Middle East Journal of Agriculture Research
ISSN 2077-4605
Volume : 07 | Issue : 02 | April-June | 2018
Pages:554-558

Effect of sowing dates on yield of different maize hybrids during summer in Nowshera, Pakistan

Waqas Liaqat[1], Haseeb Ahmad[1], Muhammad Faheem Jan[1], Nawab Ali[1], Muhammad Mehran Anjum[1] and [2]Wazir Rehan

[1]*The University of Agriculture, Peshawar, Pakistan*
[2]*Agriculture Research Institute, Tarnab, Peshawar, Pakistan*

Received: 06 Jan. 2018 / Accepted: 30 April 2018 / Publication date: 28 May 2018

ABSTRACT

Optimum sowing time with appropriate cultivar is a critical factor in determining the crop yield potential. An experiment with three sowing dates (June 25, July 10 and July 25) and four hybrids (SB-92K97, SB-909, SB-989 and Babar) was laid out in randomized complete block design using split plot arrangement during summer 2017 at Kurvi, Nowshera. Analysis of the data showed a substantial effect of both sowing dates and hybrids on yield and yield contributing traits of maize crop. Sowing made early in season on June 25 resulted in higher grain and biological yield with yield traits i.e. ear length, grains ear^{-1} and thousand grain weight also. Crop yield decreased when sowing was delayed to July 25. Delayed sowing of maize in season has adverse effect on its yield and yield traits. Among hybrids, SB-92K97 gave highest values for yield and yield components. The study suggested that maize hybrid SB-92K97 should be planted early in season i.e. June 25 for better yield and yield traits in the studied area.

Key words: Sowing dates, hybrids, Plant height, thousand grain weight, ear length, grain yield

Introduction

Genotype with environment are the major factors that determine yield of a crop. Climatic conditions and soil of Pakistan are highly favorable for maize production however, its average yield is still very low. Maize productivity in an area mostly depends on appropriate sowing time and variety along with soil health, temperature of area and irrigation availability (Ramankutty *et al.,* 2002). Timely sowing of maize in season is important for achieving higher yield. Delay in maize sowing significantly decrease yield due to limited growing conditions (Anapalli *et al.,* 2005). Selection of appropriate sowing time with a good variety in addition to recommended agro-management practices guarantee higher maize production (Qureshi *et al.,* 2007). For achieving higher efficiency from available nutrients, water, and solar energy, selection of optimum sowing time for the existing varieties is unavoidable (Ogobomo and Remison, 2009). Under the changing climate, selection of high yielding hybrid in an area is utmost important for higher net returns. Among several yield limiting factors, non-availability of high yielding hybrid and optimum sowing time are the major one. High yielding hybrid has a key role in successful maize husbandry (Inamullah *et al*., 2011a). Comparison of different maize hybrids for yield potential is necessary under the climatic conditions of Peshawar region (Inamullah *et al*. 2011b). The objective of the experiment was to find out best sowing date along with a high yielding hybrid for the studied area.

Materials and Methods

An experiment was conducted at Kurvi, Nowshera to determine the influence of sowing dates on different maize hybrids during summer 2017. Two factors i.e. sowing dates (June 25, July 10 and July 25) and maize hybrids (SB-92K97, SB-909, SB-989 and Babar) were studied. Experiment was laid out in a randomized complete block design under split plot arrangement having three replications. Sowing dates were allotted to main plots and hybrids to subplots. A

Corresponding Author: Waqas Liaqat, The University of Agriculture, Peshawar, Pakistan
Email: waqasliaqat@aup.edu.pk

subplot size of 3.8 m x 3.75 m was used. Each plot consisted of five rows, 75 cm apart from each other. Recommended fertilizer for hybrids i.e. N-P-K at the rate of 210-130-90 kg ha^{-1} respectively was applied. Half of the nitrogen was applied at sowing while other half was applied after 30 days of sowing. Complete doses of P and K was applied during seedbed preparation. Seedbed was prepared using cultivator two times followed by rotavator at field capacity level for each sowing date. Irrigations were applied when necessary subject to weather conditions prevailed in the area. Weeding was done with the help of hand hoe three times i.e. 15, 30, and 45 days after emergence for complete weeds removal. All cultural practices were uniform for all sowing dates and hybrids.

Procedure for recording data

For plant height five random plants were selected in each subplot. Plant height was measured from base to tip of tassel with the help of meter rod and averaged for mean data. Ear length was calculated by randomly selecting ten ears in each subplot. Ears were measured form base to tip with the help of a ruler and averaged for a single ear length data. Ten ears were randomly selected in each subplot after harvesting for counting grains. Grains in these ears were counted carefully and averaged for a single data. Thousand grains were counted and weighed in each experimental unit for determining thousand grain weight. Three central rows in each subplot were harvested at harvest maturity, sun dried and weighed in the field to determine biological yield per sampled area. The data was converted to kg ha^{-1}. Ears from three rows already harvested for biological yield were detached, shelled and cleaned to determine grain yield per sampled area. The obtained data was converted to kg ha^{-1}.

Results and Discussion

Plant height (cm)

Sowing dates and hybrids significantly affected plant height of maize crop (Table 1). Mean values showed that as sowing delayed plant height decreased accordingly with taller plants recorded in early sowing and shorter plants in late sowing. Difference in plant height for early and late sown crop might be due to variation in growing period for sowing dates. Early sown crop in season had the opportunity to avail more optimum conditions for its life cycle than less optimum conditions in case of late sowing. Kharazamshahi *et al*. (2015) also reported taller and shorter plants for early and late sowing respectively. Among hybrids maximum plant height was recorded for SB-92K97 followed by SB-909 which was statistically not different from SB-909. Minimum plant height was recorded for Babar. Variation in genetics of the hybrids could be the possible reason for difference in plant height among hybrids. Hussain *et al*. (2010) documented significant differences in hybrids regarding their plant height.

Ear length (cm)

Analysis of data showed a significant effect of sowing dates and hybrids on ear length (Table 1). Sowing made on June 25 resulted in maximum ear length which decreased as sowing delayed with minimum ear length recorded for last sowing made on July 25. Difference in environmental conditions for early and late sowing time might be the reason for different ear length. Our outcomes are similar to Shah *et al*. (2012) regarding small ears for delayed sowing. SB-92K97 produced ears with maximum length followed by SB-909 while minimum ear length was recorded for Babar. Buriro *et al*. (2015) found differences in ear length of maize hybrids and stated that genetic variations among hybrids might be the reason for different ear length.

Grains (ear^{-1})

Significant variations were found in grains (ear^{-1}) for sowing dates and maize hybrids (Table 1). Means of the data showed that more grains (ear^{-1}) were counted for sowing made early in the season while subsequent delay in sowing time decreased number of grains (ear^{-1}). Late sowing

results in less number of grains (ear^{-1}). Optimum conditions during early growth enhances the process of fertilization and grain development, hence leads to more grains. While shorter and comparatively cooler climate during late sowing results in less grains. Ali *et al*. (2015) reported less grains (ear^{-1}) when sowing was delayed. Among hybrids SB-92K97 produced more grains (ear^{-1}) followed by SB-909 with less grains (ear^{-1}) counted for Babar. Difference in rows per ear, ear length, ear diameter and grains per row of different hybrids might be the reason for difference in their grains (ear^{-1}). Ali *et al*. (2015) highlighted difference in grains (ear^{-1}) for different maize hybrids.

Thousand grain weight (g)

Thousand grain weight was significantly affected by both sowing dates and maize hybrids (Table 1). Sowing made early i.e. on June 25 resulted in heavier and bold grains while lighter and small grains were recorded for delayed sowing i.e. sowing made on July 25. In early sowing, no temperature and solar constraint for the crop complete growth and development might be the reason for heavier grains. Also, grain filling duration in case of early sowing was more than late sowing where grains has less time for assimilates storage. Giunta *et al*. (2009) stated that lower seed weight for late sowing is due to low rate of grain development with less assimilates translocation towards sink. Shah *et al*. (2012) also reported the same result of heavier and lighter grains for early and late sowing respectively. Maximum thousand grain weight was recorded for SB-92K97 which was statistically not different from SB-909 while minimum grains weight was recorded for Babar. Difference in genetic makeup of the hybrids could be the reason for variations in grains weight of the hybrids. Jing *et al*. (2003) documented the same results. Sowing time, however, significantly affect grain weight but it can be compensated with a good hybrid selection.

Biological yield (t ha^{-1})

Analysis showed a significant effect of sowing dates and hybrids on biological yield of maize (Table 1). Mean data showed that maximum biological yield was recorded for first sowing made early in season (June 25). As sowing delayed, total biomass also decreased with minimum value recorded for late sowing i.e. July 25. Early sowing in season allowed the crop to avail more optimum environmental conditions and to produce more dry matter plant^{-1} than late sowing. Maximum biological yield was recorded for SB-92K97 followed by SB-989 which was statistically alike with SB-909. Minimum biological yield was recorded for Babar. Variations in plant height, leaf area, number of leaves and ears per plant with ear weight might be the reason for difference in biological yield among maize hybrids. Ali *et al*. (2015) documented different biological yield for different hybrids sown on various dates.

Grain yield (t ha^{-1})

Grain yield of maize hybrids was significantly affected by various sowing dates (Table 1). Interaction of sowing dates and hybrids was also found significant. Among sowing dates, early sowing (June 25) made in season resulted in higher yield followed by second sowing made on July 10 while lowest grain yield was recorded for late sowing i.e. July 25. Early sown crop had more optimum conditions in terms of longer and warmer growing period for complete growth and development than shorter and mild period for late sowing. Low temperature during grain development in case of late sowing might be responsible for lower grain yield. Ali *et al*. (2015) recorded lower grain yield for delayed sowing. Among hybrids SB-92K97 produced maximum grain yield which was statistically similar with SB-909 followed by SB-989. Minimum yield was recorded for Babar. Interaction of sowing dates and hybrids showed that maximum grain yield was recorded in early sowing by SB-92K97 which decreased as sowing delayed with minimum yield in late sowing i.e. July 25. Babar produced lowest grain yield in early sowing which also decreased with delay in sowing time (Figure 1).

Table 1: Response of plant height (cm), ear length (cm), grains (ear^{-1}), thousand grain weight (g), biological yield (t ha^{-1}) and grain yield (t ha^{-1}) of maize hybrids sown on various dates.

Treatments	Plant height (cm)	Ear length (cm)	Grains ear^{-1}	Thousand grain weight (g)	Biological yield (t ha^{-1})	Grain yield (t ha^{-1})
Sowing dates (SD)						
25-Jun	226a	22.5a	538a	393a	21.2a	7.5a
10-Jul	214b	20.6b	487b	365b	17.8b	5.8b
25-Jul	189c	18.8c	429c	334c	13.7c	4.6c
LSD (0.05)	8	1.6	30.3	18.5	2.8	1.16
Maize hybrids (H)						
SB-92K97	216a	22.3a	517a	391a	20.0a	7.0a
SB-909	209b	21.4b	488b	370ab	17.3b	6.3ab
SB-989	209b	19.9c	473bc	360b	17.7b	6.1b
Babar	204c	18.9d	461c	336c	15.2c	4.4c
LSD (0.05)	3.92	0.78	25.52	21.9	1.88	0.78
Interaction (SDxH)						
LSD	NS	NS	NS	NS	NS	*

Means of the same parameter sharing same letters are non significant at 5% level of probability
NS = non significant * = significant

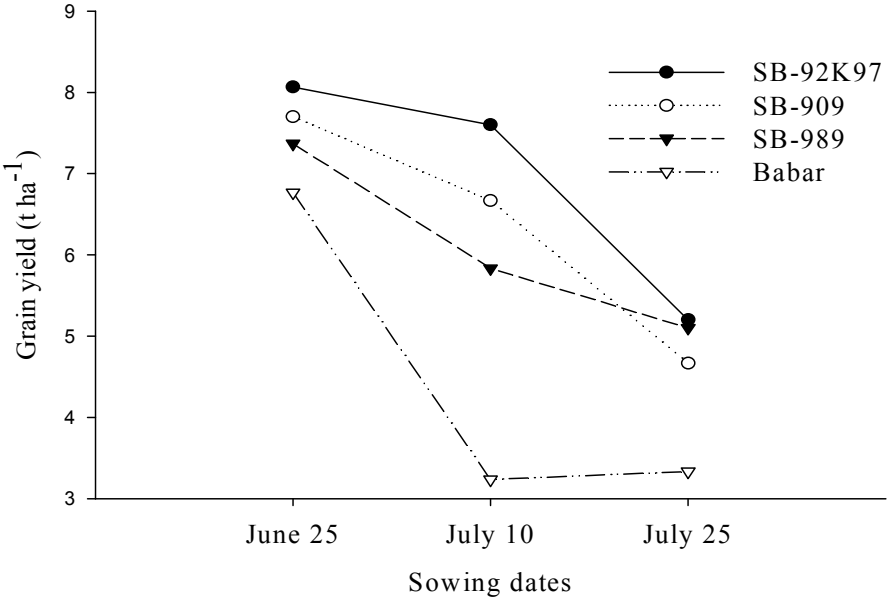

Fig. 1: Grain yield of maize hybrids against different sowing dates.

Conclusion

From the experiment, it is concluded that among sowing dates, sowing made early in season i.e. June 25 produced higher grain and biological yield. Likewise, among the selected maize hybrids, SB-92K97 produced higher grain and biological yield. Thus, it is recommended that sowing of maize hybrid SB-92K97 should be made on June 25 for achieving higher maize yield in Nowshera region.

Acknowledgements

The authors are highly thankful to the residents of Kurvi for providing technical and physical support.

References

Ali, S., Inamullah, A. Jan, M. Din and M. Habibullah, 2015. Yield response of maize (*Zea mays* L.) hybrids sown on various dates during kharif in Peshawar-Pakistan. J Environ. & Earth Sci, 5: 13-17.

Anapalli, S.S., L. Ma, D.C. Nielsen, M.F. Vigil and L.R. Ahuja, 2005. Simulating planting date effects on corn production using RZWQM and CERES-Maize models. Agronomy J, 17: 58-71.

Buriro, M., T.A. Bhutto, A.W. Gandahi, I.A. Kumbhar and M.U. Shar, 2015, Effect of sowing dates on growth, yield and grain quality of hybrid maize. J. Basic Appl. Sci., 11: 553-558.

Giunta, F., G. Prunddu and R. Motzu, 2009. Radiation interception and biomass and nitrogen. Field Crops Res, 110: 76-84.

Hussain, N., Q. Zaman, M.A. Nadeem and A. Aziz, 2010. Response of maize varieties under agro-ecological conditions of Dera Ismail Khan. J. Agric. Res., 48(1): 59-63.

Inamullah, N.H. Shah, N. Rehman, M. Siddiq and Z. Khan, 2011a. Phenology, yields and their correlations in popular local and exotic maize hybrids at various nitrogen levels. Sarhad J. Agric, 27 (3): 363-369.

Inamullah, N. Rehman, N.H. Shah, M. Arif, M. Siddiq and I. Mian, 2011b. Correlations among grain yield and yield attributes in maize hybrids in various nitrogen levels. Sarhad J. Agric, 27(4): 531-538.

Jing, Q., W. Bingwv and M. Yong, 2003. A study on comprehensive evaluation of maize hybrids. J. Jilin. Agric. Uni, 25: 139-142.

Kharazmshahi, H.A., H. Zahedi and A. Alipour, 2015. Effects of sowing date on yield and yield components in sweet maize (*Zea mays* L.) hybrids. Biol. Forum Int. J, 7(2): 835-840.

Ogbomo, K.E.L and S.U. Remison, 2009. Growth and yield of maize as influenced by sowing date and poultry manure application. Not. Bot. Hort. Agrobot. Cluj, 37 (1):199-203.

Qureshi, A.S., M. Qadir, N. Heydari, H. Turral and A. Javadi, 2007. A review of management strategies for salt-prone land and water resources in Iran. International water management Institute. 30P (IWMI working paper 125) Colombo, Sri Lanka.

Ramankutty, N., J.A. Foley, J. Norman and K. McSweeney, 2002. The global distribution of cultivable lands: Current patterns and sensitivity to possible climate change. Global Ecology Biogeogr, 13: 377-392.

Shah, A., M. Akmal, M. Asim, Farhatullah, Raziuddin and A. Rafi, 2012. Maize growth and yield in Peshawar under changing climate. Pak. J. Bot, 44: 1933-1938.