Int.J.Curr.Microbiol.App.Sci (2018) *7*(5): 3232-3239

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 7 Number 05 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.705.378

Evaluating Effect of Irrigation, Planters and Conservation Tillage on Sugarcane Crop under NWPZ Conditions after Wheat Crop Harvest

Manish Kumar[1*], Ashok Tripathi[2] and Jaya Sinha[1]

[1]Farm Machinery Testing Centre, College of Agricultural Engineering, Dr. Rajendra Prasad Central Agriculture University, Pusa- (Samastipur) 848125, Bihar, India
[2]Department of Farm Machinery and Power Engineering, VIAET, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad – 211007, Uttar Pradesh, India

**Corresponding author*

Keywords

Sugarcane, Irrigation, Tillage, Planters, Ridger, Slit, Yield

Article Info

Accepted:
22 April 2018
Available Online:
10 May 2018

A B S T R A C T

A field experiment was conducted for two consecutive years (2014-15 to 2015-16) at Amroha district of Uttar Pradesh State, India. Different sugarcane planter and conservation tillage practices were tested for intensification and productivity of sugarcane (*Saccharum officinarum* L.) after wheat harvest in Fauladpur research farm of Amroha district in NWP region of Uttar Pradesh. With three replication with different trials, the results of the experiment revealed that the ridger type sugarcane cutter planter showed the highest value in treatment effect of the planters on average sett length (32.69 cm). The lowest value in treatment effect of the ridger type sugarcane cutter planter was average percentage damage buds (4.85 %), average percentage overlapping of setts (31.68 %) and average percentage missing (3.89 %).

Introduction

Sugarcane is a worldwide crop cultivated in 105 countries. Sugarcane has played an important role to improving socioeconomic status of human life from its ancient production to modern day's status.

Sugarcane was mostly utilized as a crop for the purpose of food production of sugar, Jaggery or bura, shakkar and other form of sweetener. For the purpose of maximize the production of sugarcane from per unit area field and highest production of sugar from the sugar factories, researchers have been practices many improved cane varieties and production techniques. Sugarcane has a great economical importance for a farmer due to its versatile nature. Sugarcane is important crop for sugar because it contributes about 64.6% of sugar production.

Sugarcane (*Saccharum officinarum* L.) is an important food cum cash crop and cultivated between 32^0N to 32^0S latitude covering more than 90 countries of the world (Kumar *et al.*, 2017a; Kumar and Tripathi, 2017c). Sugarcane occupies a very prominent position

on the agricultural map of India covering astronomically immense areas in sub-tropics and tropics (Kumar *et al.*, 2017b).

India is one of the highest producers of sweetener (sugar) and it has a tough competition with Brazil for the first rank. The India has shared about 13.25% of the World's and about 41.11% of Asian sugar production and sugarcane is cultivated in about 4.10mn hectares with the yearly production of about 300.25mn tons of sugarcane and 18.90mn tons of sugar**.** In India the major area under this crop presented in subtropical belt covering Uttar Pradesh, Bihar, Punjab, Uttarakhand, Haryana, Rajasthan and Madhya Pradesh; which used about 70% of the cane cultivated area and 50% of the sugarcane production. Sugarcane cultivated highly in Uttar Pradesh and Uttarakhand states which is jointly make 49.74% of the total cane area and about 44.34% of the total cane production in country.

Planting of sugarcane carried a number of operations such as cutting of canes into setts, tillage, furrows opening, use of fertilizer in the furrows, inserting setts and covering these open furrows with a blanket of soil. To suit the varying agro climatic conditions of different states, these operations are sometimes changed and modified and are performed either manually with help of animal drawn or tractor drawn ridge and sugarcane sets are placed and covered manually or by machinery. Thereafter, wooden planked is used to ensure better sett and soil moisture content.

The whole process of sugarcane planting is very labour and time intensive. In order to achieve uniform crop stand, correct seed rate, appropriate depth of setts placements and uniformity of setts with required overlapping are important. By using tractor-drawn sugarcane cutter planter, the economising labour and energy could be reduced. Planting of sugarcane is performed by cuttings setts from a mature plant of sugarcane, rather than from its seed. Although certain types of sugarcane varieties are still producing from the seeds, but the present methods of stem cuttings of mature sugarcane have become the most common method of reproduction of sugarcane. For this purpose, each cutting has at least one bud. There are various methods of the planting of sugarcane such as flat type, trench type, pit type, staggered row and spaced transplanting methods. Farm mechanization of sugarcane production is an essential thing to the modern agriculture, as it enhances better productivity, besides reducing human drudgery and cost of cultivation. Since, the cost of harvesting of sugarcane by mechanized process is almost one third of complete manual process. Thus cane cutter planters are getting good response by the farmers, due to the reduction of unit operations and man power (Kumar *et al.*, 2015).

Planting of any crops creates the ground for it and plays an important role in its production. It is planted in the form of cut setts of 2–3 buds. For preparing setts, manually operated hand tools and power operated sett-cutting machines are used. Tractor operated rotary plough, cultivator and ridger are the main farm equipments, used for tillage and ridge forming operations in sugarcane cultivation.

In the present era of labour shortage and unavailability of animal to do farm operations, there is an urgent need to mechanize sugarcane planting for reducing the cost as well as the human drudgery involved. Under conventional method, the sugarcane sett cutting process is a pre planting practice, while in mechanized system setts cutting is done simultaneously by the planter. This ultimately reduces time, labour and moisture loss in setts of cane and helps in higher germination percentage. Thus to reduce

drudgery and cost of planting, efficient utilization of seed and fertilizer, use of planters is advocated.

Materials and Methods

A field experiment was conducted for two consecutive years (2014-15 to 2015-16) at Amroha district of Uttar Pradesh State, India. Different sugarcane planter and conservation tillage practices were tested for intensification and productivity of sugarcane (*Saccharum officinarum* L.) after wheat harvest in Fauladpur research farm of Amroha district in NWP region of Uttar Pradesh. There were two irrigations, pre- planting irrigation (I_1) and post-planting irrigation (I_2), four planters as Disc type sugarcane cutter planter (P_1), Slit type sugarcane cutter planter (P_2), Ridger sugarcane cutter planter (P_3) and Furrower type sugarcane cutter planter (P_4) and control (P_0) as conventional practice, two tillage as (T_1) Conventional tillage (1 ploughing + 2 harrowing) and Tillage operation by rotary tiller (2 rotavator) (T_2) were tested under RBD (Factorial 2 x 5 x 2) with three replications. The control was the conventional practices of sugarcane planting (furrow opening by the tractor operated ridger and then manual sett placement in the furrows) as prevailing in the district. The plot size was 10 m x8 m and sugarcane variety was CoS-767. The different machine performance and crop parameters were taken during the field operations which are discussed below:

Average sett length (cm)

Average percentage damage buds

This was determined by the dividing the total average number of damaged buds by the total average number of buds in five meter.

$$Avrage\ damaged\ buds\ (\%) = \frac{Average\ nuber\ of\ damaged\ budsin\ 5m}{Average\ number\ of\ the\ buds\ in\ 5m} \times 100$$

Average percentage overlapping of setts

The percentage overlapping of the setts was estimated by the following relationship:

$$Percentage\ overlapping = \frac{l_s - l_p}{l_p} \times 100$$

Where,

l_s = Total sett length in 5 m planted distance, cm

l_p = Observed distance in 5 m

Average percentage missing

The unplanted distance observed during planting was measured in 5m length. The percentage missing area was determined by the following relationship:

$$Percent\ missing\ area = \frac{Unplanted\ distance\ in\ 5m}{5m} \times 100$$

Results and Discussion

Effect of irrigation

Results of the experiment from Table 1 revealed that non significantly the highest value was observed in treatment effect of the irrigation on the *viz.,* that average sett length (30.92 and 31.07 cm) at 2014-15 and 2015-16, average percentage damage buds, average percentage overlapping of setts (28.43) at second year and average percentage missing (3.23) at second year in treatment, respectively (I_1) Pre-planting irrigation. However, non significantly the highest value of average percentage damage buds (4.29 and 4.35) during 2014-15 and 2015-15, average percentage overlapping of setts (28.37) and average percentage missing (3.28) at first year in treatment, respectively in (I_2) Post-planting irrigation.

Table.1 Response of irrigation, planters and tillage on average sett length (cm), average percentage damage buds, average percentage overlapping of setts and average percentage missing of sugarcane

Treatments		Average sett length (cm)		Average percentage damage buds		Average percentage overlapping of setts		Average percentage missing	
		2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
Irrigations (I)									
I_1	Pre- planting irrigation	30.92	31.07	4.22	4.16	28.12	28.43	3.19	3.23
I_2	Post-planting irrigation	30.58	30.63	4.29	4.35	28.37	28.14	3.28	3.14
	F-test	NS	NS	NS	NS	NS	NS	NS	NS
	S. Ed. (±)	2.64	2.47	0.74	0.78	2.19	2.18	0.60	0.64
	C. D. (P = 0.05)	-	-	-	-	-	-	-	-
Planters (P)									
P_0	Conventional practice (Tractor operated ridger) (control)	24.64	25.66	1.55	1.61	11.79	11.39	0.00	0.00
P_1	Disc type sugarcane cutter planter	31.99	31.63	4.97	4.95	32.54	32.32	4.01	3.98
P_2	Slit type sugarcane cutter planter	32.15	32.39	4.86	4.89	32.42	32.32	4.18	4.12
P_3	Ridger sugarcane cutter planter	32.69	32.46	4.93	4.85	31.68	32.35	4.00	3.89
P_4	Furrower sugarcane cutter planter	32.27	32.09	4.97	4.96	32.79	33.04	3.98	3.95
F-test		S	S	S	S	S	S	S	S
S. Ed. (±)		1.27	1.56	0.47	0.49	1.39	1.38	0.38	0.40
C. D. (P = 0.05)		4.78	4.47	1.34	1.42	3.97	3.94	1.09	1.15
Tillage (T)									
T_1	Conventional tillage (1ploughing + 2 harrowing)	30.83	30.91	4.24	4.20	28.10	28.38	3.15	3.17
T_2	Tillage operation by rotary tiller(2 rotavator)	30.67	30.79	4.27	4.31	28.39	28.19	3.32	3.20
F-test		NS	NS	NS	NS	NS	NS	NS	NS
S. Ed. (±)		2.64	2.47	0.74	0.78	2.19	2.18	0.60	0.64
C. D. (P = 0.05)		-	-	-	-	-	-	-	-
Interaction (PxI)									
F-test		NS	NS	NS	NS	NS	NS	S	NS
S. Ed. (±)		1.18	1.10	0.33	0.35	0.98	0.97	0.27	0.28
C. D. (P = 0.05)		-	-	-	-	-	-	0.77	-
Interaction (PxT)									
F-test		NS	NS	NS	NS	NS	NS	S	S
S. Ed. (±)		1.45	1.35	0.41	0.43	1.20	1.19	0.33	0.35
C. D. (P = 0.05)		-	-	-	-	-	-	0.95	1.00
Interaction (IxT)									
F-test		S	S	S	S	S	S	S	S
S. Ed. (±)		1.87	1.75	0.50	0.55	1.55	1.54	0.43	0.45
C. D. (P = 0.05)		5.35	5.00	1.50	1.58	4.44	4.41	1.22	1.29

Table.2 Interaction effect of irrigation, planters and tillage on average sett length (cm), average percentage damage buds, average percentage overlapping of setts and average percentage missing of sugarcane

Treatments		Average sett length (cm)		Average percentage damage buds		Average percentage overlapping of setts		Average percentage missing	
		2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
T_1	$I_1P_0T_1$	25.10	26.03	1.65	1.26	11.53	12.00	0.00	0.00
T_2	$I_1P_0T_2$	25.13	26.13	1.38	1.47	11.20	11.13	0.00	0.00
T_3	$I_1P_1T_1$	32.20	31.47	4.98	4.97	32.23	31.93	4.00	4.01
T_4	$I_1P_1T_2$	31.83	31.83	4.93	4.90	33.37	32.77	4.17	4.17
T_5	$I_1P_2T_1$	31.03	31.97	4.87	4.87	33.07	32.73	3.82	3.82
T_6	$I_1P_2T_2$	33.23	33.23	4.75	4.88	32.27	32.20	4.62	4.62
T_7	$I_1P_3T_1$	34.13	33.47	4.65	4.32	29.90	32.92	3.30	3.80
T_8	$I_1P_3T_2$	31.97	31.95	4.99	4.99	31.83	31.83	3.97	3.97
T_9	$I_1P_4T_1$	31.93	31.93	5.08	5.08	33.38	34.37	4.16	4.17
T_{10}	$I_1P_4T_2$	32.63	32.63	4.90	4.87	32.43	32.43	3.85	3.77
T_{11}	$I_2P_0T_1$	24.83	25.17	1.62	1.87	12.20	11.53	0.00	0.00
T_{12}	$I_2P_0T_2$	23.50	25.30	1.55	1.85	12.23	10.90	0.00	0.00
T_{13}	$I_2P_1T_1$	31.73	31.73	4.98	4.98	31.80	31.80	3.82	3.68
T_{14}	$I_2P_1T_2$	32.20	31.48	4.98	4.96	32.77	32.77	4.05	4.05
T_{15}	$I_2P_2T_1$	32.50	32.50	4.73	4.73	31.80	31.82	4.01	4.00
T_{16}	$I_2P_2T_2$	31.83	31.87	5.08	5.08	32.53	32.53	4.27	4.03
T_{17}	$I_2P_3T_1$	32.49	32.48	4.92	4.92	32.76	32.42	4.18	4.03
T_{18}	$I_2P_3T_2$	32.18	31.94	5.17	5.17	32.24	32.23	4.55	3.75
T_{19}	$I_2P_4T_1$	32.30	32.30	4.95	4.95	32.30	32.30	4.20	4.18
T_{20}	$I_2P_4T_2$	32.20	31.49	4.95	4.94	33.05	33.07	3.69	3.69
Interaction (PxIxT)									
F-test		NS	NS	NS	NS	S	NS	S	S
S. Ed. (±)		0.84	0.78	0.23	0.25	0.69	0.69	0.19	0.20
C. D. (P = 0.05)		-	-	-	-	1.99	-	0.55	0.58

Effect of planters

A perusal of the Table 1 indicates that average sett length (cm) did differ significantly among the planters during both years. The higher value was observed as (32.69 and 32.46) in treatment (P_3) Ridger sugarcane cutter planter for years 2014-15 and 2015-16 respectively.

A perusal of the table also shows that average percentage damage buds (4.97 and 4.96) and average percentage overlapping of setts (32.79 and 33.04) did differ significantly higher the treatment in planters (P_3) Furrower sugarcane cutter planter for the years 2014-15 and 2015-16 respectively. While, in planters significantly higher value of average percentage missing (4.18 and 4.12) during 2014-15 and 2015-16 in treatment (P_2) slit type sugarcane cutter planter respectively. This may be due to sugarcane coming directly in contact with blade center. In this design, cutting was smooth as evident from clean cut obtained. However, feeding rate was labour dependent, which may have caused variation in length of setts. With the advent of sugarcane cutter planters on the scene, where cutting of whole cane into setts is also done simultaneously, planting through machine has become a viable proposition. Slit, ridger type, disc and furrower type sugarcane cutter planters have been developed and successfully tested and demonstrated in the farmer's fields (Singh and Singh 2006).

Effect of tillage

The results indicated from Table 1 revealed that non significantly the maximum value was observed in treatment effect of the tillage on the *viz.*, average sett length (30.83 and 30.91cm) during both of the years and average percentage overlapping of setts (28.8) during 2015-16 in treatment (T_1) Conventional tillage (1 ploughing + 2 harrowing) respectively. However, non significantly the maximum value average percentage damage buds (4.27 and 4.31) during both of the years, average percentage damage buds (28.39) at 2015-16 and average percentage missing (3.32 and 3.20) during in both of the years in treatment, (T_2) Tillage operation by rotary tiller (2 rotavator) respectively.

Interaction effect

A perusal of the data from Table 1 and 2 on average sett length (cm), average percentage damage buds and average percentage overlapping of setts non-significantly during both years by interaction effect of planters with irrigation (PxI) and planters with tillage (PxT) and significantly the highest in interaction of irrigation and tillage (IxT). However, average percentage missing significantly higher during both years by interaction effect of planters with irrigation (PxT) and planters with tillage (IxT). It is also clear that from the data which found interaction effect of planters with irrigation and tillage (PxIxT) in both years. The highest value found *viz.*, average percentage missing (4.62 and 4.62), treatment (T_6) $I_1P_2T_2$ Pre-planting irrigation + Slit type sugarcane cutter planter + Tillage operation by rotary tiller (2 rotavator) during the years 2014-15 and 2015-16, respectively.

However, average sett length (34.13 and 33.47 cm) during both of the year in treatment $I_1P_3T_1$ (T_7) Pre- planting irrigation + Ridger sugarcane cutter planter + Conventional tillage (1ploughing + 2 harrowing), average percentage damage buds (5.17 and 5.17) during both of the year in treatment $I_2P_3T_2$ (T_{18}) Post-planting irrigation + Ridger sugarcane cutter planter + Tillage operation by rotary tiller (2 rotavator), and average percentage overlapping of setts (33.38 and 34.37) during both of the year in treatment

$I_1P_4T_1$ (T_{18}) Pre- planting irrigation + Furrower sugarcane cutter planter + Conventional tillage (1ploughing + 2 harrowing), respectively.

After the analysis of the different treatment of the sugarcane production with the consideration of two irrigation planting field conditions (pre and post- planting irrigation), two tillage (Conventional tillage (1ploughing + 2 harrowing) and Tillage operation by rotary tiller (2 rotavator)) and one conventional and four sugarcane cutter planters for two years. The minimum treatment effect of the average percentage damage buds, average percentage overlapping of setts and average percentage missing of sugarcane in the Ridger sugarcane cutter planter was found during the years in comparison of the other planters and it was (4.85,31.68 and 3.89 %) respectively. Maximum treatment effect of the average sett length was found (32.69 and 32.46 cm) during both year 2014-15 and 2015-16 respectively for Ridger sugarcane cutter planter.

Acknowledgements

Authors express thanks to anonymous reviewers for exhaustive review and constructive comments that helped us lot in improving the manuscript. We gratefully acknowledge the efforts of Dr. Ashok Tripathi, Professor& Head, Department of Farm Machinery and Power Engineering, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad - 211007, U.P. (India).

References

Anon. 2000. AICRP on Ergonomics and Safety in Agriculture (Leaflet), CIAE, Bhopal, India.

Bell, M. J., Halpin, N. V., Garside, A. L., Moody, P. W., Stirling, G. R. and Robotham, B. J. 2003. Evaluating combinations of fallow management, controlled traffic and tillage options in prototype sugarcane farming systems at Bundaberg Proc. Aust. Soc. *Sugar Cane Technol.* Pp. 25.

Chaorakam, Isara, Anek Sukcharoen Thanankorn Jaiphong 2012. Field Evaluation of Subsoiling and Liquid Fertilizer Injection for Minimum Tillage of Sugarcane Planter (Part 1) -Effects of Subsoiling and Liquid Fertilizer Injection on Germination Test. *International Journal of Applied Science and Technology*, (2)7.

Kladivk, S., 2001. Soil acidification and potassium leaching in northeast Thailand. In: Proceedings of Second International Conference on Land Degradation, KhonKaen, Thailand, Pp. 25-29.

Kumar Manish, Tripathi Ashok, 2015. "To Study of the Different Modes of Tillage for the Performance of Sugarcane Cutter Planter". International Research Journal of Engineering and Technology (IRJET) Volume: 02 Issue: 03 | June-2015.

Kumar Manish, Tripathi Ashok, 2017 c. "Study of the Different Types of Sugarcane Planter in India". IOSR-Journal of Agriculture and Veterinary science (JAVS), Vol. 10(7), 01-07.

Kumar Manish, Tripathi Ashok, D'souza M Prashant and Kumar Devesh, 2017 a, A study on the performance on productivity of sugarcane crop with different combination of tillage operations, International journal of agricultural engineering. Vol. 10, Issue 2, Page No. 340-346.

Kumar Manish, Tripathi Ashok, Kumar Devesh and Kumar Sumit, 2017 b, Study of the Effect of Pre and Post Irrigation on Different Tillage Treatments for Different Planter on

Soil's Physical Properties, International journal of agricultural engineering. Vol. 10, Issue 2, Page No. 409-415..

Lavelle, R., 2000. Introductory remarks. In: Horn, R., van den Akker, J.J., Arvidson, J. (Eds.), Subsoil Compaction: Distribution, Processes and Consequences, Advances in Geoecology, 33, 32-43.

Mandal, C. R. and Manji, R. K. 2008. Role of Japan in promotion of agricultural mechanization in India. *Agricultural Mechanization in Asia.* America and Latin America, 44(4): 15-17.

Maraddi E 2008. *Agricultural Machinery Costing Methods and Standards*. Published by South African Sugarcane Research Institute, Mount Edgecombe, South Africa.

Muhammad Ashraf, Muhammad Shafi Sabir, Manzoor Ahmed and Muhammad Younis. 2003. Effects of different tillage systems on bulk density and sugarcane yield. *Pakistan Journal of Life and Social Sciences*. 1(1): 69-71.

Pawar S. and Bukhtar. R. 2011. Performance Feasibility and Economic Viability of Sugarcane Planter in Western Plane Zone of Uttar Pradesh, India, *Sugar Tech* (2): 101–108.

Salunkhe JN, Bhoyal J, and Tiwari AL. 2001. Development and modification of machinery for an improved farming system in the Australian sugar industry. *Proc IntSocSug Cane Technol*26: 103-113.

Sharma M.P., Singh, J. and Singh A. K. 1995. Mechanization of Sugarcane Cultivation in India, *Sugar Tech.*, 04(4): 310–314

Singh M. A. and Singh S. 2006: Response of sugarcane canopy development to water stresses. *Field Crops Research*, 98: 91-97.

How to cite this article:

Manish Kumar, Ashok Tripathi and Jaya Sinha. 2018. Evaluating Effect of Irrigation, Planters and Conservation Tillage on Sugarcane Crop under NWPZ Conditions after Wheat Crop Harvest. *Int.J.Curr.Microbiol.App.Sci.* 7(05): 3232-3239.
doi: https://doi.org/10.20546/ijcmas.2018.705.378