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Research Paper

Influence of irrigation scheduling and mulching on yield and economics in summer sweet corn

■ SUSHMA B. SONPURE, S.S. ILHE AND S.C. WADILE

See end of the paper for authors' affiliations

Correspondence to :

SUSHMA B. SONPURE
Department of Agronomy, College of Agriculture, DHULE (M.S.) INDIA

ABSTRACT : A field experiment was carried out at Post Graduate, Research Farm of Agronomy Section in the College of Agriculture., Dhule in summer season of 2014 to study the influence of irrigation scheduling and mulching on yield and economics in summer sweet corn.The results of present investigation showed that, with different irrigation and mulching treatments significantly increased the green cob and fodder yield. But, the interaction effect between irrigation scheduling and mulching found to be non-significant. From the present study, it is observed that, irrigation treatment IW/CPE ratio 1.00 gave highest green cob yield (190.82 q ha^{-1}) and fodder yield (348.66 q ha^{-1}) with maximum gross monetary returns (Rs. 243045 ha^{-1}), net monetary returns (Rs. 169113 ha^{-1}) and higher benefit cost ratio (3.26). While, mulching@ 5 t/ha. gave highest green cob yield (175.43 q ha^{-1}) and fodder yield (342.55q ha^{-1}) with higher gross monetary returns (Rs. 226808 ha^{-1}), net monetary returns (Rs.153983 ha^{-1}) and higher benefit cost ratio (3.11). Whereas, the minimum green cob and fodder yield with lower economics were recorded in irrigation treatment as per critical growth stages and without mulching. The mulching is done by using chick pea husk after 10th day from the common irrigation.

KEY WORDS : Sweet corn, Irrigation scheduling, Mulching

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INTRODUCTION :

Maize (*Zea mays* L.), has the highest production potential among present day cereals. It is used as staple food for human, feed for animals and has wide industrial uses. Maize being a C_4 plant has high photosynthetic efficiency and high yield potential that is why it is called a "Miracle crop" or Queen of cereals". In India, area and production of maize is 9233 "000" hectare and 23673"000" tones, respectively, with average productivity of 2564 kg ha^{-1} during 2015 (Anonymous, 2016). In Maharashtra, the area and production of maize is about 1059"000" hectare and 2203 "000" tones, respectively, with average productivity of 2080 kg ha^{-1} during 2015 (Anonymous, 2016). Hence, there is lot of scope to increase the yield of maize in India. Sweet corn can be a promising cash crop of the Khandesh region. It can be alternative to cotton based cropping system, as it is a short duration crop, maturing in 85 to 95 days. Cobs have good market potential. In addition to this, at harvest, plants are in green stage with good vigoure which can be used

as nutritious and palatable fodder for the animals. Considering the commercial demand of sweet corn its productivity needs to be increased. Therefore, considering the importance of these aspects in sweet corn production, an experiment was planned on influence of irrigation scheduling and mulching on yield and economics in summer sweet corn.

MATERIALS AND METHODS :

The field experiment was conducted at Post Graduate Research Farm, Agronomy Section, College of Agriculture., Dhule which is situated in Agro-climatic zone 3 and 4 *viz.*, scarcity zone of Northern Maharashtra. It lies between 20.4^{0}N latitude and 74^{0}E longitudes. The altitude is 258 m above mean sea level. Climatologically, this area falls in the sub-tropical region at the North. Generally, monsoon commences by second forth night of June and retreats at the end of September with the average annual rainfall of 607 mm. This is realized entirely from South-West monsoon. The rainfall is mostly received in 34 to 40 rainy days. Experimental plot was clay in texture and slightly alkaline in reaction. The soil was very low in available nitrogen, low in phosphorus and very high in available potassium. The soil was free from any kind of salinity or sodicity hazards. The experiment was laid out in Split Plot Design with four replications and eight treatments combination during summer season 2014. The crop was dibbled on 19th February, 2014 at the depth of 3-5 cm keeping inter row spacing of 60 cm using recommended seed rate of 15 kg ha^{-1}. Recommended dose of fertilizer (120:60:40 kg NPK ha^{-1}) was applied to sweet corn through urea, single super phosphate (SSP) and murate of potash (MOP), respectively. Nitrogen was applied in 3 split doses *viz.*, 1/3rd at sowing, 1/3rd at knee height and 1/3rd at tasseling stage and other agricultural operations were carried out as per package of practices. The chickpea husk was used as mulching material @ 5 t ha^{-1}. The mulch was applied as per the treatments after 10th day from the common irrigation with the help of manual labour.

Treatment details :

Main plot treatments (*Irrigation scheduling*):

I_1 =As per critical growth stages
I_2 = IW/CPE ratio 1.00
I_3 = IW/CPE ratio 0.80
I_4 = IW/CPE ratio 0.60.

Sub-plot treatments (*Mulching*) :

M_1 = With mulch - 5t ha^{-1}
M_2 = Without mulch.

Gross returns (Rs. ha^{-1}):

The gross monetary returns were calculated by considering prevailing market prices of sweet corn cobs and green fodder at the time of harvest.

Net monetary returns (Rs. ha^{-1}):

The net monetary return was calculated by deducting the cost of cultivation from the gross returns.

Net returns (Rs. ha^{-1}) = Gross income (Rs. ha^{-1}) – Total cost of cultivation (Rs. ha^{-1}).

Benefit cost ratio:

It is the ratio of gross monetary returns to cost of cultivation.

$$\mathbf{B : C} = \frac{\textbf{Gross returns (Rs. ha}^{-1}\textbf{)}}{\textbf{Cost of cultivation (Rs. ha}^{-1}\textbf{)}}$$

RESULTS AND DATA ANALYSIS :

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Yield attributing character:

Effect of irrigation scheduling :

The significantly higher values of green cob yield (190.82 kg ha^{-1}) and green fodder yield (348.66 kg ha^{-1}) were recorded in the treatment IW/CPE ratio 1.0 than rest of treatments of irrigationare presented in Table 1and depicted in Fig. 1. Similar results reported by Khan *et al.* (1996); Shivakumar *et al.* (2011); Leta *et al.* (1998); Hussaini *et al.* (2001); Kumar *et al.* (2001) and Shivakumar *et al.* (2011). Higher yield produced might be due to higher values of leaves and leaf area, could have been resulted into higher synthesis of photoassimilate and thereby higher dry matter and ultimately yield. Whereas, the minimum green cob and forage yield with lower economics were recorded in irrigation treatment as per critical growth stages and without mulching.

Effect of mulching:

The significantly higher values of yield attributing characters, green cob yield (175.43 q ha^{-1}) and green

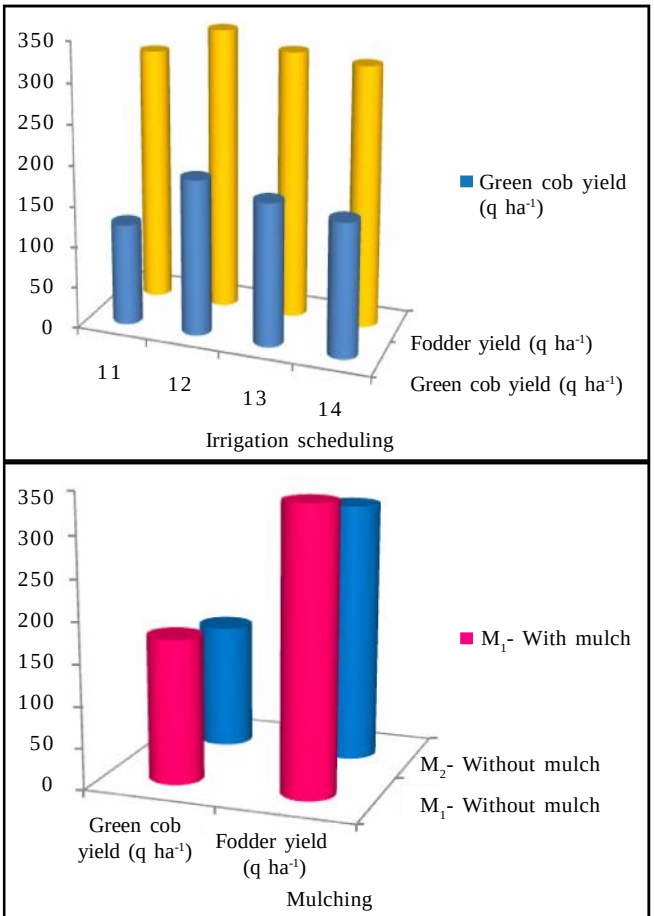

Fig. 1 : Green cob and fodder yield as influenced by different treatments

fodder yield (342.55 q ha^{-1}) were recorded in mulching than without mulching. Similar results reported by Gosavi (2009) and Pinjari (2007). The interaction effect between irrigation scheduling and mulching on yield attributes were found to be non-significant.

Economics :

Effect of irrigation scheduling :

The economics of irrigation scheduling in sweet corn is influenced significantly are presented in Table 2. The data revealed that significantly higher gross monetary return of Rs. 243045 ha^{-1} recorded in the treatment IW/CPE ratio 1.0. Similar result was reported by Painyuli *et al.* (2013). This might be due to higher yield of cob and green fodder in sweet corns. The experimental result showed variation in the cost of cultivation due to irrigation scheduling. The economic data revealed that higher cost of cultivation of Rs. 73932 ha^{-1} recorded in the treatment IW/CPE ratio 1.0. This might be due to the increased number of irrigation and yield. Whereas, the minimum cost of cultivation were recorded in treatment irrigation scheduling as per critical growth stages. The significantly higher net monetary return of Rs. 169113 ha^{-1} recorded in the treatment IW/CPE ratio 1.0 as compared to other treatment. Whereas, significantly minimum net monetary return (Rs.103828 ha^{-1}) was recorded in the treatment irrigation scheduling as per critical growth stages. Similar result was also reported by Painyuli *et al.* (2013). This

Table 1 : Effect of irrigation scheduling and mulching on yield in sweet corn

Treatments	Green cob yield (q ha^{-1})	Fodder yield (q ha^{-1})
Main plot treatment (irrigation scheduling)		
I_1 . As per critical growth stages	124.47	314.96
I_2 - IW/CPE ratio 1.0	190.82	348.66
I_3 - IW/CPE ratio 0.8	174.61	328.89
I_4 - IW/CPE ratio 0.6	163.62	320.18
S.E. ±	0.66	0.75
C.D. (P=0.05)	2.14	2.40
Sub plot treatment (mulching)		
M_1 - With mulch	175.43	342.55
M_2 - Without mulch	151.25	313.80
S.E. ±	0.06	0.58
C.D. (P=0.05)	0.21	1.80
Interaction (A x B)		
S.E. ±	0.13	1.17
C.D. (P=0.05)	N.S.	NS
General mean	163.34	328.17

NS= Non-significant

Table 2 : Economics of irrigation scheduling and mulching in sweet corn

Treatments	Gross monetary returns (Rs. ha^{-1})	Cost of cultivation (Rs. ha^{-1})	Net monetary returns (Rs. ha^{-1})	B : C
Main plot treatment (irrigation scheduling)				
I_1 - As per critical growth stages	171710	67882	103828	2.53
I_2- IW/CPE ratio 1.0	243045	73932	169113	3.26
I_3- IW/CPE ratio 0.8	223954	69336	153618	3.22
I_4- IW/CPE ratio 0.6	211474	68757	141717	3.07
S.E. ±	642.83	…..	642.79	…..
C.D. (P=0.05)	2055.27	…..	2055.49	…..
Sub plot treatment (mulching)				
M_1- With mulch	226808	72825	153983	3.11
M_2 - Without mulch	198288	67812	130471	2.92
S.E. ±	131.65	…..	131.65	…..
C.D. (P=0.05)	405.67	…..	404.83	…..
Interaction (Main x sub)				
S.E. ±	263.30	…..	263.91	…..
C.D. (P=0.05)	NS	…..	NS	…..
General mean	22546	70091	142455	3.01

NS= Non-significant

might be due to less cob and green fodder yield as compared to other treatments. The highest B:C (3.26) was recorded in the treatment IW/CPE ratio 1.0. Similar result was reported by Jadhav *et al.* (1993). Whereas, the minimum B:C (2.53) was recorded in the treatment irrigation scheduling as per critical growth stages.

Effect of mulching:

The treatment mulching with chickpea husk (@ 5 t ha^{-1}) was recorded higher gross monetary return (Rs. 226808 ha^{-1}), cost of cultivation (Rs. 72825 ha^{-1}), net monetary returns (Rs. 153983 ha^{-1}) and B:C (3.11) as compared to the treatment without mulch. The higher gross and net monitory returns might be due to the more cob and fodder yield resulted due to mulching. Similar results were reported by the Gosavi (2006); Pinjari (2007) and Singh *et al.* (2002). The higher cost of cultivation was recorded with the treatment of mulch than without mulch treatment. This might be due to the cost of mulch. Similar results were also reported by Gosavi (2006) and Pinjari (2007).

The interaction effect between irrigation scheduling and mulching on net monetary returns and gross monetary returns were found to be non-significant.

Conclusion:

The maximum green cob and fodder yield, gross, net monetary returns and higher B:C were reported in the treatment IW/CPE ratio 1.0. The treatment mulching with chickpea husk (@ 5 t ha^{-1}) recorded the higher green cob and fodder yield, gross monetary returns, net monetary returns and B:C. On the basis of one year study it is concluded that, the sweet corn (variety sugar-75) to be cultivated with irrigation scheduling at IW/CPE ratio 1.0 along with mulch in summer season.

Authors' affiliations:
S.S. ILHE AND S.C. WADILE, Department of Agronomy, College of Agriculture, DHULE (M.S.) INDIA

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