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Climate friendly cultivation of baby corn in Gangetic Bengal

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Abstract
A field experiment was conducted during pre kharif season, 2017 and 2018 to study the production potentiality of Baby corn in Gangetic Bengal region. Baby corn variety G-5414 was sown on D_1 (7th February) and D_2 (23rd February) of 2017 and 2018 under three spacing levels S_1 (40×25 cm), S_2 (30×20 cm), S_3 (25×15 cm) and two nitrogen levels N_1 (140 kg N/ha) and N_2 (120 kg N/ha). All the treatments had crucial role to change the canopy architecture and geometry resulting change in micro environment in baby corn. Through the analysis of canopy ambient temperature differential (CATD) (°C) availability of water during the life span of the crop was measured. Profound effect of different spacing, nitrogen dose, date of sowing was also evident on different micro-climatic parameters like canopy temperature, PAR interception (%). Among the various plant spacing, 25×15 cm showed better response in case growth characteristics such as plant height, no of functional leaves plant^{-1}, cob length, cob diameter and dehusked cob weight. But in case of no of cobs plant^{-1} and weight of husked cob, 40×25 cm spacing was superior compared to others. A decreasing trend was observed in case of husked, dehusked, and green fodder yield with widening of plant spacing. Maximum husked, dehusked, green fodder yield was recorded 44.5 t ha^{-1}, 9.72 t ha^{-1} and 27.76 t ha^{-1} for 25×15 cm spacing whereas it was only 23.0 t ha^{-1} 4.38 t ha^{-1} and 22.84 t ha^{-1} for 40×25 cm respectively. Nitrogen level 140 kg N/ha perform better for all yield attributing traits compared to 120 kg N/ha except for plant height. Yield of husked baby corn was maximum for 120 kg N/ha treatment (32.72 t ha^{-1}) followed by 140 kg N/ha (31.86 t ha^{-1}). In case of dehusked baby corn yield and green fodder yield both the nitrogen doses showed more or less same performance.In case of D_2 crops shows greater values for all production components compared to D_1 in both years. Plant shown on 23rd February (D_2) recorded highest value for the yield of husked baby corn (38.05 t ha^{-1}) and dehusked baby corn (7.59 t ha^{-1}) followed by the plants of 1st date of sowing 26.53 t ha^{-1} and 5.87 t ha^{-1} respectively.

Keywords: Baby corn, PAR, canopy architecture, canopy ambient temperature differential (CATD)

1. Introduction

Maize (*Zea mays* L, family Gramineae) is one of the most important cereal grain grown worldwide in wider range of environments because of its greater adoptability. Due to its immense potential both as food source and animal feed, maize had gained the tittle of “Queen of cereals” as well as “Miracle crop”. Baby corn, a new economic product of maize (*Zea mays* L.) is the dehusked corn ear, harvested within 2-3 days of silk emergence i.e. prior to fertilization (Pandey *et al*., 2000). Baby corn is mainly used as vegetable crop. Considering the economic product utilisation and agronomic practices of Baby corn production, it is almost similar to that of maize or corn production, except few modification viz., number of plants ha^{-1} is much higher, requirement of nitrogen is little higher and most importantly detasseling is required in case of baby corn to avoid fertilisation (Kallo and Kumar, 1998). Baby corn has short growth duration which offers intensive rotation cultivation. World leading baby corn producing countries are Thailand, China, Taiwan, Sri Lanka and Myanmar. Baby corn cultivation have recently developed in several states of India like Meghalaya, western parts of Uttar Pradesh, Haryana, Maharashtra, Karnataka and Andhra Pradesh.(Ramchandrappa *et al*., 2004).

Different seed sowing period is very important factors to extend growing season in different ecologies. Therefore, extended planting period makes crops get more exposed to stress caused by climate. some studies have been conducted in different ecologies regarding seed sowing periods and it has been identified that seed sowing times have an effect on ear yield and quality (Sari; 1997). Early sowing had significant and positive effect on grain yield and the interaction effect of variety and sowing date was significant for grain yield. However adequate data on the effects of plant spacing, date of sowing and nitrogen on the yield of baby corn are limited and these necessities initiating studies in this direction for improving yield of baby corn. The aim of this study is to investigate the effect of different sowing periods, spacing and different nitrogen level on production component of baby corn and to determine the relationships among the microclimatic parameters and growth attributes of baby corn in new alluvial agro climatic region of West Bengal.

2. Materials and Methods

The field experiment was conducted at the Jaguli Instructional Farm, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, West

Bengal (Latitude : 22˚56' N, Longitude : 88º32' E and Altitude : 9.75 m above mean sea level). The site is under new alluvial zone (NAZ) and the soil of the experimental field was of medium fertility status and with sandy clay loam texture and neutral pH 6.7 (approximately). The weather parameters were collected from the principle meteorological observatory located at Jaguli Instructional Farm, Department of Agricultural Meteorology and Physics, B.C.K.V, during the year 2017 and 2018. The meteorological data, recorded during experimental period showed that crop received 40.46 mm average total rainfall and average mean weekly rainfall ranges from 0.3 mm to 4 mm during the crop growth period in the year 2017 and 2018. The average mean weekly maximum temperature ranges from 27.6℃ to 36.1℃ with an average of 32.5℃ and the average mean weekly minimum temperature ranges from 10.3℃ to 23.5℃ with an average 17.9℃ during the crop growth period in 2017 and 2018.

The experiment was conducted with the high yielding variety G-5414 F_1 hybrid in a Randomised Block Design with two replications. Two nitrogen level of 140 kg/ha (N_1) and 120 kg/ha (N_2),three spacing level of 40×25 cm (S_1), 30×20 cm (S_2), 25×15 cm (S_3) and two dates of sowing 7th February (D_1) and 23rd February (D_2) were used as treatments. Dimension of individual plot was 3m × 3m. The crop was fertilized with Phosphorus (P) = 40 kg/ ha (60 gm SSP/ plot), Potassium (K) = 60 kg/ha (337.5 gm MOP/plot) at the time of sowing. Pre treated (Thiram+Apron) baby corn seeds were sown in line showing method. First irrigation was given immediately after sowing. Young Baby corn cobs were harvested carefully just 2-3 days after silk emergence (2-3 cm silk length) from one meter square area in each plot which was demarcated earlier and weights of husked and dehusked cobs were recorded for each picking. After the final picking from each plot green fodder was harvested and per plot weight was taken in kg and yield was recorded in t ha^{-1}.

All the successive plant biometric observations during crop growth like plant height (cm), no of leaves /plant are taken from specifically labelled plants. Two plants randomly harvested from the each net plot to calculate dry matter production (gm $plant^{-1}$) at 7 days interval. Dry weights were recorded separately for leaf, stem, and root and were added to get total dry matter in g $plant^{-1}$. The number of ears of baby corn, lengths of green cob (cm) and diameter of dehusked green cobs (cm) were also noted. The total weight of green cobs from two tagged plants was taken along, with and without the husk and the average weight per cob was worked out and expressed in t ha^{-1}. After harvesting the green cobs, the two tagged plants were cut and the weight was recorded and expressed in ton ha^{-1}. Among the different micrometeorological parameters canopy temperature (°C) and air temperature were measured to calculate Canopy-air temperature differential (CATD) using the following formula CATD = T_c -T_a (T_c= Midday canopy temperature ℃, T_a=Midday air temperature ℃). Different components of photosynthetically active radiation (PAR) like incident PAR, reflected PAR and transmitted PAR were measured and intercepted PAR percentage of baby corn canopy was calculated by following formula:

$$Intercepted\ PAR\ \% = \frac{IPAR - (TPAR + RPAR)}{IPAR} \times 100$$

Where,
IPAR = Incident PAR
RPAR = Reflected PAR
TPAR = Transmitted PAR

The data on different aspects of baby corn were subjected to statistical analysis by using the technique of analysis of variance (ANOVA).The significance of difference for treatments was tested by "F" test at 5% level. The critical difference were calculated when differences among the treatments were found significant by "F" test.

3. Results and discussion:

3.1 Effect of different spacing, dates of sowing and nitrogen level on canopy temperature (°C) of baby corn.

Table 1 reveals that canopy temperature was greatly influenced by different spacing and shows that canopy temperature was increased from initial growth stage to silking stage. With increasing plant spacing canopy temperature also increased throughout the growing period except 39 DAS. Baby corn is a high feeding crop, Crop responses to the 140 kg/ha (N_2) more compared to 120 kg/ha (N_1). Leaf architecture, leaf angle of baby corn developed very dense canopy with time in case of N_2. Same result was found by Kumar *et al*., 2001, noted significantly higher CGR was at 160 kg N ha^{-1} compared to 80 and 120 kg N ha^{-1} at Varanasi. In case of N_2 plant showed less canopy temperature than N_1 throughout the growing period except 39 DAS. Maximum canopy temperature was observed for 1st date of sowing (36.2℃) at 57 DAS, whereas for D_2 it was only 33.9℃.

Table 1: Periodical measurement of canopy temperature (℃) within baby corn canopy as influenced by different spacing dates of sowing and nitrogen levels (pooled data of 2017 and 2018)

Treatments	33 DAS	39 DAS	46 DAS	53 DAS	60 DAS
S_1 (40×25 cm)	29.16	30.59	31.59	31.59	35.34
S_2(30×20 cm)	27.69	31.09	31.25	31.25	35.22
S_3 (25×15 cm)	27.88	31.31	29.34	29.34	34.63
SEm(±)	0.07	0.12	0.11	0.11	0.07
CD at 5%	0.22	0.36	0.34	0.34	0.23
N_1 (140 kg/ha)	27.69	31.69	30.73	30.73	34.35
N_2 (120 kg/ha)	28.79	30.31	30.73	30.73	35.77
SEm(±)	0.06	0.09	0.09	0.09	0.06
CD at 5%	0.18	0.29	NS	NS	0.19
D_1 (7th February)	28.19	30.27	31.44	31.44	36.23
D_2 (23rd February)	28.29	31.73	30.02	30.02	33.90
SEm(±)	0.06	0.09	0.09	0.09	0.06
CD at 5%	NS	0.29	0.28	0.28	0.19

3.2 Effect of different spacing, dates of sowing and nitrogen level on Canopy–air temperature differential (CATD) (°C) of baby corn.

The difference between canopy temperature (T_c) and air temperature (T_a) termed as CATD, which is an important factor to estimate the rate of evapotranspiration loss from the soil system. Periods evaluating temperature difference act as a potential indicator of water stress comprised different growing seasons with rainfall and temperatures. The lower T_c is an indicator of higher rates of evapotranspiration. It is evident from table 2 that starting from 33 DAS to 60 DAS a negative CATD values were analysed. The negative CATD values implied lower canopy temperature as compare to air temperature during the periodical observations. The critical difference value was more at 46 DAS (0.45) followed by 53 DAS (0.44), 33 DAS (0.29), 33

DAS (0.24) & 60 DAS (0.24) due to different levels of spacing. Among two nitrogen levels N_2 faced less water stress than N_1 except 33 and 39 DAS. Plants were showed on 23rd February (D_2) faced less water stress than D_1 (7th February) except 46 DAS. Critical value was more at 46 DAS (0.37) followed by 53 DAS, 33 DAS, 60 DAS and 39 DAS due to different date of sowing.

Table 2: Canopy –air temperature differential as CATD in (^{O}C) as influenced by different dates of sowing, spacing and nitrogen (pooled data of 2017 and 2018)

Treatments	33 DAS	39DAS	46 DAS	53 DAS	60 DAS
S_1 (40×25 cm)	-4.76	-4.70	-4.06	-3.27	-1.14
S_2(30×20 cm)	-5.35	-4.59	-4.36	-3.72	-0.39
S_3 (25×15 cm)	-4.51	-4.13	-6.14	-4.74	-3.21
SEm(±)	0.09	0.08	0.15	0.14	0.08
CD at 5%	0.29	0.24	0.45	0.44	0.24
N_1 (140 kg/ha)	-4.39	-4.22	-5.04	-4.38	-2.58
N_2 (120 kg/ha)	-5.36	-4.73	-4.66	-3.45	-0.58
SEm(±)	0.08	0.06	0.12	0.11	0.06
CD at 5%	0.24	0.19	0.37	0.36	0.20
D_1 (7th February)	-2.93	-2.88	-7.47	-2.74	-0.83
D_2 (23rd February)	-6.82	-6.07	-2.24	-5.09	-2.33
SEm(±)	0.08	0.06	0.12	0.11	0.06
CD at 5%	0.24	0.19	0.37	0.36	0.20

3.3 Effect of different spacing, dates of sowing and nitrogen level on Intercepted PAR % (IPAR) of baby corn.

From the analysed table 3 it is clearly evident that two different levels of nitrogen, two dates of sowing and three spacing have a very important effect on in PAR interception (%). PAR interception is in increasing trend along with the advancement of crop growth stage. The highest PAR interception (%) was observed 59.76 % at 60 DAS for 25×15 cm spacing and lowest was observed for 11.53 % for 40×25 cm spacing. It clears that S_3 treatment produces denser crop canopy compared to other treatments. As a result of having bigger canopy the plants sown in 25×15 cm spacing tends to intercept more amount of PAR compared to other spacing. The different doses of nitrogen also have a positive impact on interception PAR %. N_1 (140 kg N/ha) shows comparatively greater PAR interception compared to N_2 (120 kg/ha) throughout the crop growth period. In case of D_1 plants intercepted more amount of PAR compared to D_2.

Table 3: Effect of different levels of nitrogen, dates of sowing and spacing on PAR interception (%) of baby corn (pooled data of 2017 and 2018)

Treatments	33 DAS	39DAS	46 DAS	53 DAS	60 DAS
S_1 (40×25 cm)	11.53	20.38	31.70	41.59	50.64
S_2(30×20 cm)	14.26	24.88	35.63	45.09	54.00
S_3 (25×15 cm)	18.45	28.86	39.95	50.03	59.76
SEm(±)	0.09	0.07	0.07	0.07	0.09
CD at 5%	0.27	0.23	0.23	0.21	0.29
N_1 (140 kg/ha)	15.96	26.27	37.14	47.43	56.93
N_2 (120 kg/ha)	13.53	23.14	34.38	43.70	52.67
SEm(±)	0.07	0.06	0.06	0.05	0.08
CD at 5%	0.22	0.19	0.19	0.17	0.24
D_1 (7th February)	15.03	25.13	36.03	46.02	55.48
D_2 (23rd February)	14.47	24.28	35.48	45.12	54.13
SEm(±)	0.07	0.06	0.06	0.05	0.08
CD at 5%	0.22	0.19	0.19	0.17	0.24

3.4 Effect of different levels of nitrogen, spacing and dates of sowing on root, shoot & leaf dry matter accumulation (gm /plant)

It is noted that spacing has a profound effect on root dry matter production. In comparison between three spacing S_3 (25×15 cm) showed more root dry matter production followed by S_2 (30×20 cm) and S_1 (40×25 cm) respectively (table 4).The maximum root dry matter accumulation was observed 43.51gm/plant for first dose of nitrogen(N_1). According to Chillar and Kumar, (2006) application of 150 kg N ha^{-1} resulted in the greatest dry weight /plant. Significant increase in dry weight/plant of sweet corn was noted with application of increasing levels of nitrogen from 0-120 kg ha^{-1}. In case of D_2 plant produce higher root dry matter than D_1 throughout the growing period except 60 DAS.

Likewise root dry matter production, shoot dry matter production is also significantly related with different levels of spacing, dates of sowing and nitrogen. S_3 provide more shoot dry matter followed by S_2 and S_1 (table 5). Thakur et al., (1997) observed that dry matter plant^{-1} significantly decreased with successive decrease of plant spacing. Shoot dry matter accumulation is also influenced by different nitrogen level. Shoot dry matter production was maximum in N_1 (140 kg N/ ha) compared to N_2 (120 kg N/ ha) throughout entire crop life. The treatment difference was significant between the two nitrogen levels applied as urea. The increment of dry matter accumulation was significantly increased up to 150 kg N ha^{-1} (Choudhary et al., 2007). 2nd date of sowing shows more shoot dry matter accumulation over 1st date of sowing. Highest shoot dry matter is recorded 44.29 gm. / plant at 60 DAS for 2nd date of sowing while lowest is recorded 4.16 gm. /plant at 33 DAS for 1st date of sowing. The treatment difference value reached its maximum as 0.17 at 53 DAS. A large number of scientists reported similar response of dates of sowing on dry matter accumulation. (Williams, M. M. 2008).

Table 4: Dry matter accumulation in roots (gm./plant) as influenced by different levels of nitrogen, spacing and dates of sowing (pooled data of 2017 & 2018)

Treatments	33 DAS	39DAS	46 DAS	53 DAS	60 DAS
S_1 (40×25 cm)	2.65	7.98	15.72	26.65	36.72
S_2(30×20 cm)	3.41	9.92	19.89	31.78	42.11
S_3 (25×15 cm)	3.64	14.44	26.63	38.84	48.23
SEm(±)	0.03	0.09	0.07	0.07	0.10
CD at 5%	0.08	0.28	0.22	0.22	0.33
N_1 (140 kg/ha)	3.37	11.18	21.83	33.97	43.51
N_2 (120 kg/ha)	3.10	10.38	19.66	30.88	41.20
SEm(±)	0.02	0.07	0.06	0.06	0.09
CD at 5%	0.06	0.23	0.18	0.18	0.27
D_1 (7th February)	3.20	10.58	20.66	32.29	42.66
D_2 (23rd February)	3.27	10.98	20.83	32.56	42.05
SEm(±)	0.02	0.07	0.06	0.06	0.09
CD at 5%	0.06	0.23	0.18	0.18	0.27

From the analysed table 6 it has been clear that spacing had significant effect on leaf dry matter production. Maximum leaf dry matter accumulation was measured in S_3 followed by S_2 and S_1 throughout the crop growth cycle. Periodical monitoring of leaf dry matter showed highest leaf dry matter accumulation 48.23 gm. /plant for S_3 at 60 DAS and minimum is 2.65 gm. /plant for S1 (40×25 cm) at 33 DAS. In comparison with 2nd dose of nitrogen (120 kg N/ha), 1st dose of nitrogen (140 kg N/ha) shows better leaf dry matter accumulation during crop growth period. The leaf dry matter increased with crop development. leaf dry matter increased with crop development process ranging from 3.37 gm./plant to 43.51gm/plant for N1(140 kg N/ha) and from 3.10 to 41.20gm/plant for N2 (120 kg N/ha). Maurya et al., (2004) observed significant increase in dry matter plant^{-1}of maize crop with each successive increase in nitrogen level ranging from 50 to 150 kg ha^{-1}.In case of analysing the effects of sowing dates on leaf dry matter accumulation, it is observed that 2nd date of sowing(23rd Feb) produces more leaf dry matter over 1st date of sowing(7th Feb.) where at 60 DAS crop produced 42.05 gm./plant leaf dry matter(2nd DOS) compared to 42.66 gm./plant (1st DOS).

Table 5: Dry matter accumulation in shoots (gm. /plant) as influenced by different levels of nitrogen, spacing and dates of sowing (pooled data of 2017 & 2018)

Treatments	33 DAS	39DAS	46 DAS	53 DAS	60 DAS
S_1 (40×25 cm)	3.56	7.50	17.53	27.42	37.99
S_2(30×20 cm)	4.04	8.60	20.35	34.50	45.13
S_3 (25×15 cm)	5.08	9.59	20.76	38.66	49.05
SEm(±)	0.04	0.04	0.05	0.07	0.06
CD at 5%	0.12	0.13	0.15	0.21	0.19
N_1 (140 kg/ha)	4.37	8.91	20.08	34.21	45.04
N_2 (120 kg/ha)	4.09	8.22	19.01	32.84	43.07
SEm(±)	0.03	0.03	0.04	0.05	0.05
CD at 5%	0.10	0.10	0.12	0.17	0.16
D_1 (7th February)	4.16	8.46	19.45	33.39	43.82
D_2 (23rd February)	4.30	8.67	19.64	33.67	44.29
SEm(±)	0.03	0.03	0.04	0.05	0.05
CD at 5%	0.10	0.10	0.12	0.17	0.16

Table 6: Dry matter accumulation in leaves (gm. /plant) as influenced by different levels of nitrogen, spacing and dates of sowing (pooled data of 2017 & 2018)

Treatments	33 DAS	39DAS	46 DAS	53 DAS	60 DAS
S_1 (40×25 cm)	2.65	7.50	15.72	26.65	36.72
S_2(30×20 cm)	3.41	8.60	19.89	31.78	42.11
S_3 (25×15 cm)	3.64	9.59	26.63	38.84	48.23
SEm(±)	0.03	0.04	0.07	0.07	0.10
CD at 5%	0.08	0.13	0.22	0.22	0.33
N_1 (140 kg/ha)	3.37	8.91	21.83	34.21	43.51
N_2 (120 kg/ha)	3.10	8.22	19.66	32.84	41.20
SEm(±)	0.02	0.03	0.06	0.05	0.09
CD at 5%	0.06	0.10	0.18	0.17	0.27
D_1 (7th February)	3.20	8.46	20.66	33.39	42.66
D_2 (23rd February)	3.27	8.67	20.83	33.67	42.05
SEm(±)	0.02	0.03	0.06	0.05	0.09
CD at 5%	0.06	0.10	0.18	0.17	0.27

3.5 Effect of different levels of nitrogen, spacing and dates of sowing on different plant and yield attributes at 60 DAS

Table 7 shows that different treatments used in the experiment left a significant impact on plant height, no of functional leaves per plant and on other yield attributes. Plant height, no of functional leaves per plant, cob length, and cob diameter was recorded highest for the spacing level 25×15 cm (S_3). Same result was supported by Sukanya *et al*., (1999) in a field trial of baby corn cv.YBC-705, ITC-zeneca and C6 with the plant population of 74074,111111,148148 plants/ha observed that increasing plants population per ha tends to increase the growth character of baby corn. Only maximum no of cob produced per plant at spacing level 40×25 cm. Except for plant height(cm), other yield attributes like no of functional leaves plant^{-1}, no of cobs plant^{-1}, cob length(cm) and cob diameter (cm) showed comparatively better performance at N_1 than N_2. Among the two dates of sowing, the plants which were sown on 1st date attained maximum height compared to other date. But on the other hand plants sown on 2nd date exhibited better result in leaves and cob production per plant, cob length and cob diameter.

Table 7: Effect of different levels of nitrogen, spacing and dates of sowing on plant height, number of functional leaves per plant and yield attributes at 60 DAS (Pooled data of 2017 & 2018)

Treatments	Plant height (cm)	Number of functional leaves per plant	No of cobs / plant	Cob length(cm)	Cob diameter (cm)
S_1(40×25 cm)	149.81	16(15.63)	8(7.50)	17.24	1.91
S_2(30×20 cm)	155.50	18(17.50)	7(7.13)	16.75	1.88
S_3(25×15 cm)	165.06	19(18.75)	7(6.88)	17.54	2.05
SEm(±)	0.21	0.07	0.06	0.10	0.04
CD at 5%	0.64	0.22	0.19	0.32	0.11
N_1 (140 kg/ha)	156.46	17(17.42)	7(7.25)	17.18	1.98
N_2 (120 kg/ha)	157.13	17(17.17)	7(7.08)	17.17	1.92
SEm(±)	0.17	0.06	0.05	0.09	0.03
CD at 5%	0.52	0.18	0.16	NS	NS
D_1 (7th February)	157.46	17(17.08)	7(6.92)	15.86	1.77
D_2 (23rd February)	156.13	18(17.50)	7(7.42)	18.49	2.13
SEm(±)	0.17	0.06	0.05	0.09	0.03

CD at 5%	0.52	0.18	0.16	0.26	0.09

3.6 Effect of different levels of nitrogen, spacing and dates of sowing on yield of baby cob (with husk), baby cob (dehusked) and green fodder.

From table no 8 it is evident that spacing with different row and plant arrangement produces 23 t ha^{-1}(S_1), 29 t ha^{-1} (S_2)and 44.56 t ha^{-1} (S_3) of husked cobs which indicate wider spacing yielded less production compared to others. Same result was found by Paradkar (2004) at Chindwara reported that when baby corn sown with plant spacing at 60cm × 10cm, 60cm × 15cm and 60 cm × 20cm produced 134.6, 88.0 and 88.9 thousand cobs ha^{-1}, respectively. It is observed that at a certain limit of urea application, there is chance of higher production of baby corn (N_1 produces 31.86 t ha^{-1} and N_2 produces 32.72 t ha^{-1} of husked baby cob). Paradkar (2004) reported that application of 180 kg N ha^{-1} significantly increased baby corn yield by 19.03 per cent over 120 kg N ha^{-1}and 44.13 per cent over 60 kg N ha^{-1}, respectively. The second date of sowing (D_2) produce more husked cob yield (38.05 t ha^{-1}) compared to first date of sowing (D_1) (26.53 t ha^{-1}) and D_2 produce less green matter than D_1. A trend of increase in dehusked cob yield with the increase in plant population has been recorded. Increasing plant density generally increased yields of commercial ears (Pereira et al., 1998). For the case of nitrogen treatments a decrease in yield was observed with the subsequent decrease of nitrogen dose. N_1 and N_2 produce 6.84 t ha^{-1} and 6.62 t ha^{-1} dehusked cob. Same result also found by Raja, 2001 reported that successive increase in application of nitrogen levels (0-120 kg ha^{-1}) significantly increased green ear yield of super sweet corn. 2nd date of sowing produces 7.59 t ha^{-1} of dehusked baby corn which is quiet higher than 1st date of sowing production (5.87 t ha^{-1}). The result revealed that there was a significant difference in green fodder yield with each increased level of plant population. It is observed that different nitrogen level is responsible for the difference in green matter yield. 1st and 2nd nitrogen treatment produces 25.07 and 25.43 t ha^{-1} of green matter respectively.

Table 8: Effect of different levels of nitrogen, spacing and dates of sowing on husked baby cob, dehusked baby cob and green fodder yield. (Pooled data of 2017 & 2018)

Treatments	Husked cob yield (t ha^{-1})	Dehusked cob yield (t ha^{-1})	Green fodder yield (t ha^{-1})
S_1(40×25 cm)	23.00	4.38	22.84
S_2(30×20 cm)	29.30	6.08	25.15
S_3(25×15 cm)	44.56	9.72	27.76
SEm(±)	0.09	0.09	0.11
CD at 5%	0.29	0.26	0.34
N_1 (140 kg/ha)	31.86	6.84	25.07
N_2 (120 kg/ha)	32.72	6.62	25.43
SEm(±)	0.07	0.07	0.09
CD at 5%	0.23	0.22	0.28
D_1 (7th February)	26.53	5.87	25.56
D_2 (23rd February)	38.05	7.59	24.94
SEm(±)	0.07	0.07	0.09
CD at 5%	0.23	0.22	0.28

3.7 Relationship between different micrometeorological parameter and yield (husked and dehusked cob) (t ha^{-1})

The result from the fig.4 and fig.6 revealed that intercepted PAR % is positively corelated with yield of dehusked cob at 33 DAS and 46 DAS, with R^2 value 0.644 and 0.654 respectively. Canopy temperature shows negetive relation with yield of dehusked cob (fig.5), with R^2 value 0.392 at 46 DAS. In case of husked baby cob yield the intercepted PAR % has also shown positive relation at 33 DAS, with R^2 value 0.362.

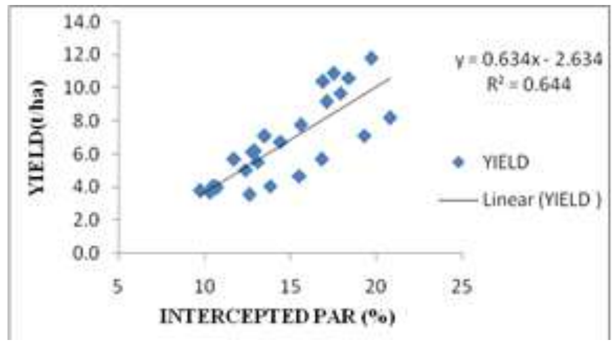

Fig 4: Association between Yield (dehusked cob) and intercepted PAR % at 33 DAS

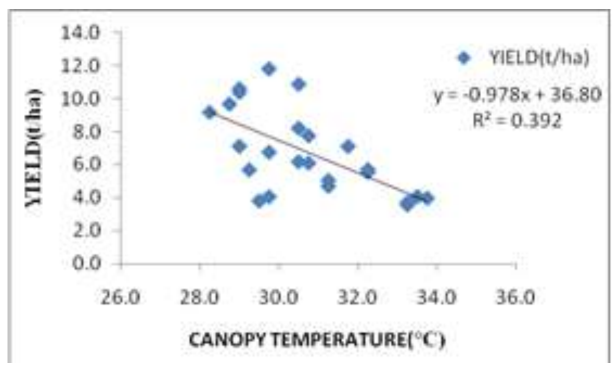

Fig 5: Association between canopy temperature and yield (dehusked cob) at 46 DAS

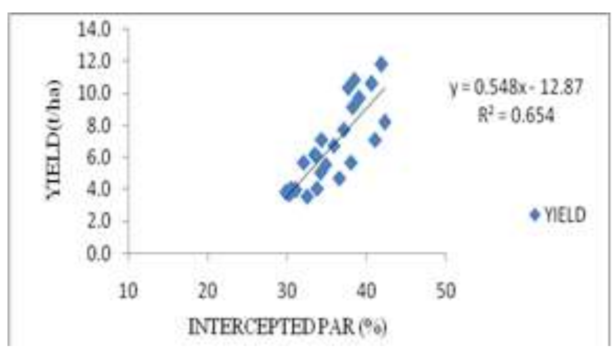

Fig 6: Association between intercepted PAR % and yield (dehusked cob) at 46 DAS

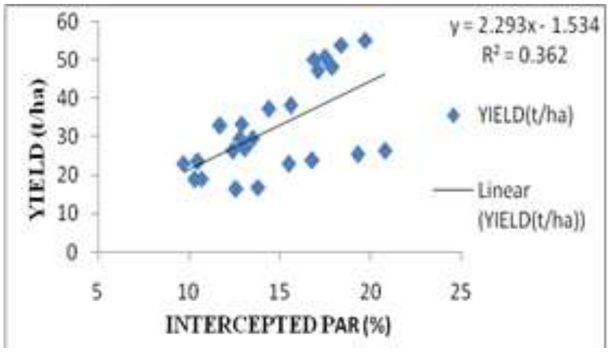

Fig 7: Association between intercepted PAR % and yield (husked cob) at 33 DAS

4. Conclusion

All the selected treatments of three spacing along with two nitrogen level and two dates of sowing had significant effect on crop biometric attributes of plant height, no. of effective leaves, dry matter partitioning. Canopy temperature, Canopy –air temperature differential and PAR depends on canopy architecture. Treatment differences for three factors were mostly significant during different periodical observations. Canopy–air temperature differential (CATD) values showed that there was no water stress during entire crop development stages. Significant changes due to the effect of three important factors responsible for canopy modification were observed in case of PAR and its three components. Out of three different spacing S_1 provides maximum no of cobs / plant followed by S_2 and S_3. Maximum cob length of individual baby corn was observed for spacing S_3 (25×15 cm) followed by S_1 (40×25 cm) and S_2 (30×20 cm). Diameter of individual dehusked cob was maximum for S_3 where S_2 gives minimum individual cob diameter. Yield of husked baby corn was 44.56 t ha^{-1} for S_3 spacing but S_1 provides only 23 t ha^{-1}. Maximum dehusked baby corn production was 9.72 t ha^{-1} for S_3 and minimum yield was observed for S_1 (4.38 t ha^{-1}). N_1 perform better for other yield attributing traits compared to N_2. Yield of husked baby corn was maximum for N_2 treatment (32.72 t ha^{-1}) followed by N_1 (31.86 t ha^{-1}). The different dates of sowing had an important role on no of cobs per plant where D_1 provides maximum cob per plant (7.25) and minimum for D_2 (7.08). Weight of individual husked baby corn was more in case of D_2 (21.39 gm. /cob). D_2 showed maximum individual dehusked cob weight (5.82 gm/cob) and 5.25gm/cob for D_1. Diameter and length of individual cob was more in case D_2 followed by D_1. Yield of husked baby corn was recorded for D_2 as 38.05 t ha^{-1} followed by 26.53 t ha^{-1} for D_1. Same trend was observed for yield of dehusked baby corn where D2 provide maximum yield (7.59 t ha^{-1}). Salient findings coming from climate friendly cultivation of baby corn under the schedule experiment recommended that farmers will get maximum economic benefit when they will sow baby corn during last week of February maintaining 120 kg /ha urea and with closer spacing (25×15 cm).

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