Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2582-2845.9069

ISSN: 2582 – 2845

Ind. J. Pure App. Biosci. (2024) *12*(2), 51-57

Indian Journal of Pure & Applied Biosciences

Peer-Reviewed, Refereed, Open Access Journal

Research Article

Efficacy of Sowing Dates in Growth and Yield of Hybrid Maize under Namsai Conditions

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Received: 10.01.2024 | Revised: 27.02.2024 | Accepted: 9.03.2024

ABSTRACT

The study was conducted in the instructional and research farm during the period 10th February to 11th September 2023 in a randomized block design (RBD) method. The first sowing dates started on 10th February, followed by 20th February, 2nd March, 12th March, 22nd March, 1st April, 11th April, 21st April, 1st May and 11th May, respectively, at 10 days intervals. The growth parameters like seed germination, number of leaves per plant, plant heights, number of cobs per plant, number of grains per cobs, 100 grain seed index, leaf area index and grain yield per hectare has been observed and evaluated. On evaluation it was noted that maize sown on 1st April gave highest seed germination of 95.87%, tallest plant of 198.83 cm, maximum number of 20.33 leaves per plant, highest leaf area index of 582.56, maximum number of 8.00 cobs per plant, maximum number of 31.27 grains per cob, highest seed index of 41.33 and highest grains yield of 9.31 kg/plot when compared to all other sowing dates. The germination (r= 0.704), plant height (r= 0.641), number of leaves (r= 0.966), leaf area (r= 0.709), number of cobs per plant (r= 0.994), number of grains per cob (r= 0.698) and seed index (r= 0.968) are positively stimulated yield response in hybrid maize. Thus, sowing on 1st April has a paramount effect on the production of hybrid maize in Namsai conditions. Further study may be needed to investigate precise sowing dates of local maize in the Namsai region.

Keywords: *Maize, growth parameters, yield, correlation, sowing dates.*

INTRODUCTION

Maize (*Zea mays* L.) belongs to the family Poaceae and is one of the most important cereal crops worldwide. It is used as food for human beings and feed for animals. Production is now estimated to be 28 million MT.

Cite this article: Katung, T. N., Singh, S. R., Sharma, A., Hazarika, M., Kesavan, A. K., Ajaykumara, K. M., Chatterjee, B., Rabina, K., & Yengkhom, D. (2024). Efficacy of Sowing Dates in Growth and Yield of Hybrid Maize under Namsai Conditions, *Ind. J. Pure App. Biosci. 12*(2), 51-57. doi: http://dx.doi.org/10.18782/2582-2845.9069

The total Indian maize production estimate was 35.91 million tonnes. Karnataka is the largest producer of maize in India, contributing around 15% to the country's total maize output. The US is the world's biggest producer of corn, accounting for 32% of global corn production or almost 390 million metric tons.

It is a staple of human food, livestock feed, fermentation, and many industrial uses. It is having abundant starch (65%). Maize is one of the world's most important crops – responsible for roughly six per cent of human calorie intake. Bakery products (biscuits, bread, crackers, fillings, icing, macaroons, pretzels, cookies, crackers, wafers, etc.) Beverages brewed (beer**,** ale, etc.) Food acids (citric, etc.). Maize contains vitamin C, Vitamin E, vitamin K, vitamin B_1 (thiamine), vitamin B_2 (nician), vitamin B_3 (riboflavin), vitamin B_5 (pyridoxine), folic acid, selenium, N-p-coumaryl tryptamine and N-ferrulyl tryptamine and potassium (Kumar & Sanjay, 2013). Maize germ contains about 45-50% oil that is used in cooking, salads and is obtained from wet milling process. It contains various major phytochemicals such as carotenoids, phenolic compounds and phytosterol. It is believed to have potential anti-HIV activity due to the presence of Galanthus nivalis agglutinin (GNA) lectin or GNA-maize. Decoction of maize silk, roots. Leaves and cob are used for bladder problems, nausea, and vomiting and stomach complaints. Zein, an alcohol-soluble prolamin found in maize endosperm, has unique novel applications in pharmaceutical and nutraceutical areas. Phytochemicals are bioactive chemical compounds naturally present in plants that provide human health benefits and have the potential for reducing the risk of chronic diseases (Liu, 2004). Carotenoids belong to a family of red, orange and yellow pigments. There is a large quantity of carotenoid pigments present in yellow maize grains, especially in horny and floury endosperm (Liu, 2007). According to Watson and Ramstad (1987) and Moros et al. (2002), a phytochemical compounds concentration in per 100 mg maize have Carotene 100 mg, Xanthophylls 2.07 mg, Lutein 1.50 mg and Zeaxanthin 0.57 mg.

Maize spread fast because it was nutritious and easy to grow, store, and carry. In Arunachal Pradesh, the Maize crop is cultivated in an area of 54215 hectares with a production of 85399 metric tonnes (Deptt. of Agril. Govt. of A.P, Agril. Census, 2021-22). However, due to a lack of knowledge on actual and suitable times for maize cultivation, farmers of the state and Namsai district, in particular, are not taking up maize cultivation on a commercial scale to meet the increasing demands of maize grains and their by-products. Instead people of the state and Namsai depend on Assam for most of its maize demand. As per previous researchers, it is also said that sowing dates is effective in increasing the total annual yield of maize, and therefore, growers are concerned about the yield response of maize to sowing dates. The present investigation of the researcher is aimed at finding out a suitable time for sowing.

i) To evaluate growth parameters and yield response in hybrid maize

ii) To estimate the correlation coefficient between growth and yield in hybrid maize

MATERIALS AND METHODS

Place of experiment: was carried out in an instructional and research farm of Arunachal University of Studies Namsai from February to September 2023. The site was situated at geo-coordinates of $27^0$30´ to $27^0$55´N and $95^0$45' to $96^0$20' E with an elevation of 157 m above mean sea level. The rainfall was 117.4 mm and 13.7-36.9 temperature in april, 2023 month.

Planting materials: Maize hybrid Nem-33 was sown at 10 day intervals starting on 10th February and lasting up to 11th May 2023.

Methods: The different sowing dates S0D0-10th February 2023, S1D1-20th February 2023, S2D2- 2nd March 2023, S3D3-12th March 2023, S4D4- 22nd March 2023, S5D5-1st April 2023, S6D6- 11th April 2023, S7D7-21st April 2023, S8D8- 1st May 2023, S9D9-11th May 2023The experiment was laid out in randomized block design (RBD) with three

replications and ten treatment having plot size of 2 m x 1.5 m each.

Management: For pre-plant application, one round of glyphosate 50 EC @ 5ml per water was sprayed one week before sowing seeds to kill the germinated weeds as glyphosate is a non-selective broad-spectrum herbicide (Plate 5). Three rounds of manual weeding were done, one each at 30 DAS, 60 DAS, and 90 DAS (Plate 6), to keep the weeds under control, which otherwise would cause a 50- 60 per cent yield reduction.

Observations: germination (%), plant height (cm), number of leaves, leaf area index (LAI), number of cobs/plant, number of grains/cob, seed index (100 grain seeds) and yield (kg/plot) (Figure 1).

RESULTS AND DISCUSSION

i) Evaluation of growth parameters and yield response in hybrid maize

The computational data of growth parameters in hybrid maize was reported significant variations among treatments. The mean value ranges of 61.83-95.87% germination percentage, 106.17-197.99 cm plant height, 4.41-18.72 number of leaves, 192.83-582.56 leaf area index, 0.33-31.27 number of cobs per plant, 10.16-47.50 seed index and 0.53-9.31 kg per plot were obtained in the hybrid maize. The highest germination percentage of 95.87%, 91.60%, followed by 88.34% and 89.86%, was obtained in sowing dates S_5D_5 -1st April, S_6D_6 -11th April, S_7D_7 - 21st April and S_8D_8 -1st May respectively. The sowing dates of S_5D_5 - 1st April, S_6D_6 -11th April, followed by S_7D_7 -21st April resulted in 197.99 cm, followed by 178.83 cm and 176.07 cm highest plant height in hybrid maize. The highest number of leaves of 18.72, 16.60 followed by 14.38, was attained in sowing dates S_5D_5 - 1st April, S_6D_6 -11th April, followed by S_7D_7 -21st April, respectively. The sowing dates S_5D_5 - 1st April followed by S_3D_3 - 12th March and S_2D_2- 2nd March achieved 582.56, 525.21 and 465.43 highest leaf area index, respectively, in hybrid maize. The highest number of cobs per plant of 8.00, 7.00 followed by 6.00 was obtained in sowing dates S_5D_5 - 1st April, S_6D_6 -11th April and S_7D_7 -11th April, respectively. The sowing dates S_5D_5 - 1st April followed by S_3D_3 - 21st april and S_8D_8- 1st may were resulted 31.27, 26.16, 23.00 and 21.50 highest number of grains per, respectively in hybrid maize. The highest seed index of 47.50, and 41.53, followed by 37.51, were obtained in sowing dates S_5D_5 - 1st April, S_6D_6 -11th April and S_7D_7 -11th April, respectively. The sowing dates S_5D_5 - 1 April, S_6D_6 -11th April, followed by S_7D_7- 21st April, was found to be 9.31 kg, 8.16 kg and 7.03 kg highest yield, respectively, in hybrid maize (Table 1, Figure 2, 3).

ii) Determination of the correlation coefficient between growth and yield in hybrid maize

The obtained values in correlation matrices resulted in significant differences in the variables of hybrid maize. The germination was positively responded in the morphological growth plant height (r= 0.984), number of leaves (r= 0.856), leaf area index (r= 0.318), number of cobs per plant (r= 0.685), number of grains per cob (r= 0.986), seed index (r= 0.593) and yield (r= 0.704). The plant height is positively involved in vegetative growth germination (r= 0.984), number of leaves (r= 0.806), leaf area index (r= 0.264), number of cobs per plant (r= 0.632), number of grains per cob (r= 0.985), seed index (r= 0.526) and yield (r= 0.641). The number of leaves is positively incorporated in morphological growth germination (r= 0.856), plant height (r= 0.806), leaf area index (r= 0.640), number of cobs per plant (r= 0.956), number of grains per cob (r= 0.856), seed index (r= 0.903) and yield (r= 0.966). The leaf area index is positively stimulated in phenotypic growth germination (r= 0.318), plant height (r= 0.264), number of leaves (r= 0.640), number of cobs per plant (r= 0.674), number of grains per cob (r= 0.314), seed index (r= 0.674) and yield (r= 0.709). The number of cobs per plant is positively stimulated vegetative growth germination (r= 0.685), plant height (r= 0.632), number of leaves (r= 0.956), leaf area index (r= 0.674), number of grains per cob (r= 0.688), seed index (r= 0.976) and yield (r= 0.994). The number of grains per cob are positively

involved in morphological growth germination (r= 0.986), plant height (r= 0.985), number of leaves (r= 0.856), leaf area index (r= 0.314), number of cobs per plant (r= 0.688), seed index (r= 0.592) and yield (r= 0.698). The seed index is positively stimulated external growth germination (r= 0.593), plant height (r= 0.526), number of leaves (r= 0.903), leaf area index (r= 0.674), number of cobs per plant (r= 0.976), number of grains per cob (r= 0.592) and yield (r= 0.968). The germination (r= 0.704), plant height (r= 0.641), number of leaves (r= 0.966), leaf area (r= 0.709), number of cobs per plant (r= 0.994), number of grains per cob (r= 0.698) and seed index (r= 0.968) are positively stimulated yield response in hybrid maize **(Table 2).**

Table 1: Observation of Growth parameters in hybrid maize

Treatments	vegetative phase				reproductive phase			
	germination (%)	plant height (cm)	number of leaves	leaf area index (LAI)	number of cobs/plant	number of grains/cob	seed index (100 grain seeds)	yield (kg/plot)
S0D0- 10th Feb'	61.83	106.17	4.71	192.83	0.33	6.83	18.28	0.53
S1D1- 20th Feb'	66.16	113.16	7.82	357.36	2.16	8.33	21.83	3.26
S2D2- 2nd March'	69.14	121.72	9.38	465.43	3.16	10.16	25.73	4.34
S3D3- 12th March'	72.68	129.98	11.55	525.21	4.17	13.50	30.06	5.20
S4D4- 22nd March'	76.14	136.88	12.82	393.53	5.16	17.90	34.13	6.18
S5D5- 1st April	95.87	197.99	18.72	582.56	8.00	31.27	47.50	9.31
S6D6- 11th April	91.60	178.83	16.60	330.53	7.00	26.16	41.33	8.16
S7D7- 21st April	88.34	176.07	14.38	372.66	6.00	23.00	37.51	7.03
S8D8- 1st May	85.86	163.53	9.38	301.10	0.66	21.50	14.16	2.01
S9D9- 11th May	78.05	160.15	8.06	235.46	1.00	19.20	10.16	1.48
SEm (±)	0.39±78.57	0.13±148.45	1.19±11.34	0.35±375.66	0.16±3.76	0.28±17.78	0.36±28.06	0.17±4.75
CD (5%)	1.15	0.38	3.53	1.06	0.50	0.84	1.08	0.52

Table 2: Correlation matrix of growth and yield in hybrid maize

Variables	Germination (%)	plant height (cm)	number of leaves	leaf area index (LAI)	number of cobs/plant	number of grains/cob	seed index (100 grain seeds)	yield (kg/plot)
Germination (%)	1.000	0.984	0.856	0.318	0.685	0.986	0.593	0.704
plant height (cm)	0.984	1.000	0.806	0.264	0.632	0.985	0.526	0.641
number of leaves	0.856	0.806	1.000	0.640	0.956	0.856	0.903	0.966
leaf area index (LAI)	0.318	0.264	0.640	1.000	0.674	0.314	0.674	0.709
number of cobs/plant	0.685	0.632	0.956	0.674	1.000	0.688	0.976	0.994
number of grains/cob	0.986	0.985	0.856	0.314	0.688	1.000	0.592	0.698
seed index (100 grain seeds)	0.593	0.526	0.903	0.674	0.976	0.592	1.000	0.968
yield (kg/plot)	0.704	0.641	0.966	0.709	0.994	0.698	0.968	1.000

pearson's value (0.05) = 0.70

Fig. 1: Field preparation and cultural practices in experimental area

Fig. 2: Observation of growth parameters and yield attribution in hybrid maize

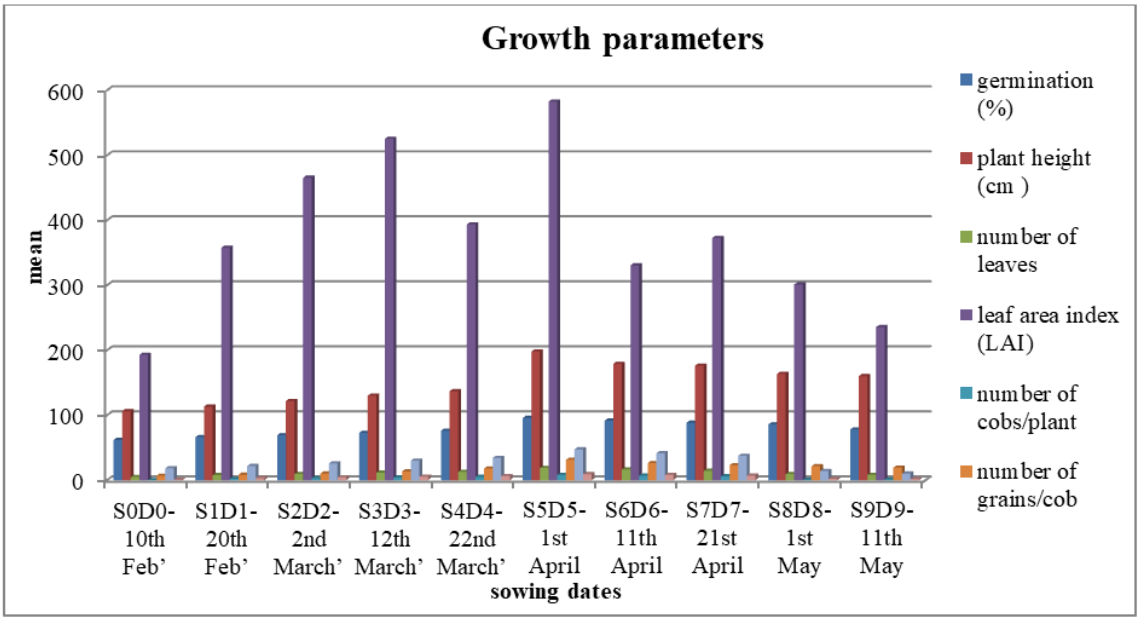

Fig. 3: Mean of growth parameters in hybrid maize with different sowing dates

CONCLUSIONS

The hypothetical inferences have been obtained significant differences in the growth and yield of hybrid maize. The sowing dates, 1st of April and 11th of April are the optimum planting dates of hybrid maize compared to other sowing dates. The resulting sowing dates enhance growth parameters and yield response in hybrid maize. The hybrid maize is positively stimulated in the phenotypic growth and yield in hybrid maize. The application of resulted sowing dates would obscurely improve food security and revenue of the peasants in local regions. It reforms production and post-harvest value additions in the local regions.

Acknowledgement:

The author (s) thank the Arunachal University of Studies, Namsai, for providing the facilities required to undertake the study. The conflict

of interest related data and literature are not created among author and co-authors.

Funding: NIL.

Conflict of Interest:

There is no such evidence of conflict of interest.

Author Contribution

All authors have participated in critically revising of the entire manuscript and approval of the final manuscript.

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