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Influence of Modified Soil Environment on Growth and Yield of Summer Baby Corn (*Zea mays* L.) as Affected by Irrigation and Mulch in West Bengal, India

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A B S T R A C T

Two years field experiment was conducted during *pre-kharif* seasons of 2016 and 2017 at Instructional Farm, Jaguli, B.C.K.V, Nadia, W.B, to study the effect of irrigation and mulches on soil environment modification, growth, yield attributes and yield of summer baby corn (*Zea mays* L.) var. G5414-F1 hybrid. The experiment was designed in split plot with three replications. The treatments comprised of three levels of irrigation (IW: CPE 1.0, 0.8 and 0.6) as main plot and four levels of mulching (no mulch-control, 30µ polythene mulch, paddy straw mulch @4 t ha^{-1} and geotextile mulch @ 500 g m^{-2}) as sub plots. Results revealed that significantly taller plants, maximum number of functional leaves $plant^{-1}$, higher root and shoot length, shoot diameter and yield attributes i.e. length, weight and girth of baby cobs (with and without husk) were obtained by IW: CPE 1.0 and polythene mulch. Significantly higher cob yield (2270 kg ha^{-1}), corn yield (1795 kg ha^{-1}) and green fodder yield (37 t ha^{-1}) were recorded from the interaction effect of IW: CPE 1.0 and polythene mulch. Soil temperature at 5, 10 and 20 cm depth was lower in IW: CPE 1.0 and maximum under IW: CPE 0.6. Mulch with polythene recorded highest soil temperature at harvest compared to no mulch and paddy straw mulch at both the depths (5 and 10 cm). Higher soil moisture (%) was observed at 15-30 cm depth under IW: CPE 1.0 and polythene mulch during initial growth stages. Strong positive correlation was observed with soil temperature and different growth parameters, yield attributes and yield of summer baby corn.

Introduction

Maize (*Zea mays* L.), one of the most versatile crop with wider adaptability is the third most important cereal crop in the world next after wheat and rice in terms of area and first in terms of productivity. Green cobs harvested 2-3 days of silk emergence but prior to fertilization are known as baby corn (Pandey *et al.*, 2000). Being a C_4 plant, baby corn has higher photosynthetic efficiency and higher yield potential, that's why it is called "queen of cereals" or "miracle crop". Out of 160 m ha of cultivated land, 39 m ha is irrigated by ground water, 22 m ha by irrigation canals and rest two third area still depends on monsoon

rainfall in India. With 1544 m^3 per capita water availability, India is continuously moving towards water stressed country (Dhawan, 2017). In this context, judicial application of water at proper time and with proper amount and also to conserve the soil moisture for longer time is of prime importance. So in our study, scheduling of irrigation with the concept of depth of irrigation water (IW) and cumulative pan evaporation (CPE) and applying different types of mulch, we tried to understand how the treatments affect the soil environment and different growth, yield parameters and finally yield of *pre-kharif* baby corn in Gangetic West Bengal.

Materials and Methods

Study site

Field experiments were conducted during pre-kharif/ summer seasons of 2016 and 2017 at Instructional Farm, Jaguli, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal (Lat: 22˚56′ N, Long: 88˚ 32′ E, Alt: 9.75 m above mean sea level).

The site is under new alluvial zone, with sandy clay loam soil and neutral soil pH. Meteorological data during experimental period showed that the crop received 145.22 mm and 40.46 mm of total rainfall during 2016 and 2017. The weekly pan evaporation value ranged from 16.8 to 42.9 mm day^{-1} and 18.6 to 37.6 mm day^{-1} in two years respectively.

Experimental set up

The experiment was laid out in split plot design with irrigation and mulching as main plot and sub-plot factors. Three levels of irrigation (IW: CPE 1.0, 0.8 and 0.6 as I_1, I_2 and I_3 respectively) and four levels of mulching (no mulch or control, 30 µ blue polythene mulch, paddy straw mulch @ 4t ha^{-1}, geotextile mulch @ 500 g m^{-2} as M_0, M_1, M_2 and M_3 respectively) thus 12 treatment combinations, replicated thrice with total 36 plots. Variety G5414-F_1 hybrid was sown in raised bed with 40 cm×20 cm spacing, seed rate 20 kg ha^{-1}. Date of sowing was 19th February both the years. Depth of irrigation was maintained at 5cm, first common irrigation was applied at the time of sowing, then according to treatments as surface irrigation in the channels. Manure, fertilizer was applied as conventional practice.

Data collection

Periodical soil moisture content (%) data at 0-15 and 15-30 cm depth was collected at 20, 40 and 60 DAS by gravimetric method using the following formula by Black (1965).

$$\text{Soil moisture content}(\%) = \frac{\text{wet weight of soil sample}\,(g) - \text{dry weight of soil sample}\,(g)}{\text{dry weight of soil sample}\,(g)} \times 100$$

Soil temperature was measured with soil thermometer inserted in three channels at 5, 10 and 20 cm depths at an angle of 45˚, kept for 5 minutes to record temperature between 1130 hrs to 1200 hrs. All growth parameters were recorded freshly from 20 to 60 DAS whereas yield attributes and yield data were collected at the time of harvest (60 DAS). Except soil moisture (%), all meteorological and plant data were pooled over two years.

Statistical analysis

Data on various aspects were subjected to statistical analysis by analysis of variance (ANOVA) suggested by Gomez and Gomez (1984), the significance of difference for treatments were tested by "F" test at 5% level. Association of various data was done by Pearson's correlation.

Results and Discussion

Influence of irrigation and mulch on soil moisture

The data pertaining to soil moisture content (%) of baby corn as influenced by irrigation and mulching in 0-15 cm and 15-30 cm soil depths at different intervals during 2016 and 2017 are presented in Table: 1. Both the treatments significantly influenced the soil moisture percentage in both the years.

Significantly higher soil moisture (26.85%) was observed at 20 DAS (15-30 cm depth) under IW: CPE 1.0 (I_1) and lower moisture content (18.46 %) was recorded at 60 DAS (harvest) from the same soil layer in IW: CPE 0.6 (I_3). On an average soil moisture found higher at 15-30 cm depth at 20 DAS and minimum at 60 DAS (harvest).Variation of soil moisture (%) was higher at 20 DAS at 15-30 cm depth in 2016.

Higher extractable soil moisture (26.91%) was found in polythene mulch (M_1) from 15-30 cm depth at 20 DAS, and level of soil moisture was lower (16.71%) at 60 DAS (harvest) from same layer under no mulch (M_0) situation. At 40 DAS the effect of polythene mulch (M_1), paddy straw mulch (M_2) and geotextile mulch (M_3) over soil moisture individually at two different depths was statistically at par, compared to significant lower moisture content under control plots (M_0). Significant difference of soil moisture percentage was higher at 20 DAS and minimum variation was at 40 DAS in 2016.

Statistically significant interaction effect between treatments (I×M) was registered except 15-30 cm depth at 40 DAS in 2016.

In 2017 similar results were observed but maximum soil moisture (23.89%) reduced from previous year 20 DAS in IW: CPE 1.0 (I_1) and minimum soil moisture (19.80%) content increased from previous year in IW: CPE 0.6 (I_3) both at 15-30 cm depth. Maximum soil moisture variation was recorded at 60 DAS (harvest).

In 2017 also polythene mulch (M_1) recorded maximum soil moisture (25.54%) at 20 DAS from 15-30 cm soil layer (decreased from 2016) and minimum amount of moisture (17.85%) from no mulch (M_0) plots (increased from 2016). Maximum variation of soil moisture was recorded at 60 DAS (harvest).

Significant difference in soil moisture due to treatment interaction effect (I×M) was recorded except 0-15 cm soil depth at 60 DAS (harvest).

Influence of irrigation and mulch on soil temperature

Soil temperature as observed from 20 to 60 DAS at an interval of 10 days (pooled of 2016 and 2017) at 5, 10 and 20 cm depths under different treatments are illustrated in Figure 1. It is clear from the graphs, that the sequence of soil temperature (˚C) under different irrigation treatments was IW: CPE 0.6(I_3) > IW: CPE 0.8(I_2) > IW: CPE 1.0(I_1). For I_3, soil temperature at 5 cm depth ranged from 32.33˚C to 36.37˚C. At 5 cm depth soil temperature of I_2 ranged from 30.12˚C to 32.99˚C and for I_1 soil temperature value ranged from 28.42˚C to 32.82˚C. For 10 cm soil depth, temperature ranged from 30.64˚C to 33.36˚C in I_3, 29.12˚C to 32.97˚C in I_2 and 28.00˚C to 32.73˚C in I_1. For 20 cm soil depth, soil temperature ranged from 31.96˚C to 33.11˚C in I_3, 31.35˚C to 32.80˚C in I_2 and 26.86˚C to 32.79˚C in I_1. Maximum variation in 5 cm soil temperature was recorded at 30 DAS, minimum variation at 60 DAS. Variation of soil temperature at 10 cm was higher at 30 DAS and lowest variation was observed at 60 DAS. Similarly soil

temperature at 20 cm depth varied maximum at 30 DAS and lowest variation was at 50 DAS.

For mulching, the soil temperature recorded at 20, 30, 40, 50 and 60 DAS at 5cm, 10 cm and 20cm depths showed temperature sequence at polythene mulch (M_1)> geotextile mulch (M_3)> paddy straw mulch (M_2)> no mulch (M_0). Soil temperature at 5 cm depth varied from 31.96˚C to 34.28˚C in M_1, 30.75˚C to 32.89˚C in M_3, 30.67˚C to 32.77˚C in M_2, and 29.46˚C to 32.30˚C in no mulch plots. Soil temperature at 10 cm depth ranged from 30.40˚C to 33.82˚C for M_1, 29.49˚C to 33.19˚C in M_3, 29.06˚C to 32.96 ˚C in M_2, and 28.69˚C to 32.32˚C in no mulch. Soil temperature measured at 20 cm ranged from 31.94˚C to 34.03˚C in M_1, 30.19˚C to 32.98˚C in M_3, 29.45˚C to 32.65˚C in M_2, and 28.66˚C to 32.55˚C in no mulch treatment. For 5 cm soil depth, temperature variation was more at 30 DAS; minimum variation was at 50 DAS. For 10 cm soil depth, maximum temperature variation was recorded at 40 DAS, minimum variation at 50 DAS. For 20 cm depth, maximum soil temperature variation was recorded at 30 DAS and minimum temperature variation was observed at 50 DAS. Soil temperature at 5, 10 and 20 cm depth was lower in IW: CPE 1.0 and maximum under IW: CPE 0.6.

This may be due to higher number of functional leaves per plant, higher LAI, there was sufficient transpiration from plants and more soil evaporation, combindly increasing latent heat loss from the soil resulted by lower soil temperature. The highest soil temperature at above mentioned depths was recorded in mulch with polythene over rest of the treatments. Mulch with polythene recorded highest soil temperature at harvest compared to no mulch and paddy straw mulch at the both the depths (5 and 10 cm). Similar results were also reported by Muragan *et al.,* 2003.

Influence of irrigation and mulch on growth parameters

Tallest plants were observed at 60 DAS under both the treatments. Irrigation scheduled at IW: CPE 1.0 (I_1) recorded taller plants compared to IW: CPE 0.8 (I_2) and IW: CPE 0.6 (I_3). During harvest (60 DAS), I_1 recorded tallest plant height of 174.0 cm. Soil moisture always remain at field capacity in IW: CPE 1.0, because of which plant absorb more moisture and nutrients from soil which reflected in increase in cell elongation and multiplication. These results are conformity by those reported by Hussaini *et al.,* 2001. Polythene mulch (M_1) recorded taller plants compared to geotextile mulch (M_3) and paddy straw mulch (M_2) during all growth stages. Tallest plants were observed at 60 DAS (171.6 cm) by polythene mulch (M_1), followed by geotextile mulch (M_3) (168.7 cm) and paddy straw mulch (M_2) (162.7 cm) and lowest plant height was observed in control (M_0) plots (160.3 cm). The results are conformity with findings of Uwah and Iwo (2011). Interaction effect (I×M) was also significant at all stages.

Maximum functional leaf number (13.9) was recorded at 60 DAS by IW: CPE 1.0 (I_1) and lowest leaf number (11.8) was observed by IW: CPE 0.6 (I_3). Maximum number of functional leaves (14.5) was recorded in plots treated with polythene mulch (M_1), followed by geotextile mulch (13.0) and paddy straw mulch (12.5). Lowest number of functional leaves (11.2) was observed in control plots. Treatment interaction (I×M) was statistically significant at 30, 40 and 60 DAS.

Root length found maximum by IW: CPE 1.0 (31.08 cm) and with application of polythene mulch (28.83 cm) at 60 DAS. Maximum shoot length was recorded by IW: CPE 1.0 (93.90 cm) and polythene mulch (98.61 cm) at 60 DAS. Shoot girth reached at maximum value at 60 DAS.

Table.1 Influence of irrigation and mulch on soil moisture (%) at different depths in 2016 and 2017

		2016						2017					
		20 DAS		40 DAS		60 DAS (Harvest)		20 DAS		40 DAS		60 DAS (Harvest)	
Soil depth (cm)		0-15	15-30	0-15	15-30	0-15	15-30	0-15	15-30	0-15	15-30	0-15	15-30
Treatments													
I_1 (IW:CPE=1.0)		24.92	26.85	22.17	21.63	23.60	19.92	23.41	23.89	22.93	23.63	22.77	21.88
I_2 (IW:CPE=0.8)		24.48	26.42	21.01	20.90	21.85	19.19	23.19	23.61	21.78	23.25	21.70	20.56
I_3 (IW:CPE=0.6)		21.73	25.62	20.79	20.56	21.54	18.46	22.98	22.82	21.61	22.24	21.02	19.80
SEm (±)		**0.17**	**0.18**	**0.09**	**0.17**	**0.11**	**0.09**	**0.08**	**0.04**	**0.11**	**0.08**	**0.12**	**0.28**
CD (at 5%)		**0.68**	**0.71**	**0.36**	**0.67**	**0.45**	**0.37**	**0.30**	**0.14**	**0.42**	**0.33**	**0.47**	**1.10**
M_0 (Control)		21.19	24.90	19.97	20.03	21.16	16.71	21.17	21.68	20.23	21.17	19.78	17.85
M_1(Polythene mulch)		25.19	26.91	22.50	21.45	24.05	20.80	25.23	25.54	24.31	25.18	24.26	23.19
M_2 (Paddy straw mulch)		24.57	26.67	21.58	21.85	22.18	17.86	21.87	22.04	20.91	23.98	20.36	19.66
M_3 (Geotextile mulch)		23.89	26.71	21.24	20.80	21.93	21.38	24.50	24.51	22.97	21.82	22.93	22.29
SEm (±)		**0.15**	**0.94**	**0.12**	**0.20**	**0.26**	**0.11**	**0.16**	**0.11**	**0.18**	**0.12**	**0.32**	**0.17**
CD (at 5%)		**0.44**	**2.74**	**0.35**	**0.59**	**0.76**	**0.34**	**0.48**	**0.34**	**0.52**	**0.35**	**0.94**	**0.52**
I×M	SEm (±)	**0.26**	**0.24**	**0.21**	**0.34**	**0.45**	**0.20**	**0.28**	**0.20**	**0.31**	**0.20**	**0.55**	**0.30**
	CD (at 5%)	**0.76**	**0.70**	**0.61**	**NS**	**1.32**	**0.58**	**0.83**	**0.59**	**0.91**	**0.61**	**NS**	**0.89**

Table.2 Plant height (cm), number of functional leaves plant^{-1}, root length (cm), shoot length (cm), shoot girth (cm) affected by irrigation and mulch (pooled of 2016 and 2017)

		Plant height					Functional leaves plant^{-1}					Root length					Shoot length					Shoot girth				
Treatments		**20 DAS**	**30 DAS**	**40 DAS**	**50 DAS**	**60 DAS**	**20 DAS**	**30 DAS**	**40 DAS**	**50 DAS**	**60 DAS**	**20 DAS**	**30 DAS**	**40 DAS**	**50 DAS**	**60 DAS**	**20 DAS**	**30 DAS**	**40 DAS**	**50 DAS**	**60 DAS**	**20 DAS**	**30 DAS**	**40 DAS**	**50 DAS**	**60 DAS**
I_1		25.8	65.9	133.3	142.8	174.0	5.1	7.0	12.5	12.7	13.9	10.79	11.47	28.32	29.01	31.08	9.18	14.09	40.56	69.18	93.90	2.66	3.05	6.29	6.40	7.44
I_2		24.5	57.0	116.5	129.5	167.3	5.1	6.0	11.9	12.0	12.8	8.67	8.82	23.71	24.68	25.97	8.82	12.30	30.71	59.67	91.94	2.52	2.71	5.48	5.65	6.39
I_3		21.7	52.4	100.0	119.4	156.1	4.8	5.5	11.3	10.1	11.8	7.54	7.69	18.80	20.13	21.53	8.62	10.18	27.35	55.12	86.30	2.42	2.58	4.68	4.89	5.74
SEm (±)		**0.1**	**0.8**	**0.2**	**0.2**	**0.1**	**0.1**	**0.0**	**0.1**	**0.1**	**0.1**	**0.03**	**0.02**	**0.13**	**0.12**	**0.15**	**0.04**	**0.10**	**0.14**	**0.17**	**0.20**	**0.01**	**0.01**	**0.05**	**0.04**	**0.06**
CD (5%)		**0.4**	**3.1**	**0.6**	**0.7**	**0.5**	**NS**	**0.2**	**0.3**	**0.5**	**0.3**	**0.13**	**0.09**	**0.49**	**0.49**	**0.58**	**0.17**	**0.40**	**0.54**	**0.68**	**0.79**	**0.05**	**0.06**	**0.19**	**0.15**	**0.22**
M_0		21.8	52.7	109.9	122.3	160.3	4.5	5.0	9.6	9.9	11.2	8.27	8.81	21.55	22.44	24.63	8.36	10.71	30.83	61.24	84.28	1.86	2.05	5.35	5.45	5.82
M_1		26.3	67.0	123.8	138.1	171.6	5.8	7.3	13.9	13.1	14.5	10.52	10.68	26.16	27.01	28.83	9.32	14.44	35.31	65.06	98.61	3.08	3.67	5.73	6.06	7.41
M_2		23.6	54.9	113.6	128.3	162.7	4.7	5.8	11.8	11.0	12.5	8.34	8.42	22.94	24.14	25.16	8.75	11.54	31.57	58.52	86.27	2.44	2.58	5.34	5.50	6.14
M_3		24.4	59.1	119.3	133.4	168.7	5.0	6.4	12.3	12.3	13.0	8.88	9.40	23.78	24.83	26.15	9.05	12.08	33.79	60.46	93.71	2.74	2.83	5.49	5.57	6.72
SEm(±)		**0.1**	**1.0**	**0.1**	**0.3**	**0.2**	**0.1**	**0.1**	**0.1**	**0.3**	**0.1**	**0.04**	**0.04**	**0.11**	**0.18**	**0.14**	**0.05**	**0.11**	**0.20**	**0.23**	**0.24**	**0.02**	**0.03**	**0.04**	**0.04**	**0.06**
CD (5%)		**0.3**	**2.9**	**0.3**	**0.9**	**0.5**	**0.4**	**0.3**	**0.4**	**0.9**	**0.3**	**0.12**	**0.12**	**0.33**	**0.52**	**0.43**	**0.16**	**0.32**	**0.59**	**0.68**	**0.70**	**0.07**	**0.09**	**0.13**	**0.11**	**0.18**
I×M	**Sem (±)**	**0.2**	**1.7**	**0.2**	**0.5**	**0.3**	**0.3**	**0.2**	**0.3**	**0.5**	**0.2**	**0.07**	**0.07**	**0.20**	**0.30**	**0.25**	**0.09**	**0.18**	**0.34**	**0.40**	**0.41**	**0.04**	**0.06**	**0.07**	**0.06**	**0.11**
	CD (5%)	**0.5**	**5.0**	**0.5**	**1.6**	**0.9**	**NS**	**0.5**	**0.8**	**NS**	**0.6**	**0.21**	**0.22**	**0.58**	**0.91**	**0.74**	**0.28**	**0.55**	**1.02**	**1.18**	**1.22**	**0.12**	**0.16**	**0.22**	**0.19**	**0.32**

Table.3 Cob yield, corn yield and green fodder yield of baby corn influenced by irrigation and mulch

Treatments		Cob yield (kg ha^{-1})	Corn yield (kg ha^{-1})	Green fodder yield (t ha^{-1})
I_1(IW:CPE=1.0)		2188	1505	35
I_2 (IW:CPE=0.8)		2157	1456	29
I_3 (IW:CPE=0.6)		2101	1312	23
SEm (±)		13	20	0.3
CD (at 5%)		52	78	1.0
M_0 (Control)		2038	1071	26
M_1(Polythene mulch)		2257	1730	32
M_2 (Paddy straw mulch)		2101	1345	28
M_3 (Geotextile mulch)		2198	1550	30
SEm (±)		14	16	0.3
CD (at 5%)		41	46	0.8
I_1×M_0		2098	1150	33
I_1×M_1		2270	1795	37
I_1×M_2		2145	1410	34
I_1×M_3		2238	1668	35
I_2×M_0		2045	1046	26
I_2×M_1		2259	1791	33
I_2×M_2		2102	1354	28
I_2×M_3		2222	1629	32
I_3×M_0		1972	1019	18
I_3×M_1		2241	1605	27
I_3×M_2		2057	1272	23
I_3×M_3		2135	1352	22
	SEm (±)	24	27	0.5
I×M	**CD (at 5%)**	NS	80	1.4

Table.4 Pearson's correlation between (a) soil temperature and growth parameters, (b) soil temperature and yield attributes and (c) soil temperature and yield parameters

Growth parameters	$ST_{5\ cm}$ 60 DAS		$ST_{10\ cm}$ 60 DAS	
Plant height 60 DAS	0.454	***		
Number of leaf plant^{-1} 60 DAS	0.638	***	0.344	**
Root length 60 DAS	0.329	*		
Shoot length 60 DAS	0.694	***	0.392	*
Shoot girth 60 DAS	0.479	***		

(a)

Yield attributes	$ST_{5\ cm}$ 60 DAS		Yield attributes	$ST_{10\ cm}$ 60 DAS		Yield attributes	$ST_{20\ cm}$ 60 DAS	
Cob length	0.693	***	**Cob length**	0.567	***	**Cob length**	0.459	***
Cob weight	0.482	***	**Cob girth**	0.349	**	**Cob girth**	0.283	*
Cob girth	0.697	***	**Corn length**	0.383	**			
Corn length	0.524	***						
Corn weight	0.500	***						
Corn girth	0.454	***						

(b)

Yield parameters	$ST_{5\ cm}$ 60 DAS		$ST_{10\ cm}$ 60 DAS		$ST_{20\ cm}$ 60 DAS	
Cob yield	0.607	***	0.535	***	0.288	*
Corn yield	0.774	***	0.584	***	0.394	**
Green fodder yield	0.387	**				

(c)

Sample size (N) = 36, *Significant at 5% level, ** Significant at 1% level, ***Significant at 0.01% level. ST=soil temperature (˚C), DAS=days after sowing

Fig.1 Soil temperature at 5, 10 and 20 cm depths under different irrigation and mulch

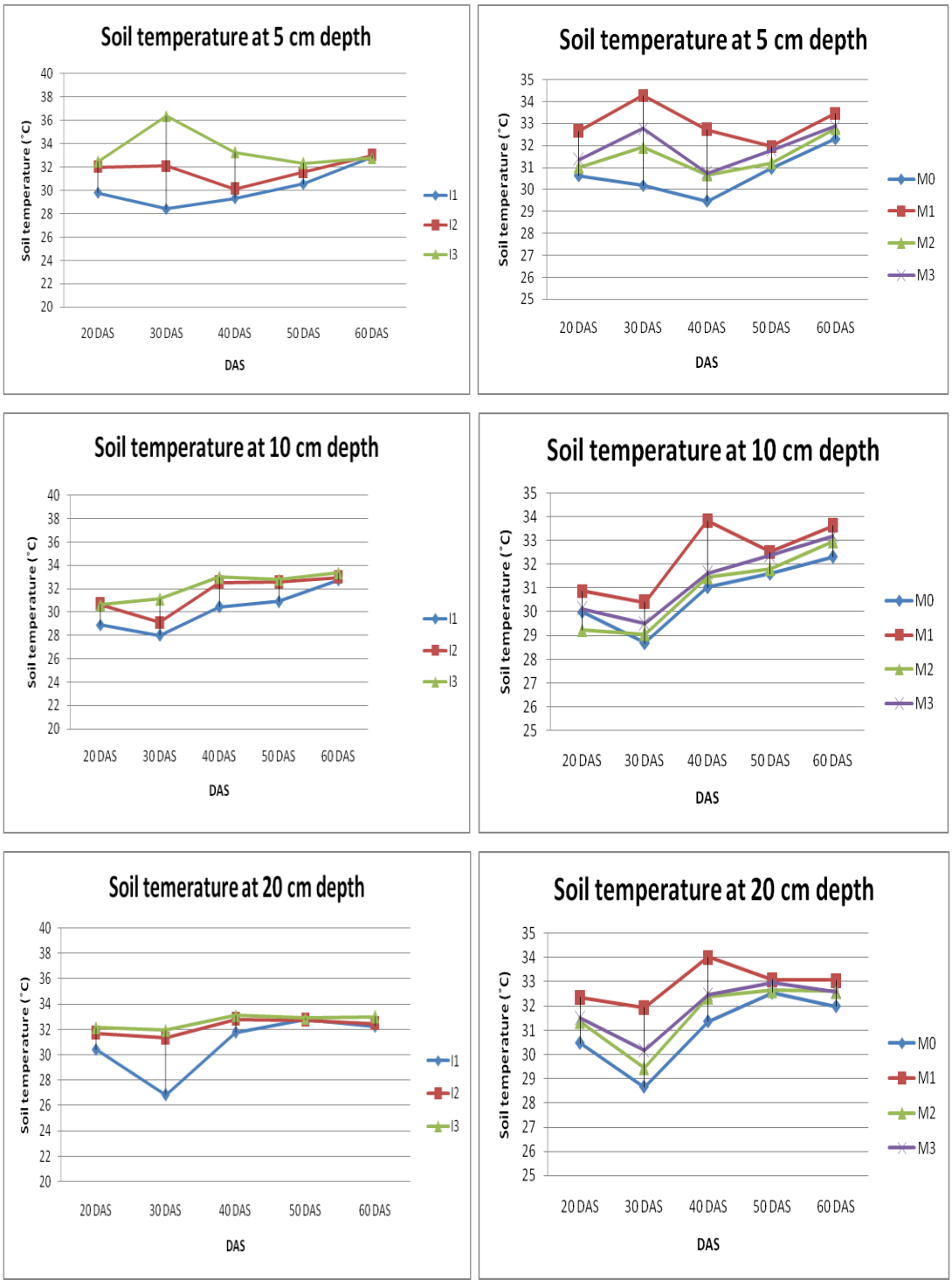
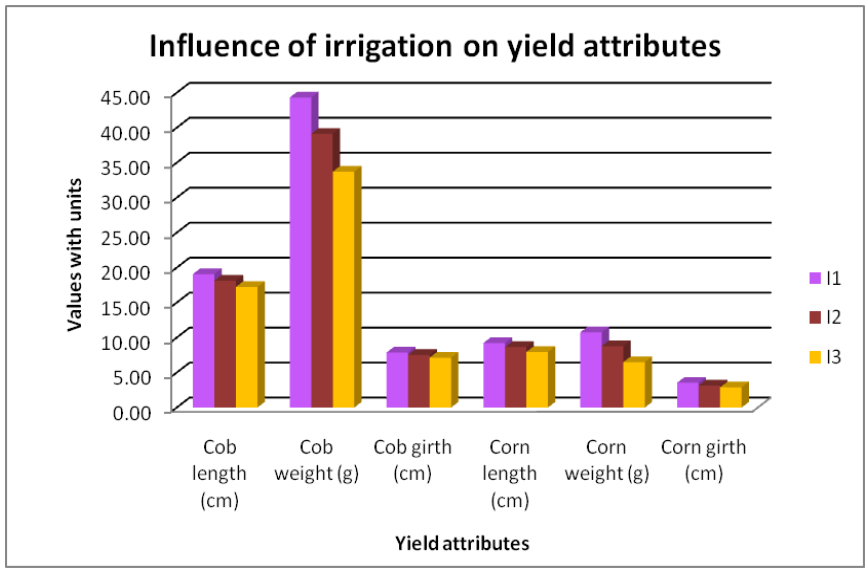
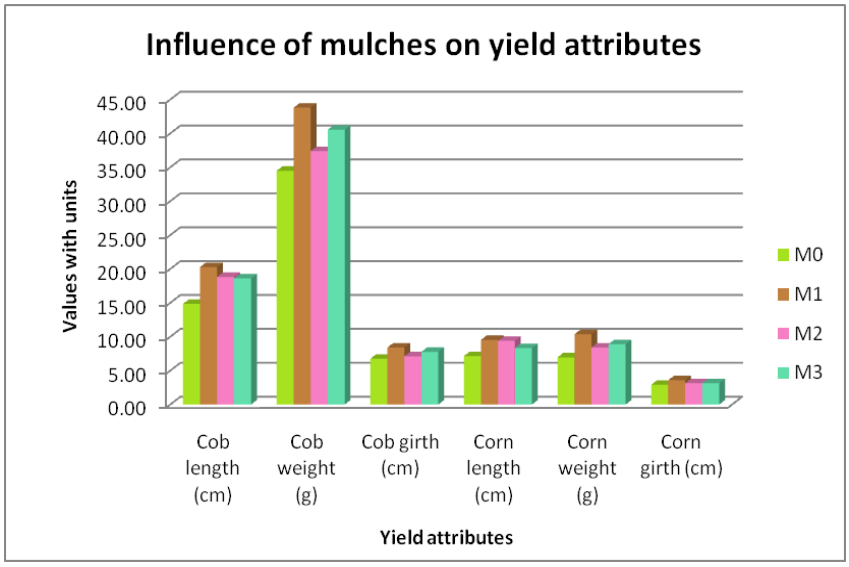


Fig.2 Effect of irrigation and mulch on yield attributes of summer baby corn (pooled)





Maximum shoot girth was recorded by IW: CPE 1.0 (7.44 cm) and polythene mulch (7.41 cm). Interaction effect (I×M) for these parameters found to be statistically significant during all observational phases (Table 2).

Influence of irrigation and mulch on yield attributes

IW: CPE 1.0 (I_1) recorded significantly the highest cob length (19.08 cm), while IW: CPE 0.6 (I_3) recorded significantly lower cob length (17.23 cm). Application of irrigation at IW: CPE 1.0 gave higher weight (44.33 g) and girth (7.86 cm) of baby corn with husk, though effect of irrigation was not significant in cob girth of baby corn. Significantly higher length (9.22 cm), weight (10.75g) and girth (3.54 cm) of dehusked baby corn was recorded by IW: CPE 1.0 (I_1) followed by IW: CPE 0.8 (I_2) and IW: CPE 0.6 (I_3) (Figure 2). The increase in the length, weight and girth of

cobs (husked and dehusked) under higher level of irrigation schedules might be due to constant soil moisture availability up to later growth stage of plant. These findings are in corroboration with the results of Rajendran and Singh (1999) and Oktem and Oktem (2009). Maximum cob length (20.28 cm, 9.54 cm); cob weight (43.80g,10.38g) and cob girth (8.40 cm and 3.59 cm) with and without husk respectively was recorded by applying polythene mulch (M_1) and lowest by no mulch (M_0) treatments. This might be due to regular supply of all nutrients at progressive growth stage of crop under mulch allowed satisfactory metabolic process in plant. Similar findings were also reported by Gossavi (2006).

Influence of irrigation and mulch on Cob yield (with and without husk) and green fodder yield

From the pooled data furnished in Table: 3, it is clear that highest cob yield of 2188 kg ha^{-1}, corn yield or dehusked cob yield of 1505 kg ha^{-1} and green fodder yield of 35 t ha^{-1} was achieved by applying irrigation at IW: CPE 1 (I_1), though cob yield and corn yield from IW: CPE 0.8 (I_2) were statistically at par with that of I_1. Higher yield produced might be due to higher number of functional leaves, higher root-shoot length, could have been resulted into higher synthesis of assimilate and thereby higher yield (Shivakumar *et al.,* 2011). Application of mulches over soil surface played vital role in yield of baby corn, reported maximum cob yield with and without husk (2257, 1730 kg ha^{-1} respectively), and highest green fodder yield (32 t ha^{-1}) by polythene mulch (M_1) and lowest yield from control plots (M_0). This might be due to soil moisture non stress situation throughout growth period of crop resulted in more growth and yield attributes in mulching treatment which was reflected higher yield (Bhatt *et al.,* 2004).

Correlation of soil temperature affected by irrigation and mulch with different growth parameters, yield attributes and yield of baby corn

Soil temperature (˚C) at different depths had a very good positive correlation with different growth parameters, yield attributes and yield parameters (Table: 4; a, b and c).Very strong association was observed with soil temperature (5cm depth) and plant height (r=0.454), number of functional leaves $plant^{-1}$ (r=0.638), and root length (r=0.694) at the time of harvest. Significantly very high correlation was recorded with soil temperature at harvest (5 cm depth) and cob length (r=0.693), cob weight (r=0.482), cob girth (r=0.697), corn length (r=0.524), corn weight (r=0.500) and corn girth (r=0.454); soil temperature at harvest (10 cm depth and 20 cm depth) with cob length (r=0.567, 0.459 respectively). Soil temperature at 5 cm and 10 cm depth during harvesting was strongly correlated with cob yield (r=0.607, 0.535 respectively), corn yield (r=0.774, 0.584 respectively).

From this study it can be concluded that with proper irrigation scheduling exact amount of water was applied according to the crop need and by applying different kind of mulches, soil moisture could be stored for longer time, thus preventing water loss which increased water use efficiency of crop. Thus providing suitable soil micro-environment by irrigation and mulches; crop growth, yield attributes and yield of summer baby corn at Gangetic West Bengal could be optimized.

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