Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.5316

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **6 (3):** 382-387 (2018)

Research Article

OPEN ACCESS

Evaluation of Maize Hybrids for their Maturity Groups and their Effect on Yield

Pradeep M. G.[1*] and R. H. Patil[2]

[1]M. Sc student, Department of Agronomy, [2]Department of Environmental Sciences,

College of Agriculture, University of Agricultural Sciences, Dharwad – 580 005 Karnataka, India

*Corresponding Author E-mail: pradi.gowda492@gmail.com

Received: 26.07.2017 | Revised: 30.07.2017 | Accepted: 8.06.2017

ABSTRACT

The field experiment was conducted during kharif season of 2016 on deep black soil at the Main Agricultural Research Station, University of Agricultural Sciences, Dharwad, Karnataka, India. The study included 36 hybrids (nine early, 24 medium, and three late maturing type) and were laid out using Randomised Complete Block Design replicated twice. The detailed plant phenology and final grain yield were recorded for all the hybrids and statistically analysed for comparison and to record potential yield. Among the three maturity groups of hybrids the maximum days taken for 50 % anthesis was recorded by hybrids DMH-1 (55 DAS), GH-15305 (59 DAS) and DKC-9141 (63 DAS), while days taken to physiological maturity was recorded by the hybrids GH-1316 (109 DAS), GK-3150 (119 DAS) and DKC-9141 (125 DAS) in early, medium, and late maturing hybrids, respectively. The mean grain yield of these maturity groups were 7550, 9342 and 11050 kg ha^{-1}, respectively, thus indicating that late maturing hybrids give the highest yield under potential management condition followed by medium and the lowest by early maturing hybrids.

Key words: *Wheat, Yield, Hybrids, Fertilizer*

INTRODUCTION

Maize is the world's third most important cereal crop after wheat and rice. With an average yield of 5.11 t ha^{-1} maize stands first with respect to productivity among the cereals and is followed by rice, wheat and millets with an average productivity of 3.7, 2.5 and 1.2 t ha^{-1}, respectively. Due to high productivity, maize is called as the 'Queen of Cereals'. Maize is grown primarily for grain as food and animal feed, but it is also used as raw material for many industries like poultry, starch *etc.* and used in preparation of diversified value added consumable products. The increase in the production of maize in future must come from higher yield per unit area per unit time and to achieve this proper management of growth resources with modern technology particularly use of chemical fertilizer, suitable hybrids and precision management are most important.

Cite this article: Pradeep M.G. and Patil, R.H., Evaluation of Maize Hybrids for their Maturity Groups and their Effect on Yield, *Int. J. Pure App. Biosci.* **6 (3):** 382-387 (2018). doi: http://dx.doi.org/10.18782/2320-7051.5316

Efficient use of fertilizers and their management together with the use of high yielding cultivars with suitable physiological maturity group for the given climate or cropping system is one of the most important aspects to optimize the maize productivity and production. Identifying hybrids based on different physiological maturity groups and performance of hybrids at different production levels and quantifying the yield through field experiments help us choose appropriate cultivar for given climate and management. Hence, the study was carried out to screen different public and private maize hybrids for their physiological maturity group and potential yield under current climatic condition through field experimentation.

MATERIAL AND METHODS

The present study was conducted during *kharif* season of 2016 on deep black soils at the Main Agricultural Research Station, University of Agricultural Sciences, Dharwad (Karnataka) under rainfed condition, but irrigation was provided at regular interval to supplement deficit rainfall to make sure the crop did not experience moisture stress, thus creating moisture stress free growing condition. Hence NPK (150:65:65) recommended for irrigated maize was applied to the crop as per the recommended timings. The material for the present study included of two sets of maize hybrids *i.e*., Private and Public maize hybrids, which were obtained from different Private and Government Organizations presently operating in Karnataka. A total of 36 hybrids were included. These cultivars were classified into three maturity groups: early maturing (100-110 DAS), medium maturing (110-120 DAS) and late maturing (120-130 DAS). The experiment was laid out using Randomised Complete Block Design with two replications and each plot was of 4.8 x 3.0 m in size. The seeds of all the hybrids were sown at a spacing of 60 x 30 cm on 10th of June 2016 and harvested at once on November 5th of 2016, although days to physiological maturity varied with maturity group. Hand weeding operation was carried out periodically thrice during the crop growth at 20, 35 and 45 DAS to keep the plot weed free. Two inter-cultivation operations were also done to enable earthing up and to remove weeds present between crop rows. No incidence of disease was noticed in the crop during the growing period, but quinolphos was sprayed @ 2.0 ml l^{-1} to manage stem borer incidence.

Collection of experimental data

From each treatment, three plants from net plot were tagged and were used to record phenology and other non-destructive observations. The cobs from these plants at harvest were used for recording the yield parameters. After shelling the cobs, grain yield from net plot was recorded and yield ha was calculated. The time taken by plants to reach 50 % anthesis, start of grain filling, 50 % dough stage and physiological maturity was recorded when half of the plants in the net plot reached this stage.

RESULTS AND DISCUSSION

Table 1: Days taken by different maize hybrids to reach different phenological stages and their maturity groups

Table 1a: Early maturing hybrids (DAS = days after sowing)

Hybrids	DAS to 50 % anthesis	DAS to start of grain filling	DAS to 50 % dough stage	DAS to physiological maturity	Yield (kg ha^{-1})	Maturity group
GH-0727	49	57	70	102	6953	EARLY
DMH-1	55	63	78	102	7539	EARLY
GH-1314	50	58	85	105	6631	EARLY
DMH-21	53	60	77	105	7641	EARLY
GH-1436	53	61	77	106	7867	EARLY
H-628	54	62	77	107	7219	EARLY
GH-1427	52	59	81	108	7419	EARLY
NMH-145	54	60	81	109	8511	EARLY
GH-1316	54	59	79	109	8170	EARLY

Table 1b: Medium maturing hybrids (DAS = days after sowing)

Hybrids	DAS to 50 % anthesis	DAS to start of grain filling	DAS to 50 % dough stage	DAS to physiological maturity	Yield (kg ha^{-1})	Maturity group
GH-15688	56	66	82	110	6648	MEDIUM
DKC-9144	59	64	79	111	9227	MEDIUM
BISCO PRINCE	55	62	82	111	9522	MEDIUM
CAH-1574	54	61	82	111	8097	MEDIUM
NK-6240	51	62	83	112	8801	MEDIUM
GH-150241	56	69	88	112	8221	MEDIUM
740 deluxe	58	66	82	113	9355	MEDIUM
GH-15305	59	67	83	113	9227	MEDIUM
BRMH-1	54	65	88	113	7598	MEDIUM
DKC-9133	56	66	84	113	9402	MEDIUM
GH-15060	57	64	83	113	8861	MEDIUM
D-4114	56	65	80	114	9794	MEDIUM
NANDINI	55	68	85	114	9577	MEDIUM
DMH-3	53	67	86	114	8873	MEDIUM
S-6668	56	65	80	115	10123	MEDIUM
DMH-1107	57	66	79	115	10174	MEDIUM
P-3550	57	71	87	116	9765	MEDIUM
DKC-9149	56	64	83	116	9479	MEDIUM
CHAMUNDI	58	71	92	116	10383	MEDIUM
CP-818	58	67	86	117	10003	MEDIUM
GK-3059	60	67	85	117	10396	MEDIUM
DKC-9126	57	74	91	118	9509	MEDIUM
P-3401	58	70	89	118	10037	MEDIUM
GK-3150	61	67	86	119	11129	MEDIUM

Table 1c: Late maturing hybrids (DAS = days after sowing)

Hybrids	DAS to 50 % anthesis	DAS to start of grain filling	DAS to 50 % dough stage	DAS to physiological maturity	Yield (kg ha^{-1})	Maturity group
DKC-9141	63	76	95	125	11492	LATE
900M GOLD	63	74	91	121	10170	LATE
D-4685	61	74	92	123	11487	LATE
S.Em ±	**0.51**	**1.07**	**1.77**	**0.28**	**585.25**	
C.D. (0.05)	**1.46**	**3.08**	**5.09**	**0.80**	**1680.25**	

Phenology:

Amongst all the hybrids tested maximum number of days taken to reach 50% anthesis was recorded with DKC-9141 and 900M GOLD (63 DAS) followed by GK-3150 and D-4685 (61 DAS), whereas the minimum number of days taken to 50% anthesis was recorded by GH-0727 (49 DAS) followed by GH-1314 (50 DAS), and NK-6240 (51 DAS). The results are in agreement with the findings of Dowker[1] who carried out a trial in Kenya to compare the reliability of yield of early maturing maize (Taboran) over the medium maturing local hybrid under rainfed conditions. The results showed a consistent difference in days to 50 % silking. Taboran cultivar was found, on an average, 17 days earlier than the local hybrid, though there was no difference in spacing and other management. The tested hybrids revealed that the maximum number of days taken to reach the grain filling stage was recorded by DKC-9141 (76 DAS) followed by D-4685, DKC-9126 and 900-M-GOLD (74 DAS), while the minimum number of days were taken by GH-0727 (57 DAS) which was closely followed by GH-1314 (58 DAS), GH-1427 and GH-1316 (59 DAS). Among all the hybrids the maximum number of days to reach the dough stage was recorded by DKC-9141 (95 DAS), followed by CHAMUNDI and D-4685 (92 DAS) and DKC-9126 (91 DAS), while the minimum number of days was recorded by GH-0727 (70 DAS), followed by hybrids DMH-21, GH-1436 and H-628 (77 DAS) and DMH-1 (78 DAS).

Number of days taken to reach physiological maturity was maximum with DKC-9141 (125 DAS), closely followed by D-4685 (123 DAS), 900-M-GOLD (121 DAS), GK-3150 (119 DAS) and P-3401 (118 DAS), while the minimum number of days was recorded by GH-0727 and DMH-1 (102 DAS), followed by GH-1314 and DMH-21 (105 DAS), and GH-1436 (106 DAS).

Grain Yield (kg ha^{-1}) and maturity groups

The study revealed that among the maize hybrids tested, DKC-9141 gave the highest grain yield of 11492 kg ha^{-1} closely followed by D-4685 (11487 kg ha^{-1}), and both were at par, but the next best was GK-3150 (11129 kg ha^{-1}), GK-3059 (10396 kg ha^{-1}) and CHAMUNDI (10383 kg ha^{-1}). The hybrid GH-1314 with a yield of 6631 kg ha^{-1} recorded the lowest yield closely followed by GH-15688 (6648 kg ha^{-1}), GH-0727 (6953 kg ha^{-1}), H-628 (7219 kg ha^{-1}) and GH-1427 (7419 kg ha^{-1}). The result obtained is in agreement with findings of Singh *et al.*[7], who also recorded significant variation in grain yield amongst hybrids of different maturity groups under normal conditions. The findings of this study is also supported by findings of Opsi *et al.*[4], who tested early maturing (Cisko FAO 300) and late maturing hybrids (Arma FAO 700). The late maturing hybrid (Arma FAO 700) recorded higher yield with whole plant dry matter being 40 % higher than early maturing hybrid (Cisko FAO 300).

The hybrids tested in this study were categorised under three different maturity groups *viz.*, early maturing, medium maturing and late maturing. The study revealed that among all the 36 hybrids tested nine hybrids (GH-0727, DMH-1, GH-1314, DMH-21, GH-1436, H-628, GH-1427, NMH-145) were in early maturing group, 24 hybrids (GH-15688, DKC-9144, BISCO PRINCE, CAH-1574, NK-6240, GH-150241, 740 deluxe, GH-15305, BRMH-1, DKC-9133, GH-15060, D-4114, NANDINI, DMH-3, S-6668, DMH-1107, P-3550, DKC-9149) were in medium maturing group and only three hybrids were under the category of late maturing (DKC-9141, 900M GOLD, D-4685).

Table 2: Phenological phases (days) recorded for different maize hybrids

Hybrids	Days from 50 % anthesis to start of grain filling	Days from 50 % anthesis to 50 % dough stage	Days from 50 % anthesis to physiological maturity
DKC-9141	14	32	63
DKC-9133	10	28	57
900M GOLD	11	28	58
DKC-9149	9	27	61
DKC-9126	17	34	61
DKC-9144	5	20	52
NK-6240	12	32	61
S-6668	9	24	59
CP-818	9	28	59
P-3550	14	30	59
P-3401	12	31	60
D-4685	13	31	63
D-4114	9	24	58
DMH-1107	9	22	58
GK-3059	7	25	57
GK-3150	6	25	58
740 deluxe	8	24	55
BISCO PRINCE	7	27	56
NMH-145	6	27	55
CHAMUNDI	13	34	58
NANDINI	13	30	59
GH-150241	13	32	56

GH-0727	8	21	53
GH-1427	7	29	56
GH-1436	8	24	53
CAH-1574	7	29	58
GH-1314	8	35	55
GH-1316	5	25	55
GH-15060	7	26	56
GH-15688	10	26	54
GH-15305	8	24	54
BRMH-1	11	34	59
H-628	8	23	53
DMH-1	8	23	47
DMH-3	14	33	61
DMH-21	7	24	52
S.Em ±	**1.19**	**1.73**	**0.55**
C.D. (0.05)	**3.40**	**4.97**	**1.59**

Phenological phases

The maximum number of days between the time to reach 50 % anthesis and start of grain filling was recorded in DKC-9126 (17 Days), followed by DKC-9141, P-3550 and DMH-3 (14 Days), while the minimum difference between these two stages was recorded in DKC-9144 and GH-1316 (5 Days), which was followed by GK-3150 and NMH-145 (6 Days) and GH-1427 (7 Days). Difference between time to reach 50 % anthesis to 50% dough stage was higher in hybrid GH-1314 (35 Days), followed by the hybrids CHAMUNDI, DKC-9126 and BRMH-1 (34 Days) and DMH-3 (33 Days), whereas the lowest number of days between the stages was noticed in the hybrid DKC-9144 (20 Days), closely followed by the hybrid GH-0727 (21 Days), DMH-1107 (22 Days), H-628 and DMH-1 (23 Days).

Maximum number of days taken by hybrids to reach the maturity stage from anthesis was recorded higher in case of hybrids DKC-9141 and D-4685 (63 Days), closely followed by hybrids DKC-9126, DKC-9149 and DMH-3 (61 Days), while the lowest number of days between the stages was observed in the hybrid DMH-1 (47 Days), followed by the hybrids DMH-21 and DKC-9144 (52 Days), H-628 and GH-0727 (53 Days). This result is supported by findings of Gunn[2], in a study conducted at England, showed that the spread of silking ranged from 13 to 18 days and the spread of maturity from 34 to 47 days in different hybrids. The study revealed that the late maturing hybrids outperformed the medium and early maturing hybrids with respect to yield with the mean yield levels of different groups being 7550 kg ha^{-1} (for early maturing), 9342 kg ha^{-1} (for medium maturing) and 11050 kg ha^{-1} (for late maturing). In this study, on an average, the days to maturity recorded was 106 DAS for early maturing, 114 DAS for medium maturing and 123 DAS for late maturing hybrids. This study was supported by the study carried out by Row *et. al.*[5], that showed maize grain yield and plant dry matter yield increased over time with the use of hybrid DKC-61(normal season- 111 day) over the hybrid DKC-52 (short season-102 day).

REFERENCES

1. Dowker, and B. D., Breeding of maize for low rainfall areas of Kenya:1. The reliability of yield of early and late maturing maize. *The Journal of Agricultural Science*. 523-530 (2009).
2. Gunn and R. E., Flowering and maturation of grain maize under British conditions. *The Journal of Agricultural Science*. 173-176 (2009).
3. Norwood, and C. A., Dryland corn production in western Kansas: effect of hybrid maturity, plating date and plant population. *Agronomy Journal*, **93:** 540-547 (2001).
4. Opsi, F., Fortina, R., Borreani, G. and Tabacco, E., Influence of cultivar, sowing date and maturity at on yield, digestability,

rumen fermentation kinetics and estimated feeding value of maize silage. *The Journal of Agricultural Science*. 265-273 (2012).

5. Row, A., Shreck, L., Bondurant, and Robert, G., Effect of corn plant maturity on yield and nutrient quality of corn plants. Nebraska Beef Cattle Reports. 819 (2015).
6. Sharifi, R. S. and Taghizadeh, R., Response of maize (*Zea mays* L.) cultivars to different levels of nitrogen fertilizer. *Journal of Food, Agriculture & Environment*, **7:** 518-521 (2009).
7. Singh, V., Ajaya, S., Singh, R. K. and Amit, B., Performance of different maturity groups of maize (*Zea mays*) hybrids under temporary waterlogging condition in a Mollisol. *Indian Journal of Agricultural Sciences* **83 (6):** 639–46 (2013).
8. Swamy, S. N. and Swamy, K. K., Influence of nitrogen on crop performance and yield of hybrid maize. *Seed Research*, **24 (2):** 93-96 (1996).