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Morpho-physiological responses of baby corn to varied irrigation and sowing strategies

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Abstract
A field study was conducted at the post graduate experimental field of Biswanath College of Agriculture, Assam Agricultural University, to find out the influence of varied irrigation schedule and date of sowing on morphological and physiological parameters *viz.*, plant height, total dry weight plant^{-1}, Leaf area index (LAI), crop growth rate (CGR) and relative growth rate (RGR). The experiment was composed of four irrigation schedule (rainfed, IW/CPE = 0.5, IW/CPE = 0.8 and IW/CPE = 1.0) and four different sowing dates (20th October, 5th November, 20th November and 5th December) and laid in split plot design. The crop scheduled with IW/CPE = 1.0 registered significantly highest plant height, total dry weight plant^{-1}, LAI, CGR and RGR however with an exception of lower RGR at 50 DAS-picking. Among the sowing dates, the 5th November sown crop recorded maximum values of morphological and physiological parameters with the exception of lower RGR at 50 DAS-picking.

Keywords: Irrigation scheduling, sowing dates, IW/CPE ratio, morphological parameters

Introduction

Maize (Corn) a species of family Poaceace, known for its versatility and multipurpose use is termed as queen of cereals due to its tremendous potentiality. "Since its domestication some 9,000 years ago, maize (*Zea mays* L.) has played an increasing and diverse role in global agri-food systems" (Erenstein, 2022). It holds second position under most widely cultivated crop in the world. USA produces more than 40% of maize, China, Brazil, Mexico Indonesia and India succeeds it by producing 20%, 6.3%, 2.5%, 2.2% and 2% of maize grain respectively. It can be cultivated in diversified types. Among the product of diversified maize one important type is Baby corn which refers to young, immature cobs harvested before full maturation, typically when they are 4-10cm long. It is grown from specific maize varieties, often hand-picked early to ensure tenderness. The ears of Baby corn are light creamy in color and have a uniform arrangement of ovary. The nutritional content per 100 g of edible Baby corn includes 8.2 g carbohydrates, 1.9 g protein, 28 mg calcium, 86 mg phosphorus, 0.1 mg iron, 0.5 mg thiamine, 0.08 mg riboflavin, and 11 mg vitamin C (Jinjala *et al.*, 2016) [3]. Besides, as it is wrapped in husk at the time of harvesting, it also free of residues from agro-chemicals. Moreover it has a short crop duration which makes it fit to be cultivated in any cropping system. However just like Maize it is sensitive to water. Thus, irrigation scheduling—particularly when based on evapotranspiration (ET)—plays a critical role in supplying crops with the precise amount of water they need, thereby enhancing water-use efficiency. When combined with timely sowing, it optimizes the use of all resources and boosts crop productivity. Therefore, this study was conducted to evaluate the morpho-physiological responses of the crop under varying irrigation schedules and sowing dates.

Materials and Methods

A field experiment was carried out during *rabi* 2024-25 at the Postgraduate experimental field (Lat.: 26°72´52´´, Long.: 93°13´54´´) in Biswanath College of Agriculture, AAU. The soil was sandy loam, extremely acidic in reaction (4.30), high in organic carbon (0.76%), medium in available Nitrogen (283.43 kg ha^{-1}) and low in available phosphorus (21.60 kg ha^{-1}) and potassium (120.9 kg ha^{-1}) and has high infiltration rate of 3.98 cm hr^{-1}. During the period of experimentation (October-March), the total rainfall received was 708 mm.

Maximum amount of rainfall was concentrated in the month of October. The average maximum and minimum temperature recorded was 26.59 °C and 14.18 °C respectively while the average BSSH received was 0.16 hr day^{-1}. The study involved four (4) schedules of irrigation *viz.*, I_1: Rainfed (Control), I_2: IW/CPE = 0.5, I_3: IW/CPE = 0.8, and I_4: IW/CPE = 1.0 and four (4) dates of sowing *viz.*, S_1: 20th October, S_2:5th November, S_3: 20th November and S_4: 5th December; laid in split-plot design where irrigation schedules were assigned to the main plots and sowing dates to the sub-plots and replicated three times. The variety of Baby corn cultivated was G-5414 which was a male sterile line. Irrigation scheduling was done using ET based method *i.e.*, IW/CPE approach. The depth of irrigation water was 30 mm and was measured using volumetric method. Plant height was measured using a meter scale from base of the plant to the tip of folded leaf. To weigh the plant, it was chopped and sun dried for two days and then dried in hot air oven at 60 ± 5 °C to obtain a constant weight. To compute LAI, CGR and RGR following formula cited by Sestak *et al.*, 1971 [14], Watson, 1952 [18] and Redfort, 1967 [11] were used respectively.

$$LAI = \frac{\text{Leaf area per plant}(cm^2)}{\text{Ground area occupied by plant}(cm^2)}$$ ” (Sestak *et al.*, 1971) [14]

$$CGR = \frac{W_2 - W_1}{A\,(T_2 - T_1)}$$ ” (Watson, 1952) [18]

$$RGR = \frac{\log W_2 - \log W_1}{(T_2 - T_1)}$$ ” (Redfort, 1967) [11]

Results and Discussion

Morphological parameters

Irrigation schedule had no significant effect on plant height at 20 and 35 days after sowing (DAS). However, frequent irrigation (IW/CPE = 1.0) gave the tallest plants at 50 DAS and at picking, followed by IW/CPE = 0.8 and 0.5. The rainfed treatment recorded the shortest plants at these stages. This is due to higher irrigation frequency under greater IW/CPE ratios, which ensured sufficient soil moisture, improved nutrient uptake, and promoted cell division and elongation, leading to increased plant height (Manna *et al.*, 2018; Roy *et al.*, 2015; Rathod *et al.*, 2023) [7, 12, 10]. Similarly, total dry weight per plant was highest at 35 DAS, 50 DAS, and picking under IW/CPE = 1.0, and lowest under rainfed conditions. Adequate water availability enhanced nutrient access, boosted cell division, and increased dry matter buildup. Paul (2023) [9] stated that frequent irrigation supports cell division and expansion, resulting in steady biomass gain.

Sowing date significantly influenced plant height at 20, 35, 50 DAS, and picking, regardless of irrigation. The earliest sowing (20 October) produced the tallest plants at 20, 35, and 50 DAS, followed by 5th November and 20th November, while 5th December gave the shortest plants. This was likely due to favorable weather during early sowing (Panda and Dutta, 2019; Talukdar *et al.*, 2020) [8, 17]. At picking, the 5th November sowing recorded the greatest height, statistically similar to 20th October. The longer growth period allowed more time for cell division and elongation. Sharma *et al.* (2010) [15] found that pigeonpea varieties with longer maturity periods achieved greater plant height. Sowing date also had a conspicuous effect on total dry weight plant^{-1}. At 20, 35, and 50 DAS, dry weight decreased with delayed sowing, with the highest values in 20th October and lowest in 5th December. Talukdar *et al.* (2020) [17] explained that early sowing benefited from better weather, supporting growth and biomass accumulation. At picking, 5th November sowing gave the highest dry weight, followed by 20th October, and 5th December the lowest. This may be due to longer sunshine duration in early November, which increased biomass buildup (Paul, 2023) [9].

The combined effect of irrigation scheduling and sowing dates significantly influenced the total dry weight per plant at 35 and 50 DAS. The maximum total dry weight plant^{-1} at 35 DAS was obtained from crop sown on 20th October and irrigated at IW/CPE = 1.0, which was comparable with crop sown on 20th October and irrigated at IW/CPE = 0.8. The minimum was recorded from rainfed crop sown on 5th December. Again, the maximum total dry weight plant^{-1} at 50 DAS was found under crop sown on 20th October and irrigated at IW/CPE = 1.0 which was however found to be statistically similar to crop sown on 20th October and irrigated at IW/CPE = 0.8. The least value was noted under rainfed crop sown on 5th December. This result could be attributed to collective influence of shifts in sowing and irrigation schedules which in turn resulted in modification of microclimate of the crop (Kalita., 2020) [4].

Table 1: Plant height and total dry weight plant^{-1} as influenced by irrigation scheduling and sowing date

	Plant height (cm)				Total dry weight plant^{-1} (g)			
Treatment	**20 DAS**	**35 DAS**	**50 DAS**	**Picking**	**20 DAS**	**35 DAS**	**50 DAS**	**Picking**
Irrigation schedule								
I_1: Rainfed	13.93	38.59	71.33	97.00	1.24	5.82	31.03	54.74
I_2: IW/CPE = 0.5	13.33	39.18	76.34	106.15	1.26	5.90	36.72	62.76
I_3: IW/CPE = 0.8	13.76	40.42	78.40	117.68	1.21	6.15	42.99	70.91
I_4: IW/CPE = 1.0	13.68	41.76	82.08	121.58	1.25	6.33	47.51	78.34
CD (P = 0.05)	NS	NS	2.28	4.97	NS	0.22	2.29	4.45
Sowing date								
S_1:20th Oct	17.11	47.21	88.42	115.19	1.77	6.95	50.14	67.88
S_2: 5th Nov	16.44	45.75	81.06	119.10	1.50	6.29	43.78	72.89
S_3: 20th Nov	11.04	34.15	71.51	109.15	0.89	5.58	35.64	65.78
S_4: 5th Dec	10.11	32.83	67.14	98.97	0.78	5.38	28.68	60.20
CD (P = 0.05)	0.92	1.30	1.99	4.52	0.09	0.15	2.23	2.96
Interaction (I×S)								
CD (P = 0.05)	NS	NS	NS	NS	NS	0.30	4.46	NS

Physiological parameters

Irrigation schedules significantly affected LAI at pre-tasseling and silking stages, regardless of sowing dates. The highest LAI at both stages was recorded under IW/CPE = 1.0, which was statistically similar to IW/CPE = 0.8. At pre-tasseling, IW/CPE = 0.8 was comparable to IW/CPE = 0.5, which in turn was similar to the rainfed treatment and recorded the lowest LAI. At silking, IW/CPE = 0.8 was followed by IW/CPE = 0.5, with the rainfed treatment showing the lowest LAI. The higher LAI under greater IW/CPE ratios can be attributed to increased photosynthesis, larger leaf surface area, and greater crop biomass (Shivkumar *et al.*, 2011; Roy *et al.*, 2015; Kiran *et al.*, 2019; Paul, 2023) [16, 12, 5, 9].

Sowing dates significantly affected LAI at pre-tasseling and silking, regardless of irrigation. The highest LAI at both stages was recorded in the 5th November sowing, which was statistically similar to 20th October. The lowest LAI was noted undere 5th December sowing which was however comparable to 20th November. This is likely due to the longer growth period in 5th November sowing, providing more time for photosynthate production and accumulation, resulting in better leaf development. Kumar and Singh (2001) [6] reported that LAI of maize is more in winter season than summer season.

Irrigation schedule significantly influenced CGR at 20-35 and 35-50 DAS, regardless of sowing date, but had no effect at 50 DAS-picking. The highest CGR at both intervals was under IW/CPE = 1.0, followed by IW/CPE = 0.8 and 0.5, with rainfed recording the lowest. This was due to greater total dry weight per plant under IW/CPE = 1.0 (Baviskar *et al.*, 2016; Saini *et al.*, 2020) [1, 13]. Irrigation had no effect on RGR at 20-35 DAS but significantly affected it at 35-50 DAS and 50 DAS-picking. At 35-50 DAS, RGR was highest under IW/CPE = 1.0 (similar to IW/CPE = 0.8), followed by IW/CPE = 0.5, and lowest under rainfed. At 50 DAS-picking, the trend reversed: highest RGR was under rainfed (comparable to IW/CPE = 0.5), followed by IW/CPE = 0.8, and lowest under IW/CPE = 1.0. Higher IW/CPE ratios reduced efficiency in converting resources to new growth (Saini *et al.*, 2020) [13].

The highest crop growth rate (CGR) at 20-35 DAS and 35-50 DAS was recorded in the 20th October sowing, followed by 5th November. At 20-35 DAS, the 5th November treatment was comparable to 20th November, which in turn was statistically similar to 5th December and recorded the lowest CGR. At 35-50 DAS, however, 5th November and 20th November followed 20th October, with 5th December showing the lowest value. This was likely due to greater total dry weight per plant in early sowings (Talukdar *et al.*, 2020) [17]. In contrast, CGR at 50 DAS-picking was highest under 5th November, statistically similar to 5th December and 20th November, while the lowest was under 20th October, reflecting varying rates of biomass increase during this period. In case of RGR the highest magnitude was noted under 5th December sown crop, succeeded by 20th November and 5th November. The lowest RGR was recorded under 20th October sown crop. It was due to lower initial mass of late sown crops which led to higher rate of conversion of existing resources into new mass with progress in growth stages.

The interaction between irrigation schedule and sowing date significantly affected CGR at 20-35 and 35-50 DAS. The highest CGR at both intervals was recorded in the 20th October sowing under IW/CPE = 1.0, while the lowest was under the 5th November rainfed treatment at 20-35 DAS and the 5th December rainfed treatment at 35-50 DAS. A significant interaction also influenced RGR at 35-50 DAS, with the maximum under 20th October at IW/CPE = 1.0 and the minimum under 5th December rainfed. This likely resulted from the combined impact of irrigation and sowing date on crop microclimate, thereby altering biomass accumulation efficiency.

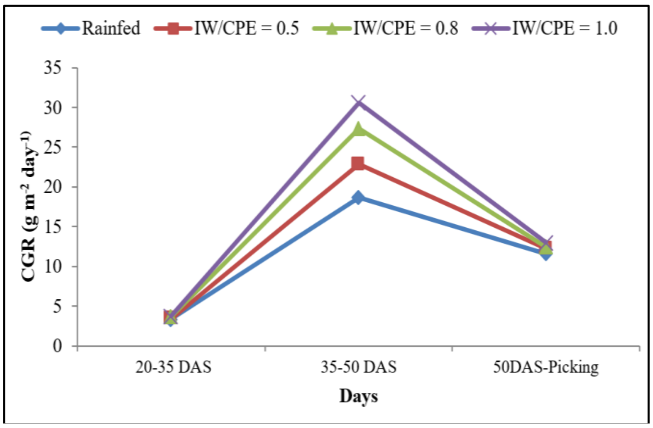

Fig 1: CGR as influenced by irrigation schedule

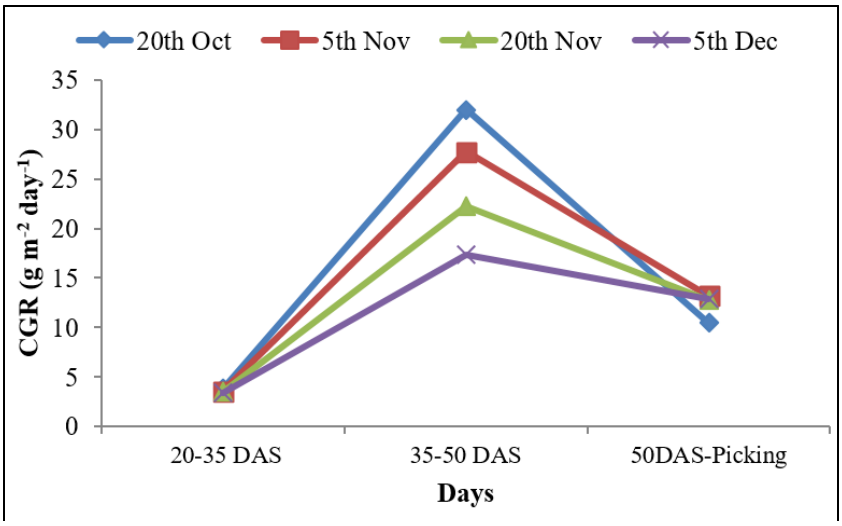

Fig 2: CGR as influenced by sowing dates

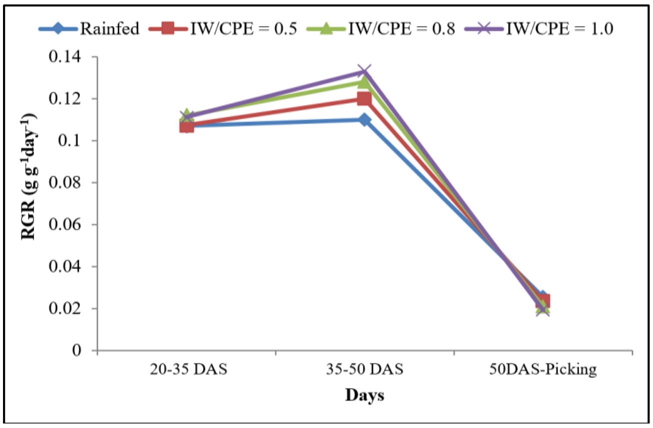

Fig 3: RGR as influenced by irrigation schedule

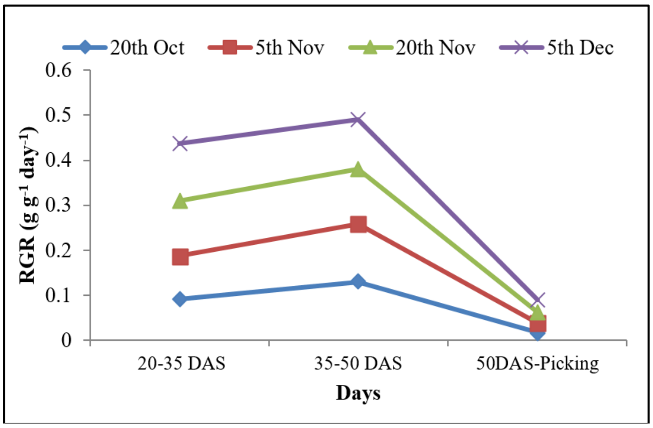

Fig 4: RGR as influenced by sowing dates

Table 2: LAI as influenced by irrigation scheduling and sowing dates

Treatment	LAI	
	Pre-tasseling	Silking
Irrigation schedule		
I_1: Rainfed	4.72	4.58
I_2: IW/CPE = 0.5	4.79	4.70
I_3: IW/CPE = 0.8	4.89	4.78
I_4: IW/CPE = 1.0	4.95	4.83
CD (P = 0.05)	0.10	0.09
Sowing date		
S_1:20th Oct	4.90	4.79
S_2: 5th Nov	4.97	4.85
S_3: 20th Nov	4.76	4.65
S_4: 5th Dec	4.71	4.61
CD (P = 0.05)	0.10	0.11
Interaction (I×S)		
CD (P = 0.05)	NS	NS

Conclusion

The study demonstrated that irrigating Baby corn at an IW/CPE = 1.0 and sowing on 5th November yielded superior morphological and physiological performance. Nevertheless, additional site-specific research is needed to develop a practical, ready-to-use guide that directly benefits farmers.

References

1. Baviskar VS, Patel JB, Shitap MS, Takle SR, Patel VJ. Physiological growth indices and yield of wheat (*Triticum aestivum* L.) as influenced by irrigation schedules, seed rates and sowing methods in paddy land. Int J Bio-resour Stress Manag. 2016;7(6):124-130.
2. Erenstein O, Jaleta M, Sonder K, Mottaleb K, Prasanna BM. Global maize production, consumption and trade: trends and R&D implications. Food Secur. 2022;14(5):1295-1319.
3. Jinjala VR, Virdia HM, Saravaiya NN, Raj AD. Effect of integrated nutrient management on baby corn (*Zea mays* L.). Agric Sci Dig. 2016;36(4):291-294.
4. Kalita R. Resource use efficiency in winter rice (*Oryza sativa* L.) under system of rice intensification (SRI) concept as influenced by microclimate. PhD thesis. Assam: Assam Agricultural University; 2020.
5. Kiran YD, Sumathi V, Reddy GP. Growth, yield and water use of maize as influenced by drip irrigation schedules and nitrogen levels. J Res ANGRAU. 2019;47(4):1-11.
6. Kumar SN, Singh CP. Growth analysis of maize during long and short duration crop seasons: influence of nitrogen source and dose. Indian J Agric Res. 2001;35(1):13-18.
7. Manna T, Saha G, Saha A, Dutta D, Nanda MK. Contribution of microclimate towards yield attributing factors and yield of summer baby corn (*Zea mays* L.) under different irrigations and mulches. Int J Curr Microbiol Appl Sci. 2018;7(7):1542-1552.
8. Panda D, Dutta R. Production of baby corn influenced by different dates of sowing and planting geometry. Int J Curr Microbiol Appl Sci. 2019;8(11):1302-1309.
9. Paul A. Effect of nano urea and irrigation management practices on rabi maize (*Zea mays* L.). PhD thesis. Jorhat: Assam Agricultural University; 2023.
10. Rathod AD, Modhvadia JM, Patel RJ, Patel NH. Response of summer fodder maize (*Zea mays* L.) to irrigation scheduling based on IW/CPE ratio and nitrogen levels. Pharma Innov J. 2023;12(12):3584-3588.
11. Redford PJ. Growth analysis formulae—their use and abuse. Crop Sci. 1967;7(3):171-175.
12. Roy S, Sengupta A, Barman M, Puste AM, Gunri SK. Effect of irrigation and nutrient management on growth, yield, quality and water use of summer baby corn (*Zea mays* L.) in new alluvial zone of West Bengal. J Crop Weed. 2015;11(2):111-116.
13. Saini AK, Patel AM, Saini LH, Malve SH. Growth, phenology and yield of summer pearl millet (*Pennisetum glaucum* L.) as affected by varied application of water, nutrients and hydrogel. Int J Ecol Environ Sci. 2020;2(3):248-252.
14. Sesták Z, Catský J, Jarvis PG. Plant photosynthetic production: Manual of methods. The Hague (Netherlands); 1971.
15. Sharma A, Rathod PS, Basavaraj K. Agronomic management of pigeonpea (*Cajanus cajan*) based intercropping systems for improving productivity under rainfed conditions. Karnataka J Agric Sci. 2010;23(4):570-574.
16. Shivakumar HK, Ramachandrappa BK, Nanjappa HV, Mudalagiriyappa M. Effect of phenophase-based irrigation schedules on growth, yield and quality of baby corn (*Zea mays* L.). Agric Sci. 2011;2(3):267-272.
17. Talukdar L, Bora PC, Kurmi K, Kalita S. Date of sowing and row spacing for improving growth attributes of baby corn. Int J Curr Microbiol Appl Sci. 2020;9(7):1614-1621.
18. Watson DJ. The physiological basis of variation in yield. Adv Agron. 1952;4:101-145.