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Effect of various potassium sources on suru sugarcane ratoons under different irrigation regimes in inceptisols

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Abstract
An field experiment was conducted to test effect of various potassium sources on growth, and yield of suru sugarcane ratoon under different irrigation regimes in inceptisols of MPKV, Rahuri, Maharashtra. Application of water as per crop evapotranspiration demand can help to precisely apply water to sugarcane. However, there was need to evaluate on how sugarcane reacts to decreased water quantity through drip irrigation. So different irrigation regimes viz., 60%, 80% and 100% ETc level were experimented. Nutrient use efficiency of conventional potassic fertilizer MOP is also a low due to fixation of potassium in soil and losses with water percolation. India meets most of its potassium fertilizer demands through exports causing heavy burden on government. Polyhalite as a source of potassium is naturally occurring mineral which contains four major nutrients viz., Potassium, Calcium, Magnesium and Sulphur has been gaining recognition in recent years worldwide due to its multi-nutrient, slow-release nature and better results in many crops when compared with MOP. So different combinations viz., 100:0, 50:50, 75:25 and 100:0 levels of Potassium through Polyhalite and MOP respectively were tried as source of potassium to supply recommended dose of fertilizer to suru sugarcane ratoon. Results indicate that significantly higher growth and yield attributes sugarcane ratoons were obtained with drip irrigation at 100% ETc (Crop evapotranspiration) regime, however results were at par with irrigation at 80% ETc regime. Thus, water saving to the tune of 20 percent can be achieved by applying drip irrigation on alternate day at 80% ETc demand under shortage of water availability. Among the potassium sources, application of potassium through Polyhalite alone or in combination with MOP at 75:25 percent respectively, resulted in higher growth and yield of sugarcane ratoon.

Keywords: Potassium, sugarcane, crop evapotranspiration, drip irrigation and polyhalite

Introduction
Sugarcane is an important commercial crop of India and playing key role in the national economy. In India, Sugarcane is cultivated in around 50 lakh ha area with production of about 405.42 million tonnes and productivity of 80.11 tonnes ha^{-1} during 2018-19 with highest sugar production of 331.30 lakh tonnes (Anonymous, 2020) [1-2]. Molasses, sugar and Khandsari etc., are produced from the juice of sugarcane. Production of the crop is mainly located in the states of Uttar Pradesh, Maharashtra, Tamil Nadu, Karnataka and Gujarat. Sugarcane cultivation needs temperature of 15 degree to 40 degree and rainfall of 100 to 150 centimeters and fertile loamy soil or hard soil. Sugarcane is a long duration crop which produces huge amounts of biomass, requiring large quantities of water, which typically are supplied through 25-30 irrigation cycles per crop season. In India, the sugar industry is the second largest agriculture based industry after textile fibers (Nandhini and Padmavathy, 2017) [12].
Water stress has a negative impact on sugarcane development and productivity. Improving sugarcane survival and growth rates during periods of water stress is important to achieve sustainable agronomic production in northern India. Sugarcane quality and performance under water stress can be measured in terms of crop water use efficiency (WUE) (Bhatt *et al.*, 2020) [8]. Sugarcane is a very highwater demanding crop, as an average 10,000-12,000 m^3 of water is required to produce 100 t ha^{-1}. Due to changing climatic scenario inadequate supply of water will result in great yield penalty up to 60 percent (Gentile *et al.*, 2015) [9]. On an average 20 megalitres of water ha^{-1} is required by the crop to fulfill its metabolic activities, evapo-transpiration and losses during the course of irrigation and thereafter (Shrivastava *et al.* 2011)

[13]. Rapid expansion of sugarcane and dominant water use to irrigate sugarcane in the low-rainfall areas has raised concerns regarding water scarcity and allocation in Maharashtra (Anonymous, 2016) [3]. In 1999, the Maharashtra Water and Irrigation Commission recommended that sugarcane should be banned in areas that received less than 1000 mm rainfall per year and many water experts have repeated similar recommendations. Nevertheless, 82% of sugarcane cultivation falls in regions with low-rainfall where farmers have limited assess to surface irrigation.

This indicates that there is need to utilize the available water judiciously (Anonymous, 2016) [3].

However, scheduling of irrigation through drip also need to be made precise. There are different approaches to scheduling drip irrigation, one such approach is crop evapotranspiration demand approach. Drip irrigation at 2, 3 and 4-day intervals produced 20, 16 and 13 percent higher cane yield than furrow irrigation at 75 mm cumulative pan evaporation (CPE) in which the cane yield was 131.4 t ha^{-1} (Singandhupe *et al.*, 2008) [14]. Application of water as per crop evapotranspiration demand can help to precisely apply water to sugarcane and can help to save excess use of this precious resource. So, there was a need to understand precise level of irrigation required through drip based on crop evapotranspiration demand to save water without reducing the yield significantly.

Similarly, to sustainably cultivate sugarcane second important factor is judicious use of nutrients, as under application may lead to significant yield and quality loss, as well as depleting the soil (Bhatt *et al*., 2021) [6-7]. It is estimated that for every 100 tonnes of sugarcane produced, key nutrient requirements are: nitrogen (N) 208 kg ha^{-1}, phosphorus (P) 53 kg ha^{-1}, potassium (K) 280 kg ha^{-1}, sulphur (S) 30 kg ha^{-1}, iron (Fe) 3.4 kg ha^{-1}, manganese (Mn) 1.2 kg ha^{-1} and copper (Cu) 0.6 kg ha^{-1}. While sugarcane K requirements are high (above those of N and P), in practice, little K is applied, even in K-deficient soils (Bhatt *et al.*, 2011) [19]. Sugarcane is heavy feeder of Potassium (K). The most important function of K in sugarcane is improvement in cane quality by converting reducing sugars to recoverable sugars. The excess K in plant tissues interferes in sugar process due to scale formation in pans. Its demand may exceed 800 kg/ha. Agronomic value of K rests with increased cane volume, girth and weight per cane, drought and disease resistance and reduced lodging. In rations, K is essential to realize high yield and quality and response was more than for Nitrogen and Phosphorus (Hunsigi, 2011) [10]. Muriate of potash (MOP) is most commonly used and concentrated source of potassium in India to meet potassium nutrition demand of crops (Bhatt and Singh, 2021) [6-7]. However, MOP contains chlorine and it is claimed in recent researches that it reduces sugar recovery in sugarcane. Watanabe *et al.* (2016) [17] reported that sucrose concentration in sugarcane juice gets affected due to chlorine component of KCl or MOP. As well as nutrient use efficiency of conventional potassic fertilizer (MOP) is also a low due to fixation of potassium in soil and losses with water percolation.

Polyhalite is naturally occurring mineral which contains four out of six major nutrients *viz.*, Potassium, Calcium, Magnesium and Sulphur. Earlier research has concluded positive effect of sulphur and magnesium on growth and yield of sugarcane. Polyhalite as a source of potassium has been gaining recognition in recent years worldwide due to its multi-nutrient, slow-release nature and better results in many crops when compared with MOP (Yermiyahu *et al.*, 2019; Barbarick, 1991) [18, 4]. Ratoons, which frequently provide lower yields than plant cane because modern agricultural practices are not used, occupy more than 50 to 55 percent of land that is planted with sugarcane in India. Therefore, it is evident that even a slight enhancement in ratoon management techniques would significantly increase total sugarcane yield, quality and sugar recovery (Van Der *et al.*, 2013) [15]. The management of water and nutrients is essential for enhancing sugarcane performance during ratooning. So, considering balanced source of potassium now available in the form of Polyhalite, there was a need to investigate different sources of potassium *viz*. MOP and Polyhalite regarding their effects on growth, yield, quality of sugarcane ratoons and economics of sugarcane ratoons as well as scheduling of drip irrigation at different levels of crop evapotranspiration and interaction between these two factors.

After considering above investigations, an experiment was planned to test effect of various potassium sources on growth, and yield of suru sugarcane ratoon under different irrigation regimes in inceptisols of MPKV, Rahuri, Maharashtra with objectives to study the effect of irrigation regimes and sources of potassium on growth and yield of sugarcane ratoon I and II.

Material and Methods

A field experiment was carried out at All India Cordinated Research Project on Irrigation water management, Mahatma Phule Krishi Vidypeeth, Rahuri, during 2020-21 and 2021-22. Experimental plot is geographically situated at 19^{0}37' North lattitude and 74^{0}64' East longitude. The altitude of experimental site is about 447 m above the mean sea level. Soil was medium deep black and well drained. Topography of land was fairly levelled. Depth of the soil was about 1.5 m. Soil samples were taken before starting of experiment on ratoons after the harvest of plant crop in february 2020. Similarly treatment plotwise samples were drawn after harvest of each ratoon from all indiviual plots by making 'v' shape pits to depth of 20 cm. These samples were used to analyse for various soil chemical and physical properties.

The highest mean daily air temperature was recorded was 38.5 °C during May of month 2020 where as lowest mean daily temperature recorded was 14.2 °C in the month of December during 2000. Total annual rainfall of 1285 mm was recorded during first ratoon with 63 rainy days. Maximum rainfall of about 311.4 mm was received in month of June during first ratoon.

The highest mean daily air temperature recorded was 37.7 °C in the month of April where as lowest mean daily temperature recorded was 13.7 °C in the month of January of during 2022. Total annual rainfall of 940 mm was recorded during second ratoon with 53 rainy days. Maximum rainfall of about 246 mm in was received in month of September during second ratoon.

After removal of plant cane on 1st of February 2020 experimenatal site were laid out into different plots. Transfer of excess trash to bunds was carried out to mark out the plots and buffer zones. Experimental plot was laid out in a split plot design to with three replications.

Experiment consisted of three levels of irrigation regimes in the main plots (I_1, I_2 and I_3) and seven levels of potassium fertilizer combinations in the sub plots (F_1, F_2, F_3, F_4, F_5, F_6 and F_7) which made the total treatment combinations of 21. Irrigation was given with drip irrigation layout however fertilizer sources were applied mannualy to keep uniform method of application for different sources. Sugarcane variety CoM 0265 was selected for experiment with recommended dose of fertilizer 215:115:115 kg ha^{-1} of N, P_2O_5 and K_2O respectively.

Treatment details

Symbols	Treatments
	Main plot treatments: Irrigation regimes (I)
I_1	60% ETc through drip at alternate day
I_2	80% ETc through drip at alternate day
I_3	100% ETc through drip at alternate day
	Sub plot treatments: Fertilizer levels (F)
F_1	0% N: 0% P_2O_5: 0% K_2O kg ha^{-1} (Absolute control)
F_2	75% N: 75% P_2O_5:*%75* K_2O of RDF kg ha^{-1} through *conventional fertilizers + 100% **Recommended dose of Mg and S kg ha^{-1}
F_3	75% N: 75% P_2O_5 %: 75% K_2O of RDF (100% K_2O through Polyhalite)
F_4	100% N: 100% P_2O_5: 100% K_2O of RDF kg ha-1 through conventional fertilizers
F_5	100% N: 100% P_2O_5: 100% K_2O of RDF kg ha-1 (50% K_2O through MOP + 50% K_2O through Polyhalite)
F_6	100% N: 100% P_2O_5: 100% K_2O of RDF kg ha-1 (25% K_2O through MOP + 75% K_2O through Polyhalite)
F_7	100% N: 100% P_2O_5 :100% K_2O (100% K_2O through Polyhalite)

Conventional fertilizer sources used for experiment were Urea for nitrogen, DAP for phosphorus and MOP as source of potassium. **Mg @ 10 kg ha^{-1} through $Mgso_4$ and S @ 40 kg ha^{-1} through elemental sulphur. As source of organic manure, 10 t of FYM was applied after harvest of plant cane to all plots except absolute control F1.

For recording of observations initialy, five sugarcane plants from each plot were randomly selected, lebelled with pegs and tags and subsequently used for recording biometeric observations at regular intervals *viz*. 60, 120, 180, 240, 300 days after ratooning and at harvest. Observations such as plant height, number of tillers, leaf area, number of internodes, girth and length of middle internode/cane were recorded. During maturity period, the clumps were randomly selected for quality studies *viz*. brix, pol, purity and CCS (%). Similarly at harvest average cane weight, canes per clump and cane yield were recorded.

The leaf area studies were undertaken at bi-monthly interval from 60 days upto harvest. The maximum length and width of third, fourth, fifth and sixth leaves mean was calculated from the top of main shoot was measured in centimetre and converted in decimetre. It was then multiplied with the total number of leaves were determined in the five selected plant. The leaf area of individual leaves of the plant was calculated by multiplying with a factor, 0.6274 (Bathla and Sharma 1978) [5].

A = (L x B) K

Where,
A = Leaf area of individual leaf (dcm2)
L = Maximum length of leaf (dcm)
B = Maximum leaf width (dcm)
K = Correction factor (0.6274)

The mean leaf area of selected leaves was multiplied by number of leaves per plant to arrive at the leaf area per plant and expressed in deci-meter square.

The five canes selected from dry matter sampling rows were cut at the base and separated into stem and leaves, chapped separately and kept for air drying in shade. The semi dried material was kept in hot air oven at 65-70 °C still it reaches constant weight and oven dry weight was recorded. After weighing, the total dry matter production was calculated and was converted into tons per hectare. Malleable canes refer to the canes that have attained normal height and thickness at their physiological maturity and are ready to harvest for processing.

Number of millable canes in each experimental unit was counted at harvest and then converted into number of millable canes per net plot.

Harvesting of sugarcane ratoon was done when crop attained peak maturity based on quality assessment. The canes from the experimental plot were harvested by cutting at the base close to the ground level. Then it was de-trashed, de-topped at appropriate level, bundled and weighed. The yield was recorded for indiviual plot and expressed as tonnes ha^{-1} .

The malleable canes from each plot were counted and their number was calculated on hectare basis. The number of visible internodes of five randomly selected canes were counted and recorded at harvest. The mean values were worked out and expressed as number of internodes/cane. The length of centrally located internode of five randomly selected plants were recorded at harvest. The mean values were worked out and expressed as cm. The girth of five randomly selected canes was measured from the base, middle and top internodes with the help of tape in centimeters and averaged to get cane girth of each treatment plot at harvest. The weight of five randomly selected canes was recorded and averaged to get Cane weight in each treatment plot. Canes were harvested from indiviual plot after de-trashing and removal of top from plants, the weight of millable cane and tops as per treatments were recorded. This weight is then converted into yield per net plot. Cane yield obtained per net plot was converted into cane yield per hectare area and expressed in tonne ha^{-1}.

Water requirement (Scheduling of irrigation by drip system)

The main (75 mm), sub main (63 mm), manifold (50 mm) and lateral (16 mm) were used for installation of drip system. One lateral was provided for each bed at a spacing of 120 cm with pressure compensating emitters fitted on lateral at 37 cm. The design discharge through emitter was 4 lph with operating pressure maintained 1.20 kg cm^{-2} at control head with the help of control valve. In all, ten emitters were fixed on each lateral. The irrigation water requirement was calculated on alternate day basis by using pan evaporation data and crop factor. The quantity of water applied through emitter and time of operation of drip unit was estimated by using following standard formula. The depth of water application was calculated using the formula given in FAO paper 36 (Vermerin and Jobling, 1980) [16]

ETc = CPE x Kp x Kc

Where,
ETc = Evapotranspiration of crop (mm) of two days
CPE = Cumulative Pan evaporation of two days (mm)
Kp = Pan factor**,** Kc = Crop factor as per crop growth stage
ETca = ETc x Wa (Karmeli and Keller, 1975) [11]

Where,
ETca = Actual evapotranspiration of crop of two days (mm)
Wa = Wetted area (0.70)

Results and discussion

Effect of irrigation regimes on growth attributes of sugarcane ratoon Different irrigation regimes had a considerable influence on growth attributes of sugarcane *viz*., plant height, number of leaves, leaf area, number of internodes, number of tillers, girth of cane and dry matter production. In general, higher values of growth attributes at harvest *viz*., plant height (267.3 cm), leaf area (63.7 dm^2 $plant^{-1}$), number of tillers (5.55), number of internodes (21.36) per plant, girth of cane (10.57 cm) and dry matter production (38.25 t ha^{-1}) were recorded in I_3 (100% ETc) irrigation regime which remained at par with I_2 (80% ETc) regime. This indicate that 20% water saving can be possible without significant reduction in growth attributes of sugarcane.

Significantly lower values of growth attributes was recorded in I_1 (60% ETc) irrigation regime at harvest. Significantly lower growth attributes of sugarcane *viz*., plant height (247.4 cm), leaf area (57.8 dm^2 $plant^{-1}$), number of internodes (19.63), number of tillers (5.15) , girth of cane (10.03) and dry matter production (28.69 t ha^{-1}) were recorded in I_1 (60% ETc) irrigation regimes.

Effect of potassium sources on growth attributes of sugarcane ratoons

Different potassium sources had a considerable influence on growth attributes of sugarcane *viz*., plant height, number of leaves, leaf area, leaf area index, number of tillers at harvest during ratoon I and II. In general, potassium sources level F_7 (100% RDF N, P + 100% K through Polyhalite) recorded significantly higher plant height (279.9 cm), leaf area (64.9), number of internodes (22.7), number of tillers (5.74), girth of cane (11.33 cm) and dry matter production (39. 82 t ha^{-1}) than conventional potassium sources level F_4 (100% RDF N, P + 100% K through MOP). However, it was at par with level F_6 (100% RDF N, P + 75% K through Polyhalite and 25% K through MOP) and F_5 (100% RDF N, P + 50% K through Polyhalite and 50% K through MOP) level at these intervals.

Significantly lowest values of these growth attributes *viz*., plant height (212.4 cm), leaf area (52.8 dm^2 $plant^{-1}$), number of tillers (4.4), girth of cane (8.13 cm) and dry matter production (19.81 t ha^{-1}) were recorded in level F_1 (0% RDF N, P, K) which was absolute control. This could be attributed to availability to basal dose to all treatments except F_1.

Effect of irrigation regimes on yield contributing characters and yield of sugarcane ratoons

Different irrigation regimes had a considerable influence on yield contributing characters *viz*. weight of millable cane $plant^{-1}$, number millable canes ha^{-1} and yield of sugarcane ratoons. In general, higher number of millable cane 74.22 thousand ha^{-1}, weight of millable cane 1.74 kg $plant^{-1}$ and cane yield 130.13 t ha^{-1} of sugarcane ratoon pooled data were recorded in I_3 (100% ETc) irrigation regime which remained at par with I_2 (80% ETc) regime. This indicate that 20% water saving can be possible without significant reduction in yield contributing characters and yield of sugarcane ratoons.

However, significantly lower values of number of millable cane 68.02 thousand ha^{-1}, weight of millable cane 1.53 kg $plant^{-1}$ and cane yield 105.28 t ha^{-1} sugarcane ratoon pooled data were recorded in I_1 (60% ETc) irrigation regime. This indicate that sugarcane ratoons could not grow at their full potential with 40 percent stressed application of water.

Effect of potassium sources on yield contributing characters and yield of sugarcane ratoons

Significantly higher number of malleable canes 77.30 thousand ha^{-1}, weight of millable cane 1.82 kg $plant^{-1}$ and cane yield 71.85 t $ha^{-1}$of ratoon I and ratoon II pooled data, was noticed in potassium sources level F_7 (RDF N, P + 100% K through Polyhalite) than conventional potassium sources level F_4 (100% RDF N, P + 100% K through MOP). However, it was at par with level F_6 (100% RDF N, P + 75% K through Polyhalite and 25% K through MOP) and F_5 (100% RDF N, P + 50% K through Polyhalite and 50% K through MOP) level at these intervals. Significantly lowest values of number of malleable canes 56.25 thousand ha^{-1}, weight of millable cane 1.27 kg $plant^{-1}$ and cane yield 71.85 t $ha^{-1}$of ratoon I and ratoon II pooled data, were recorded in level F_1 (0% RDF N, P, K) which was absolute control.

Table 1: Effect of irrigation regimes and potassium sources on growth attributes of sugarcane ratoons pooled data (2020-22).

Tr. No.	Treatment	Pooled Biometric observations^{-1}					
		Plant height (cm)	Leaf area (dm^2)	No. of internodes	No. of tillers	Girth of cane (cm)	Dry matter production (gm $plant^{-1}$)
I.	Irrigation regimes (ETc %)						
I_1	60%	247.4	57.8	19.63	5.15	10.03	28.69
I_2	80%	263.9	62.6	20.95	5.47	10.30	34.42
I_3	100%	267.3	63.7	21.36	5.55	10.57	36.25
	S.Em. ±	0.81	0.36	0.14	0.03	0.03	0.37
	C.D. at 5%	3.16	1.40	0.56	0.12	0.13	1.45
F.	Potassium source levels						
F_1	0% N: 0% P_2O_5: 0% K_2O kg ha^{-1} (Absolute control)	212.4	52.8	15.76	4.40	8.13	19.80
F_2	75% N: 75% P_2O_5:75% K_2O of RDF kg ha^{-1} through *CF + *Mg @ 10 kg ha^{-1} + S @ 40 kg ha^{-1}	250.1	59.9	19.77	5.28	9.64	29.78
F_3	75% N: 75% P_2O_5 : 75% K_2O of RDF kg ha^{-1} (K_2O through Polyhalite)	248.5	60.5	19.90	5.32	9.77	30.69
F_4	100% N: 100% P_2O_5: 100% K_2O of RDF kg ha^{-1} through *CF	273.0	63.5	21.93	5.63	10.94	36.39
F_5	100% N: 100% P_2O_5: 100% K_2O of RDF kg ha^{-1} (50% K_2O through MOP + 50% K_2O through Polyhalite)	275.3	63.7	22.15	5.66	11.06	36.94
F_6	100% N: 100% P_2O_5: 100% K_2O of RDF Kg ha^{-1} (25% K_2O through MOP + 75% K_2O through Polyhalite)	277.6	64.3	22.33	5.71	11.20	38.41
F_7	100% N: 100% P_2O_5 :100% K_2O (100% K_2O through Polyhalite)	279.9	64.9	22.70	5.74	11.33	39.82
	S.Em. ±	0.86	0.65	0.24	0.07	0.15	0.55
	C.D. at 5%	2.46	1.86	0.68	0.19	0.42	1.58
	Interaction (I x F)						
	S.Em. ±	1.49	1.12	0.41	0.11	0.25	0.95
	C.D. at 5%	4.46	NS	NS	NS	NS	NS
	General mean	259.5	61.4	20.65	5.39	10.30	33.12

Table 2: Effect of irrigation regimes and potassium sources on yield contributing characters and yield of sugarcane ratoon pooled data (2020-22)

Tr. No.	Treatment	Pooled data yield & yield contributing characters		
		Millable canes (000 ha^{-1})	Millable cane weight (kg $plant^{-1}$)	Cane yield (t ha^{-1})
I.	**Irrigation regimes (ETc %)**			
I_1	60%	68.02	1.53	105.28
I_2	80%	73.03	1.70	125.50
I_3	100%	74.22	1.74	130.13
	S.Em. ±	0.47	0.02	1.60
	C.D. at 5%	1.84	0.06	6.30
F.	**Potassium source levels**			
F_1	0% N: 0% P_2O_5: 0% K_2O kg ha^{-1} (Absolute control)	56.25	1.27	71.85
F_2	75% N: 75% P_2O_5:75% K_2O of RDF kg ha^{-1} through *CF + *Mg @ 10 kg ha^{-1} + S @ 40 kg ha^{-1}	70.05	1.58	110.97
F_3	75% N: 75% P_2O_5 : 75% K_2O of RDF kg ha^{-1} (K_2O through Polyhalite)	70.57	1.60	113.21
F_4	100% N: 100% P_2O_5: 100% K_2O of RDF kg ha^{-1} through *CF	75.52	1.75	132.56
F_5	100% N: 100% P_2O_5: 100% K_2O of RDF kg ha^{-1} (50% K_2O through MOP + 50% K_2O through Polyhalite)	75.87	1.77	134.59
F_6	100% N: 100% P_2O_5: 100% K_2O of RDF Kg ha^{-1} (25% K_2O through MOP + 75% K_2O through Polyhalite)	76.74	1.80	138.34
F_7	100% N: 100% P_2O_5 :100% K_2O (100% K_2O through Polyhalite)	77.30	1.82	140.59
	S.Em. ±	1.03	0.02	1.75
	C.D. at 5%	2.95	0.06	5.02
	Interaction (I x F)			
	S.Em. ±	1.78	0.04	3.03
	C.D. at 5%	NS	NS	NS
	General mean	71.76	1.66	120.30

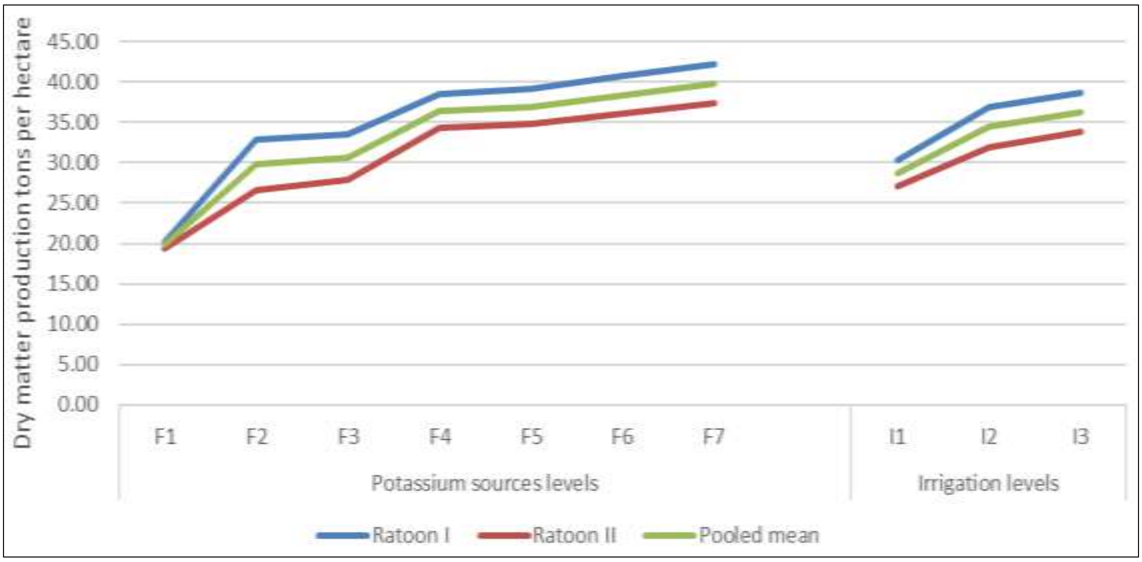

Fig 1: Effect of potassium sources and irrigation levels on dry matter production of suru sugarcane Ratooon I, Ratoon II and Pooled grown in Inceptisols

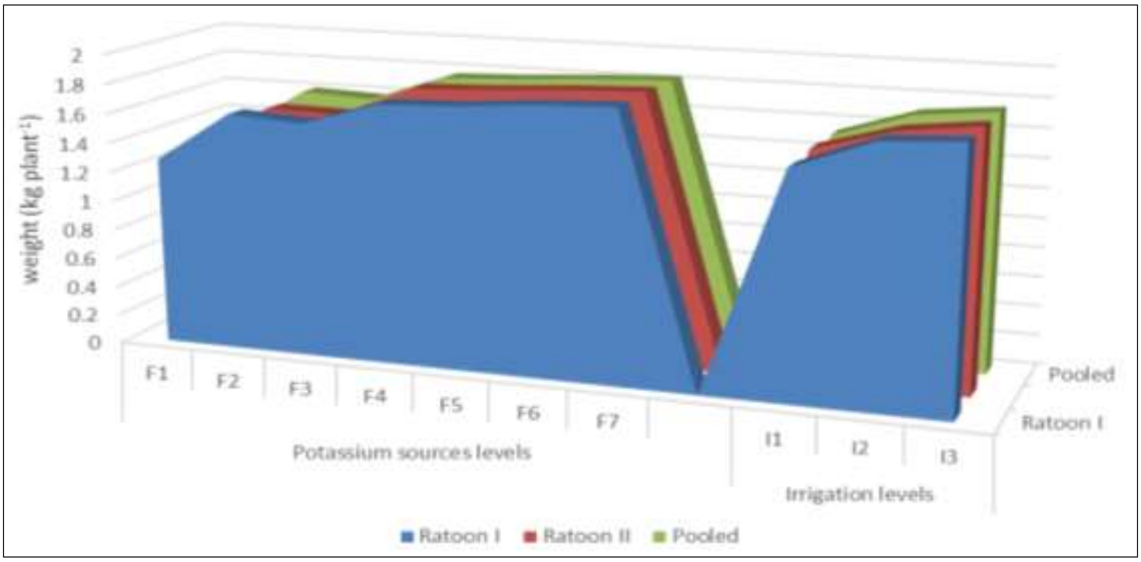

Fig 2: Effect of potassium sources and irrigation regimes on weight of millable cane per plant at harvest of suru sugarcane ratoon-I, II and Pooled.

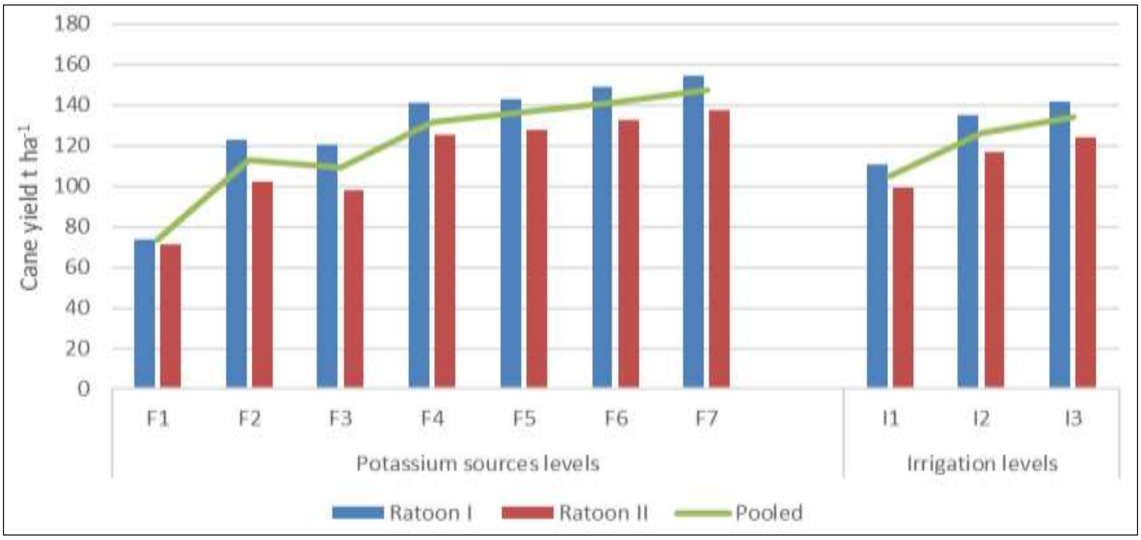

Fig 3: Effect of potassium sources and irrigation levels on cane yield tons per hectare at harvest of suru sugarcane ratoon-I, II and Pooled mean grown in Inceptisols.

Conclusion

Significantly higher growth and yield attributes sugarcane ratoons are obtained with irrigation regime I_3 (100% ETc) when recommended dose of fertilizer was applied. Thus, it is recommended to apply drip irrigation at 100% ETc regime (or 80% ETc regime in case of water deficit). Water saving to the tune of 20 percent can be achieved by applying drip irrigation on alternate day at 80% of crop evapotranspiration (ETc) demand which resulted in at par growth and yield of sugarcane ratoons compared to irrigation at 100% ETc demand level.

Among the potassium sources *viz*. MOP and Polyhalite, application of potassium through potassium source polyhalite alone or in combination with MOP at 75:25 percent level for better growth, yield, quality and economic returns of sugarcane ratoons.

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