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Effect of drip irrigation and bioregulators on water use efficiency and fruit yield of round gourd (*Praecitrullus fistulosus*)

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Abstract

A field experiment was conducted during 2011 and 2012 at Niche Area Excellence Farm, Bikaner to study the effect of drip irrigation and bio-regulators on water use efficiency and fruit yield of round gourd (*Praecitrullus fistulosus*). The treatments consists of three drip irrigation schedules viz. 60, 80 and 100% ETc and four levels of bioregulators viz. control (water spray), thiourea (500 ppm), N-acetyl cysteine (20ppm) and TGA (100 ppm) foliar spray twice at vegetative and flowering stage. One absolute control was taken and the crop was grown with surface irrigation using recommended package of practices. The experiment was conducted in randomized block design and replicated thrice. Results indicated that there was increase in fruit yield with increase in irrigation levels from 60% to 100% ETc and the highest fruit yield of 328.8 q/ha was recorded with 100% ETc.. The study further revealed that number of fruit per plant increase with increasing level of irrigation upto 100% ETc. Among the bioregulators fruit yield was maximum in N-acetyl cysteine @ 20ppm (319.5 q/ha) spray as compared to thiourea (500ppm) and TGA (100ppm) spray where yields were 314.5 and 319.5 q/ha, respectively. The study also indicated that number of fruits per plant, fruit weight and water use efficiency (WUE) were higher in bioregulators spray as compared to water spray (control).

Key words: *Bioregulators- thiourea, N-acetyl cysteine, TGA, drip irrigation level, round gourd, fruit yield, water use efficiency.*

Introduction

Rajasthan, particularly western region comes under hyper arid zone with very scarce water resource. Thus, more crop per drop of water is main motto of any agricultural production system in these region of the state. Round gourd (*Praecitrullus fistulosus*) the major cucurbitaceous vegetable of the region is grown extensively in this area. However, the yield level is very poor even with higher amount of water use. Drip irrigation maintains moisture content at near about field capacity in one hand and eliminates water losses on other hand. Devaranavadgi *et al*, 2011 reported that drip irrigation (100% ET) produced superior values for plant height, average fruit length, fruit weight, fruit girth and fruit yield/ha in bitter gourd. Sulphydryl (-SH-) compounds improve phloem translocation of photosynthate and thus enhance crop productivity. So, they act as bioregulators and play an important role in improving water use efficiency through enhanced phloem translocation and yield formation in arid regions. Thiourea (500 ppm) significantly increased yield and quality of tubers in potato (Mani *et al*, 2013). Beside thiourea, N-acetyl cysteine and thioglycolic acid (TGA) also may enhance fruit yield and water use efficiency of round gourd. The information on bioregulators, and drip irrigation on round gourd growth and yield are meager. Hence, there is a felt need to generate precise information on irrigation requirement of round gourd through drip and effect of bio-regulators on round gourd in summer season.

Materials and Methods

A field experiment was conducted on round gourd during summer season of 2011 and 2012 at Niche Area Excellence Farm, S K Rajasthan Agricultural University, Bikaner situated in western hyper arid zone of Rajasthan. The soil was sandy loam in nature, having field capacity 6.50%, PWP 1.8%, bulk density 1.51 g /cc, pH (1:2) 8.4, electrical conductivity (1:2) 0.2 dS/m. The soil is very low in organic matter (0.11%) and medium in available P (32.4 kg/ ha) and high in available K (336 kg/ ha). The experiment was laid out in randomized block design with three replications. The treatments consist of three irrigation levels (60%, 80% and 100% ETc) and four bio-regulators levels (conrol-water spray, thiourea @ 500ppm, N- acetyl cysteine @

20ppm and TGA @ 100 ppm) foliar spray at vegetative and flowering stage. The irrigation treatments were compared with control i.e., crop grown with surface irrigation.. The total irrigation water provided were 326.26, 426.26 and 526.3 mm at 60%, 80% and 100% ETc, respectively including the rainfall of 26.2 mm (Table 1). Where as, in control 10 irrigation each of 60 mm was applied and thus total 626.2 mm water was applied including rainfall. Ground water was beyond 10 m throughout the growth period. Round gourd variety Tinda Ludhiana was sown on 14th March using seed rate of 12 kg/ha in crop geometry of 120 cm x 60 cm and finalally harvested on 30th June in both the years. In total plucking of fruits were done for 5 to 6 times in both the years. All the cultural operations were carried out as per recommendations.

Table 1. Monthwise irrigation events and irrigation water applied mean of two years

Month	Irrigation events	Irrigation water applied through drip (mm)	
	60% ETc	80% ETc	100% ETc
March (14 to 31)	22.15	29.53	36.91
April	84.5	112.67	140.84
May	130	173.33	216.66
June (1-21)	63.41	84.53	105.69
Total	300.06	400.06	500.1
Rainfal	26.2	26.2	26.2
Total (Including rainfall)	326.26	426.26	526.3

Water used in control (surface irrigation): 626.2 mm

Results and Discussions

Irrigation levels

Increasing irrigation levels from 60% to 100% ETc under drip increased fruit yield (Table 2). The highest fruit yield of 328.8 q/ha was recorded at 100% ETc against 320.8 and 293.3 q/ha with 80% and 60% ETc irrigation through drip, respectively. However 60% and 80% ETc and 80% and 100% ETc gave at par fruit yield. All the drip irrigation levels gave significantly higher yield than surface irrigation which recorded 112.6 q/ha fruit yield.

Drip irrigation levels of 60%, 80% and 100% ETc saved water by 299.94, 199.94 and 99.96 mm, respectively over surface irrigation which used 626.2 mm water. Hence, increased yield coupled with less water use in drip irrigation recorded higher water use efficiency (WUE) of 89.88, 75.24 and 62.47 kg/ ha-mm at 60%, 80% and 100% ETc, respectively against 17.96 kg/ ha- mm under surface irrigation (Table 2). Lower water use efficiency in surface irrigation (absolute control) may be due to loss of irrigation water from sandy loam soil through deep percolation resulted in higher water use but lowered fruit yield. Drip irrigation system saved quite a large amount of water, which can be useful in horizontal expansion of crop area in summer season when mostly irrigated crops are raised

Table 2. Effect of irrigation and bioregulators on yield, yield attributes, water use and water use efficiency of round gourd (pooled of two years)

Treatment	Fruit yield (q/ha)	No. of fruits/ plant	Fruit Weight (g)	Water use (mm)	WUE (kg/ha-mm)
Drip irrigation level					
60%	293.3	12.5	189.4	326.26	89.88
80%	320.8	14.4	201.7	426.26	75.24
100%	328.8	14.7	205.5	526.30	62.47
Surface irrigation	112.5	9.5	115.6	626.2	17.96
CD at 5%	8.6	1.1	2.5	-	-
Bioregulator spray					
Control	305.5	13.3	195.6	426.28	71.67
Thiourea (500 ppm	314.5	13.9	198.8	426.28	73.79
N-acetyl cysteine (20 ppm)	319.5	14.3	201.9	426.28	74.96
TGA (100 ppm)	317.4	14.0	199.1	426.28	74.47
CD at 5%	9.9	NS	2.8	-	-

in Rajasthan.

Bio-regulator

Highest fruit weight of round gourd was recorded with N-acetyl cysteine (20 ppm) foliar spray (201.9 g) as compared to control (195.6 g) , thiourea spray @ 500 ppm (198.8 gm), TGA @ 100 ppm (199.1 g). Similarly, though not significant N-acetyl cysteine @ 20 ppm foliar spray also gave the highest number of fruit per plant than all other bioregulators spray. Thus, increased yield attributes with foliar spray of N-acetyl cysteine (20 ppm) recorded higher fruit yield (319.5 q/ha) over thiourea spray @ 500 ppm (314.5 q/ha), TGA @ 100 ppm (317.4 q/ha) and control (305.5 q/ha)). However, fruit yield in control and thiourea, thiourea and N-acetyl cysteine and N-acetyl cysteine and TGA were at par (Table 2).

Interaction effect

Highest fruit yield (300.6 q/ha) with the bioregulator spray of N-acetyl cysteine compare to all other bioregulator treatments at drip irrigation level of 60% ETc which was at par with 80% ETc in control (315.6 q/ha) (Table 3). Similarly, fruit yield in 80% ETc at N-acetyl cysteine @ 20 ppm (324.5 q/ha) was at par with 100% ETc with or without bioregulator spray. Thus, application of N-acetyl cysteine @ 20 ppm can save 20% irrigation water. It is further observed that at 80 and 100% ETc bioregulators gave at par yield with no spray treatment. However, at 60% ETc N-acetyl cysteine gave significantly higher yield than control.

Table 3. Inter action effect of irrigation and bioregulator on fruit yield and water use efficiency

Tratment	Fruit yield (q/ha)			Water use efficiency (kg/ha-mm)		
	60% ETc	80% ETc	100% ETc	60% ETc	80% ETc	100% ETc
Control	280.5	315.6	320.5	85.97	74.03	60.89
Thiourea (500 ppm	294.5	320.5	328.6	90.26	75.18	62.43
N-acetyl cysteine (20 ppm)	300.6	324.5	333.5	92.13	76.12	63.36
TGA (100 ppm)	297.5	322.4	332.5	91.18	75.63	63.17
CD at 5%	17.1			-		

References

Devaranavadgi,V. S., Shirahatti, S.S. and Patil, M.G. 2011.Effect of different drip irrigation level on growth and yield of bitter gourd (*Momordica chanrantia* L.) in semi arid conditions of Karnataka. *International Journal of Agricultural Engineering*, 4(2):179-182.

Mani, F. , Bettaieb, T. , Zheni, K., Doudech, N and Hannachi, C. 2013. Effect of thiourea on yield and quality of potato (*Solanum tuberosum* L.). *Journal of Stress Physiology & Biochemistry*, 9(1):87-95.

Manjunatha, M.V. and Manjunatha, Hebbara. 2003. Response of ridge gourd to various levels of drip and surface irrigation in saline vertisols of canal command, Karnataka. *Asian Journal of Soil Science*, 5(2):257-260.