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Research Article

ECONOMICS OF *RABI* SORGHUM (*Sorghum Bicolor* (*L.*) Moench) AS INFLUENCED BY DIFFERENT DRIP IRRIGATION LEVELS

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Abstract- The field experiment was conducted during *rabi* 2014-2015 with CSH-16 sorghum hybrid at Water Technology Center, College farm, College of Agriculture, Rajendranagar, Professor Jayashankar Telangana State Agricultural University, Hyderabad to study the influence of different drip irrigation levels i.e. drip irrigation at estimated 0.6 ETc throughout the life (I_1), 0.8 ETc throughout the life (I_2), 1.0 ETc throughout the life (I_3), 1.2 ETc throughout the life (I_4), 0.6 ETc up to flowering 0.8 ETc later on (I_5), 0.6 ETc up to flowering 1.0 ETc later on (I_6), 0.6 ETc up to flowering 1.2 ETc later on (I_7), 0.8 ETc up to flowering 1.0 ETc later on (I_8), 0.8 ETc up to flowering 1.2 ETc later on (I_9) and in addition to surface furrow irrigation at 0.8 IW/CPE ratio (I_{10}) on economics of *rabi* sorghum. The results indicated that growing of *rabi* sorghum was economically viable as net returns and B: C ratio (₹. 1, 29,774 and 3.85, respectively) were significantly higher with drip irrigation at estimated ETc of 1.2 throughout the life compared to surface furrow irrigation at 0.8 IW/CPE ratio (₹. 96,014 and 3.49, respectively) and B: C ratio was on par with each other (3.85 and 3.49).

Keywords- Drip Irrigation, surface furrow irrigation and sorghum economics.

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Introduction

Sorghum (*Sorghum bicolor* (L.) Moench) is one of the main staple crops for the world's poorest and most food-insecure people. It belongs to the family *Poaceae*, used for food , fodder, the production of alcoholic beverages and biofuels. It is truly a dual-purpose crop where both grain and stover are highly valued outputs. In large parts of the developing world, stover represents up to 50 per cent of the total value of the crop, especially in drought years. Sorghum is the fifth most important cereal crop and is the dietary staple for more than 500 million people in 30 countries and grown in an area of 40 million ha in 105 countries of which USA, India, México, Nigeria, Sudan and Ethiopia are the major sorghum producers. [5] The sorghum area in India is 6.10 million ha (2012-13), out of which 3.78 million ha in the post rainy (*rabi*) season and in Telangana it is grown in 1.09 lakh ha area with productivity of 1015 kg ha^{-1}, respectively [2]. Water is increasingly becoming scarce because of erratic distribution of monsoons and uncontrolled exploitation of ground water. The global challenge for the coming decades is to increase the food fodder and fiber production, with less utilization of water and as water is a limiting input in near future. The present experiment initiated to maximize net returns of *rabi* sorghum with less water.

Materials and Methods

The field experiment was conducted during *rabi* 2014-2015 with CSH-16 sorghum hybrid at Water Technology Center, College farm, College of Agriculture, Rajendranagar, Professor Jayashankar Telangana State Agricultural University, Hyderabad on a sandy clay loam soil, alkaline in reaction and non-saline, low in available nitrogen, high in available phosphorous and available potassium, medium in organic carbon content with field capacity and Permanent wilting point of 21.7 and 9.60 per cent, respectively having available soil moisture of 76.50 mm in 0- 45 cm depth, the recommended dose of fertilizer 100-60-40 kg NPK ha^{-1}, entire dose of P and K was applied as basal before sowing and N applied as fertigation in 6 splits of equal doses at 10 days interval from 15 days after sowing (DAS). The experiment was conducted in a randomized block design with ten treatments of drip irrigation schedules *viz.,* drip irrigation at 0.6 ETc throughout the life (I_1), 0.8 Etc throughout the life (I_2), 1.0 Etc throughout the life (I_3), 1.2 ETc throughout the life (I_4), 0.6 ETc up to flowering 0.8 ETc later on (I_5), 0.6 ETc up to flowering 1.0 ETc later on (I_6), 0.6 ETc up to flowering 1.2 ETc later on (I_7), 0.8 ETc up to flowering 1.0 ETc later on (I_8), 0.8 ETc up to flowering 1.2 ETc later on (I_9) in addition to surface furrow irrigation at 0.8 IW/CPE ratio (I_{10}) and replicated thrice. The data was analyzed statistically and N, P and K were estimated by following standard procedures. Sorghum was shown on October 2014 adopting a spacing of 0.40 m between rows and 0.15 m between plants to mean population of 1,66,666 plants ha^{-1}. Irrigation was scheduled based on USWB class a pan evaporation rates by estimating ETc by adopting suitable pan coefficient based on daily wind speed and relative humidity and crop coefficient as per crop stage as per FAO [1].

Results and Discussions

Cost of cultivation *rabi* sorghum varied from 35708 to 36874 (₹ ha^{-1}) in different treatments. Main variation in cost of cultivation was land preparation; weed control, cost of water and man power required for irrigation among treatments. Gross returns from drip irrigated *rabi* sorghum varied among different treatments and significantly higher (₹.1, 16,396 ha^{-1}) gross returns were recorded with drip irrigation scheduled at estimated ETc of 1.2 throughout the life compared to drip irrigation at 0.6 or 0.8 ETc throughout the life, 0.6 ETc up o flowering and 0.8 or 1.0 ETc later on and surface furrow irrigation at 0.8 IW/CPE ratio and was on par with deficit drip irrigation at estimated 0.8 ETc up to flowering and 1.0 or 1.2 ETc later on, drip irrigation at 0.6 ETc up to flowering and 1.2 ETc later on and drip irrigation at 1.0 ETc throughout the life irrigation scheduling treatments [Table-1]. Significantly lower gross returns (₹.72,515 ha^{-1}) were recorded at estimated 0.6 ETc throughout the life drip irrigation scheduling treatment than all other of the treatments studied. Whereas sorghum gross returns obtained under surface furrow irrigation at 0.8 IW/CPE ratio were significantly lower (₹.106142 ha^{-1}) compared to drip irrigation treatments of 0.8 or 1.0 or 1.2 ETc throughout the life, drip irrigation at 0.8 ETc up to flowering and 1.0 or 1.2 ETc later on and drip irrigation at 0.6 ETc up to flowering and 1.2 ETc later on and it was on par with drip irrigation at 0.6 ETc up to flowering 1.0 ETc later on, though significantly higher than drip irrigation at 0.6 ETc up o flowering and 0.8 ETc later on and 0.6 ETc throughout the life drip irrigation scheduling treatments.

Table-1 *Cost of cultivation, Gross, Net returns (₹ ha^{-1}) and B: C ratio of rabi sorghum as influenced by different drip irrigation treatments.*

Treatment	Cost of cultivation (₹ ha^{-1})	Gross returns (₹ ha^{-1})	Net returns (₹ ha^{-1})	B:C ratio
I_1 - Drip Irrigation at estimated 0.6 ETc throughout the life	35730	72515	60605	2.03
I_2 - Drip Irrigation at estimated 0.8 ETc throughout the life	36111	116396	104359	3.22
I_3 - Drip Irrigation at estimated 1.0 Etc throughout the life	36493	129716	117552	3.55
I_4 - Drip Irrigation at estimated 1.2 ETc throughout the life	36874	142065	129774	3.85
I_5 - Drip Irrigation at estimated 0.6 ETc up to flowering and 0.8 ETc later on	35960	90590	78603	2.52
I_6 - Drip Irrigation at estimated 0.6 Etc up to flowering and 1.0 ETc later on	36190	109895	97832	3.04
I_7 - Drip Irrigation at estimated 0.6 ETc up to flowering and 1.2 ETc later on	36420	132052	119912	3.63
I_8 - Drip Irrigation at estimated 0.8 ETc up to flowering and 1.0 ETc later on	36341	132294	120181	3.64
I_9- Drip Irrigation at estimated 0.8 ETc up to flowering and 1.2 ETc later on	36571	138309	126119	3.78
I_{10}- Surface furrow irrigation at 0.8 IW/CPE ratio with irrigation water of 50 mm	30386	106142	96014	3.49
Mean	35708	116997	105095	3.29
SEm±		5073	5042	0.15
C.D (P=0.05)		15073	14980	0.45
CV		7.5	8.3	8.0

Net returns of drip irrigated *rabi* sorghum obtained at estimated ETc of 1.2 throughout the life treatment (₹. 1, 29,774) was on par with drip irrigation at 0.8 ETc up to flowering and 1.0 or 1.2 ETc later on, drip irrigation at 0.6 ETc up to flowering and 1.2 ETc later on and drip irrigation at estimated 1.0 ETc throughout the drip irrigation scheduling treatments and significantly higher than the rest of the treatments [Table-1] Drip irrigation scheduling of 0.6 ETc throughout the life recorded significantly lower net returns (₹.60, 605) than the rest of the treatments and decrease in net returns were 53.3 per cent compared to drip irrigation at 1.2 ETc throughout the life. Significantly lower net returns of *rabi* sorghum obtained under surface furrow irrigation at 0.8 IW/CPE ratio (₹. 96,014) than drip irrigation at 1.0 or 1.2 ETc throughout the life, 0.6 ETc up to flowering and 1.2 ETc later on and 0.8 ETc up o flowering and 1.0 or 1.2 ETc later on and it was on par with drip irrigation scheduling treatment estimated ETc of 0.8 throughout the life, though it was higher than drip irrigation 0.6 ETc up to flowering and 0.8 ETc later on and 0.6 ETc throughout the life and decrease in net returns were 26.0 per cent compared to 1.2 ETc throughout the life and 23.9 per cent compared to 0.8 ETc up to flowering and 1.2 ETc later on.

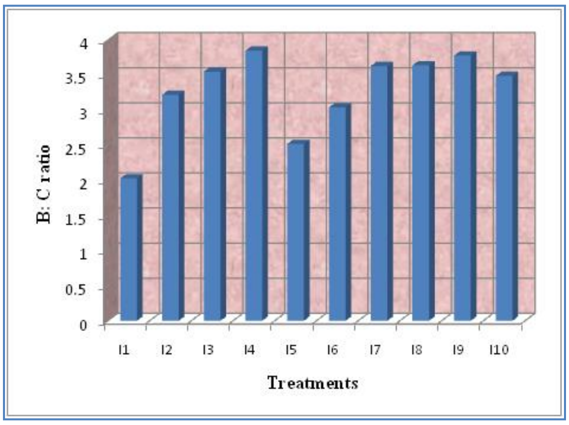

Fig-1 B:C ratio of *rabi* sorghum as influenced different drip irrigation treatments

B:C ratio of drip irrigated *rabi* sorghum recorded at estimated ETc of 1.2 throughout the life (3.85) significantly higher than rest of the drip irrigation scheduling treatments except surface furrow irrigation at 0.8 IW/CPE, deficit drip irrigation at 0.8 ETc up to flowering and 1.0 or 1.2 ETc throughout the life and 0.6 ETc up to flowering and 1.2 ETc later on treatments [Table-1] and [Fig-1]. B:C ratio obtained under deficit drip irrigation with 0.8 ETc up to flowering and 1.0 or 1.2 ETc throughout the life and 0.6 ETc up to flowering and 1.2 ETc later on were found to be at par with the with drip irrigation at estimated ETc of 1.2 throughout the life. Deficit drip irrigation at estimated ETc of 0.6 throughout the life recorded significantly lower B:C ratio (2.03) to rest of the drip irrigation scheduling treatments. Surface furrow irrigation at 0.8 IW/CPE ratio recorded significantly higher B:C ratio (3.49) than deficit drip irrigation at 0.6 ETc throughout the life and 0.6 ETc up to flowering and 0.8 ETc later on and it was on par with rest of the treatments. Similar results reported by [3] and [4].

Conclusion

B:C ratio of drip irrigated *rabi* sorghum recorded at estimated ETc of 1.2 throughout the life (3.85) was on par with surface furrow irrigation at 0.8 IW/CPE, drip irrigation with 0.8 ETc up to flowering and 1.0 or 1.2 ETc throughout the life and 0.6 ETc up to flowering and 1.2 ETc later on treatments and significantly higher than rest of the drip irrigation scheduling treatments. Growing of *rabi* sorghum under drip irrigation was economically viable as net returns were significantly higher with drip irrigation at estimated ETc of 1.2 throughout the life compared to surface furrow irrigation at 0.8 IW/CPE ratio (₹. 96,014 ha^{-1}) and B:C ratio was on par with each other (3.85 and 3.49).

Conflict of Interest: None declared

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