Potassium 60 kg/ha + NAA 100 ppm + Triacantanol 500 ppm](#). With the addition of potassium and PGR, pearl millet yielded substantially more stover yield than it did without them. [Growth](#)-[The growth](#) of plant [&and](#) dry matter production may have

increased because of greater photosynthesis. In this way, [the](#) rise of potassium supply may have boosted all growth metrics and yield features, which finally contributed to [the](#) 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-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:1** :Effect of potassium and plant growth regulators on yield attributes of pearl millet.

TreatmentNo	Treatment	Earhead length (cm)	No.ofgrains/ear head	Testweight(g) 1000 grain weight (g)
1.	40kgk/ha+100 ppm NAA/ha	16.15	1621.00	7.90
2.	40kg K/ha+ 500 ppm Triacantanol/ha	16.77	1681.00	8.00
3.	40kg K/ha+ 100 ppm NAA/ha+ 500 ppm Triacantanol/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 Triacantanol/ha	18.30	1856.00	8.40
6.	50kgk/ha+ 100 ppm NAA/ha+500 ppm Triacantanol/ha	19.60	1868.00	8.43
7.	60kgk/ha+100 ppm NAA/ha	18.20	1945.00	8.30
8.	60kgk/ha500 ppm Triacantanol/ha	20.40	1964.00	8.50
9.	60kgk/ha+ 100 ppm NAA/ha+500 ppm Triacantanol/ha	20.50	1970.00	8.53
10	Control	15.91	1521.00	7.69
	<b>Ftest</b>	S	S	S
	<b>SEm±</b>	0.061	5.163	0.148
	<b>CD(P=0.05)</b>	0.18	14.9	0.44

**Table 2.** Effect of potassium and plant growth regulators on [the](#) economics of pearl millet.

Treatments	Total cost of	Gross	Net return	B:C
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	<b>cultivation</b> <b>(INRRs/ha)</b>	<b>return</b> <b>(INRRs/ha)</b>	<b>(INRRs/ha)</b>	<b>Ratio</b>
potassium 40 kg/ha + NAA 100 ppm/ha	42,790.00	1,16,500.00*	73,710.00	1.72
potassium 40 kg/ha + Triacantanol 500 ppm/ha	42,840.00	1,09,000.00	66,160.00	1.54
potassium 40 kg/ha + NAA 100 ppm/ha+ Triacantanol 500 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 + Triacantanol 500 ppm/ha	43,000.00	1,28,000.00	85,000.00	1.97
potassium 40 kg/ha + NAA 100 ppm/ha+ Triacantanol 500 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 + Triacantanol 500 ppm/ha	43,160.00	1,34,500.00	91,550.00	2.12
potassium 40 kg/ha + NAA 100 ppm/ha+ Triacantanol 500 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 is~~ concluded that ~~the~~ application of 60 kg K/ha + 100 ppm NAA/ha+Traicontanol 500 ppm Triacantanol/ha ~~has~~ ~~has~~ recorded maximum seed yield (2.72t/ha), gross return (Rs. 1,36,000.00 INR/ha), net return (Rs. 92,840.00 INR/ha) and B:C ratio (2.14). ~~was recorded.~~ These findings are based on one season ~~data~~ therefore, further ~~trial~~ ~~trial~~ may be required for further confirmation.



Fig 2:Field experiment

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