HEAD DIAMETER OF SUNFLOWER AS AN INDICATOR FOR SEED YIELD

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INTRODUCTION

Bird damage is often a minor problem in the large areas cultivated by sunflower. However, it is a major problem in the experimental field plots. Burns (1970) stated that head size is a good indicator for seed yield per plot. He found a high positive correlation between head size and seed yield per plot.

The present study aimed at giving a relationship between head diameter and seed yield per head, and how to make an accurate prediction for the seed yield of the damaged heads by birds.

MATERIALS AND METHODS

Two sunflower cultivars, one open pollinated (Mayak) and one hybrid (SH-26), were planted in the Experimental Farm of Cairo University at Giza, Egypt in 1984 and 1985 seasons with two N levels (30 and 60 kg/ac). The experiment consisted of four plots 5 × 20 m (100 m^2) without replications. Seeds were hand seeded at 25 × 60 cm plant spacing on 15 and 25 of May in the two successive seasons. Thinning was done 20 days after planting, and N fertilizer was applied after thinning and just before the first irrigation. The common cultural practices of sunflower were applied. Shortly after the end of pollination 30 heads were bagged by paper bags to avoid the bird damage. At harvest 25 undamaged heads were collected to measure head diameter and seed yield per head.

Correlation coefficients (r) and regression coefficients (b) between head diameter and seed yield per head were calculated at different levels of degrees of freedom as follows :

1 — values of both cultivars in each season were taken in consideration (100), they were the combination of Mayak and SH-26 cvs. under 30 & 60 kg N ;
2 — values of Mayak cv. at 30 and 60 kg N levels (50 values) ;
3 — values of SH-26 cv. at 30 and 60 kg N levels (50 values) ;
4 — values of Mayak cv. at 30 kg N (25 values) ;
5 — values of Mayak cv. at 60 kg N (25 values) ;
6 — values of SH-26 cv. at 30 kg N (25 values) ;
7 — values of SH-26 cv. at 60 kg N (25 values) ;
8 — all values of both seasons (200 values).

Seed yield per head was predicted by using all regression formulae derived from these values. Thereafter, it was compared by the actual harvested seed yields by „t“ test.

RESULTS AND DISCUSSION

Data in *Table 1* show that there is a highly significant and positive correlation between head diameter and seed yield per head. This means larger heads could produce greater seed yield. This conclusion was also found by Burns (1970), Shabana (1974), Velkov (1976) and Abo El-Zahab et al. (1978). Also, path-coefficient analysis showed that head diameter had the greatest direct effect on seed yield per head (Kamel et al., 1985).

Table 2 show the regression formulae based on different environments. These formulae were used for predicting the seed yield per head in each case. *Table 3* show that the predicted yields were so close to the actual yields in both seasons. Therefore, "t" test was done between the predicted and actual seed yields. The differences between the averages of the two yields were not significant in all cases. This means we could use these formulae for predicting seed yield per head under the condition of this experiment and similar conditions.

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Table 1

Simple correlation coefficients (r) and regression coefficients (b) between head diameter and seed yield per head at different environments

Environment	df	1984		1985	
		b	r	b	r
1 — all values of both cvs.	98	+8.11	+0.739**	+7.53	+0.817**
2 — values of Mayak cv.	48	+8.97	+0.737**	+8.39	+0.841**
3 — values of SH—26 cv.	48	+7.84	+0.795**	+6.78	+0.798**
4 — values of Mayak under 30 kg N	23	+6.98	+0.569*	+6.35	+0.768**
5 — values of Mayak under 60 kg N	23	+3.20	+0.399*	+3.33	+0.672**
6 — values of SH—26 under 30 kg N	23	+4.78	+0.787**	+4.93	+0.870**
7 — values of SH—26 under 60 kg N	23	+4.37	+0.476*	+3.05	+0.671**
8 — all values of both seasons	198	+7.65	+0.769**	—	—

Table 2

Regression formulae calculated for the environments of table 1

Environment	1984	1985
1 —	$Y = -67.75+8.11\ X$	$Y = -57.55+7.53\ X$
2 —	$Y = -81.87+8.97\ X$	$Y = -70.07+8.39\ X$
3 —	$Y = -62.29+7.84\ X$	$Y = -46.58+6.78\ X$
4 —	$Y = -56.28+6.98\ X$	$Y = -44.22+6.35\ X$
5 —	$Y = +8.40+3.20\ X$	$Y = -7.37+3.30\ X$
6 —	$Y = -22.03+4.78\ X$	$Y = -24.00+4.39\ X$
7 —	$Y = -7.84+4.37\ X$	$Y = +12.27+3.05\ X$
8 —	$Y = -60.17+7.65\ X$	

Table 3

Predicted (P) seed yield per head calculated by the formulae presented in table 2 and actual yield per head (A)

Environments	1984			1985		
	P	A	P—A*	P	A	P—A
1 —	50.58	50.51	+0.07	50.92	50.84	+0.08
2 —	49.57	49.99	—0.40	50.45	50.13	+0.32
3 —	51.22	51.06	+0.16	51.47	51.50	—0.03
4 —	42.92	43.00	—0.08	43.57	43.45	+0.12
5 —	57.02	56.94	+0.08	56.76	56.80	—0.04
6 —	45.04	45.11	—0.07	44.99	45.00	—0.01
7 —	57.50	57.00	+0.50	58.00	58.00	0.00
8 —**	50.72	50.66	+0.06			

* "t" test was done between (P) and (A) individuals and the difference between averages was not significant in all environments.
** No. 8 refer to the average of both seasons.

However, we tried to know which formula could be used in different environments. To have an answer for this question all formulae were used for predicting the seed yield of two environments viz. no. 2 and 5. Thereafter, "t" test was done between each of the predicted seed yield calculated by formula no. 2 and no. 5 for their environments, and between the predicted seed yields calculated by the other formulae for the same cases. It was found that the formula no. 1 and no. 8 were more reasonable than others, because the difference between the average of predicted seed yield by formula no. 2 and no. 5, and each of the average of predicted yield by formula no. 1 and 8 for the same environments did not reach the significance level. However, the predicted seed yield by no. 8 was close to the actual yield of the two cases. This means that we may use this formula ($Y = -60.17+ +7.65X$) for an accurate prediction of the seed yield of sunflower heads by using head diameter as independent factor (X).

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LE DIAMÈTRE DU CAPITULE COMME INDICATEUR DU RENDEMENT DU TOURNESOL

Résumé

Le diamètre du capitule chez deux cultivars de tournesol fertilisés avec deux doses d'azote (30 et 60 kg/ac), en deux saisons, a été corrélé de manière positive et hautement significative avec le rendement en graines par capitule. L'analyse de la régression a montré que le rendement en graines calculé, ne diffère pas de manière significative du rendement réel obtenu dans certaines conditions d'environnement, pour toutes les saisons, les cultivars et les doses d'azote.

Néanmoins, la formule de la régression dérivée de toutes les valeurs obtenues pour les deux saisons, soit $Y = -60.17 + 7.65\ X$, peut être utilisée pour une prévision assez exacte du rendement en graines dans différents environnements.

EL DIAMETRO DEL CAPITULO COMO INDICADOR DEL RENDIMIENTO EN SEMILLA DEL GIRASOL

Resúmen

El diámetro de dos cultivars de girasol fertilizados con dos niveles de N (30 y 60 kg/ac) en dos años, estaba correlacionado positiva y significativamente con el rendimiento de semilla/capítulo. Además, un estudio de regresión mostraba que el rendimiento predicho no diferia significativamente del rendimiento real obtenido bajo ciertos ambientes promediando, años, cultivos y niveles de Nitrógeno.

Sin embargo, la formula obtenida y derivado de los dos años. "$Y = -60.17+7.65\ X$", podrá ser utilizada para una relativamente segura predicción del rendimiento en diferentes ambientes.