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Weed dynamics and yield of single eye-budded settling sugarcane as influenced by spacing and weed management practices under south Gujarat conditions

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Abstract

A field experiment was conducted during rabi seasons of 2023–24 and 2024–25 at the College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat, to evaluate suitable spacing and weed management practices for single-eye budded settling planted sugarcane under South Gujarat conditions. The soil was clayey in texture, slightly alkaline (pH 7.66 and 7.65), with normal EC (0.41 and 0.42 dS/m), medium available nitrogen, moderately high phosphorus, and high potassium during both years. The experiment was laid out in a Split Plot Design with four spacing treatments as main plots and seven weed management practices as sub-plots, replicated thrice. Major weeds observed included monocots (*Cynodon dactylon*, *Sorghum halepense*, *Echinochloa crus-galli* and *E. colona*), dicots (*Alternanthera sessilis*, *Euphorbia hirta*, *Physalis minima*, *Hibiscus* spp., *Parthenium hysterophorus*, *Convolvulus arvensis*, *Chenopodium album* and *Amaranthus viridis*) and the sedge *Cyperus rotundus*. Among the weed management practices, W₂ [weed-free through hand weeding at 30-day intervals up to 150 DAP] recorded the lowest weed population (monocots, dicots, sedges and total weeds), minimum weed dry weight, highest weed control efficiency (92.4, 92.5 and 92.5% during 2023–24, 2024–25 and pooled analysis, respectively) and maximum cane yield (111.76, 112.52 and 112.14 t/ha during 2023–24, 2024–25 and pooled analysis, respectively). However, it remained statistically at par with W₃ (interculturing followed by hand weeding at 30 and 60 DAP) and W₅ [hand weeding at 30 DAP followed by application of 2,4-D @ 1.5 kg/ha + metribuzin @ 1.0 kg/ha at 60 DAP]. Treatment W₃ recorded the lowest weed index (1.83, 1.20 and 1.51% during 2023–24, 2024–25 and pooled analysis, respectively), closely followed by W₅ (3.81, 3.84 and 3.77%, respectively), indicating their effectiveness in weed suppression and yield enhancement in sugarcane.

Keywords: Sugarcane, spacing, weed management, 2,4-D, Metribuzine, Readymix- Mesotrione and Atrazine, Readymix- Sulfentrazone and Clomazone

Introduction

Sugarcane (*Saccharum officinarum* L.) is a crucial commercial and industrial crop grown in tropical and subtropical areas worldwide. In addition to being the main source of sugar, it is an essential raw material for producing jaggery, ethanol, biodegradable products, paper, and livestock feed, thus making a significant contribution to both agricultural and industrial economies (Mishra *et al.*, 2021) [8]. India holds the second position in sugarcane production globally, following Brazil, with sugarcane cultivated across 55.07 lakh hectares, yielding 4399.30 lakh tonnes, achieving a productivity rate of approximately 80–90 t/ha, and a sugar recovery rate of 10.25% for the period of 2024–25 (Anonymous, 2025) [1]. In Gujarat, sugarcane occupies 1.89 lakh hectares with a production of 137.11 lakh tonnes and productivity of 71.60 t/ha, contributing substantially to the state's agricultural economy (Anonymous, 2025) [1]. Major sugarcane-growing districts of Gujarat include Junagadh, Vadodara, Narmada, Bharuch, Tapi, Surat, Navsari, and Valsad.

Among the numerous factors that hinder sugarcane productivity, weed infestation stands out as one of the most significant biotic challenges. Weeds compete with the sugarcane for essential resources such as nutrients, moisture, light, and space, leading to suboptimal crop growth and considerable yield reductions. The intensity of weed competition varies with the growth stage of

the crop, being especially critical during the initial growth phase. Research indicates that the critical period for crop–weed competition in sugarcane lasts from 60 to 120 days after planting (DAP) for spring-planted cane and can extend up to 150 DAP for autumn-planted cane (Rohitashv *et al.*, 2011) ^[13]. Yield losses attributed to unchecked weed proliferation can range from 40 to 67 percent, particularly in regions where advanced weed management practices are not sufficiently implemented (Srivastava and Chauhan, 2006) ^[15].

Effective management of weeds necessitates an understanding of weed species, critical periods of competition, and appropriate control strategies. Implementing timely weed control during these critical periods reduces competition between crops and weeds, thereby promoting crop growth and productivity (Suganthi *et al.*, 2019) ^[17]. In sugarcane cultivation, weed management can be accomplished through various methods, including manual, mechanical, biological, and chemical approaches. While manual weeding is effective, it tends to be labor-intensive, time-consuming, and expensive. Mechanical methods may occasionally result in damage to the crop, while herbicides present a more cost-effective and efficient alternative, especially in situations where labor is limited. Consequently, integrated weed management strategies that combine cultural, mechanical, and chemical methods are increasingly advocated for the sustainable production of sugarcane.

Sugarcane serves as a significant cash crop in South Gujarat, with many farmers relying on it for their income and livelihood. Thus, enhancing productivity and profitability through efficient agronomic methods is crucial. Among these methods, effective weed management is essential for decreasing yield losses, reducing weed infestation, and lowering cultivation costs. In light of these factors, the current study was conducted to identify effective weed management strategies for single-eye budded

settling planted sugarcane in the context of South Gujarat conditions.

Materials and Methods

A field experiment was carried out at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat, India during *rabi* season of two consecutive years 2023-24 and 2024-25. Geographically, site is situated at 20° 57' North latitude, 72° 54' East longitude with an elevation of 10 meters of above the mean sea level. Experiment was laid out in Split Plot Design with four spacings as main plot and seven weed control measures as sub plots (Table 1).

Settlings were grown using the single eye buds of sugarcane variety CoN 15071(Divyashi). After 25 days of sowing, emerged settlings were transplanted to the main field. Recommended dose of fertilizers (250 -125 -125 kg N-P₂O₅-K₂O/ha) was given in the form of urea, single super phosphate and muriate of potash. Weed management was done by hand weeding, intercropping and applying herbicides as per treatments, except in the unweeded control plot. Additionally, final earthing up was carried out at 135 to 140 days after transplanting of crop. In W₄, dhaincha was cut down at 55 DAS and kept as mulch in the same place for smothering the weeds and incorporated in the soil at final earthing up.

Observations were recorded on weed population, dry weight of weeds, weed control efficiency, weed index and cane yield at harvest. Recorded data was subjected to statistical analysis of variance as per procedure of Split Plot Design as described by Panse and Sukhatme (1967) ^[10]. For weed population studies at 60 and 90 days after transplanting for monocots and dicots, the data were first transformed to square root to reduce the range of variation and then statistically analysed by standard method as described by Steel and Torrie (1960) ^[16].

Table 1: Treatment details of experiment

Main plot (Spacings)	
S ₁	120 × 45 cm
S ₂	150 × 30 cm
S ₃	100 × 60 cm
S ₄	120 × 60 cm
Sub plot (Weed management)	
W ₁	Unweeded (Control)
W ₂	Weed free (Hand weeding at interval of 30 days up to 150 DAP)
W ₃	Interculturing followed by hand weeding at 30 and 60 DAP
W ₄	Sugarcane with dhaincha as smothering crop (cutdown at 50% flowering and mulch)
W ₅	Hand weeding at 30 DAP + application of 2,4-D@ 1.5kg/ha + Metribuzine @1.0 kg/ha (Post emergence) at 60 DAP
W ₆	Hand weeding at 30 DAP + application of Readymix- Mesotrione 2.27% w/w + Atrazine 22.7% w/w SC@ 875 g/ha at 60 DAP
W ₇	Hand weeding at 30 DAP + application of Readymix- Sulfentrazone 28% + Clomazone 30% wp @ 700 + 750 g/ha at 60 DAP

Results and Discussion

Weed Population at 60 DAP

Different spacing treatments were not significantly affected the weed population at 60 DAP (Table 2).

The lowest monocot (11.13/m²), dicot (8.08/m²), sedges (12.26/m²) and total weed population (32.08/m²) was observed under W₂ (Hand weeding at interval of 30 days up to 150 DAP) and was at par with W₃ (IC *fb* HW at 30 and 60 DAP). This was followed by W₅, W₆ and W₇ being on par with each other. Significantly higher weed infestation was observed under W₁ (untreated control), with pooled data of monocots (25.20/m²), dicots (18.54/m²), sedges (28.26/m²) and total weeds (72/m²).

Weed Population at 90 DAP

Weed population at 90 DAP was not significantly varied among

different spacing treatments during both the years (Table 3).

Among weed management practices, W₂ recorded the lowest monocots (11.35, 10.85 and 11.10/m² during both the years and in pooled analysis, respectively) and dicot weed population (8.11, 8.09 and 8.10/m² during both the years and in pooled analysis, respectively) and was at par with W₃ with monocots (12.80, 12.45 and 12.65 during both the years and in pooled analysis, respectively) and dicots (9.11, 9.39 and 9.25/m² during both the years and in pooled analysis, respectively). This was followed by W₅ and at par with W₆.

In case of sedges weeds, lower weed population was recorded with W₅: HW *fb* 2,4-D@ 1.5 kg/ha + Metribuzine @1.0 kg/ha (7.49, 6.46 and 6.98/m² during both years and pooled analysis, respectively) and was at par with W₆: HW *fb* Readymix-Sulfentrazone 28% + Clomazone 30% wp @ 700 + 750 g/ha

(7.91, 6.89 and 7.40/m² during both years and pooled analysis, respectively). This was followed by W₇ and W₂.

At 90 DAP, total weed population was significantly recorded lower in case of W₂: weed free (31.21, 29.40 and 30.30/m² during both the years and in pooled analysis, respectively) it was statistically comparable with W₅: HW fb 2,4-D@ 1.5 kg/ha + Metribuzine @1.0 kg/ha (33.05, 31.86 and 32.46/m² during both the years and in pooled analysis, respectively) and W₆: HW fb Readymix- Sulfentrazone 28% + Clomazone 30% wp @ 700 + 750 g/ha (33.71, 32.89 and 33.30/m² during both the years and in pooled analysis, respectively) Followed by lower total weed population was observed in W₃ at par with W₇.

Weed Dry Weight at 90 DAP and Final Earthing up (g/m²)

Weed dry weight at 90 DAP and Final earthing up was not significantly varied with different spacing treatments (Table 4&5).

Among weed management treatments, W₂ (weed free) recorded the lowest weed dry weight in both years (18.84 g/m², 18.75 g/m², 18.79 g /m² during both the year and in pooled analysis), this was at par with W₃ (19.69, 19.15 and 19.82 g/m² during both the year and in pooled data), W₅ (20.08, 19.56 and 19.82 g/m² during both the year and in pooled data) and W₇ (20.32, 19.92 and 20.12 g/m during both the year and in pooled analysis. While higher dry weight was recorded in unweeded treatment (50.11, 49.39 and 49.75 g/m² during both the year and in pooled analysis, respectively). Similar treatment trend was observed at earthing up stage.

Weed Control Efficiency and Weed Index

Weed control efficiency (WCE) at final earthing up and Weed Index are presented in Table-4.20. Among the treatments, W₂ (weed-free) recorded the highest weed control efficiency (92.4, 92.5 and 92.5% during 2023–24, 2024–25 and pooled data, respectively). This was closely followed by W₃ (62.9, 62.5 and 62.7%) and W₅ (62.3, 62.1 and 62.2%) W₆ (61.6, 61.6 and 60.6% during) and W₇ (60.34, 60.84 and 61.68% during both the year and in pooled data, respectively). In contrast, W₄ (sugarcane with dhaincha as a smothering crop) recorded considerably lower WCE (33.6, 30.7 and 32.2%), indicating its limited effectiveness in weed suppression (Table 6).

The weed index, which reflects yield reduction due to weed competition. W₃, recorded lower weed index values of 1.83, 1.20 and 1.51% during 2023–24, 2024–25 and pooled analysis, respectively closely followed by W₅ (3.81, 3.84 and 3.77%). Followed by lower weed index (5.69, 5.08 and 5.35%) in W₇. The highest weed index was observed under W₁ (unweeded control) with values of 54.76, 53.69 and 54.23%, indicating maximum yield loss due to severe weed competition.

In the study, weed-free treatment consistently recorded the lowest weed population, dry weight and higher weed control efficiency, indicating complete suppression of crop-weed competition.

However, comparable performance of W₃ (intercultivation followed by hand weeding) and integrated treatments W₅ (HW + 2,4-D + metribuzin), W₆ (HW + mesotrione + atrazine) and W₇ (HW + sulfentrazone + clomazone) suggests that combining mechanical weeding with post-emergence herbicides provides extended weed control by targeting both initial and subsequent weed flushes, ensuring season-long weed control. These weed control results align with previous studies of Singh and Kumar (2013) ^[14], Ombase *et al.* (2019) ^[9], Kadam *et al.* (2023) ^[7], Patel *et al.* (2024) ^[11] and Jaiswal *et al.* (2024) ^[6]. In contrast, unweeded check produced high weed population, dry weight due to no weed control and led to higher yield losses as confirmed with higher weed index.

Cane yield (t/ha)

Among the spacings, S₂: 150 × 30 cm recorded significantly higher cane yield (106.64, 108.58 and 107.61 t/ha) during both the year and in pooled data analysis, respectively). Also, S₁: 120 × 45 cm (96.12, 97.01 and 78 96.57 t/ha, respectively) and S₃: 100 × 60 cm (95.30, 95.85 and 95.58 t/ha) obtained significantly higher cane yield than S₄:120 × 60 cm (85.66, 86.83 and 86.24 t/ha during both the year and in pooled data analysis, respectively) (Table 4). Higher yield advantage under 150 cm × 30 cm aligns with other reports by Ghaffar *et al.* (2012) ^[4], Chaudhari *et al.* (2021) ^[3] and Virdia *et al.* (2023) ^[18] where it was observed that wider inter row and closer intra row spacing increased plant density and yield due to better canopy architecture and resource utilization. The lowest yield recorded under the 120 × 60 cm spacing (S₄) suggested that excessively intra row spacing reduced effective stand and light interception, leading to lower productivity (Table 7).

Weed management significantly influenced sugarcane yield. The weed free treatment (W₂) maintained by hand weeding at 30 day intervals up to 150 DAP produced the highest pooled cane yield (111.76, 112.52 and 112.14 t/ha during both years and pooled data, respectively) which was statistically at par with W₃: Interculturing followed by hand weeding at 30 and 60 DAP (109.72, 111.17 and 110.45 t/ha) and W₅: Hand weeding at 30 DAP + application of 2,4-D@ 1.5kg/ha + Metribuzine @1.0 kg/ha (Post emergence) at 60 DAP (107.5, 108.2 and 107.91 t/ha). In contrast, significantly lower cane yield was recorded under unweeded control (50.56, 52.11 and 51.33 t/ha).

The yield advantage under intercultivation + hand weeding (W₃) and hand weeding fb 2,4-D@ 1.5kg/ha + Metribuzine @1.0 kg/ha as 60 DAP provided effective weed control as weed-free which assisted in expression of full plant potential to gain higher cane yield production. This is consistent with literature, Ballyan *et al.* (2015) ^[2], Ramesha *et al.* (2018) ^[12], Ghodke *et al.* (2020) ^[5] and Patel *et al.* (2024) ^[11] where effective weed management through cultural and chemical methods has been reported to minimize weed biomass and improve cane yield significantly.

Table 2: Effect of weed management on weed population at 60 DAP

Treatment	Monocot			Dicot			Sedges			Total weeds		
	2023-24	2024-25	Pooled	2023-24	2024-25	Pooled	2023-24	2024-25	Pooled	2023-24	2024-25	Pooled
Spacing												
S ₁	3.88 (14.59)	3.96 (15.08)	3.92 (14.84)	4.32 (11.24)	4.16 (11.09)	4.24 (11.17)	4.09 (18.62)	3.93 (16.98)	4.01 (17.80)	6.66 (44.45)	6.57 (43.15)	6.62 (43.80)
S ₂	4.26 (17.42)	4.17 (16.73)	4.21 (17.08)	4.46 (10.67)	4.30 (11.39)	4.38 (11.03)	4.22 (19.06)	4.05 (17.67)	4.14 (18.36)	6.88 (47.15)	6.78 (45.79)	6.83 (46.47)
S ₃	4.03 (15.94)	3.95 (15.22)	3.99 (15.58)	4.37 (11.59)	4.20 (12.29)	4.28 (11.94)	4.13 (19.87)	3.96 (18.30)	4.04 (19.08)	6.81 (47.40)	6.70 (45.81)	6.76 (46.61)
S ₄	4.18	4.09	4.13	4.52	4.37	4.45	4.29	4.13	4.21	7.01	6.90	6.96

	(16.80)	(16.03)	(16.41)	(12.57)	(13.20)	(12.88)	(19.74)	(18.41)	(19.07)	(49.10)	(47.64)	(48.37)
SEm ±	0.13	0.14	0.09	0.09	0.08	0.06	0.12	0.10	0.07	0.20	0.18	0.133
CD ($P \leq 0.05$)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV (%)	14.15	15.79	14.98	9.47	8.60	9.06	13.28	11.92	12.65	13.08	12.41	12.75
Weed management												
W ₁	5.13 (25.47)	5.08 (24.92)	5.11 (25.20)	5.52 (17.89)	5.33 (19.19)	5.43 (18.54)	5.34 (29.30)	5.14 (27.22)	2.54 (28.26)	8.58 (72.66)	8.50 (71.33)	8.54 (72.00)
W ₂	3.49 (11.42)	3.41 (10.85)	3.45 (11.13)	3.74 (8.11)	3.59 (8.08)	3.66 (8.10)	3.46 (13.43)	3.30 (12.26)	3.38 (12.85)	5.77 (32.96)	5.63 (31.19)	5.70 (32.08)
W ₃	3.71 (12.79)	3.67 (12.45)	3.69 (12.62)	3.97 (9.11)	3.86 (9.39)	3.91 (9.25)	3.71 (14.67)	3.58 (13.79)	3.64 (14.23)	6.13 (36.57)	6.05 (35.63)	6.09 (36.10)
W ₄	4.24 (18.00)	4.24 (17.51)	4.24 (17.75)	4.75 (12.67)	4.49 (13.49)	4.62 (13.08)	4.55 (24.51)	4.29 (21.41)	4.42 (22.96)	7.38 (55.18)	7.20 (52.41)	7.29 (53.80)
W ₅	3.96 (14.85)	3.91 (14.43)	3.94 (14.65)	4.26 (10.72)	4.13 (10.95)	4.20 (10.84)	4.02 (17.35)	3.88 (16.21)	3.95 (16.78)	6.60 (42.93)	6.50 (41.6)	6.56 (42.27)
W ₆	3.96 (14.85)	3.94 (14.71)	3.9 (14.78)	4.26 (10.83)	4.16 (11.23)	4.21 (11.04)	4.02 (17.55)	3.91 (16.73)	3.97 (17.14)	6.61 (43.24)	6.57 (42.68)	6.59 (42.96)
W ₇	4.09 (15.92)	4.04 (15.48)	4.07 (15.71)	4.39 (11.30)	4.25 (11.61)	4.33 (11.46)	4.15 (18.40)	4.01 (17.23)	4.09 (17.82)	6.80 (45.64)	6.71 (44.34)	6.76 (44.99)
SEm ±	0.15	0.13	0.14	0.11	0.10	0.09	0.15	0.14	0.10	0.25	0.23	0.18
CD ($P \leq 0.05$)	0.42	0.38	0.28	0.32	0.28	0.30	0.42	0.40	0.38	0.71	0.67	0.58
CV%	12.55	11.53	12.05	8.70	8.10	8.24	12.10	12.20	12.15	12.63	12.05	12.35
Interaction effect (S × W)												
SEm ±	0.30	0.27	0.047	0.22	0.20	0.13	0.29	0.28	0.20	0.50	0.47	0.34
CD ($P \leq 0.05$)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Note: Figures in parenthesis are original data, outside parenthesis are ($\sqrt{X+0.5}$) transformed value

Table 3: Effect of spacing and weed management on weed population at 90 DAP

Treatments	Monocot			Dicot			Sedges			Total weeds		
	2023-24	2024-25	Pooled	2023-24	2024-25	Pooled	2023-24	2024-25	Pooled	2023-24	2024-25	Pooled
Spacing												
S1	3.88 (14.49)	3.96 (15.08)	3.92 (14.79)	3.48 (11.24)	3.45 (11.10)	3.47 (11.17)	3.80 (15.42)	3.66 (14.58)	3.73 (15.00)	6.35 (41.15)	6.31 (40.76)	6.33 (40.95)
S2	4.26 (17.44)	4.17 (16.73)	4.21 (17.09)	3.40 (10.67)	3.49 (11.39)	3.44 (11.03)	4.21 (19.69)	4.10 (18.90)	4.15 (19.29)	6.81 (47.80)	6.75 (47.03)	6.78 (47.41)
S3	4.03 (15.84)	3.95 (15.22)	3.99 (15.33)	3.53 (11.64)	3.61 (12.34)	3.57 (11.99)	4.43 (21.01)	4.31 (20.19)	4.37 (20.60)	6.88 (48.50)	6.81 (47.76)	6.85 (48.13)
S4	4.18 (16.80)	4.09 (16.03)	4.13 (16.41)	3.66 (12.57)	3.73 (13.20)	3.69 (12.88)	4.54 (22.64)	4.44 (22.16)	4.49 (22.40)	7.11 (52.00)	7.05 (51.39)	7.08 (51.70)
SEm ±	0.13	0.14	0.09	0.08	0.05	0.05	0.15	0.13	0.09	0.15	0.12	0.13
CD ($P \leq 0.05$)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV%	14.15	15.79	14.98	10.10	6.95	8.65	16.06	14.15	15.16	8.71	8.38	8.55
Weed Management												
W ₁	5.13 (25.42)	5.08 (24.92)	5.11 (25.17)	4.34 (17.89)	4.49 (19.20)	4.41 (18.54)	7.32 (52.78)	7.38 (53.66)	2.60 (53.22)	9.85 (96.09)	9.93 (97.78)	9.89 (96.94)
W ₂	3.49 (11.35)	3.41 (10.85)	3.45 (11.10)	3.02 (8.11)	3.01 (8.09)	3.01 (8.10)	3.47 (11.75)	3.33 (10.46)	2.50 (11.10)	5.65 (31.21)	5.49 (29.40)	5.57 (30.30)
W ₃	3.71 (12.80)	3.67 (12.45)	3.69 (12.62)	3.18 (9.11)	3.22 (9.39)	3.20 (9.25)	4.05 (15.50)	3.93 (14.48)	2.57 (14.99)	6.19 (37.41)	6.11 (36.32)	6.15 (36.86)
W ₄	4.24 (17.75)	4.24 (17.51)	4.24 (17.63)	3.71 (12.75)	3.80 (13.51)	3.75 (13.13)	5.60 (31.49)	5.53 (30.86)	2.42 (31.17)	7.87 (61.98)	7.88 (61.88)	7.88 (61.93)
W ₅	3.97 (14.84)	3.92 (14.43)	3.94 (14.64)	3.43 (10.72)	3.45 (10.96)	3.44 (10.84)	2.87 (7.49)	2.69 (6.46)	2.52 (6.98)	5.83 (33.05)	5.73 (31.86)	5.78 (32.46)
W ₆	3.97 (14.96)	3.94 (14.71)	3.96 (14.84)	3.44 (10.83)	3.49 (11.29)	3.47 (11.06)	2.95 (7.91)	2.77 (6.89)	2.55 (7.40)	5.88 (33.71)	5.81 (32.89)	5.84 (33.30)
W ₇	4.09 (15.87)	4.04 (15.48)	4.07 (15.68)	3.51 (11.30)	3.55 (11.61)	3.53 (11.46)	3.43 (10.90)	3.28 (9.88)	2.54 (10.40)	6.24 (38.07)	6.16 (36.98)	6.20 (37.53)
SEm ±	0.15	0.13	0.10	0.08	0.06	0.04	0.16	0.14	0.10	0.12	0.10	0.07
CD ($P \leq 0.05$)	0.42	0.38	0.28	0.21	0.18	0.13	0.45	0.39	0.29	0.34	0.30	0.22
CV%	12.55	11.53	12.05	7.39	6.14	6.79	12.85	11.50	12.21	6.13	5.36	5.76
Interaction: S×W												
SEm ±	0.30	0.27	0.20	0.15	0.13	0.09	0.31	0.27	0.20	0.24	0.21	0.15
CD ($P \leq 0.05$)	NS	NS	NS	NS	NS	NS	NS	0.78	NS	NS	NS	NS

Note: Figures in parenthesis are original data, outside parenthesis are ($\sqrt{X+0.5}$) transformed value

Table 4: Weed dry weight at 90 DAP as influenced by different spacing and weed management

Treatments	Weed dry weight at 90 DAP (g/m ²)		
	2023-24	2024-25	Pooled
Spacing			
S ₁ : 120 cm × 45 cm	26.42	25.95	26.19
S ₂ : 150 cm × 30 cm	28.48	28.33	28.40
S ₃ : 100 cm × 60 cm	23.76	23.44	23.60
S ₄ : 120 cm × 60 cm	26.84	26.38	26.61
SEm ±	0.90	0.92	0.643
CD (P ≤ 0.05)	NS	NS	NS
CV (%)	15.58	16.23	15.91
Weed Management			
W ₁ : Unweeded (Control)	50.11	49.39	49.75
W ₂ : Weed free (HW at interval of 30 days up to 150 DAP)	18.84	18.75	18.79
W ₃ : IC fb HW at 30 and 60 DAP	19.69	19.15	19.42
W ₄ : Sugarcane with dhaincha as smothering crop (cutdown @ 50% flowering and mulch)	33.83	34.42	34.12
W ₅ : HW at 30 DAP + application of 2,4-D@ 1.5kg/ha + Metribuzine @1.0 kg/ha (Post emergence) at 60 DAP	20.08	19.56	19.82
W ₆ : HW at 30 DAP + application of Readymix- Mesotrione 2.27% w/w + Atrazine 22.7% w/w SC@ 875 g/ha at 60 DAP	21.76	20.99	21.37
W ₇ : HW at 30 DAP + application of Readymix- Sulfentrazone 28% + Clomazone 30% wp @ 700 + 750 g/ha at 60 DAP	20.32	19.92	20.12
SEm ±	0.91	0.84	0.021
CD (P ≤ 0.05)	2.60	2.40	1.74
CV (%)	11.99	11.25	11.63
Interaction effect: S×W			
SEm ±	1.83	1.69	1.24
CD (P ≤ 0.05)	NS	NS	NS

Table 5: Weed dry weight at earthing up as influenced by different spacing and weed management

Treatments	Weed dry weight at Earthing up (kg/ha)		
	2023-24	2024-25	Pooled
Spacing			
S ₁	453.51	429.62	441.57
S ₂	470.47	473.24	471.85
S ₃	478.21	482.34	480.27
S ₄	513.21	510.00	511.60
SEm ±	16.78	15.15	11.30
CD (P ≤ 0.05)	NS	52.42	NS
SEm ±	16.05	14.65	13.58
Weed Management			
W ₁	1026.72	1006.25	1016.48
W ₂	77.23	75.16	76.20
W ₃	380.55	377.25	378.90
W ₄	680.74	697.24	688.99
W ₅	386.12	381.00	383.56
W ₆	407.15	394.04	400.60
W ₇	393.42	385.66	389.54
SEm ±	20.26	19.12	13.92
CD (P ≤ 0.05)	57.61	54.36	39.09
SEm ±	14.66	13.98	14.33
Interaction: S×W			
SEm ±	40.52	38.23	27.85
CD (P ≤ 0.05)	NS	NS	NS

Table 6: Weed control efficiency and weed index

Treatments	Weed control efficiency			Weed index		
	2023-24	2024-25	Pooled	2023-24	2024-25	Pooled
W ₁	0	0	0	54.76	53.69	54.23
W ₂	92.4	92.5	92.5	0.00	0.00	0.00
W ₃	62.9	62.5	62.7	1.83	1.20	1.51
W ₄	33.6	30.7	32.2	23.6	23.2	23.4
W ₅	62.3	62.1	62.2	3.81	3.84	3.77
W ₆	61.6	61.6	61.6	9.54	9.17	9.33
W ₇	60.3	60.8	60.5	5.69	5.08	5.35

Table 7: Effect of spacing and weed management on cane yield of sugarcane

Treatments	Sugarcane yield (t/ha)		
	2023-24	2024-25	Pooled
Spacing			
S ₁ : 120 cm × 45 cm	96.12	97.01	96.57
S ₂ : 150 cm × 30 cm	106.64	108.58	107.61
S ₃ : 100 cm × 60 cm	95.30	95.85	95.58
S ₄ : 120 cm × 60 cm	85.66	86.83	86.24
SEm ±	1.91	1.97	1.93
CD (P ≤ 0.05)	6.60	6.81	6.71
CV%	9.11	9.29	9.20
Weed Management			
W ₁ : Unweeded (Control)	50.56	52.11	51.33
W ₂ : Weed free (Hand weeding at interval of 30 days up to 150 DAP)	111.76	112.52	112.14
W ₃ : Interculturing followed by hand weeding at 30 and 60 DAP	109.72	111.17	110.45
W ₄ : Sugarcane with dhaincha as smothering crop (cutdown @ 50% flowering and mulch)	85.34	86.34	85.84
W ₅ : Hand weeding at 30 DAP + application of 2,4-D @ 1.5kg/ha + Metribuzine @ 1.0 kg/ha (Post emergence) at 60 DAP	107.5	108.2	107.91
W ₆ : Hand weeding at 30 DAP + application of Readymix- Mesotrione 2.27% w/w + Atrazine 22.7% w/w SC @ 875 g/ha at 60 DAP	101.1	102.2	101.68
W ₇ : Hand weeding at 30 DAP + application of Readymix- Sulfentrazone 28% + Clomazone 30% wp @ 700 + 750 g/ha at 60 DAP	105.4	106.8	106.14
SEm ±	2.48	2.57	2.52
CD (P ≤ 0.05)	7.06	7.32	7.16
CV%	8.97	9.18	9.08
Interaction effect (S × W)			
SEm ±	4.97	5.15	5.04
CD (P ≤ 0.05)	NS	NS	NS

Conclusion

Based on the results of the experiment under South Gujarat conditions, planting sugarcane at 150 × 30 cm spacing coupled with interculturing followed by hand weeding at 30 and 60 DAP (W₃) or hand weeding at 30 DAP followed by application of 2,4-D @ 1.5 kg/ha+ metribuzin @ 1.0 kg/ha at 60 DAP (W₅) can be recommended as effective and economically feasible weed management practices for achieving higher cane yield and efficient weed control in single-eye budded settling planted sugarcane.

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