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Productivity of Maize Genotypes under Different Planting Dates

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Abstract
Genotypic yield potential of maize genotypes is greatly affected by planting dates. This study was conducted to determine optimum planting dates of maize genotypes in 2013/14 at Rampur, Chitwan, Nepal. Four genotypes namely RML-4/RML-17, RML-32/RML-17, ACROSS-9944/ACROSS-9942 and S99TLYQ-B were planted at every week from April to March. The experiments were laid out in randomized complete block design with four replications . The result of experiment showed that the highest production (5565 kg/ha) was obtained in August followed by February (5266 kg/ha), June (4475 kg/ha) and July (4255 kg/ha) respectively. The lowest yield (2572 kg/ha) was obtained in the month of November and December planting (3019 kg/ha). The highest grain yield was obtained in RML-4/RML-17 (7392 kg/ha) and RML-32/RML17 (6606 kg/ha), ACROSS- 9944/ACROSS-9942 (5004 kg/ha) during August planting and higher yield of QPM variety S99TLYQ-B was obtained in the month February planting. Winter maize has higher production potential than the rainy season maize. Based on this experiment RML-4/RML-17, RML-32/RML17 and ACROSS-9944/ACROSS-9942 should be planting in August (winter season) and S99TLYQ-B in February (spring season) for higher grain yield production.

Key words: Grain yield, planting dates and genotypes

Introduction
Maize is the second most important cereal crop in terms of both area and production and first staple food crop for the hills in Nepal. Its area, production and productivity is 8.49 million ha, 19.9 million mt and 2.3 mt/ha (MoAD, 2013). It contributes about 25.02% in total cereal production, 6.54% in AGDP and 3.15% in GDP (MoAD, 2013). The proportion of maize area consists of 70.23% in hills followed by 19.32% in Terai and 10.45% in mountain (MoAC, 2009/10). Almost all quantity of the maize produced in the mid (1.3 million mt) and high hills (0.18 million mt) directly utilizes in human consumption and a very little portion is fed to animals. However, more than 80% Tarai production (0.38 million mt) is being utilized for poultry and animal feeds and remaining 20% is used as industrial (10%) and human consumption (10%) (NMRP, 2011).

It is grown in 875660 hectare of land with average yield of 2.119 t/ha (MoAC, 2009/10) this yield is very low compared to that of neighboring countries. Either early planting or late planting can result in lower yield because the probability exists that unfavourable climatic conditions can occur after planting or during the growing season. Therefore, determination of sowing dates for maize genotypes is very crucial for better crop yield. In order for crop to best utilize moisture, nutrient and solar radiation, they must be grown from optimum sowing dates. Nepal is a small country with large environmental variation. Throughout the seasons of a year, weather conditions fluctuate a lot (Table 1). In this situation, the same genotypes may perform differently in different seasons. For maximization of benefit to farmers, they have to grow the best maize genotypes in the best season for location. It had been reported that maize grain yield was reduced when sowing was delayed to the end of October (McCormick, 1971). Maize planting date will effect on growing date, plant population, plant suitable growth, the time for developing reproductive organs, pollination and the time of harvest- so reaching the proper planting time for maize cultivation is particularly important in the success. Tanaka and Hara (1974) in India reported that variation in maize grain yield is due to the reduction in 1000 seed weight when sowing was delayed to the end of October**.** Very little work was done to determine optimum sowing dates of maize genotypes in Nepal. Therefore present study was carried out to determine optimum planting dates of maize genotypes for increased grain production in terai region of Nepal.

Materials and methods

The experiment was started at Rampur, Chitwan, Nepal during 2013/14. Maize was planted on sandy silt loam, strongly acidic soil (pH 5.0), medium in total nitrogen (0.130%), high in soil available phosphorous (279 kg/ha), high in soil available potassium (215 kg/ha) and high in organic matter content (2.70%) (NMRP, 2012). During this year, Four genotypes namely S99TLYQ-B RML4/RML17, RML32/RML17 and ACROSS-9944/ACROSS-9942 were sown in every week from the second week of April 2013 to last week of March 2014. The design was randomized complete block design with four replications. In each month, the planting was replicated 4 times at seven days intervals. Spacing 75 cm row to row and 25 cm plant to plant spacing was maintained and two to three seeds are sown and after two weeks thinned one plants/hill. Plot size was 2 rows of 5 meter (1.5 m x 5 m) in which, whole plot was used to assess final harvest. Fertilizer @ FYM 10 t/ha and 120:60:40 kg NPK/ha was applied for each experiment. Half dose of nitrogen and full dose of phosphorous and potash was applied as basal dose at the time of final land preparation and remaining half of nitrogen was divided into two; one part applied at 20-24 days after sowing and second 40-45 days after sowing. Weeding and irrigation was done as per recommendations. Grain yield was calculated using ear weight at harvest assuming 80% shelling and adjusted to 15 % moisture level. Analyses were performed using the MSTATC software. In addition the Fisher's least significant difference (LSD) was used to find significant differences among means.

Results and discussion

Determination of sowing dates for maize genotypes is very crucial for better crop

Table 1. Meterological data at Rampur, Chitwan, Nepal during 2013-2014

Month	Mean daily temperature (^{0}C)			Total Rainfall (mm)	Relative Humidity (%)
	Maximum	Minimum	Average		
April (2013)	34.6	16.0	25.3	34.2	87.1
May	35.0	23.9	29.45	375.9	89.2
June	34.2	26.3	30.25	667.5	92.2
July	33.3	33.7	33.5	16.1	93.6
August	23.6	28.0	25.8	7.5	88.6
September	30.06	29.30	29.68	13.0	79.90
October	27.33	26.21	26.77	0.4	77.76
November	21.73	20.17	20.95	0.0	72.08
December	17.40	16.66	17.03	0.0	73.85
January (2014)	18.53	16.19	17.36	0.3	70.88
February	18.95	16.97	17.96	5.2	68.78
March	21.93	20.91	21.42	3.4	66.66

(NMRP, 2014)

Table 2. Effect of different genotypes and date of planting on grain yield of maize (kg/ha) at Rampur, Chitwan, during 2013/14

SN	Factor	Level	Grain yield (kg/ha)
1	variety	1. S99TLYQ-B	2979
		2. RML-4/RML17	4837
		3. RML32/RML17	4846
		4. ACROSS-9944/ ACROSS 9942	3029
F-test		**	
2	Date of planting	1. April (Baisakh)	3913
		2. May (Jesth)	3370
		3. June (Aasad)	4475
		4. July (Shrawan)	4255
		5. August (Bhadra)	5565
		6. September (Aaswin)	3559
		7. October (Kartik)	3954
		8. November (Mangsir)	2572
		9. December (Paush)	3019
		10. January (Magh)	3238
		11. February (Falgun)	5266
		12. March (Chaitra)	3889
Grand mean		3923	
F-test		**	
$LSD_{0.05}$		2234.1	
CV%		40.7	

yield. Grain yield of maize influenced by genotypes and date of sowing is shown in the Table 2. Genotypes also showed highly significant effect on yield. The genotype promising hybrid RML-32/RML-17 produced the highest 4846 kg/ha grain yield followed by RML-4/RML-17 (4837 kg/ha). S99TLYQ-B produced the lowest 2979

Table 3. Interaction effect of different genotypes and date of planting (month) on grain yield (kg/ha) of maize at Rampur, Chitwan during 2013/14

Sowing Month	Genotype			
	S99TLYQ-B	**RML-4/ RML-17**	**RML32/RML17**	**ACROSS- 9944/ ACROSS-9942**
1. April (Baisakh)	3353	5225	4843	2624
2. May (Jesth)	3353	3897	4174	2057
3. June (Aasad)	2907	6894	5784	2314
4. July (Shrawan)	3169	5541	4934	3375
5. August (Bhadra)	3258	7392	6606	5004
6. September (Aaswin)	3741	3219	3483	3792
7. October (Kartik)	2388	3554	5690	4186
8. November (Mangsir)	2084	2775	3177	2252
9. December (Paush)	2305	3722	3653	2396
10 . January (Magh)	2584	4217	3897	2252
11. February (Falgun)	4198	6649	6520	3698
12. March (Chaitra)	2809	4963	5384	2400
Mean	2979	4837	4846	3029
Grand mean	3923			
F-test	**			
$LSD_{0.05}$	2234.1			
CV,%	40.7			

kg/ha. Effect of date of sowing was also highly significant in case of grain yield. The highest production was 5565 kg/ha in August followed by February (5266 kg/ha), June (4475 kg/ha) and July (4255 kg/ha) respectively. The lowest yield was of month November 2572 kg and December planting (3019 kg/ha). Gurung *et al.* (2011) found that Rampur Composite and Arun-2 produced highest yield in August and lowest yield in May at Rampur Chitwan condition. Maize planted in August produced the highest yield (Lal, 1973; Saberi, 2014). Winter maize has higher production potential than the rainy season maize. Pests like insects, diseases, weeds are not problem during winter season but sometimes parrot is a problem during maturity period. Crop receives longer sunshine duration, higher rate of photosynthesis and assimilates utilization occurs during winter season. Fertilizer use efficiency is higher in winter season. These factors contribute higher production during winter season.

Interaction effect of date of planting and genotypes was found no significant (Table 3). RML-4/RML-17 and RML-32/RML17 produced the highest yields of 7392 kg and 6606 kg/ha respectively followed by February planting) (6649 kg and 6520 kg/ha). Lowest yield was produced by the genotype S99TLYQ-B (2084 kg/ha) in November planting (Table 3).

Conclusion

The highest grain yield was obtained in RML-4/RML-17(7392 kg/ha) and RML-32/RML17 (6606 kg/ha), ACROSS-9944/ACROSS-9942 (5004 kg/ha) during August planting and higher yield of QPM variety S99TLYQ-B was obtained in the month February planting. Based on the result of single year experiment it can be concluded that the higher grain yield in

Hybrid RML-4/RML-17, RML-32/RML-17, and ACROSS-9944/ACROSS-9942 obtained by planting them in early winter season especially in September and S99TLYQ-B in spring season in February.

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