Journal of AgriSearch 3(4):244-247
Peer Reviewed Quarterly

ISSN : 2348-8808 (Print), 2348-8867 (Online)
http://dx.doi.org/10.21921/jas.v3i4.6710

Short Note

Effect of Sowing Dates on Growth and Grain Yield of Maize Inbred Lines

KAMAL BHUSAL*, ROSHAN SUBEDI AND JIBAN SHRESTHA[1]

Institute of Agriculture and Animal Science, Lamjung Campus, Lamjung, Nepal

ARTICLE INFO

ARTICLE INFO		
Received on	:	29.11.2016
Accepted on	:	08.12.2016
Published online	:	14.12.2016

ABSTRACT

This study was carried out at National Maize Research Program, Rampur, Chitwan, Nepal to evaluate the effect of sowing dates on growth and grain yield of maize inbred lines. Seven maize inbred lines namely NML-2, RML-17, RML-32, RML-4, RML-86, RML-95 and RML-96 were planted on three different dates i.e. September 02, September 12, September 22, 2015 during winter using randomized complete block design with two replications. The results of this study showed that the growth and yield traits were significantly affected by various planting dates. The inbred line RML-17 produced the highest grain yield where as NML-2 gave the lowest yield during winter season. The highest yield was obtained when inbred lines were planted on September 12 and the lowest yield on September 2. The planting from September 2 to September 12 increased the grain yield. The delay in planting i.e. September 22 decreased grain yield. Therefore September 12 planting was suitable for inbred lines to maximize grain yield production.

Keywords: Sowing dates, maize inbred line, yield and agronomic traits

INTRODUCTION

Worldwide, Maize (*Zea mays* L.) is leading energy providing food crop apart from wheat and rice (Singh *et al*., 2012). Maize occupies second largest cultivated area (849635 ha) after rice (1420570 ha) in the Nepal (Shrestha *et al*., 2016). Out of the total cultivated area of cereal crops (3339077 ha), the share of maize cultivation is 25.44%. The contribution of agriculture and forestry sector in GDP is 34.74% and 65.6% population are being engaging in agriculture sectors. National average productivity of maize is 2353 kg/ha. Among the total cereal production of the country (8580285 mt), the contribution of maize is 23.29%. The seed yield of corn (*Zea mays* L.) consists of different proportional contributions of the effective factor in all growth stages from emergence to maturity. In order to minimized negative effect of some abiotic and biotic stress on plant, sowing date can play a major role in determining the seed yield, quality, seed germination and understanding whole phenological stages in many regions. Early and intermediate sowings tend to best utilize solar radiation for grain production (Otegui *et al*., 1995). Each hybrid has an optimum sowing date, and the greater the deviation from this optimum (early or late sowing), the greater the yield loss (Sárvári and Futó, 2000; Berzsenyi and Lap, 2001). Planting date was reported to affect the growth and yield of maize significantly. Norwood (2001) suggested that farmers should plant on more than one planting date in order to safeguard against unpredicted seasons.

The seven inbred lines namely RML-4, NML-2, RML-32, RML-17, RML-95,RML-86 and RML-96 were used in the experiment. The experimental site was research field of National Maize Research Program, Rampur, Chitwan, Nepal. The geographical location of the trials was 27° 37' N latitude, 84° 25' E longitude at an altitude of 256 meter above sea level and has a sub tropical climate (Thapa and Dangol, 1988).

The experiment was conducted at the National Maize Research Program, Rampur, Chitwan, Nepal during September to February, 2015. The first planting was done in September 02, 2015 and then next planting was done in 10 days interval after that. The experimental design was randomized complete block design (RCBD) with two replications in both years. The individual plot size was 4 rows of 3 m length (7.2 m^2) with spacing of 60 cm × 25 cm (RR ×PP) and all plots were fertilized with 120:60:40 N :P_2O_5 :K_2O kg/ha in the form of urea, di-amonium phosphate (DAP), and murate of potash (MoP). Of this 50 % of nitrogen, full 100% of phosphorous and potassium fertilizers were applied as basal and remaining 50 % of nitrogen was split first at knee high stage (top dressing) and second at tasseling stage (side dressing). Thinning was done at 25th day after sowing (DAS) to maintain a single plant per hill. A Furadon (3 % C.G) 2-3 granule per plant of maize was applied against the stem borer to the uppermost whorls of leaves at the grand growth stage (40 DAS). Two manual weedings were done throughout the maize growing period, first at knee-high (25 DAS) and second at tasseling stage (55 DAS). Irrigations was done two times during the growing period of maize hybrids, first at grand growth stage (40 DAS) and second at tasseling stage (60 DAS). The observation on plant height, ear height, maturity, leaf area index, grain yield and test weight was taken. Five plants in each subplot (harvested plot) after harvesting were randomly selected; their ear lengths were measured with the help of measuring tap. The data generated were averaged to record ear length. Ears harvested for grain yield were used for the determination of number of grains/ear by selecting ten ears randomly from each subplot, dried (around 15% moisture) and shelled (80% shelling) for grains/ear. Data regarding thousand grains weight were recoded by counting randomly

[1]*National Maize Research Program, Rampur, Chitwan, Nepal*
*Corresponding Author Email: kamalbhusalfeat@gmail.com

selected 1000 grains from each sub plot and weighed with sensitive electronic balance. The grain yield (kg/ha) was recorded by weighing the grains shelled from the ears obtained from the central four rows of each subplot and converted it into kg/ha using the formula: Grain yield was obtained by adjusting the grain moisture at 15% and converted to the grain yield per hectare with the help of the following formula (Carangal *et al.*, 1971; Shrestha *et al.*, 2015).

$$\text{Grain yield}\left(\frac{kg}{ha}\right) \quad \frac{(100-MC)\times Y\times 10000\times 0.8}{(100-15)\times A}$$

Where,
MC = Moisture content of grain (%) just before weighing the seed bulk
Y = Net plot yield (kg)
0.8 = Shelling percentage
A = Net plot area (m^2)
(100-MC)/(100-15) = Conversion factor for grain yield at 15% moisture content
(10,000)/A = Conversion factor for actual harvested area into hectare basis.

The grain yield was converted from kg/ha into tones/ha. Data were analyzed using the statistical package MSTAT-C (Russel and Eisensmith, 1983) and the significant differences between treatments were determined using least significant difference (LSD) test at probability level of 0.01 or 0.05 where the effects of the treatments were significant at 1% or 5% level of probability, respectively.

Highly significant difference was found on days to 50% maturity considering the planting dates. The highest maturity days occurred when the genotypes were planted in September 22 while lowest in September 2. Highly significant difference was found in maturity days between the genotypes. The latest maturing genotype was RML-4 while the earliest maturing genotype was RML-96. Highly significant difference was found in terms of plant height. Highest plant height was found in RML-17 which is statistically at par with RML-96. Lowest plant height was found in RML-4. The inbred lines RML-32, RML-86 and RML-95 were found statistically at par in terms of plant height. Highly significant difference was found in between the genotypes in terms of ear height (Table 1). Highest ear height was observed in RML-17 which is statistically at par with RML-96 and NML-2. Lowest ear height was observed in RML-32 which is statistically at par with RML-4 and RML-86. No any significant difference was observed in plant and ear height considering the planting dates. RML-17 had highest plant and ear height and gave the highest grain yield. Obilana and Hallauer (1974) found a significant correlation between plant height and ear height in unselected inbreds.

Table 1: Effect of sowing dates and genotypes on maturity days, plant height, ear height, leaf area index, test wt. and yield

Treatment	Maturity days (50%)	Plant height (cm)	Ear height (cm)	Leaf area index	Test wt. (g)	Grain Yield (t/ha)
Planting date						
Sep 2	139^{c}	142.5^{a}	64.66^{a}	0.015^{b}	162.1^{c}	1.695^{c}
Sep 12	143^{b}	141.5^{a}	61.88^{a}	0.017^{a}	205.8^{a}	2.41^{a}
Sep 22	155^{a}	145.5^{a}	63.76^{a}	0.018^{a}	178.4^{b}	2.174^{b}
Ftest	<0.01(**)	0.543(NS)	0.487(NS)	0.008(**)	<0.01	<0.01
LSD 0.05	0.1217	7.36	4.837	0.0018	0.11	0.069
Genotypes						
NML -2	145^{d}	154.3^{b}	70.06^{ab}	0.01542^{c}	209^{b}	1.557^{f}
RML -17	143^{e}	168.3^{a}	76.45^{a}	0.01902^{a}	212.2^{a}	2.933^{a}
RML -32	146^{c}	132.2^{c}	50.45^{c}	0.01691^{abc}	165.7^{f}	1.69^{e}
RML -4	150^{a}	113.2^{d}	52.42^{c}	0.01540^{c}	194.2^{c}	2.375^{c}
RML -86	146^{c}	130.5^{c}	57^{c}	0.01583^{bc}	168.6^{e}	2.515^{b}
RML -95	147^{b}	137.8^{c}	65.72^{b}	0.01735^{abc}	140.9^{g}	1.848^{d}
RML -96	143^{f}	165.4^{ab}	71.95^{ab}	0.01879^{ab}	184.2^{d}	1.734^{e}
F - test	<0.01(**)	<0.01(**)	<0.01(**)	0.053(NS)	<0.01	<0.01
LSD 0.05	0.1858	11.25	7.388	0.0028	0.168	0.106
CV%	0.1	6.5	9.7	13.7	0.1	4.2

No any significant difference was found in terms of leaf area index of the genotypes. Highly significant difference was found in terms of leaf area index considering the planting dates. Highest leaf area index was observed when genotypes were planted in September 22 and lowest in September 2. Radiation interception is largely determined by leaf area index (LAI) which in turn is influenced by genotype, temperature and photoperiod (Muchow and Carberry, 1989).

High grain yields (GYs) result from an increased availability of assimilate supply (source) for grain setting and grain filling accompanied by an enhanced capacity of the kernels (sink) to accommodate those assimilates.

Highly significant difference was observed in test weight between the genotypes considering the planting dates. Highest test weight was observed when the genotypes were planted in September 12 and lowest in September 2. The heavier grains with earlier planting might be due to prolonged growing and grain filling period which enabled the plants to produce bold and plump grains. These results are in conformity with findings of Rizzardi *et al.* (1994), cha and chol (1995) who reported reduction in 1000 grain weight with delay in sowing date. Highly significant difference was found in test weight between the genotypes. Highest test weight was observed in RML-17 and lowest was observed in RML-95. Highly significant difference was found in grain yield between the genotypes considering the planting dates. Highest grain yield was observed when the genotypes were planted in September 12 while the lowest in September 2. Applying the optimum sowing date for maize cultivars has a positive effect on a grain yield and physiological index in maize. This result agree with finding by Otegui *et al.*(1995) that optimum planting date resulted in higher grain yield than early and late planting dates because of higher cob numbers and greater kernel numbers per plant. Highly significant difference was found in grain yield between the genotypes. Highest grain yield was observed in RML-17 and lowest was observed in NML-2.

Table 2: Interaction effect of planting dates and genotypes on grain yield (t/ha)

Planting Date	Inbred lines						
	NML-2	RML-17	RML-32	RML-4	RML-86	RML-95	RML-96
Sep2	0.46	2.89	1.63	1.89	1.91	1.42	1.66
Sep12	1.38	2.95	2.22	2.66	2.91	2.29	2.45
Sep22	2.82	2.96	1.22	2.57	2.73	1.84	1.09
F - test <0.01							
LSD 0.05 0.183							
CV% 4.2							

Highly significant difference was found in grain yield between the genotypes considering the planting dates. Highest grain yield was observed when the genotypes were planted in September 12 while the lowest yield was observed when planted in September 2 (Table 2). Applying the optimum sowing date for maize cultivars has a positive effect on a grain yield and physiological index in maize. The study revealed that both sowing date and cultivar had significant effect on grain yield in used maize cultivars under the field conditions.

CONCLUSION

There was variation in yield and agro-morphological traits of maize inbred lines due to different planting dates. The inbred line RML-17 was found superior in term of grain yield and yield attributing characters like plant height, ear height, leaf area index and test weight. Hence this inbred line was found suitable for winter planting. The suitable sowing date was September 12 for highest grain yield. The research showed that further delay in sowing date reduced the yield.

REFERENCES

Berzsenyi Z and Lap DQ. 2001. Effect of sowing time and N fertilisation on the yield and yieldstability of maize (*Zea mays* L.) hybrids between 1991–2000. *Acta Agronomica Hungarica* **50**:309-31.

Carangal VR, Ali SM, Koble AF and Rinke EH. 1971. Comparison of S1 with testcross evaluation for recurrent selection in maize. *Crop Sci.* **11:** 658-61.

Cha TH and Chol HO.1995. The influence of the ripening character and 1000 grain mass change of maize hybrids at mountain areas on the yield. *Academy of Agric.Sci. of the democratic peoples republic of Korea* **1**:32-5.

Muchow RC and Carberry PS. 1989. Environmental control of phenology and leaf growth in tropical adapted maize. *Field Crops Res* **20**:221-36.

Norwood CA. 2001. Dryland corn production in Western Kansas: Effect of hybrid maturity, planting date and plant population. *Agron. J.* **93**:540-7.

Obilana AT and Hallauer AR. 1974. Estimation of variability of quantitative traits in BSSS by using unselected maize inbred lines. *Crop Science* **14**:99-103.

Otegui ME, Nicolini MG, Ruiz RA and Dodds PA. 1995. Sowing date effects on grain yield components for different maize genotypes. *Agron. J.* **87**:29-33.

Rizzardi MA, Witech D and Deggerone I. 1994. Grain yield and yield components of maize cultivars at two sowing dates. *Ciencia Rural*.**24**:477-82.

Russel F and Eisensmith SP.1983. MSTAT-C. Crop and Soil Sci. Deptt. Michigan State Univ. USA.

Sárvári M and Futó Z. 2000. Correlation between the sowing date, yield and grain content of maize hybrids on chernozem soil. *Debreceni Egyetem Agrártudomány Közlemények J.*, **1**: 32–41.

Shrestha J, Koirala KB, Katuwal RB, Dhami NB, Pokhrel BB, Ghimire B, Prasai HK, Paudel A, Pokhrel K and KC G. 2015. Performance evaluation of quality protein maize genotypes across various maize production agro ecologies of Nepal. *Journal of Maize Research and Development* **1(1):**21-7.

Shrestha U, Amgain LP, Karki TB, Dahal K Rand Shrestha J. 2016 Effect of Sowing Dates and Maize Cultivars in Growth and Yield of Maize along with their Agro-Climatic Indices in Nawalparasi, Nepal. *Journal of AgriSearch* **3** (1):57-62.

Singh AK, Chandra N, and RC Bharti.2012.Effects of Genotype and Planting Time on Phenology and Performance of Rice (Oryza sativa L.).*Vegetos* **25** (1): 151-6.

Thapa RB and Dangol DR. 1988. A preliminary survey of weed flora at IAAS and its vicinity. In: F. P. Neupane (ed.) *IAAS Research Report (1985-1988)*. Institute of Agriculture and Animal Science, Rampur, Chitwan, Nepal pp. 59-65.

Citation:

Bhusal Kamal, Subedi Roshan and Shrestha Jiban. 2016. Effect of Sowing Dates on Growth and Grain Yield of Maize Inbred Lines. *Journal of AgriSearch* **3**(4): 244-247