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STATISTICAL TEST FOR INTERACTION OF GXE ON QPM GRAIN YELLOW FOR HYBRID CANDIDATE UNDER LOWLAND IN INDONESIA

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ABSTRACT.

The application of statitical test has been conducted on interaction of two factors were ten genotypes as single crosses (G) and five environments (E) under QPM grain yellow for candidate of releasing new hybrid by iceri Maros. Statistical pooled model were (1) yi= μ+τ+α+ε and (2) yij=μ+τ/λ+α+(αxλ)+ε, (effect of mean, replication within location, entri, interaction gxe, error). The parent material was introduced of CIMMYT Maize Lines (CML) and tester grain yellow color was modified by MR14xCML164 in backcrosses untill BC3F3. The environemt (ei, i=1,2,3, 4,5) were lowland zone in (e1)Maros experimental Farm, (e2)Bajeng, (e3)Bontobili, (e4)Sidondo and (e5)Polman farmers field. Experiments were conducted by RBD with three replications. The first analyzed were separate in each ei (i:1,2,3,4,5), and contuining in pool analyzed by gj (j:1,2,3, . . . , 10), there are ten variables were observed and grain yield be predicted in wc. 15%. Spacing by used 75x20cm one plant per se, fertilizer be applied urea-ponska (200-150) kg/ha, weeding and irrigated was regularly conducted for max.plant growth. The experiments conducted as evt on rainy season 2018.
Statistical test shown that there are siginificant differet of genotypes under five environments, interaction gxe, and cv: 10.69%, test by lsd (least significant different) founded two candidates single cross (1)CML161-2-1-4-2xMR14Q and (2)CML165-3-1-2-4xMR14Q were highly yield and significant different with two check MSQ.C0xMR14Q and Bima 13Q. The two single crosses could be promising as new QPM hybrids with yield potential 9.0-10.0 t/ha, characters ear position was middle of plant height, shelling 75.2-77.8%, flowering 55 days and plant aspect be score one (very nice).

QPM (Quality Protein Maize/Corn) is material which is difine specialty corn which high content of lysine and tryptophane. These are two essential amino acids better nutritional for human body, anticipated of disease (kwashiorkor) on severe among children, and could be corrective use in balancing diets.
Key words : QPM, single cross, pooled analyzed

1. INTRODUCTION

Statistical test has been conducted on two factors interaction GxE under evt (evaluation variety trial). There are ten genotypes as single crosses (G) of QPM yellow grain and five of lowland environments (E) under tropical zone in IND. Pooled model were (1) one factor yi= μ+τ+α+ε and (2) intraction factors yij=μ+τ/λ+α+(αxλ)+ε, (effect of mean, replication within environment/location, entri or genotypes, interaction gxe, and error). Genetic material of QPM (Quality Protein Maize) was discovery by Linn Bates on 1963 which identified high lysine in opaque-2. The opaque-2 mutant still ranks at the top of all viable single mutant, and opaque-2 endosperm also contains a much higher level of tryptophan (Mertz, 1992). The essential amino acid was better nutritional for deficiency of disease (kwashiorkor) on severe among children, and could be as food for corrective use in balancing diets (Bourlaug, 1992). The objective of research was to study of statistical test by interaction of GxE of candidate single cross hybrids QPM in evt under lowland tropical zone in IND

2. MATERIAL AND METHOD

The all experiments were conducted by RBD with three replication (R). There are ten QPM-Genotypes (Gi, i:1,2,3 . .10) grain yellow color include chek Bima 13Q were evaluated in five environment (Ej, j:1,2,3,4,5) under low land tropical zone in IND (<50 m above the sea). Yield of grain under 15% wc were predicted by : Y: ((10000/7.5)*(100-wc)/85)*(shelling)*ear weight. Shelling sample from five ears (CYMMIT, 2012). The statistical anova for grain yielded was analysis by two factors interaction (GxE) (Sharma, 2008; Pixley *et al*., 2005; 2010; Yasin *et al*., 2015). Genotypes were planting in four rows per se. plant spacing 75x20 cm one seed per hole and lenght of plot 5.0 m, fertilizer applied by Urea and Ponska (300-200) kg/ha, water irrigated was every 7-10 days. The parent material of QPM (CML161, CML165, CML170, CML172) were imported from CIMMYT El Batan Mexico on 2002, and MSQ(S1) was result of ICERI reccombination CML grain yellow (CML161-CML172) on cycle of zero (CIMMYT, 2002; Sumarno dan N. Zuraida. 2004). Treatment as single cross was selected under light table which opaque color. EVT were conducted in Maros exp. Farm,, Bajeng, Bontobili, Sidondo and Polman farmers field (e1,e2,e3,e4,e5). Data

collected like of variable vegetative plant and ear height, tasseling, and component of gererative stage, and soil characteristics. The ICERI program for evt were conducted on rainy season Febr-May on 2018

3. RESULT AND DISCUSSION.

Yield Variable. The result analysis of all variable be observed shown in anova and there are highly significant interaction of yield, flowering, shelling, and water content (table 1). Yield shown that CML161-2-1-4-2 x tester(MR14Q), CML170-1xtester, MSQ(S1)C0-26-1-1xtester, and MSQ(S1)C0-43-1-1-1xtester were significant different compared to check Bima 13Q. This single cross was the best of yield and hoping released under new hybrid variety is CML161-2-1-4-2xMR14Q. In table 1 could be founded single factor was significant also in plant height, flowering, shelling, lines number per cob, number of seeds per cob, and water content. In table 2 shown that average in three replication of variable grain yield (under 15% water content) was the best CML161-2-1-4-2xMR14Q, productivity could be founded in Polman 10.03 t/ha and average of five location was 8.85 t/ha. Yielded Candidate were 24.10% higher than check Bima 13Q and significant different on e1, e2, e3, and e4 (maros, bajeng, bontobili and polman), in e5 (Sidondo) candidate single cross was lower yield than check (Bima 13Q).

Table 1. M.S of anova on variable under candidate single cross QPM

Variable	E	R/E	G	E x G	Error	CV
df	4	10	9	36	90	(%)
Yield	86.803	0.436	3.164**	1.571**	0.726	10.68
Plant height	19,536.264**	310.048	366.256**	136.729^{ns}	172.216	6.03
Ear height	10,110.140**	87.513	140.347^{ns}	72.903^{ns}	117.903	10.46
Flowering	133.657**	5.867	17.292**	5.331**	3.452	3.32
Shelling	7.538^{ns}	5.750	15.193**	6.006^{ns}	6.495	3.29
Lines number	25.867**	1.647	2.630**	1,053^{ns}	1.499	9.78

Seeds no./line	63.814**	14.545	23.394^{ns}	20.171^{ns}	16.369	12.58
Seeds no./cob	25.867**	1.787	2.726**	1.185^{ns}	1.520	9.84
Water content	424.490**	2.176	32.753**	5.325**	2.505	5.56
Weight 1000 seeds	23,985.876**	131.521	428.779^{ns}	763.107^{ns}	390.197	6.27

ns : not significant
*: significant in leve 95%
** : : highly significant in level 99%

The CV was be founded for yield variable <20,0% and be assume that there are could be selected of Gi, i =1, 2, 3, . . ,9 for F1 new corn vareties (Yasin *et al*., 2015). The population of specialty corn which is grain yellow from CIMMYT could be adaptep in Maros after selected by S1 families and genetic improve by one cycles of selection, yield 8.0-10.0 t/ha (Yasin and Mejaya, 2016).

Agronomic Variables. The average observed of agronomic characters and statistical analysis by LSD and coeffcient of variation (CV) of plant and ear height, tasseling, flowering/silking, water content of seeds, weight of 1000 seeds, and visual observed by plant aspect could be shown in table 3. The height plant were significant under rainy season shown in table 3. There are six F1 were significant to check. The agronomic characters of single cross be assume that ear height, tasseling and silking periods and water content was same with check Bima 13Q. Plant aspect be score <2.0 (good/completed). Weight 1000 seeds of candidate was not significant with check. The CML161-2-1-4-2 x tester which is the best has been shown that ear height was middle of plant height and this character was selected for superior plant and anthesis silking interval *(asi)* were less than three days. *Asi* was the different of silking and tasseling period, the value asi >5.0 days was not selected. Variable of asi (*anthesis silking interval)* shown that the range of silking and tasseling periods were 2.0-4.0 days. The value of asi<3.0 days was very sincronice for founded maximal number of seeds, asi >6.0 days could not be founded of grain. The conducting experiment by Djamaluddin and Yasin (2008) reported that generation F1 on fungsional corn founded asi 3-4 days and yield of QPM yellow were 8-9 t/ha 15% wc. of grain. The result experiment that asi 5-6 days of population MS-2 yield be founded 2-3 t/ha (Kasim *et al*., 2010).

4. CONCLUTION

The one and two factor of GxE were highly significant different under five environment in lowland tropical zone. The best single cross was CML161-2-1-4-2xMR14Q, productivity could be founded 10.03 t/ha and average of five location was 8.85 t/ha. Yielded Candidate were 24.10% higher than check Bima 13Q and significant different on e1, e2, e3, and e4 (maros, bajeng, bontobili and polman), in e5 (Sidondo) candidate single cross was lower yield than check (Bima 13Q).

Table 2. Grain yield of candidate QPM hybrid, rainy season evt. 2018

Genotype	Maros	Bajeng	Bontobili	Polman	Sidondo^{ns}	Mean
1. CML161-2-1-4-2 x tester	9.32**	10.80**	6.47**	10.03**	7.61	8.85**
2. CML165-3-1-2-4 x tester	8.76	9.64**	5.54*	9.52	7.01	8.09*
3. CML170-1 x tester	9.71**	8.22	5.49*	10.29**	7.63	8.27*
4. CML172-2-1-2 x tester	7.67	8.12	5.73*	9.54**	7.56	7.72
5. MSQ(S1)C0-26-1-1 x tester	9.12*	8.33	5.28	10.95	6.63	8.06*
6. MSQ(S1)C0-27-1-1-# x tester	8.21	7.61	5.46	10.26**	6.17	7.54
7. MSQ(S1)C0-34-1 x tester	7.72	8.59	5.80*	10.49**	6.55	7.83
8. MSQ(S1)C0-43-1-1-1 x tester	8.31	8.74	5.21	10.66*	7.44	8.07*
9. MSQ.C0 x tester	8.32	9.50	5.05	10.26*	7.78	8.18*
10. Chek (Bima 13Q)	7.54	7.91	4.54	7.46	8.27	7.14
Mean	8.47	8.75	5.46	9.94	7.27	8.85
CV (%)	9.52	11.30	9.93	9.90	11.89	9.06
LSD 5%	1.38	1.69	0.93	2.10	2.87	0.885
LSD 1%	1.89	2.87	1.27	2.87	2.10	1.219

``` tester : MR14Q
*: significant different in level 95% to check (Bima 13Q)
** : highly significant different in level 99% to check (Bima 13Q)
ns : not significant to check (Bima 13Q)

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ATTACHMENT

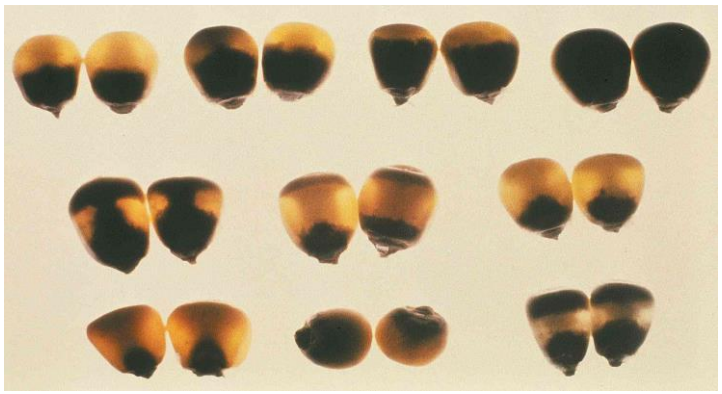
Variable were observed of candidate QPM hybrid, rainy season evt. 2018

Genotype	Water content (%)	Plant height (cm)	Ear height (cm)	Shelling %^{ns}	siliking days^{ns}	Lines no per cob	Seeds no per line	Weight 1000 seeds, gr	Plant aspect, score
1. CML161-2-1-4-2 x tester	27.9**	198.9*	105.4**	77.8	54.7	13.0*	32.2	317.0	1.0
2. CML165-3-1-2-4 x tester	27.6**	192.5*	101.2*	75.0	54.4	12.2	35.1*	310.0	1.5
3. CML170-1 x tester	27.8**	194.4*	104.6*	77.2	54.1	12.5*	33.6*	303.8	2.0
4. CML172-2-1-2 x tester	27.5**	183.1	100.7	77.1	54.4	12.6*	35.9	315.2	1.5
5. MSQ(S1)C0-26-1-1 x tester	28.5**	192.0*	106.6*	77.5	54.7	12.5*	31.0	323.9*	1.0
6. MSQ(S1)C0-27-1-1-# x tester	28.1**	194.4*	101.4*	76.9	55.2	13.2*	31.7	321.5*	1.0
7. MSQ(S1)C0-34-1 x tester	27.7**	193.6*	107.2*	78.4	53.0	12.5*	31.4	313.4	2.0
8. MSQ(S1)C0-43-1-1-1 x tester	28.4**	196.3*	106.0*	78.3	54.3	12.1	33.2*	318.1	1.5
9. MSQ.C0 x tester	28.2**	192.3*	104.7*	77.1	54.7	12.1	32.3*	317.4	1.0
10. Chek (Bima 13Q)	32.6	184.2	97.8	78.2	57.7	11.8	30.8	316.7	1.5
Mean	28.43	192.17	103.56	77.35	54.72	12.45	32.72	315.7	1.4
LSD 5%	0.57	6.82	2.29	0.93	0.94	0.50	1.48	4.44	-
LSD 1%	0.79	19.91	6.68	2.71	2.74	1.45	4.31	12.96	-
Sy(n : 30)	0.270	3.215	1.078	0.438	0.442	0.234	0.696	2.093	-
Sy(n: 15)	0.408	3.388	2.798	0.658	0.479	0.316	1.044	5.100	-
Sy(n:3)	0.914	7.577	6.256	1.471	1.072	0.786	2.335	11.401	-

:: significant different in level 95% to check (Bima 13Q)

** : highly significant different in level 99% to check (Bima 13Q)

ns : not significant to check (Bima 13Q



Gambar 1. Penciri Jagung QPM biji kunig, semakin gelap semakin tinggi kadar lisisn dan tryptophan

Gambar 2. Seleksi Jagung QPM diatas Meja Terang (Light table)

Gambar 3, Alat Seleksi Jagung QPM (Meja Terang : *Light Table)*