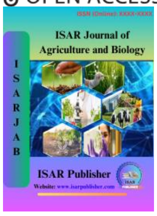

ISAR Journal of Agriculture and Biology

Volume 3, Issue 1, 2025 | Page: 15-19

Abbriviate Title- ISAR J Agri Biol

ISSN (Online)- 2584-217X

https://isarpublisher.com/journal/isarjab

Effect of Planting Dates on Growth and Yield of Sugarcane in Subtropical Region of Nepal

Jagat Bandhu Adhikari[1*], Dil Raj Yadav[1] and Chakra Ghalan[1]

National Sugarcane Research Program, Jitpur, Bara/Nepal Agricultural Research Council, Kathmandu Nepal.

***Corresponding Author**
Jagat Bandhu Adhikari
National Sugarcane Research Program, Jitpur, Bara/Nepal Agricultural Research Council, Kathmandu Nepal.

Article History
Received: 09.11.2024
Accepted: 14.12.2024
Published: 10.01.2025

Abstract: An experiment entitled "Effect of Planting Dates on Growth and Yield of Sugarcane in Subtropical Region of Nepal" was conducted during 2021-2022 at the National Sugarcane Research Program, Jeetpur, Bara, Nepal. The objective of the experiment was to quantify the effect of different sowing time on the growth and yield of sugarcane genotypes. To conduct experiment, the split-plot design was used with two sugarcane genotypes namely Co-0118 and Co-86032 as main plots and six sowing dates (from mid-November to mid-April in an interval of one month) as sub-plots. The results revealed that genotype Co-86032 consistently outperformed Co-0118 in terms of cane yield. The cane yield of Co-86032 was 74.04 t/ha and 104.61 t/ha in 2021 and 2022, respectively whereas the cane yield of Co-0118 was 55.59 t/ha and 86.69 t/ha. Among the sowing dates, mid-November planting produced the highest yields, with Co-86032 yielding 116.63 t/ha and Co-0118 yielding 88.29 t/ha, followed by mid-February planting, which yielded 109.82 t/ha and 84.01 t/ha, respectively. Delayed planting beyond mid-February significantly reduced yields, with Mid-April planting producing only 68.85 t/ha for Co-86032 and 54.35 t/ha for Co-0118 in 2021. This study reflects that mid-November planting was found appropriate for higher cane yield irrespective of sugarcane cane genotypes.

Keywords: Planting date, Sugarcane, Yield.

Cite this article:

Adhikari, J. B., Yadav, D. R., Ghalan, C., (2025). Effect of Planting Dates on Growth and Yield of Sugarcane in Subtropical Region of Nepal. *ISAR Journal of Agriculture and Biology*, *3*(1), 15-19.

1. Introduction

Sugarcane (*Saccharum officinarum* L.) is a vital commercial crop and primary source of sugar worldwide. In Nepal, sugarcane cultivation plays a significant role in the agricultural economy, particularly in the subtropical regions of the Terai. Sugarcane in Nepal covers 62,567 hectares, with a production of 3,159,434 metric tons and productivity of 50.5 metric tons per hectare. It contributes 2.1% to the GDP and generates Rs. 17 billion annually (MoALD, 2023). However, this yield remains below the potential productivity seen in neighboring countries like India and Bangladesh, where average yields range from 70 to 80 metric tons per hectare (FAO, 2022). The disparity underscores the need to investigate agronomic practices that influence sugarcane productivity in Nepal.

The average yield of sugarcane in Nepal is constrained by various factors, including limited access to improved varieties, poor irrigation, and suboptimal agronomic practices. One overlooked area is the lack of scientific studies on the impact of planting dates on sugarcane growth and yield under Nepal's subtropical conditions. Farmers often rely on traditional planting calendars, which may not align with the changing climatic patterns, resulting in yield losses and inefficiencies.

Planting dates are a critical agronomic factor affecting the growth, development, and yield of sugarcane. Optimum planting time ensures synchronization with favorable climatic conditions, allowing the crop to maximize its photosynthetic potential, water use efficiency, and nutrient uptake. In India, for example, early planting in subtropical areas has been shown to increase sugarcane yield and sugar recovery significantly (Singh et al., 2022). Similarly, in Bangladesh, studies indicate that delayed planting often results in reduced tillering and lower sucrose content due to sub-optimal temperature and water availability (Rahman et al., 1988). These findings highlight the importance of determining region-specific planting schedules to optimize sugarcane production.

Studies from sugarcane-growing regions worldwide have demonstrated the significance of planting dates on yield. Ramesh et al. (2020) reported that sugarcane planted in February in the subtropical regions of India produced 15% higher yields compared to late plantings in May due to better utilization of soil moisture and temperature conditions. Similarly, a study in Bangladesh by Hossain et al. (2019) found that early planting during the dry season allowed for extended growth periods, leading to higher sucrose accumulation. Such findings indicate that optimizing

***Corresponding Author:** Jagat Bandhu Adhikari

planting dates can substantially enhance productivity, making it a critical area of research for Nepal. So, this research was conducted with the objective of identifying the optimal planting schedule for different sugarcane genotypes to maximize the sugarcane productivity in Nepal

2. Materials and Methods

Experimental Site

The field experiment was carried out in the research block of National Sugarcane Research Program, Jeetpur, Bara, Nepal, during 2021-2022. The site is located at 27°06'48" N latitude and 84°57'07" E longitude, with an altitude of 98 meters above sea level. The region experiences a hot, humid climate in summer and cooler conditions during winter. The average maximum temperature ranges from 22.7°C to 34.5°C, while the average minimum temperature fluctuates between 8.5°C and 25.9°C. Annual rainfall averages around 1550 mm.

The soil at the site is grayish-brown in color, with a sub-angular blocky structure and a sandy loam texture. The pH of the soil was moderately acidic, measured at 5.96. Organic matter and total nitrogen levels were low, recorded at 1.0% and 0.06%, respectively. In contrast, the available phosphorus content was high at 33.76 ppm, and the extractable potassium content was also high, measured at 145.29 ppm.

Experimental design and treatment details

The experiment was laid out in a split plot design with three replications. The genotypes namely Co-0118 and Co-86032 were assigned to the main-plots while the sub-plots were dedicated to the six planting dates i.e., Nov-15, Dec-15, Jan-15, Feb-15, March-15, and April-15. Two budded sets of cane were planted in furrow with 90 cm row spacing. The area of the plot was 27 square meter (6 rows of 5 meter long). Cane setts were treated by Carbendazim 0.01% solution before planting. The chemical fertilizers were applied @ 150:60:40 NP_2O_5 K_2O kg/ha. Half dose of nitrogen and full dose of phosphorus and potash were applied at the time of planting as basal and remaining 75 kg N was top-dressed in two equal splits at 60 and 90 days after planting. Growth and yield parameters were recorded for each treatment. Key observations included were plant height, number of millable canes, cane diameter, single cane weight and yield. The collected data were subjected to analysis of variance (ANOVA) using GenStat statistical software.

Table 1: Performance sugarcane genotypes under various date of planting at NSRP, Jeetpur, 2021

Treatments	**PHT (cm)**	**CD (mm)**	**SCW (kg)**	**MC (no.)**	**Yield (ton/ha)**
Factor A (Genotypes)					
Co-0118	212.2	22.00	1.02	52016.5	55.59
Co-86032	235.2	24.17	1.18	59506.2	74.04
P value	<.001	<.001	0.005	0.039	<.001
LSD	15.35	1.138	0.098	7060.8	6.69
Factor B (Sowing dates)					
Mid-Nov	246.8	24.00	1.26	63086.4	84.15
Mid-Dec	229.7	23.52	1.11	60740.7	67.82
Mid-Jan	230.2	23.22	1.09	52592.6	55.69
Mid-Feb	230.3	23.41	1.03	64444.4	77.17
Mid-Mar	219.3	22.48	1.14	50246.9	55.07
Mid-Apr	186.0	21.89	0.95	43456.8	48.99
Mean	**223.7**	**23.09**	**1.10**	**55761.3**	**64.81**
P value	0.006	0.299	0.036	0.01	<.001
LSD	26.59	1.971	0.1698	12229.7	11.59
CV%	9.8	**7.1**	13.3	18.3	14.9

PHT = plant height, CD = cane diameter, SCW = single cane weight and MC = millable cane

Table 2: Performance sugarcane genotypes under various date of planting at NSRP, Jeetpur, 2022

Treatments	PHT (cm)	CD (mm)	SCW (kg)	MC (no.)	Yield (ton/ha)
Factor A (Genotypes)					
Co-0118	230.3	22.73	0.995	95864.2	86.69
Co-86032	270.2	25.72	1.316	104012.3	104.61
P value	<.001	<.001	<.001	0.035	<.001
LSD	9.58	0.549	0.07	7525.7	7.49
Factor B (Sowing dates)					
Mid-Nov	273.7	25.43	1.38	110740.7	120.78
Mid-Dec	260.9	24.91	1.26	101296.3	102.83
Mid-Jan	255.8	24.20	1.17	101481.5	86.80
Mid-Feb	253.8	24.83	1.12	126481.5	116.67
Mid-Mar	241.6	23.50	1.02	87592.6	77.95
Mid-Apr	215.6	22.48	0.98	72037.0	68.85
Mean	**250.2**	**24.23**	**1.16**	**99938.3**	**95.6**
P value	<.001	<.001	<.001	<.001	<.001
LSD	16.59	0.951	0.13	13034.9	12.97
CV,%	5.5	3.3	9.7	10.9	11.3

PHT = plant height, CD = cane diameter, SCW = single cane weight and MC = millable cane

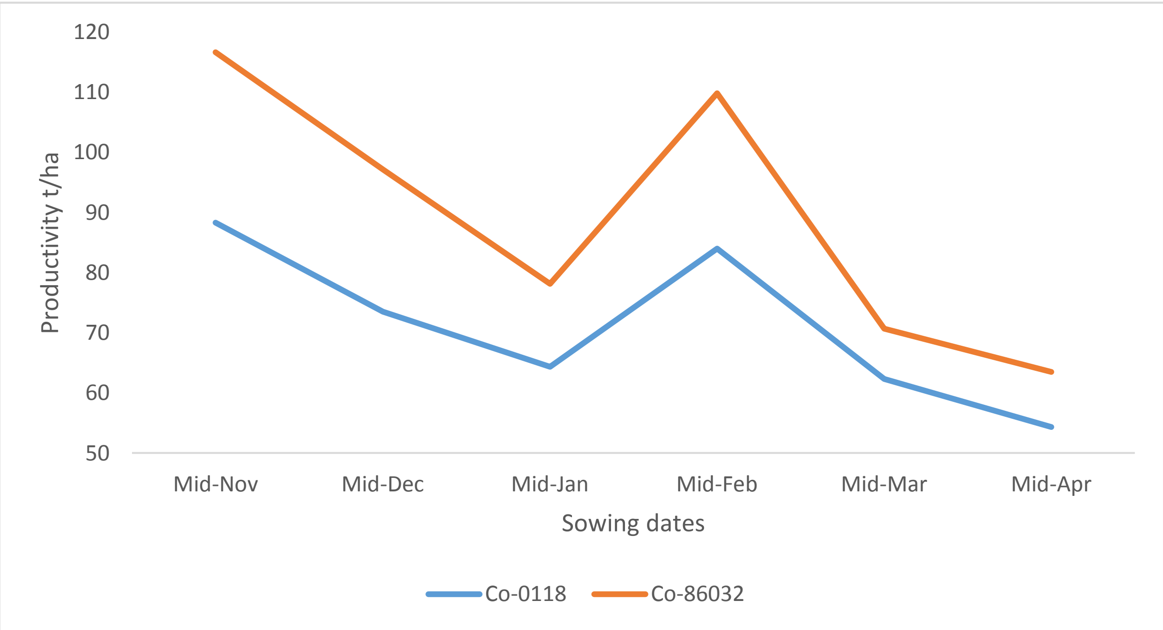

Figure 1. Yield performance of sugarcane genotypes with respect to different sowing dates over years

3. Results and Discussion

Plant height

Genotype Co-86032 exhibited taller plants in both years, averaging 235.2 cm in 2021 and 270.2 cm in 2022, compared to Co-0118 with 212.2 cm and 230.3 cm, respectively. Plant height was also influenced by sowing dates, with mid-November planting consistently producing the tallest plants (246.8 cm in 2021 and 273.7 cm in 2022). Late planting reduced plant height, with the lowest values recorded in mid-April (186.0 cm and 215.6 cm). These results highlight the importance of genotype selection and early planting for maximizing sugarcane growth. The taller plant height of Co-86032 compared to Co-0118 can be attributed to its superior genetic potential for biomass accumulation and growth vigor. Early sowing dates, such as mid-November, provide optimal environmental conditions, including better soil moisture and a longer growing season, enabling plants to achieve maximum vegetative growth. Conversely, late sowing limits the growth period and exposes plants to suboptimal conditions like higher temperatures leading to shorter plants. This finding align with the finding of Rajak *et.al* (2017), who reported sugarcane genotypes planted in 15th Nov had significantly higher stalk length.

Cane Diameter

The combined analysis of cane diameter across genotypes and sowing dates reveals significant variability influenced by genetics and planting time. In both years, Co-86032 consistently produced thicker canes, averaging 24.17 mm in 2021 and 25.72 mm in 2022, compared to Co-0118 with 22.00 mm and 22.73 mm, respectively. Early sowing dates, mid-November, resulted in the largest cane diameters (24.00 mm in 2021 and 25.43 mm in 2022). In contrast, late sowing in mid-April produced thinner canes, measuring 21.89 mm and 22.48 mm, respectively. These findings are supported by Sharma et al. (2018), who emphasized that early planting ensures favorable growth conditions for sugarcane. Similarly, Kumari et al. (2020) demonstrated that genetic variability among sugarcane genotypes significantly influences cane diameter.

Millable cane

The sugarcane genotype, Co-86032 consistently outperformed in producing millable canes, with 59,506.2 canes/ha in 2021 and 104,012.3 canes/ha in 2022, compared to 52,016.5 canes/ha and 95,864.2 canes/ha for Co-0118. Early sowing (mid-November) possessed the highest number of millable canes (63,086.4 canes/ha in 2021 and 110,740.7 canes/ha in 2022), while late sowing in mid-April resulted in significantly fewer millable canes. These results suggest that early planting provides sufficient time for tillering and cane development, while late planting reduces growth duration, limiting tiller survival and cane formation. Similar findings by Sohel et al. (2021) emphasize the role of early planting in optimizing tiller development.

Cane yield

The combined analysis of sugarcane genotype performance and sowing dates reveals critical insights into yield optimization. Across two years, the sugarcane genotype Co-86032 consistently yielded significantly higher over Co-0118, producing 74.04 tons/ha and 104.61 tons/ha, respectively, compared to 55.59 tons/ha and 86.69 tons/ha for Co-0118. This superiority can be attributed to Co-86032's greater plant height, cane diameter, and single cane weight, which contribute to higher biomass accumulation. The results align with studies highlighting the importance of genetic traits like cane girth and weight in influencing sugarcane yield (Kumari et al., 2020).

Sowing dates also significantly affected yield, with mid-November planting producing significantly higher yields in both years (84.15 tons/ha in 2021 and 120.78 tons/ha in 2022) followed by mid-February planting (77.17 tons/ha in 2021 and 116.67 tons/ha in 2022). Early planting ensures optimal growing conditions, including adequate soil moisture, favorable temperatures, and a longer vegetative phase, all of which are crucial for maximizing cane growth. This finding is consistent with Vaitor et al. (2005), who reported early sowing as a determinant of higher yields in sugarcane. Similarly, Jintrawet et al. (2000) found that sugarcane planted in early November produced higher cane yields under favorable climatic conditions. Conversely, later sowing dates (e.g., Mid-March and Mid-April) resulted in lower yields due to reduced growing periods and exposure to unfavorable conditions during critical growth stages, further corroborating these findings.

The graph shows that the two-year average yield of Co-86032 was consistently higher than that of Co-0118 across all sowing dates. Among the planting times, mid-November produced the highest yields, with Co-86032 yielding 116.63 t/ha and Co-0118 yielding 88.29 t/ha. This was followed by mid-February planting, where Co-86032 achieved 109.82 t/ha and Co-0118 recorded 84.01 t/ha. However, delayed planting in mid- March and mid-April significantly reduced yields, with Co 86032 dropping to 63.48 t/ha in Mid-April (2079/80) and Co 0118 to just 54.35 t/ha in the same period.

4. Conclusion

In conclusion, Co-8602 consistently performed well over Co-0118 in yield across all sowing dates, demonstrating its superior productivity. Among the sowing dates, mid- November planting produced the higher yield with Co-86032 achieving 116.63 t/ha and Co-0118 88.29 t/ha. Mid-February planting also performed well, with Co-86032 and Co-0118 yielding 109.82 t/ha and 84.01 t/ha respectively, making it a viable alternative. Delayed planting beyond February resulted in progressively lower yields for both genotypes.

References

1. MoAD (Ministry of Agriculture and Development). (2023). Statistical information on Nepalese agriculture 2022/23. Kathmandu, Nepal.
2. FAOSTAT. (2022). Food and Agriculture Organization of the United Nations. Production statistics. Retrieved from http://www.fao.org/faostat/
3. Singh, V., Singh, K., Singh, R. S., Pal, R., Kumar, R., & Mohan, C. (2022). CoPb 96: An early maturing sugarcane variety for Punjab. Electronic Journal of Plant Breeding, 13(1), 98-105.
4. Rahman, A. B. M. M., & Matin, M. A. (1988). Influence of different planting techniques on the tillering, tiller mortality and production of millable stalks in two selected sugarcane clones. Bangladesh J. Sugarcane, 9, 117-119.
5. Rajak, Ram & Paudel, Kapil & Shrestha, Shankar & Tripathi, Janamejai. (2017). Effect of Planting Dates and Sugarcane Genotypes on Yields in Subtropical of Nepal. Proceedings of the 30th National Winter Crops Workshop, held on 15-16 February, 2017 at National Maize Research Program Rampur, Chitwan Nepal. Nepal Agricultural Research Council.
6. Sharma, P., Gupta, Y. C., Dhiman, S. R., & Sharma, P. (2018). Effect of planting dates on growth, flowering and seed production of snapdragon. Indian Journal of Horticulture, 75(2), 352-354.
7. Kumari, P., Kumar, B., Kamat, D. N., Singh, R., Singh, D., & Chhaya, R. (2020). To study genetic variability, heritability and genetic advance for cane and sugar yield attributing traits

in mid-late maturing sugarcane clones. Journal of Pharmacognosy and Phytochemistry, 9(1), 1890-1894.

8. Sohel, M. A. T., Hossain, M. S., Islam, N., Kamruzaman, M., Shantaand, F. H., & Rajib, R. R. (2021). Effects of Planting Dates on Growth, Yield And Quality of Newly Released Sugarcane Varieties. Bangladesh Agronomy Journal, 24(2), 73-81.

9. Kumar et al. (2021) Bangladesh Agron. J. 2021, 24(2): 73-81 EFFECTS OF PLANTING DATES ON GROWTH, YIELD AND QUALITY OF NEWLY RELEASED SUGARCANE VARIETIES M.A.T. Sohel*, M.S. Hossain, N. Islam, M. Kamruzaman, F.H. Shantaand R.R. Rajib

10. Jintrawet, A., et al. (2000). Influence of Planting Date on Yield and Quality of Sugarcane under the Agro-Climatic Conditions of Mardan. Sugar Cane, 1, 15-18.

11. Viator, R. P., Richard, E. P., & Johnson, R. M. (2005). Planting method and timing effects on sugarcane yield. Crop Management, 4(1), 1-8.