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Effect of Pollination Methods on Seed Production, Growth and Grain Yield of Progenies of an Early - Maturing Maize (*Zea mays L.*) Population.

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Introduction

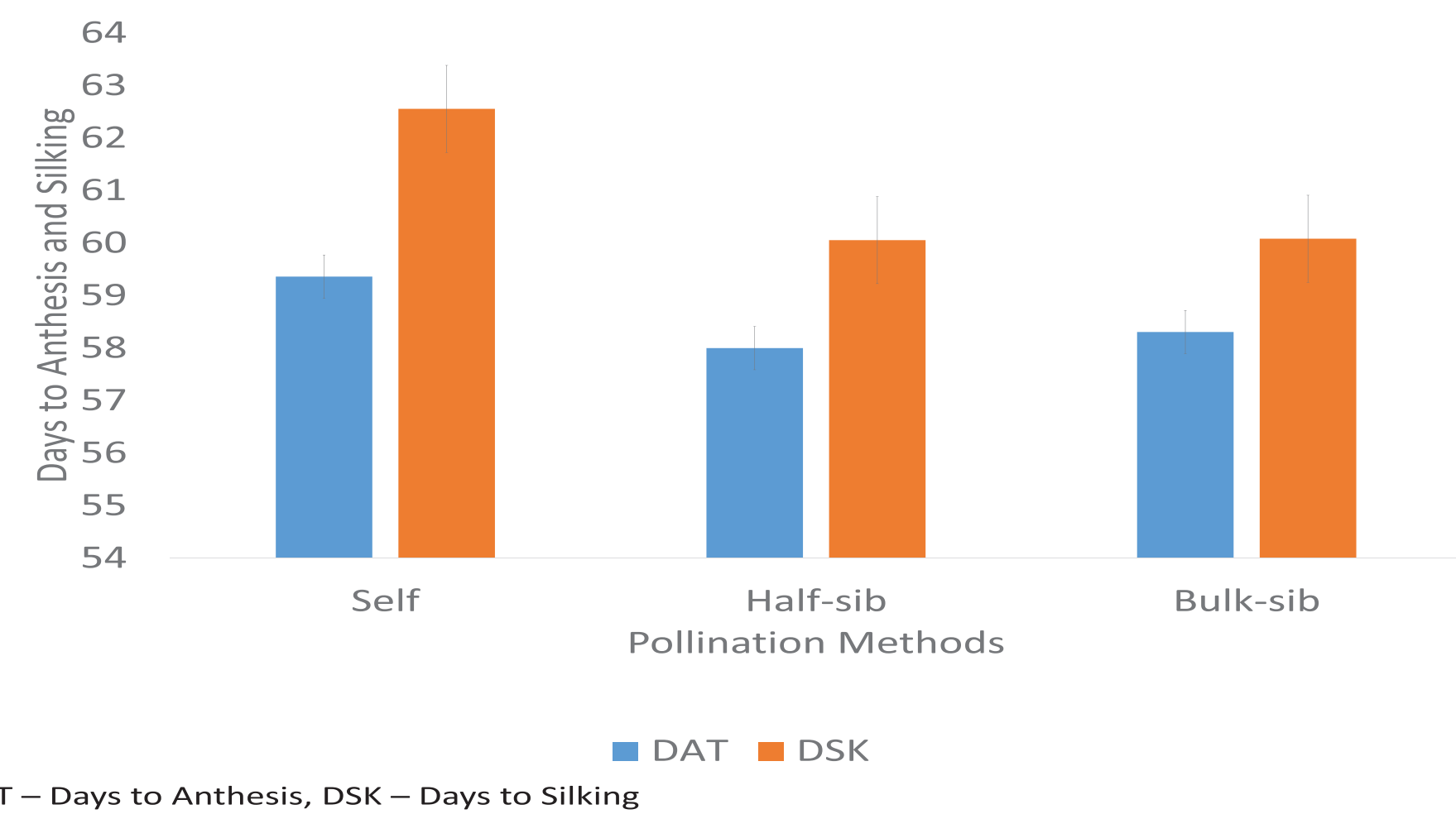
Pollination methods are constantly being used by maize breeders in the development of new improved maize varieties. However, little or no information is available on how these methods affect the quantity and quality of seeds. Therefore, the objectives of this study were to determine the effect of pollination methods on the seed quality and yield of progenies from an early-maturing maize population and determine the relationship between seed quality and grain yield of the different progenies.

Table 1: Descriptive statistics for seed number and seed weight per ear (g) of progenies developed using self, half-sib and bulk-sib pollination methods from an early-maturing yellow maize population during 2013 and 2014 late cropping seasons at the Teaching and Research Farm (TRF), Obafemi Awolowo University (O.A.U), Ile-Ife, Nigeria.

POLLINATION METHODS	Self (ENO =204; 2013, 177; 2014)		Half-sib(ENO =208; 2013, 190; 2014)		Bulk-sib(ENO =77; 2013, 123; 2014)	
	Seed No	Seed Wt (g)	Seed No	Seed Wt (g)	Seed No	Seed Wt (g)
2013	331.81	78.16	277.21	65.06	327.00	79.21
Mean	5.70	1.70	7.35	1.80	7.45	2.49
S. Error	6631.38	587.30	11228.30	676.90	4270.53	477.96
Variance	69.00	22.30	40.00	4.10	200.00	26.64
Min	534.00	159.62	606.00	146.30	485.00	139.53
Max						
2014	179.73	25.66	147.35	21.02	94.81	14.95
Mean	8.09	1.12	7.10	0.95	7.14	1.36
S. Error	11584.94	222.77	9577.08	171.07	6275.22	228.71
Variance	6.00	1.00	2.00	0.30	2.00	0.30
Min	459.00	73.00	521.00	66.10	347.00	142.00
Max						

Table 2: Means of seedling vigor traits of progenies from self, half-sib, and bulk-sib pollination methods, developed from an early-maturing yellow maize population during 2013 and 2014 late cropping seasons, and evaluated at O.A.U Seed Science Laboratory.

2013 cropping season						
Pollination methods	PRL ¹	RN	SL	LRL	RFW	RDW
Self	18.908	1.676	9.322	19.191	10.409	1.515
Half-sib	17.525	1.741	9.551	18.053	10.286	1.701
Bulk-sib	20.564	1.728	9.836	20.923	8.665	1.432
LSD _{0.05}	1.492	0.034	0.344	1.333	0.732	0.135
2014 cropping season						
Pollination methods	RFW ²	RDW	SDW			
Self	5.544	2.448	0.381			
Half-sib	3.946	1.533	0.415			
Bulk-sib	7.992	2.565	0.509			
LSD _{0.05}	0.678	0.549	0.048			



DAT – Days to Anthesis, DSK – Days to Silking

Fig. 1: Days to anthesis and silking of progenies developed by Self, half-sib and Bulk- sib pollination methods.

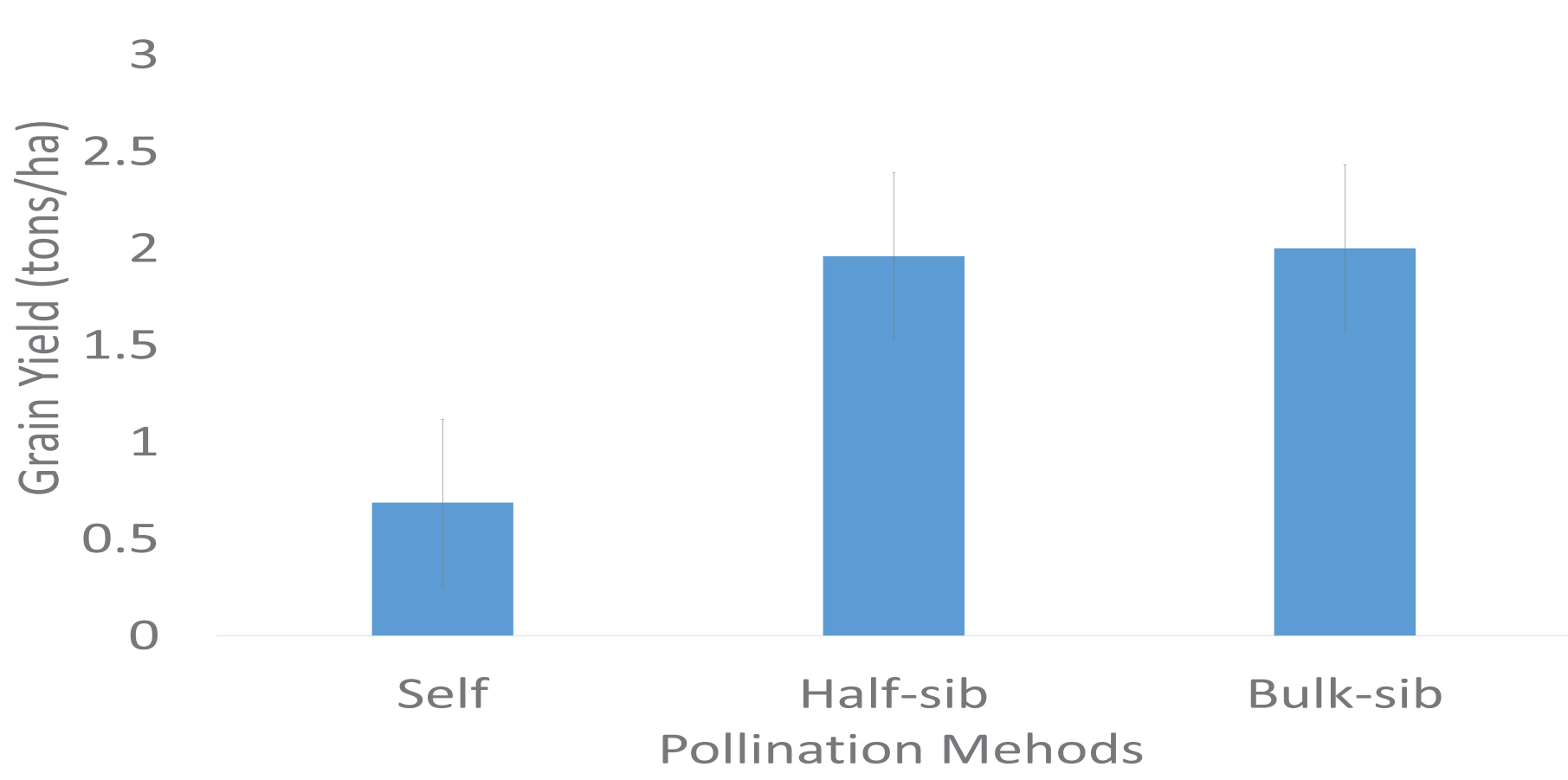


Fig. 2: Grain Yield of progenies developed from Self, half-sib and bulk pollination

Table 3: Means of Anthesis Silking Interval (ASI), Plant aspect (PASP), Plant and Ear heights (PHT, EHT), Ear aspect (EASP), Kernel Row Number (KRN) and Ear Length (EL) of progenies developed from self, half-sib, and bulk-sib pollination methods.

POLLINATION METHODS	ASI ¹	PASP	EHT _(cm)	PHT _(cm)	EASP	KRN	EL _(cm)	ED _(cm)	SH%
Self	3.194	3.833	60.272	132.928	4.097	11.678	10.325	3.480	82.54
Half-sib	2.056	2.806	72.417	152.811	3.028	12.300	12.676	3.906	87.35
Bulk-sib	1.778	2.722	70.961	152.678	3.042	12.233	12.775	3.952	86.87
LSD _{0.05}	0.630	0.214	3.096	3.358	0.253	0.460	0.416	0.112	2.53

Table 4: Correlation coefficients between grain yield and seed quality traits of progenies from self, half-sib and bulk-sib pollination methods developed from an early-maturing yellow maize population.

SEED QUALITY TRAITS	Self	Half-sib	Bulk-sib
Primary root length	-0.32	0.18	-0.36
Root number	0.03	0.41	-0.26
Shoot length	-0.43	0.25	-0.23
Longest root length	-0.30	0.16	-0.23
Root fresh weight	-0.29	0.01	-0.27
Root dry weight	-0.38	-0.03	-0.38

Hypothesis

Seeds produced from self, half and bulk sibs pollination methods vary considerably in their quantity and quality.

Materials & Methods

Progenies were developed with three controlled manual pollination methods; self, half-sib, and bulk-sib from a yellow endosperm maize population at the Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife, Nigeria, in the late cropping seasons of 2013 and 2014. Evaluations of the progenies developed by the three methods were carried out in the laboratory and on the field

Results

Self and bulk-sib pollination methods produced significantly higher seed number and weight for progenies developed in 2013 while self-pollination method produced the highest seed number and weight in 2014 with bulk-sib pollination method producing the lowest seed number and weight (Table 1). In 2013, both half-sib and bulk-sib seedlings produced significantly more root number than the selfed progeny seedlings (Table 2). For seedling vigor test, root fresh weight (RFW) and root dry weight (RDW) obtained from bulk-sib seedlings generated from 2013 were significantly lower than those of selfed and half-sibs while in 2014, bulk-sib seedlings had the highest RFW and half-sib seedlings gave the lowest (Table 2). Progenies from selfed pollination methods takes longer days to flower (Fig. 1) while half and bulk sib progenies recorded lower plant and ear aspect (Table 3). Selfed progenies had short plant and ear heights (Table 3). Progenies from half-sib and bulk-sib pollination methods produced significantly higher grain yield (Fig. 2) and yield components than self-pollinated progenies as reported in previous studies (Noor et al., 2010; Nazir et al., 2012, Kaleem et al., 2013). There was no significant relationship between seed quality and grain yield of the different progenies (Table 4).

Conclusion

Self pollination method produced the highest number of seeds while bulk-sibs pollination method produced seedlings that are more vigorous. Bulk-sib and half sib progenies produced higher grain yield than the selfed progenies. There was no relationship between seed quality and grain yield of the different progenies.

References

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