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Effects Of Planting Dates On Maize Yield Performance

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ABSTRACT

The experiment has a randomized complete block design (RCBD) with three replicates. Maize of the BARI Hybrid Butta-09 variety was used in the experiment, and the sowing dates ranged from the third (S1) and fourth (S2) weeks of October through the first (S3), second (S4), third (S5), and fourth (S6) weeks of November and the first (S7), second (S8), and third (S9) weeks of December. The yields from each planting date were drastically varied. This research found a very significant inverse relationship between the timing of planting and the subsequent harvest of maize grain. Taking into account all of the relevant factors, the first week of November might be suggested to the maize producer as the optimal planting date for optimal maize production. The second week of November may also be recommended as a backup best sowing date in case the second crop of cropping pattern is unavailable or impractical in the field. Based on these findings, it seems that February 25 is the best day to plant maize in the semi-arid climate of Sargodha, and that the optimal Maize hybrid for these circumstances is DK-6142.

KEYWORDS Maize, Planting dates, Hybrids, Sowing dates;

INTRODUCTION

The coefficient of variance in Haryana is approximately double that of other nations, and the average yield is just 37% of the world average. The state of Haryana relies heavily on maize as a staple grain. Farmers and their families in the area might be severely impacted by even a little decrease in maize production, putting everyone's well-being at risk. Given the likelihood of more climate change in the future (IPCC, 2007), stabilizing Haryana's maize production is crucial. Since most rain falls during the wet season in Africa, this weather pattern is a major determinant of the continent's maize harvest. In this context, when farmers lack access to inputs like synthetic fertilizers and pesticides, selecting the optimal planting date is crucial for maximizing crop yield by making the most of the meteorological resources at their disposal. Simulation models have shown to be a useful tool for examining the effect of planting date on maize yield. These simulations illustrate that if you sow your seeds or seedlings too far ahead of the start of the rainy season, your crop may not germinate or take root if the weather is too dry. Late planting, on the other hand, may shorten the crop's growth season and its total biomass by reducing the amount of direct sunlight it receives.

There is a lack of strong scientific evidence supporting the best time to plant maize by smallholders in India since there have been so few field studies on the impact of planting timing on maize productivity. In this research, we compared the yields of maize planted on March 1, April 1, and May 1 across six smallholder farms in Haryana, located at three elevations with substantially different climates. Planting in early June instead of early May shortens the time it takes for grains to mature by 9 days. Significant losses in maize output have occurred due to dramatic fluctuations in temperatures from sowing to harvesting, especially during the anthesis stage, and the planting date has been the most essential determinant. In light of the data, it is reasonable to hypothesize that experimenting with many sowing dates separated by a certain amount of time would provide enough data and insight to determine when the ideal time is to plant maize for the pre-kharif harvest.

LITERATURE REVIEW

Lori J. Abendroth et.al (2017) Farmers utilize a variety of management strategies, such as planting at the optimal times for their region, to increase grain output from maize (Zea mays L.). Planting date studies throughout the years have typically used categorical analysis and development of recommendations by selecting an ideal planting date and then establishing a yield reduction relative to that date. Given the variety of trial designs and possible analysis locations, this method seemed appropriate. However, a dataset covering 18 years and sites in Iowa was developed with variable planting dates, allowing regression analysis to be employed instead of categorical. As a consequence of this method, a window of acceptable planting dates was established. For each site-group, we calculated two planting windows, one for achieving a yield of 98%-100% and another for achieving a yield of 95%-100%, by taking the highest yield from the response curve and subtracting 2 or 5% relative yield. Sites in the north and south, in particular, show a more pronounced grain-yield response to planting date, as seen by the response curves for each site-grouping.

Mustapha Mas-ud et.al (2016) The impact of varied planting dates on maize and groundnut production and yield components in an intercropping system was investigated via a field experiment. A randomized full block design with four replicates was used for the experiment. Five different combinations of maize and groundnut, as well as zero, one, and two water application rates (WAR) were used in the experiment. Dry matter yield in peanuts and maize varied considerably (P 0.05) among treatments throughout all development stages. Except for the solo maize and the intercropped groundnut treatment that was planted two weeks following the planting of maize, all other treatments resulted in significantly lower grain yields (P0.05). The research demonstrated that in areas where groundnut is seen as the primary crop, a single row of groundnut should be seeded alongside the maize. One row of groundnuts and one row of maize planted simultaneously is the optimal approach for farmers who want to get the most out of their property.

R. Tsimba et.al (2014) Seven maize (Zea mays) hybrids' growth, silage yield (SY), and starch content were studied across four field tests throughout two years in the Waikato and Manawatu areas. Quadratic regression models were the most effective in describing the relationship between PD and silage yield. Maximum silage yield (optimal PD) occurred later in Manawatu (23 October) due to the region's milder, higher-latitude climate compared to

Waikato (where optimum PD occurred between 9 and 15 October). Planting 2 or 3 weeks before or after the optimal PD decreased SY by 5% in both areas.In a warmer than usual spring (+1°C), the optimal PD in Waikato was 1-2 weeks sooner. Waikato and Manawatu had lower yields (24.22 and 21.06 t/ha, respectively) when planted later under non-limiting moisture conditions than when planted earlier. This was because both temperature and radiation dropped to below average levels during grain loading (15°C and 17 MJ/m2/d, respectively). Manawatu saw a larger yield loss beyond the optimal PD than Waikato as a result of more rapid declines in fall temperature and radiation. The percentage of starch in crops increased up until November 6th, and then decreased along with the harvest index. Daily mean temperatures between 17 and 19 degrees Celsius produced the highest maximum leaf area index.

Ashik Bk et.al (2018) When winter maize is planted in Nepal's Inner Tarai area depends on a number of factors. From September 2016 to March 2017, the National Maize Research Program (NMRP) in Rampur, Chitwan, Nepal, conducted experiments to compare the yield performance of multiple maize types at different panting dates. We conducted an experiment using a factorial randomized complete block design (RCBD) with three replicates to examine the results of eight treatments, each of which included a different combination of two maize varieties and four planting dates. The correlation between planting time and harvest quantity was statistically significant. Varieties also have large effects on grain production. Furthermore, their combined impact was substantial. Planting early maize kinds as compared to later ones enhanced grain yield. In order to maximize yield, planting maize types in early September throughout the winter season is recommended.

METHODS

In order to determine what the ideal time of year is to plant maize for optimal yield, At Bangladesh Agricultural University (BAU), Mymensingh, during the 2016-2017 Rabi season, the Entomology Field Laboratory under the Department of Entomology conducted research. There was an average height of 18 meters above sea level at these coordinates of 24°75′ N and 0°50′ E. Soil from the Sonatola series, located in the Old Brahmaputra Floodplain Agro Ecological Zone (AEZ-9), was employed in the study. Temperature, relative humidity, precipitation, and daylight hours characteristic of the experimental location throughout the research period are shown in Table 1.

Twenty kg of corn seed was planted per hectare. The remaining urea and MOP were spread out over the course of three applications during the germination, early vegetative growth, and mature vegetative stages, when corn is being formed. For optimal growth and development of the maize crop, correct weeding, watering, and other intercultural operations were performed at the appropriate times.

Table 1. Meteorological data recorded at the experimental site during the study period.

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Month	During 2016-17							
	Average Temperature (°C)			Relative Humidity (%)			Average Rainfall (mm)	Total sunshine (hr)
	Max.	Min.	Av.	Max.	Min.	Av.		
January	23.5	12.0	18.0	97.0	56.0	84.0	18.2	84.70
Feb	27.8	16.8	22.3	96.0	52.0	80.0	4.0	137.8
March	31.0	20.1	25.5	94.0	52.0	75.0	104.8	190.2
April	32.4	24.3	28.4	92.0	65.0	81.0	25.6	171.2
May	32.0	23.7	27.9	93.0	65.0	81.0	331.1	165.3
June	32.7	26.2	29.5	94.0	70.0	84.0	388.8	149.5
July	31.6	26.5	29.1	95.0	74.0	87.0	522.7	101.8
Aug	33.2	26.8	30.0	92.0	66.0	81.0	97.6	179.6
Sept	32.0	26.1	29.1	95.0	73.0	87.0	408.6	125.6
Oct	32.4	24.2	28.3	96.0	64.0	84.0	31.70	200.9
Nov	29.5	18.1	23.4	97.0	52.0	81.0	1.0	204.8
Dec	27.5	14.6	21.1	97.0	48.9	81.4	0.0	180.3

We tested nine (9) different planting dates for the BARI Hybrid Butta-09 variety using a randomized complete block design (RCBD) with three (3) replicates. In the experimental fields, the crop was seeded in straight lines according to the treatments stated, with a plot size of 10m2 (4m2.5m), spacing of 6030cm between rows and plants, and a distance of 70cm between the two plots. Each replication of each treatment's grain harvest was collected, weighed, and recorded; then, the data were transformed into yield per hectare. Immediately after cob harvest, the average plant height was measured using a centimeter-based measuring tape. From the midsection of five randomly chosen plants in each replication, we measured the length (cm) and diameter (mm) of the cob without the husk. The standard centimeter was utilized for this measurement. Five plants and five cobs were selected at random from each treatment replication, and their grain and cob counts were recorded after harvest. The number of cobs used to divide the grains into two groups. After collecting grains from each replication, we used a digital weight machine to determine the total weight of the grains and the yield per hectare based on the individual plot yields. Physiological and morphological features, as well as harvest success and crop yield, cob diameter in centimeters, number of grains per cob, were measured and recorded. The purpose of the research was to determine how various corn hybrids performed in terms of sowing time, phenology, growth, and yield.

Statistical analysis

Fisher's Analysis of Variance was used to conduct statistical analysis of the data using the MSTATC program and the Least Significant Difference (LSD) test at the 5% probability level.

DATA ANALYSIS

length in centimeters of the plant Results from an ANOVA reveal that the height of maize plants varies significantly (P0.05) due to the effect of different sowing dates (Table 2), with the tallest plants being sown in the third week of October (S3) and the shortest in the first week of November (S2). The maize plants grown from early sowing were noticeably shorter than those grown from seeds planted in the first and second weeks of November.

Number of cob/ plants

Table 4 shows that there were statistically significant variations in the sowing dates at the 1% level of probability. S3 (1st week of November) yielded 1.75 times as many cobs per plant as S4 (1.71), the second greatest yield. The next set of values were 1.44 in S5, 1.42 in S6, 1.23 in S7, 1.17 in S8, 1.11 in S9, and 1.06 in S2. The average number of ears produced by S1 plants was 1.

Cob length (cm)

Table 2 shows that the length of the cob without the husk was substantially (P 0.05) influenced by the planting dates. Cob length without husk was measured at anything from 13.68 to 22.72 centimeters. Consistent with Gurung et al.'s (2017) results. The longest cobs in this research were harvested from seeds planted in the first week of November, while the shortest cobs came from seeds planted in the middle of December.

Table 2. Morpho-physiological characters

Treatment	Plant height (cm)	No. of cob/ plant	Cob length without husk (cm)	No. of grain/ cob	Grain wt. /cob (g)	Grain Yield (t/ ha)
S_1	196.76gh	1.00f	13.68g	364.75f	128.30h	5.60g
S_2	199.25g	1.06f	14.15fg	369.90f	133.90g	5.82f
S_3	221.62a	1.75a	22.72a	639.23a	233.18a	10.53a
S_4	218.14b	1.71a	22.00ab	603.69b	208.32b	10.21b
S_5	215.33cd	1.44ab	19.06c	528.14c	178.04c	9.92c
S_6	211.17d	1.42bc	17.33d	498.89c	170.52cd	9.83c
S_7	208.80de	1.23cd	17.02de	448.36d	158.19e	7.91d
S_8	206.22e	1.17d	16.29e	418.53e	150.49f	7.00e
S_9	203.42f	1.11e	15.59ef	398.45e	140.70g	5.97f
Level of significance	*	**	*	**	*	*
CV (%)	6.75	8.22	6.17	7.52	5.85	6.76
LSD	2.24	0.08	0.22	21.55	8.01	0.17
SE (±)	1.24	1.16	0.98	1.02	1.45	1.03

Number of grain/ cobs

Among the various planting dates, there were statistically significant differences at the 1% level of probability. Consequently, different planting dates had a major impact on the total grain/cob yield.

Grain weight/ cob

Table 3 displays the findings, which demonstrated that at the 5% probability level, there were discernible variations between the various planting dates. This result is consistent with that of Dahmardesh (2010), who discovered that optimal planting dates led to higher grain weight per cob than early and late planting dates due to a larger number of cobs and grains per plant.

Grain yield

At the 5% level of probability, we discovered that grain yield of maize varied significantly across different planting dates. The highest grain production was recorded for seeds planted in the third week of November (S3), followed by S4 (10.21 t/ha), S5 (9.92 t/ha), S6 (9.83 t/ha), S7 (7.91 t/ha), S8 (7.00 t/ha), S9 (5.97 t/ha), and S2 (5.82 t/ha). However, crops planted in the third week of October (S1) had the lowest grain yield (5.60t/ha). The findings corroborated those of Gurung et al. (2018).

Table 3. Regression equation

Parameter	Correlation Coefficient (r)	Regression equation Y=a + bX	Coefficient of determination (R^2)
Sowing dates v/s Grain yield	-0.983	Y_1=7.37-0.663×X_1	0.972***

Similar pattern was seen in the -0.983 r value between the sowing dates and the pooled data of yield. Sowing dates had a negative relationship with maize grain production throughout the trial season in Bangladesh (Table 5), and this relationship was very significant (P0.001). There was a clear correlation between sowing dates (X1) and grain yield (Y1), as shown by the substantial regression coefcient of the fitted regression line in the sowing dates on grain yield (t/ha) regression equation. A loss of 0.663 t/ha in grain output from delayed planting of maize may be inferred if sowing dates are advanced, delayed, or greatly delayed by one (01) week. This indicates a significant inverse relationship between the planting date (early, late, or extremely late) and the resulting grain yield of maize. The yield declined as a function of early or late seeding, as predicted by the equation.

Biological yield (Kg ha-1)

Sowing date had no statistically significant impact on biological yield, as shown in Table 5. Early planting dates provided greater biological yield than delayed dates, although improvements were also shown in sowing dates. The data shows that hybrids have a considerable impact on overall biological output. The biological yield was highest in the H1 (Dk-6142) hybrid and lowest in the H3 (Dk-9108) hybrid. This occurred because of inherent traits of maize hybrids. There was no statistically significant interaction between hybrids and planting dates.

TABLE 4 Biological yield and harvesting index

Treatment	Biological yield			Means	2Harvesting index			Means
	Hybrids				Hybrids			
	DK-6142	DK-6525	DK-9108		DK-6142	DK-6525	DK-9108	
SD_1	13552	12720	12219	12831	33.86	31.76	29.24	31.53
SD_2	12061	10697	9706	10821	31.14	31.49	30.23	31.05
SD_3	11367	10150	9111	10209	31.06	30.64	29.43	30.38
Means	12327 [A]	11189 [B]	10345 [C]		32.02 [A]	31.30 [A]	29.63 [B]	
LSD	Hybrids=391.89	Sowing dates=2466.9	Interactions=NS		Hybrids=1.59	Sowing dates=6.43	Interactions=NS	

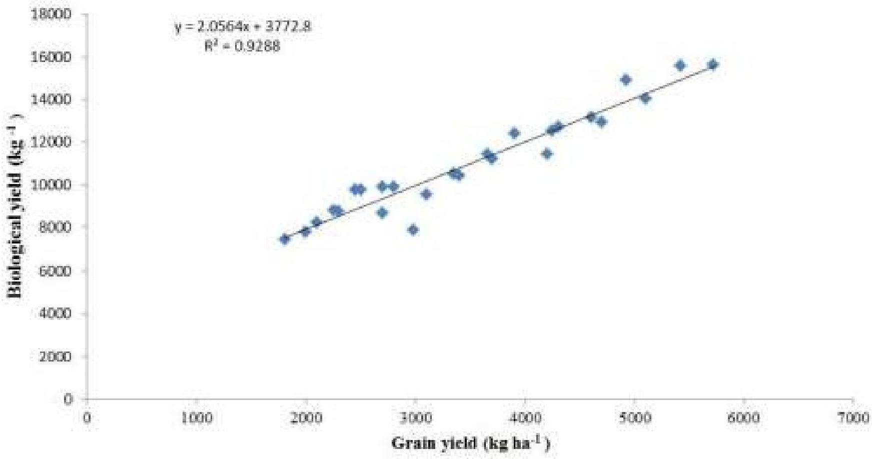

Figure 2) Relationship between grain yield and biological yield

There was no statistically significant relationship between planting date and harvest index. However, early planting dates were shown to boost Harvest index somewhat more than later sowing dates. Table 5 displays statistically significant data on the impact of hybrids on the maize harvest index. Hybrid H1 (Dk-6142) yielded the highest amount, whereas H2 (Dk-6525) and H3 (Dk-9108) yielded statistically the same amount. The combined impacts of hybrids and sowing dates were found to be insignificant, while both early sowing dates and early hybrids resulted in a higher harvest index than later sowing dates and later hybrids did. Similar findings are reported. There were discrepancies between the reported results for hybrids and the reported results for planting dates and maize hybrids.

CONCLUSION

It's safe to say that there were noticeable differences between the various sowing times. According to the results of this research, there is a very substantial inverse relationship between the date of planting and the yield of maize grain. Therefore, it is recommended that the first week of November be used as the sowing date for maize in Bangladesh in order to get maximum yield, with the second week of November coming in as a close second in cases where a second crop of the cropping pattern cannot be used. product of biology (12831 kg-1), harvest efficiency (31.53%). This research suggests that the optimal planting date for Maize in the semi-arid conditions of Sargodha is the 25th of February, and that the optimal Maize hybrid for these circumstances is DK-6142.

REFERENCE

1. Lori J. Abendroth et.al “Yield-Based Corn Planting Date Recommendation Windows for Iowa” https://doi.org/10.2134/cftm2017.02.0015
2. Mustapha Mas-ud et.al “Relative Planting Dates Effect on the Agronomic Performance of Maize (Zea Mays L.) and Groundnut (Arachis Hypogea L) in an Intercrop System” American Scientific Research Journal for Engineering, Technology, and Sciences (ASRJETS) (2016) Volume 16, No 1, pp 262-276

3. Ashik Bk, Jiban Shrestha, Roshan Subedi (2018). Grain Yield And Yield Attributing Traits Of Maize Genotypes Under Different Planting Dates. Malaysian Journal of Sustainable Agriculture, 2(2) : 06-08.
4. Nguyen V. Long et.al "Maize Yield and Planting Date Relationship: A Synthesis-Analysis for US High-Yielding Contest-Winner and Field Research Data" Volume 8 - 2017 | https://doi.org/10.3389/fpls.2017.02106
5. R. Tsimba et.al "The effect of planting date on maize: silage yield, starch content, and leaf area" Agronomy New Zealand 44, 2014
6. I. Afzal, SMA. Basra, R. Ahmad, and A. Iqbal, Pakistan Journal Agriculture Science .2002.39: 109-112.
7. A. Ajouri, A. Haben and M. Becker, Journal of Plant Nutrition and Soil Science. 2004.167: 630-636.
8. MA. Al-Mudaris and SC. Jutzi, Journal of Agronomy and Crop Science .1999. 182, pp. 135-141.
9. A. Artola, G. Carrillo - Castanda and GDL. Santose. Seed Science and Technology.2003. 31: 455-463.
10. SO. Bakar and MN. Ukwungwn. African Journal of General Agriculture.2009. 5:93- 97.
11. AS. Basra, M. Farooq, I. Afzal and M. Hussain, International Journal of Agriculture and Biology.2006. 8:19-21.
12. SMA. Basra, IA. Pannu and I. Afzal, International Journal of Agriculture and Biology.2003. 5:121-123.
13. J. Bakht, R. Shah, M. Shafi and M. Amankhan, Paskistan Journal Botany.2010. 42(6): 4123-4131.
14. DK. Bastia, AK. Rout, SK. Mohanty and A. M. Prysty, Indian Journal Agronomy.1999. (44): 621-623.
15. I. Cakmak, Zinc deficiency in wheat in Turkey. In: Micronutrient deficiencies in global crop production. Springer.2008. PP. 181- 200.