AJA. VOL (2) ISSUE 4, 2015: 87-90

Azarian Journal of Agriculture

www.azarianjournals.ir

Azarian Journals

Research article ISSN:2383-4420

Performance evaluation of maize genotypes in far western hills of Nepal

Hari Kumar Prasai[1], Subarna Sharma[1], Ujjwal Kumar Singh Kushwaha[1] and Jiban Shrestha[2]

Article Info

Accepted:
16 Aug. 2015

Keywords:
CVT, Far Western, Grain Yield, IYT, Maize, Nepal

ABSTRACT

Twenty one maize genotypes in Intermediate Yield Trial (IYT) and fourteen genotypes in Coordinated Varietal Trial (CVT) were evaluated at Bhagetada, Dipayal, Doti, Nepal in 2012 and 2013 during summer seasons. The trials were laid out in randomized complete block design with three replications. The combined analysis of IYT trials over years showed that Rampur SO3FO8, Across 9531 (RE), RPOP-1 and BLSBSO7-F12 were high yielding genotypes whereas the combined analysis of CVT trials over two years showed that RPOP-3 RPOP-2 and RPOP-4 were high yielding genotypes. The combined analysis of common genotypes (from IYT and CVT) over two years showed that higher grain yielding genotypes were RPOP-1 (3561 kg/ha), RPOP-2 (3464 kg/ha), RPOP-3 (3371 kg/ha) and RPOP-4 (3259 kg/ha).They were promising genotypes however should be tested at on-farms before promoted for general cultivation in river basin agro environment of far western hills of Nepal.

INTRODUCTION

Maize (*Zea mays* L.) is one of the most important staple food crops in Nepal where its area and productivity is 8.49 million hectare and 2.3 t/ha, respectively (MoAD 2013). It contributes to about 25.02% in total for cereal production, 6.54% in Agricultural Gross Domestic Product (AGDP) and 3.15% in Gross Domestic Product (GDP) (MoAD 2013). The maize growing environments of Nepal vary from north to south parts of the country. Maize is the only crop which is adaptive to across different agro-ecological zones because of its great diversity (Ferdu et al. 2002). Maize can be grown in far western hill of Nepal. The Far-Western Region covers nine districts and area of 19539 km^2 with the regional headquarters at Dipayal, Doti district (Wikipedia 2015).

The status of poverty of the country is 25% but is much higher, at 46%, in the far western hills and mountain districts and may go up to 80% in some mountain and hill districts (MoAD/WFP 2009). The mountain and hill districts of the far western development region include the highest number of food deficit district in the country. The poverty and food deficit in this region can be reduced through increased production in maize that can be done by the cultivation of high yielding improved maize varieties.

The information regarding suitability of maize genotypes for grain yield under environments of far western mid hill of Nepal is not sufficient. Therefore this study was conducted at Regional Agricultural Research Station, Doti in 2012 and 2013 during summer seasons in order to identify high yielding superior maize genotypes for river basin agro environment of far western hills of Nepal.

MATERIALS AND METHODS

Genetic materials and experimental site:

The genotypes namely Terai Pool yellow, Across-0033, Cotaxtla-S-9627-(1), TAKFA-S 9624, Rampur S03 F02, Rampur S03 F04, Rampur S03 F06, Rampur S03 F08, CEL-OHGYA × CELOH, Pozarica-S9627 (RE), SO 128, Across-9531 (RE), AGUAFRIA S0031, PHRAPHUTTABAT S0031, RPOP-1, RPOP-2, RPOP-3, RPOP-4, BLSBS07-F12 and Rampur Composite were planted in IYT at Regional Agricultural Research Station (RARS), Doti. Similarly, in the same location the genotypes

1-Regional Agricultural Research Station, Bhagetada, Dipayal, Doti
2-National Maize Research Program, Rampur, Chitwan, Nepal
Email: hkprasai60@gmail.com

planted in CVT were BANGLORE 9745, IQUITOS 9328 RE, POZARICA 9531, TAKFA-S-9536, SIN-IBP-UTYF, S97TLYGH "AyB"(3), Cotaxla0024, RPOP-1, RPOP-2, RPOP-3, RPOP-4, ACROSS 9331 RE and Rampur Composite. Farmers' variety was planted as local check for both trials. IYT and CVT trials were carried out in experimental field of Regional Agricultural Research Station, Doti during 2012 and 2013. The experimental site was located at altitude of 610 m above mean sea level on 29^0 15' north latitude and 80^0 55' east longitudes. The soil was light texture, low organic matter (1-2 %) and acidic in nature containing pH 6 (RARS 2015).

Experimental design and crop husbandry:

Intermediate yield trial of twenty one terai maize genotypes and coordinated varietal trial of fourteen terai maize genotypes was planted in Regional Agricultural Research Station, Doti in randomized complete block design with three replications in summer season of the year 2012 and 2013. the planting pattern was 75 × 25 (75 cm row to row distance and 25 cm plant to plant and) with plot area of 6 m^2 for IYT and 12 m^2 for CVT. Fertilizers were applied as 120:60:40 NPK kg/ha and proper crop management and cultural practices were done. Half of N and full dose of P_2O_5 and K_2O were applied as basal dose. The remaining half of the N was applied in two splits at knee-high and pre-tasseling/silking stages. Other agronomic practices were carried out as per recommended.

Data recording, measurement and analysis:

Different traits such as days to tasseling, days to silking, plant height, ear height and grain yield were taken from both IYT and CVT trials.

Grain yield (kg/ha) at 15% moisture content was calculated using fresh ear weight with the help of the below formula:

Grain yield (kg/ha)= [FW(kg/plot) × (100-moisture content %) × S × 10000]/[85× net harvested area (m^2)]

Where,

F.W. = Fresh weight of ear in kg per plot at harvest

Moisture (%) = Grain moisture content at harvest

85= Required moisture percentage 15%

S= Shelling Co-efficient (0.80)

Harvested area= net harvested plot size, m^2

The recorded data were analyzed using the statistical package MSTAT-C (Russel and Eisensmith 1983) and the significant differences between genotypes 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.

RESULTS AND DISCUSSION

There was variation among maize genotypes for their agronomic performance under different trials and years. Different researchers have reported significant amount of variability in different open pollinated varieties (Sampoux et al. 1989). Combined analysis over years (2012 and 2013) of the IYT showed that the longest days to tasseling (53.83) was found in TAKFA-S 9624 (53.83) followed by SO 128 (52.50) whereas the longest days to silking was observed in Rampur SO3 FO2 (56.83) followed by SO 128 (56.50) respectively. Highest plant height was observed in TAKFA-S 9624 (277.17 cm) followed Rampur SO3 FO6 (276 cm) whereas the highest ear height was observed in Rampur composite (130 cm) followed by Rampur SO3 FO6 (127.50 cm). Genotype namely Rampur SO3FO8 (4251 kg/ha) produced the highest grain yield (4251 kg/ha) followed by across 9531 (RE) (4219 kg/ha) and RPOP-1 (4099 kg/ha) respectively (Table 1). In this analysis genotypes and years were found highly significant for grain yield and other agronomic traits. The interaction between genotypes and years (G ×Y) was found significant for grain yield and other agronomic traits in IYT.

Combined analysis over years (2012 and 2013) of CVT showed that the longest days to tasseling was observed in the genotypes TAKFA-S-9536 (54.83), SIN-IBP-UTYF (54.33) and IQUITOS 9328 RE (54.17) respectively. Similarly, the same genotypes showed longest days to silking also (Table 2). From the analysis of the two years data, RPOP-3 (3465 kg/ha), RPOP-2 (3415 kg/ha) and RPOP-4 (3286 kg/ha) identified as the promising genotypes of maize (terai set) for river basin agro-environment of far western hills. The genotype RPOP-3 produced the highest grain yield (4664 kg/ha) yielder genotype at Doti, far western hill of Nepal as reported in NMRP (2014). Similarly genotypes namely RPOP-4 (2215 kg/ha), RPOP-3 (2157 kg/ha) and RPOP-2 (2109 kg/ha) were identified as promising genotypes maize for river basin agro-environment of far western hills (RARS 2015).Statistically, the genotypes and years were found highly significant for grain yield and other agronomic traits. The interaction between genotypes and years (G ×Y) was found non significant for grain yield and other agronomic traits in CVT.

The combined analysis of common seven genotypes (from IYT and CVT) over two years showed that RPOP-1 (3561 kg/ha), RPOP-2 (3464 kg/ha), RPOP-3 (3371 kg/ha) and RPOP-4 (3259 kg/ha) were higher grain yielder genotypes respectively. The genotype and year were highly

Table 1. Combined analysis (over years; 2012and 2013) on agronomic performance of maize genotypes evaluated in IYT at RARS Doti

SN	Genotype	Flowering (day)		Plant height	Ear height	Grain yield
		Tasseling	Silking	(cm)	(cm)	(kg/ha)
1	Terai Pool yellow	48.50	52.00	239.33	110.50	2979.58
2	Across-0033	51.00	54.83	239.50	100.67	3132.90
3	Cotaxtla-S -9627-(1)	51.67	54.83	247.67	106.17	3174.09
4	TAKFA-S 9624	53.83	56.17	277.17	120.17	3710.51
5	Rampur S03 F02	52.67	56.83	250.67	114.50	3637.61
6	Rampur S03 F04	51.33	53.83	225.50	98.50	3165.71
7	Rampur S03 F06	51.17	55.00	276.00	127.50	3293.36
8	Rampur S03 F08	49.67	54.00	255.83	126.50	4251.97
9	CEL-OHGYA ×CELOH	52.33	55.50	256.17	120.67	3942.69
10	Pozarica-S9627 (RE)	52.50	55.83	255.83	109.00	3677.68
11	SO-128	53.50	56.50	236.67	107.00	2451.72
12	Across-9531 (RE)	48.83	51.50	258.00	118.17	4219.03
13	AGUAFRIA S0031	49.33	53.17	246.67	94.83	3325.22
14	PHRAPHUTTABAT S0031	48.83	52.17	231.33	103.33	3918.77
15	RPOP-1	48.50	52.00	264.17	121.83	4099.93
16	RPOP-2	50.17	54.00	257.33	125.00	3662.09
17	RPOP-3	51.17	54.50	230.17	116.33	3277.10
18	RPOP-4	51.00	54.17	257.17	120.50	3232.35
19	BLSBS07-F12	49.83	53.17	262.17	123.83	4087.70
20	Rampur Composite	49.50	53.50	260.17	130.33	2933.10
21	Farmer's Variety	35.83	39.50	161.83	53.00	1451.77
	F-test					
	Genotype (G)	**	**	**	**	**
	Year (Y)	**	**	**	**	**
	G × Y	**	**	ns	ns	*
	CV%	1.30	1.66	7.98	13.49	22.99

*,**, Significant at 0.05 and 0.01 probability level respectively. ns, Non-significant

significant for grain yield and other agronomic traits whereas interaction between genotype and year (G × Y) was non-significant (Table 3). Shrestha et al. (2011) found that RPOP-1, RPOP-2, RPOP-3 and RPOP-4 produced the grain yield of 3223.62, 2614.48, 2803.11 and 3324.59 kg/ha respectively at the same location namely RARS Doti.

CONCLUSION

The evaluation of maize genotypes for a particular location is the most important task in maize development program. The findings of this studies showed that the maize genotypes namely Rampur RPOP-1, RPOP-2, RPOP-3 and RPOP-4 were high

Table 2. Combined analysis (over years; 2012 and 2013) on agronomic performance of maize genotypes evaluated in CVT at RARS Doti

SN	Genotype	Flowering (day)		Plant height	Ear height	Grain yield
		Tasseling	Silking	(cm)	(cm)	(kg/ ha)
1	BANGLORE 9745	53.50	56.83	225.67	98.17	1843.50
2	IQUITOS 9328 RE	54.17	58.00	253.67	116.17	2086.70
3	POZARICA 9531	52.66	55.83	233.00	99.67	1806.51
4	TAKFA-S-9536	54.83	58.00	239.50	121.00	2344.76
5	SIN-IBP-UTYF	54.33	57.67	247.17	107.67	2116.91
6	S97TLYGH "AyB"(3)	47.00	52.00	214.67	88.83	2493.25
7	Cotaxla0024	48.83	51.83	241.83	111.00	2957.88
8	RPOP-1	50.17	53.00	249.83	117.17	3021.50
9	RPOP-2	50.83	53.83	256.17	120.33	3415.71
10	RPOP-3	49.33	52.67	257.17	124.33	3465.89
11	RPOP-4	51.17	54.67	248.00	119.33	3286.58
12	ACROSS 9331 RE	50.50	54.50	223.67	104.33	2177.02
13	Rampur Composite	49.50	52.67	255.00	118.83	2374.45
14	Farmer's Variety	35.00	38.83	171.00	51.83	1182.06
	F-test					
	Genotype (G)	**	**	**	**	**
	Year (Y)	ns	**	ns	**	**
	G × Y	**	**	**	ns	ns
	CV%	2.18	2.75	7.30	13.08	35.16

**, Significant at 0.01 probability level respectively. ns, Non-significant

Table 3. Combined analysis (over years; 2012 and 2013) of common maize genotypes (from IYT and CVT) for their grain yield at RARS Doti

SN	Genotype	Year 2012	Year 2013	Combined
1	RPOP-1	2816	4306	3561
2	RPOP-2	2570	4358	3464
3	RPOP-3	1961	4782	3371
4	RPOP-4	2151	4368	3259
5	ACROSS 9331 RE	2443	3953	3198
6	Rampur Composite	1647	3659	2653
7	Farmer's Variety	915	1718	1317
F-test	Genotype			**
	Year			**
	Genotype × Year			NS
$LSD_{0.05}$	Genotype			868
	Year			464
	Genotype × Year			1227.5
CV,%				19.1

**, Significant at 0.01 probability level respectively. ns, Non-significant

yielding maize genotypes which were promising genotypes for far western mid hill of Nepal however these findings need further on-farm verification before recommendation for general cultivation.

ACKNOWLEDGEMENT

Authors are grateful to the Executive Director and Director of Crops and Horticulture Research, NARC for their guidance and moral support in conducting experiments. Similarly, they are thankful to NMRP Coordinator and his team for their technical support in conducting research in RARS, Doti. Thanks also go to the technical staffs of RARS, Doti for their untiring effort in conducting experiments in the field.

REFERENCES

Ferdu A. Demissew K. Birhane A. (2002) Major Insect Pests of Maize and their Management: A Review in: Nigussie M. Tanner D. Twumasi A.S. (Eds.) Enhancing the Contribution of Maize to Food Security in Ethiopia. Proc. 2nd Nat. Maize Workshop, Addis Ababa Ethiopia, 12- 16 Nov. 2001.

MoAD. (2013) Statistical Information on Nepalese Agriculture 2012/13. Government of Nepal, Ministry of Agriculture and Cooperatives. AgriBusiness Promotion and Statistics Division. Singha Durbar, Kathmandu, Nepal.

MoAD/WFP (2009) Ministry of Agriculture Development, World Food Program. District level monitoring resource book.

NMRP (2014) Annual Report (2013-14). National Maize Research Program (NMRP), Rampur, Chitwan, Nepal.

RARS (2015) Research Achievement in Regional Agricultural Research Station (RARS), Doti, Nepal. Retrieved on August 06, 2015, from *http://narc.gov.np/org/ars_doti.php*

Russel F. Eisensmith S.P. (1983) MSTAT-C. Crop and Soil Sci. Dept. Michigan State Univ. USA.

Sampoux J.P. Gallais A. Lefort-Buson M. (1989) S1 value combined with topcross value for forage maize selection. Agronomie, 9(5): 511-520.

Shrestha J. Rijal T.R. Gurung D. B. (2011) Evaluation of maize productivity under drought condition. International Research Journal of Applied and Basic Sciences. Vol., 2 (7): 249-253.

Wikipedia (2015) The Free Encyclopedia : Far western development region, Nepal. Retrieved on August 08, 2015 , from https://en.wikipedia.org/wiki/Far-Western_Development_Region,_Nepal

Journal sponsorship

Azarian Journal of Agriculture is grateful to the ***University of Maragheh*** and its faculty members for their ongoing encouragement, support and assistance.