

<http://www.pjbs.org>

PJBS

ISSN 1028-8880

**Pakistan
Journal of Biological Sciences**

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Maturity Studies in Hybrid and Open Pollinated Cultivars of Maize

Raiz Ahmed Shah, Bashir Ahmd, Mohammad Shafi and Jehan Bakht
Department of Agronomy NWFP Agricultural University Peshawar, Pakistan

Abstract: The experimental results revealed that local cultivar Hazara-Double emerged in 6 days whereas hybrid PAC-52 took maximum number of days. The Hazara-Double was the earliest one in reaching tasseling (52 days) but the hybrid PAC-9715 and C-501 took 61 days to tasseling. The hybrid PAC-52 silked earlier taking 55 days whereas C-501 completed silking process in 65 days. At harvest minimum grain moisture content was observed in hybrid PAC-52 (23.5) when compared to PAC-9715 (31.4) and C-501 (32%). Regarding grain yield, Hazara Double was lowest (5.3 t ha⁻¹) whereas premium brand produced maximum grain yield (9 t ha⁻¹) when compared to long duration hybrid PAC-9715 (8.6 t ha⁻¹).

Key words: Maize, maturity, hybrid, open pollinated, cultivars

Introduction

Among the major crops, seed development and maturation has been most intensively studied in Corn with recorded sharp focus on the rate and period of grain filling. Again, as in the general situation previously outlined, these studies have been oriented more towards grain production than towards seed production. The objectives of this study were to chart the process of seed maturation in corn hybrids in terms of events and attributes of special interest to seed producers, and to establish as possible, relationships among the more important events and attributes. It is suggested that ear moisture content could be reduced by reducing days to silking (Kabir, 1988). Barriere and Traineau (1986) reported that whole yield of early hybrid was similar to those of late hybrid at silking. After eking late hybrid attained highest whole plant yield (22.3 to ha⁻¹). The feeding values of the late maturing hybrids were lower than the early hybrids. Klyuchko *et al.* (1986) observed that rate of grain moisture lost during ripening was closely associated with the length of husk leaves. Torigoe *et al.* (1986) reported that leaf, flower, grain formation and grain growth varied among the various cultivars of maize. Moreover shoot dry weight declined between grain filling and physiological maturity. Kang and Zuber (1989) reported that there was decline in the rate of grain moisture reduction as harvest grain moisture decreased. Similarly, Brooking (1990) observed a consistent relationship between grain weight and ear moisture while studying maize hybrid Pioneer 3901.

Materials and Methods

Four corn hybrid and two open pollinated cultivars were planted in randomized complete block design having four replications at Agricultural Research Station Dhodial, Mansehra NWFP Pakistan during 1992. The sub plot size was 3 × 5 m with row to row distance of 75 cm and plant to plant distance of 25 cm. A uniform dose of fertilizer was applied at the rate of 140-70-0 NPK ha⁻¹. All phosphorus in the form diarnmonium phosphate at seed bed preparation along with half dose of nitrogen in the form of urea was applied. The remaining half dose of nitrogen was applied when the crop was at knee high stage. Standard agronomic practices were followed throughout the growing season. The experiment included the following cultivars.

- 1 PAC-9715 (Long season hybrid)
- 2 C-501 (Long season hybrid)
- 3 Pak-52 (Short season hybrid)

- 4 Premium brand (short season hybrid)
- 5 Azam (Open pollinated)
- 6 Hazara double (Open pollinated)

Data was recorded on days to emergence, days to tasselling, days to silking, plant height, ear height, days to physiological maturity, fresh cob weight at harvest, number of cobs plant⁻¹, stalk yield, grain moisture content, and grain yield.

Results and Discussion

Data regarding days to emergence is presented in Table 1. Statistical analysis of the data revealed that different cultivars had a significant effect on days to emergence. It is clear from the data shown in Table 1 that hybrid PAC-52 took maximum number of days to emergence followed by PAC-9715 and C501 (7) days to emergence. Premium brand hybrid and open pollinated variety Azam took 7 and 6 days on the average. Open pollinated variety Hazara Double took minimum of 6 days for emergence. The reason for this difference in days to emergence may be due to the genetic characters of the varieties and nature of the seed and its moisture content. These results are also supported by Hunter (1990).

Table 1 also shows data concerning days to tasseling. Analysis of the data indicated that days to tasseling had significantly affected days to tasseling. It can be inferred from the data that both the full season hybrids PAC-9715 and C-501 took maximum number of 61 days to produce tasseling, which is followed by short season hybrids Premium Brand and PAC-52 along with open pollinated variety Azam. Minimum days to tasseling were recorded in the local variety Hazara Double. These differences may be due to genetic characters, specific life cycle and growth periods of different varieties. Similar results are also reported by Hunter (1990). Data concerning days to silking is presented in Table 1. Statistical analysis of the data showed that different cultivars had a significant effect on days to silking. Mean values of the treatment and analysis of variance showed that maximum number of days to silking were noted in hybrids PAC-9715 and C-501 followed by open pollinated varieties of maize (Azam and Hazara Double) which took 58 and 57 days to silking respectively. Two short season hybrids PAC-52 and premium brand took minimum number of 50 and 57 days respectively. Again these differences in days to silking may be due to differences in their genetic makeup, life cycle and growth period. Similar results were also reported by Dzyubetskii *et al.* (1985) and Kabir (1988). Table 1 also shows data concerning interval between silking and tasseling. Analysis of the data indicated that interval between silking and

Shah *et al.*: Maturity studies in hybrid and open pollinated cultivars of maize

Table 1: Days to emergence, tasseling, Bilking, interval between silking and tasseling(days) and plant height (cm)

Cultivate	Days to		Interval between		Plant height
	Emergence	Tasseling	Silking	Tasseling and Silking	
PAC-9715	7.0013	61.25 A	63.50 A	2.25 C	234.37 A
C-501	7.00	61.25 A	64.50 A	3.25 B	209.00
PAC-52	9.00 A	53.50 B	55.50D	2.00 C	174.75 C
Premium Brand	6.75 B	53.25 B	57.00 C	3.75 B	208.25 B
Azam	6.25 B	54.00 B	58.50	4.50 AB	204.00 B
Hazara Double	6.00 C	51.50 C	57.50 B	6.00 A	230.75 A
LSD 0.05	0.884	1.278	1.241	1.788	13.96
S.E.	0.2933	0.424	0.4117	0.5933	4.631

Means of same category followed by different letters are significantly different using LSD test at $p < 0.05$

Table 2: Ear height (cm), number of cobs. plot⁻¹(3X15m), fresh cob weight(kg. Plot⁻¹), and days to maturity of different Maize cultivars

Cultivate	Ear height	Cobs. Plot ⁻¹	Fresh cobs weight	Days to maturity
PAC-9715	126.25 A	45.50 A	10.260 A	125.8 A
C•501	116.75 A	43.75 AB	9.250 B	125.3 A
PAC-52	69.50 D	37.25 C	6.850 B	113.0 C
Premium Brand	86.25 C	41.75 B	9.575 A	116.0 8C
Azam	104.75 13	35.00 C	6.10 BC	117.5 B
Hazara Double	127.00 A	40.75 B	5.775 C	114.5 BC
LSD 0.05	11.02	2.258	0.967	3.283
S.E.	3.675	0.749	0.3204	1.089

Means of same category followed by different letters are significantly different using LSD test at $p < 0.06$

Table 3: Moisture percentage, stalk yield (t ha⁻¹, grain yield it ha⁻¹) and germination percentage of different Maize cultivars

Cultivate	Moisture(%)	Stalk yield	Grain yield	Germination(%)
PAC-9715	31.43 A	23.79 A	8.634 AB	92.00
C-601	31.95 A	18.43 B	7.849 B	91.50
PAC-62	23.47 B	9.198 E	6.573 C	92.00
Premium Brand	24.85 B	11.06 DE	9.017 A	88.75
Azam	25.95 B	13.46 CD	5.598 CD	88.00
Hazara Double	26.63 B	15.80 BC	5.322 D	89.25
LSO 0.06	3.673	2.843	1.018	N.S.
S.E	1.185	0.943	0.3376	1.75

Means of same category followed by different letters are significantly different using LSD test at $p < 0.05$

tasseling has significantly affected by different cultivars. Mean values of the data presented in Table 1 showed that maximum interval of 6 and 5 days were observed in local open pollinated varieties i.e. Hazara Double and Azam followed by C-501 (3 days) and premium brand (4 days). The minimum interval between silking and tasseling were found in hybrid PAC-52 and PAC- 9715. Table 2 also present data regarding plant height. Analysis of the data revealed that different hybrids and open pollinated varieties had a significant effect on plant height. It can be seen from the data shown in Table 2 that tallest plants of 234 and 231 cm were attained dy PAC-9715 and Hazara Double (local variety) respectively. While plant height in C-501, Azam (Open pollinated) and premium brand were 209, 204, and 208 cm respectively. Shorter plants were recorded in PAC-52. Ear height data is shown in Table 2 Statistical analysis of the data revealed that ear height was significantly affected by different cultivars. Mean values of the data presented in Table 2 indicated that maximum ear height of 127 cm was found in the local open pollinated variety Hazara Double followed closely by PAC-9715. These three cultivate were at par with each other. The maize variety Azam, the ear height was 105 cm and in hybrid premium brand, the ear height was 88 cm while lowest ear height was observed in the short season hybrid PAC-52.

Data pertaining to number of cobs. Plot⁻¹ is presented in Table 2 Mean values of the data showed that different cultivate had a significant effect on number of cobs.plot⁻¹. It can be inferred from the data presented in Table 2 that maximum of 45 cobs. plot⁻¹ were noted in the long season hybrid followed by C-501. Hazer. Double and premium brand

were at Par with each other regarding number of cobs plot⁻¹. Maize variety Azam and hybrid PAC-52 produced minimum of 37 an 35 cobs plot⁻¹ respectively. Data regarding fresh cob weight at harvest is presented din Table 2 Statistical analysis of the data revealed that there was significant differences in cobs weight among different cultivars. Hybrid, PAC-9715 and C-501 and premium brand were significantly higher in fresh cobs weight than open pollinated varieties whereas hybrid PAC-52 was at par with Azam but significantly different from the local variety Hazara Double. Data regarding days to maturity is shown in Table 2. Statistical analysis of the data revealed that days to maturity were significantly affected by different cultivars. Data presented in Table 2 indicated that maximum of 125 days to maturity were taken by the long season hybrid followed by Azam, Premium brand and Hazara Double. Hybrid PAC-52 took minimum 113 days to maturity. Moisture percentage of grain at harvest was significantly affected by different cultivate (Table 3). It can be seen from the mean values that maximum grain moisture content of 31% and 32% were found in hybrids PAC-9715 and C-501 respectively. The other cultivate were at par with each other. However, minimum of 23% grain moisture content was observed in short duration season hybrid PAC-52. It can be inferred from these results that early maturing cultivars dried earlier than the late maturing cultivars. Kabir (1988) reported that grain moisture content can be reduced by reducing days to silking which agree with the results of this study. These results are in confirmatory with those reported by Domashnev and Dzyubetskii (1983). Data regarding stalk yield is shown in Table 3. Analysis of the data revealed that stalk yield was

Shah *et al.*: Maturity studies in hybrid and open pollinated cultivars of maize

significantly affected by different cultivars. Mean values of the data indicated that maximum stalk yield in hybrid PAC-9715 followed by C-501 while premium brand, Azam and Hazara Double produced stalk yield of 11, 13 and 16 t ha⁻¹. Minimum stalk yield of 9 t ha⁻¹ was produced by hybrid PAC-52. Similar results were also reported by Torigoe *et al.* (1986). Grain yield was significantly affected by different cultivars. Mean values of the data shown in Table 3 revealed that maximum grain yield of 9 t ha⁻¹ was produced by short season hybrid premium Brand followed by 8.6 t ha⁻¹ in case of PAC-9715. Hybrids C-501 and PAC-52 produced grain yield of 8 and 6.6 t ha⁻¹ respectively. Open pollinated varieties of maize produced minimum of 5.6 t ha⁻¹ and 5 t ha⁻¹. in case of Azam and Hazara Double respectively. It can be concluded from this result that hybrids are higher yielding than the open pollinated varieties of maize. These results are also supported by Kabir (1988) and Torigoe *et al.* (1986). Germination test after harvest revealed that different cultivar showed non significant differences (Table 3). However mean values of the data indicated that maximum germination after harvest was recorded in PAC-9715, While minimum germination of 88% was observed in open pollinated variety Azam.

References

- Barriere, Y. and R. Traineau, 1986. Characterization of Silage Maize Patterns of Dry Matter Production. LAI Evolution of Feeding Value in Late and Early Genotypes. In: Breeding of the Silage Maize, Proceedings of the 13th congress of the Maize and Sorghum section of Eucarpia Wageningen Netherlands, 9-12 September 1985, Phipps, R.H. (Ed.). Centre for Agricultural, Netherlands.
- Brooking, I.R., 1990. Maize ear moisture during grain-filling and its relation to physiological maturity and grain-drying. *Field Crops Res.*, 23: 55-68.
- Domashnev, P. P. and B.V. Dzyubetskii, 1983. Production and release of early hybrid. *Seleksiya-1-Semenovodstvo, USSR*, No. 4, 7-9. *Plant Breeding Abs.*, 056-01738.
- Dzyubetskii, B.V., V.I. Kostyuchenko, L.I. Voloshina and K.O. Red, 1985. The problems of breeding maize hybrids with rapid grain drying to maturity. *Byulleten-Vesesoyuznogo Nauchno Issledovatel, Skogo Istituta Kukuruzy* No. 1/64, 3-7. *Plant Breeding Abs.*, 057-06863. 1987.
- Hunter, J.L., 1990. Relationship between the stage of corn seed maturation and assimilate supply, assimilate uptake and seed quality. Master's Thesis, University of Kentucky, Lexington, USA.
- Kabir, K.M., 1988. Combining ability of early maize strains divergently selected for ear moisture. *Plant Breed. Abst.*, 58: 623-623.
- Kang, M.S. and M.S. Zuber, 1989. Combining ability for grain moisture, husk moisture and maturity in maize with yellow and white endosperms. *Crop Sci.*, 29: 689-692.
- Klyuchko, P.F., A. Yu and V.V. Ask, 1986. Association between rate of grain moisture loss during ripening and morphological features of the plant in maize. *Nauchno Tekhnicheskii Byulleten Vsesoyuznogo Selektsinonno Geneticheskogo Instituta*, No. 2, 22 *Plant Breeding Abstract*, 1987, 057-07898.
- Torigoe, Y., H. Watanabe and H. Kurihara, 1986. Varietal differences in morphological and physical characters of the developmental phases of maize. *Jpn. J. Crop Sci.*, 55: 474-482.