*Biological Forum – An International Journal* **16(7): 333-335(2024)**

**ISSN No. (Print): 0975-1130**
**ISSN No. (Online): 2249-3239**

# Studies on Effect of *ethrel* and Gibberellic Acid on Growth and Yield of Sugarcane variety "CoPk 05191" (Pratap Ganna 1) with Recommended Agronomic Practices

***Ramkishan Meena*, B.S. Meena, N.R. Koli, H.P. Meena, Yamini Tak and Vishal Gupta***
*Agricultural Research Station, Agricultural University, Kota (Rajasthan), India.*

*(Corresponding author: Ramkishan Meena*)*
*(Received: 03 May 2024; Revised: 27 May 2024; Accepted: 20 June 2024; Published: 15 July 2024)*
*(Published by Research Trend)*

**ABSTRACT: The farmers and sugar business in north India are concerned about the low yield of sugarcane. Around 75% of subtropical India delays planting until April or May following wheat harvest. Growth-regulating agents have a lot of potential to increase cane height and germination, particularly in late-planted sugarcane, where yields are low because the canes are short and millable. It is necessary to assess the technology used to apply these chemicals, nevertheless. In light of this, an experiment was carried out at the ARS research farm at Agricultural University of Kota (Rajasthan), India, throughout the spring seasons of three consecutive years (2015–16, 2016–17, and 2017–18). The experimental soil had a texture similar to clay loam and a modest level of organic carbon (0.52%). The available potassium level (320 kg/ha), available nitrogen (354 kg/ha), and available phosphorus (25.30 kg/ha) are all high, and the pH is 8.19. The experiment was set up in a randomized block design in March using the variety "CoPk 05191 (Pratap Ganna 1)," and it was harvested after a full year. The usage of growth agents such as gibberellic acid and ethrel had a substantial impact on the yield characteristics. In comparison to T1, T2, and T3, the treatment consisting of planting two budded setts following an overnight soak in a 100 ppm ethrel solution and spraying 35 ppm of gibberellic acid at 90, 120, and 150 DAP (days after planting) (T8) produced noticeably more millable canes/ha, cane weight, cane yield, brix, sucrose, and purity percentage. The highest gross and net returns (Rs. 247200 and Rs. 131750/ha) were achieved with this treatment.**

**Keywords:** Agronomic practices, *Ethrel,* Gibberellic acid, Growth regulators, Sugarcane, Yield and economics.

## INTRODUCTION

With the several improved agro-techniques, sugarcane productivity in India achieved an average of up to 70 t/ha. There is still a lot of room to improve productivity through the use of growth regulators. The chemical compounds known as plant growth regulators are required in little amounts and at low concentrations to alter the growth and development of plants. Typically, they have distinct sites of action and biosynthesis. Growth chemicals are often classified into four groups: gibberellins, indole derivatives, abscisic acid, and cytokinin's. Recently, ethylene has been added to these groupings. Many growth agents have been shown to have positive impacts on sugarcane production and growth (Rao *et al.,* 1960; Kanwar and Kanwar 1986; Bendigeri *et al.,* 1986). Under greenhouse circumstances, gibberellic acid induced sugarcane stem elongation. There have been reports from several sugarcane-growing nations throughout the world of I and under commercial field conditions (Nickell, 1984). While previous research has examined the impact of ethrel on cane flowering, there is a dearth of data on the plant's effect on germination. The current study was motivated by the notion that sugarcane germination percentages are typically low, while they contribute roughly 30% to cane output. The goal of the current study is to determine how growth-regulating agents, such as ethrel and gibberellic acid, affect the germination, growth, and yield of sugarcane in a field setting.

## MATERIALS AND METHODS

In the winter seasons of 2015–16, 2016–17, and 2017–18, a field experiment was carried out at the research farm of the Agricultural Research Station Kota, Agriculture University, Kota (Rajasthan). The experimental soil had a texture similar to clay loam, a pH of 8.19, a medium amount of organic carbon (0.52%), a medium amount of available phosphorus (25.30 kg/ha), a high amount of available nitrogen (354 kg/ha), and a high amount of potassium (320 kg/ha). The experiment was set up in a randomized block design in March using the variety "CoPk 05191 (Pratap Ganna 1)," and it was harvested after a full year. As test material, 'CoPk 05191 (Pratap ganna 1)', an early maturing variety, was employed. The trials were planted in March and were harvested a year later. Three years' worth of mean data were examined. Using SSP and MOP, the full recommended dosage of P and K was treated at the time of planting. Nitrogen was provided by urea, with two thirds applied as top dressing and one third as basal until the start of the monsoon. Records were kept of the number of

malleable canes, cane weight, and cane output. The specifics of the treatment are as follows: T1-Traditional planting techniques/farmers' methods (3 budded setts), T2 Setts Panting following an overnight immersion in water T3 : Panting of setts following an overnight soak in water containing 50 parts per million ethrel solution; T4: Panting of setts following an overnight soak in water containing 100 parts per million ethrel solution; Gibberllic acid (GA3) sprays in T5 T1+ and T6 T2+ amounts of 35 ppm at 90, 120, and 150 DAP and 150 DAP, respectively. Sprays T7 T3+ and T8 T4+ containing 35 ppm of gibberellic acid (GA3) were applied at 90, 120, and 150 DAP, respectively.

## RESULTS AND DISCUSSION

Tables 1 and 2 showed data on cane yield and economics over a three-year period. Compared to traditional and overnight soaking in water, millable canes, cane weight, cane yield, brix reading, sucrose, and purity percent recorded at harvest stage under overnight soaking in 100 ppm ethrel solution were significantly superior. In comparison to conventional planting, the T8 treatment (planting of two buded setts after an overnight soak in a 100 ppm ethrel solution + spraying of 35 ppm gibberllic acid at 90, 120, and 150 DAP) recorded significantly higher numbers of millable canes (146.83 thousands/ha), cane weight (856.44 g/cane), and cane yield (98.88 t/ha). Our findings are supported by the encouraging performance of ethrel and gibberellic acid on cane yield measures, as reported by Kanwar and Kanwar (1986). Numerous laborers have stated that ethrel inhibits sugarcane's ability to blossom. Numerous employees in other nations that grow sugarcane have also seen positive impacts of GA3 treatment on sugarcane growth. According to Mc David and Babiker (1981), GA enhanced the fresh weight of the stem and leaf as well as the stem's elongation. According to Gonzales *et al*. (1978), sugarcane may respond well to foliar GA3 spraying if it is applied at the appropriate time. After the tillering phase was completed, Yamaguchi *et al.* (1986) discovered that split treatment of the appropriate amount of GA3 had a longer-lasting promoting effect on internodal elongation than its single application. Moreover, the number of tillers decreased as a result of early application.

Additionally, Verma and Ali (1963) noted a notable rise in cane yield as a result of applying GA3 in the pot experiment, but there was no discernible change in the percentage of sucrose and purity of the sugarcane juice. The findings indicate that planting setts following an overnight soak in a solution containing 100 ppm ethrel and 35 ppm GA3 at 90, 120, and 150 DAP produced a notably greater number of millable canes and cane production than planting setts in a normal manner. There seems to be a lot of room in our nation for employing GA to extend the cane length in sugarcane that was planted late and produces shorter millable canes, which lowers yields.

**Table 1: Effect of plant growth regulators on yield attributes, yield and quality parameters of sugarcane (mean of 2015-16, 2016-17 & 2017-18).**

| Treatment | NMC (000/ ha) | Cane weight (g) | Cane yield (t/ha) | Brix (%) | Sucrose ( %) | CCS (%) | CCS (t/ha) | Purity (%) |
|---|---|---|---|---|---|---|---|---|
| $T_1$ : Conventional planting/ Farmers' practice (3-bud setts) | 124.32 | 699.98 | 79.45 | 19.29 | 16.72 | 11.45 | 9.13 | 86.63 |
| $T_2$ : Planting of setts after overnight soaking in water | 125.54 | 701.80 | 80.57 | 19.31 | 16.75 | 11.48 | 9.27 | 86.69 |
| $T_3$ : Planting of setts after overnight soaking in 50 ppm ethrel Solution | 136.11 | 820.21 | 91.98 | 20.33 | 17.79 | 12.25 | 11.28 | 87.50 |
| $T_4$ : Planting of setts after overnight soaking in 100 ppm ethrel Solution | 139.89 | 826.59 | 93.33 | 20.38 | 17.90 | 12.32 | 11.51 | 87.59 |
| $T_5$ : T1+$GA_3$ spray (35 ppm) at 90, 120 and 150 DAP | 136.48 | 800.66 | 90.52 | 20.60 | 18.07 | 12.45 | 11.28 | 87.72 |
| $T_6$ : T2+ $GA_3$ spray (35 ppm) at 90, 120 and 150 DAP | 138.04 | 805.71 | 91.66 | 20.72 | 18.07 | 12.55 | 11.49 | 87.81 |
| $T_7$ : T3 + $GA_3$ (35 ppm) spray at 90, 120 and 150 DAP | 145.21 | 853.35 | 97.52 | 21.02 | 18.51 | 12.78 | 12.46 | 88.04 |
| $T_8$ : T4 + $GA_3$ (35 ppm) spray at 90, 120 and 150 DAP | 146.83 | 856.44 | 98.88 | 21.20 | 18.69 | 12.91 | 12.77 | 88.16 |
| SEm ± | 3.58 | 13.12 | 2.10 | 0.18 | 0.18 | 0.18 | 0.19 | 0.19 |
| CD (P=0.05) | 10.85 | 39.80 | 6.38 | 0.55 | 0.53 | 0.54 | 0.58 | 0.57 |
| CV(%) | 4.54 | 2.86 | 4.03 | 1.54 | 1.71 | 2.51 | 2.98 | 0.37 |

**Table 2: Cost and economics of plant growth regulators treatments in sugarcane (mean of 2015-16, 2016-17 & 2017-18).**

| Treatment | Treatment cost (Rs/ha) | Production cost (Rs/ha) | Gross returns (Rs/ha) | Net returns (Rs/ha) | B: C ratio |
|---|---|---|---|---|---|
| $T_1$ : Conventional planting/ Farmers' practice (3-bud setts) | 0 | 1,01,804 | 198617 | 96813 | 0.95 |
| $T_2$ : Planting of setts after overnight soaking in water | 1,970 | 1,03,774 | 201425 | 97651 | 0.94 |
| $T_3$ : Planting of setts after overnight soaking in 50 ppm ethrel solution | 2,123 | 1,03,927 | 229942 | 126015 | 1.21 |
| $T_4$ : Planting of setts after overnight soaking in 100 ppm ethrel solution | 2,276 | 1,04,080 | 233325 | 129245 | 1.24 |
| $T_5$ : T1+$GA_3$ spray (35 ppm) at 90, 120 and 150 DAP | 11,370 | 1,13,170 | 226309 | 113135 | 1.00 |
| $T_6$ : T2+ $GA_3$ spray (35 ppm) at 90, 120 and 150 DAP | 13,340 | 1,15,144 | 229142 | 113998 | 0.99 |
| $T_7$ : T3 + $GA_3$ (35 ppm) spray at 90, 120 and 150 DAP | 13,493 | 1,15,297 | 243808 | 128511 | 1.11 |
| $T_8$ : T4 + $GA_3$ (35 ppm) spray at 90, 120 and 150 DAP | 13,646 | 1,15,450 | 247200 | 131750 | 1.14 |
| SEm ± | - | - | 5257 | 5257 | 0.05 |
| CD (P=0.05) | - | - | 15947 | 15947 | 0.15 |
| CV(%) | - | - | 4.03 | 7.77 | 8.00 |

## CONCLUSIONS

Based on three years among treatment combination of PGR, planting of setts after overnight soaking in 100 ppm ethrel solution + $GA_3$ spray at 90, 120, 150 DAP treatment was found excellent for increasing number of millable cane, cane weight, cane yield and also quality parameters *i.e.* Brix, Sucrose (%), CCS (%) CCS yield, purity (%), Gross return and net return which was significantly superior over $T_1$ and $T_2$ treatments and at par with rest of treatments followed by $T_7$ : Planting of setts after overnight soaking in 50 ppm ethrel solution + $GA_3$ (35 ppm) spray at 90, 120 and 150 DAP treatment also same trend.

**Acknowledgement.** The authors are grateful thanks to Project coordinator (Sugarcane), ICAR-IISR, Lucknow and Director of Research, Agriculture University, Kota to provide the financial support and provide the facility to conduct the experiment successfully.

**Conflict of Interest.** None.

## REFERENCES

Bendigeri, A. V., Hapse, D. G., Shaikh, A. A. and Tiwari, U. S. (1986). Efficacy of different growth regulators and hormones on sugarcane. *Proceeding. Thirty Sixth Ann. Cow. D.S.T.A.,* 289-296.

Gonzales, C. B., Merlyn, R. S., Elpidio, L. R. and Teodora, C. M. (1978). Response of sugarcane varieties to foliar spray of gibberellic acid. *J. Crop. Sci., 3* (4), 228-34.

Kanwar, K, and Kanwar, R. S. (1986). Effect of gibberellic ad genotypes. *Indian Sugar, 36*(2), 65-66.

Mc David, C. R. and Babiker, E. A. (1981). Effect of Polaris and gibberellic acid on growth, 14c fixation and translocation of sugar content of two sugarcane cultivars. *Trop. Agric. (Trinidad), 53,* 73-79.

Nickell, L. G. (1984). A review of plant growth regulators in the sugarcane industry. *Sugar Y. Azucar, 9*(3), 17-20.

Rao, G. N., Rao, N. V. M. and Rao, P. H. (1960). Preliminary note on the effect of gibberellic acid on growth and tillering of sugarcane. *Ind. Jour. of Sugarcane Res., 4*(3), 148.

Verma, H. P. and Ali, S. A. (1963). A note on the effect of gibberellic acid on growth and juice quality of sugarcane. *Indian Sugar, 32*(10), 635-636.

Yamaguchi, T, Hisao, H., Takeshi, Y. and Naotstugnv (1986). Effect of gibberllic acid application at different growth stages on the growth of sugarcane. *Sci. Rep. Fac. Agric, Kobe; Univ., 17*(1), 13-18.

**How to cite this article:** Ramkishan Meena, B.S. Meena, N.R. Koli, H.P. Meena, Yamini Tak and Vishal Gupta (2024). Studies on Effect of *ethrel* and Gibberellic Acid on Growth and Yield of Sugarcane variety "CoPk 05191" (Pratap Ganna 1) with Recommended Agronomic Practices. *Biological Forum – An International Journal, 16*(7): 333-335.