

Analysis of the Structure of Correlations Between Yields and Some Quantitative Traits in Sesame

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Objectives

This study was conducted to clarify the relationship between sesame grain yield and some quantitative traits using factor analysis.

Materials and Methods

- Total twenty sesame varieties were grown under identical conditions at the National Institute of Crop Science, Suwon for two crop years of 2001 and 2002.
- Estimated variables are plant height, days to flowering, days to maturity, days from flowering to maturity, number of capsule per plant, 1,000 seeds weight and seed weight per plant.
- Factor analysis were used to analyze the relationship among traits and combine observations into groups on some estimated variables.

Results and Discussion

- All variables have significant positive correlation with seed weight per plant, except days to maturity and days from flowering to maturity.
- Scree plot shows that an increase in the number of components was associated with a decrease in eigenvalues. This trends reached its maximum at three factors indicating three factors were accounted for most of variabilities.
- Three main factors were accounted for 92.1% of the total variability at factor analysis. The first factor included plant height, seed weight per plant, 1,000 seeds weight which accounted for 51.8%. The suggested name for this factor is biological yield. The second factor included days from flowering to maturity and days to maturity which accounted for 26.0% and it was named days to maturity. The third factor is days to flowering which accounted for 14.3% and it was named days to flowering.
- Main variables affecting sesame yield (seed weight per plant) are plant height, 1,000 seed weight and number of capsule per plant.

Keywords: sesame, factor analysis, scree plot, varimax rotation

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Table 1. Basic statistics for the estimated variables of sesame.

Variables	Mean	Max.	Min.	S. D.	C. V.	F value
Plant height (X1)	111.10	140.00	92.00	12.13	9.16	4.17**
Days to flowering (X2)	52.29	60.00	40.00	4.27	12.26	1.47*
Days to maturity (X3)	120.24	146.0	98.00	10.99	10.94	3.78**
Days from flowering to maturity (X4)	67.96	88.00	52.00	8.59	7.91	2.95*
Number of capsule per plant (X5)	53.11	69.00	40.00	7.33	7.24	2.52*
1,000 seed weight (X6)	2.56	2.85	2.40	0.13	19.50	2.52*
Seed weight per plant (X7)	6.24	8.60	5.00	1.05	5.96	0.36*

*, ** : Significant at the 5%, 1% level respectively

Table 2. A matrix of simple correlation coefficients for the estimated seven variables of sesame

Variables	X1	X2	X3	X4	X5	X6	X7
Plant height (X1)	1.000						
Days to flowering (X2)	0.149 ^{ns}	1.000					
Days to maturity (X3)	-0.236 ^{ns}	0.706**	1.000				
Days from flowering to maturity (X4)	-0.353*	0.475**	0.959**	1.000			
Number of capsule per plant (X5)	0.206 ^{ns}	-0.185 ^{ns}	-0.392*	-0.413**	1.000		
1,000 seed weight (X6)	0.693**	0.005 ^{ns}	-0.426**	-0.532**	0.398*	1.000	
Seed weight per plant (X7)	0.851**	-0.049 ^{ns}	-0.364*	-0.432**	0.472**	0.726**	1.000

*, ** : Significant at the 5%, 1% level respectively. ns : Not significant

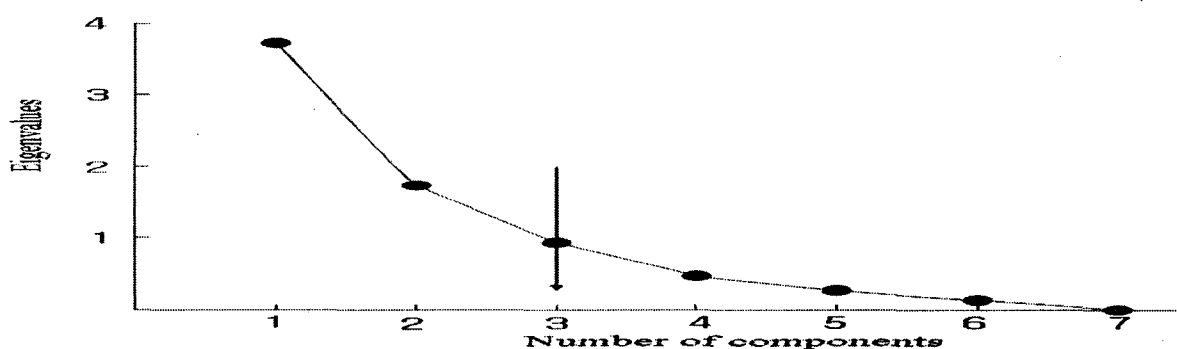


Fig. 1. Scree plot showing eigenvalues in response to number of components for the estimated variables of sesame

Table 3. Rotated (varimax rotation) factor loadings and communalities for the estimated variables of sesame

Variables	Factor 1	Factor 2	Factor 3	Communality
Plant height (X1)	0.945	-0.149	0.122	0.844
Days to flowering (X2)	0.087	0.358	0.926	0.778
Days to maturity (X3)	-0.140	0.866	0.434	0.961
Days from flowering to maturity (X4)	-0.209	0.932	0.166	0.855
Number of capsule per plant (X5)	0.157	-0.197	-0.072	0.361
1,000 seed weight (X6)	0.522	-0.285	0.046	0.779
Seed weight per plant (X7)	0.882	-0.162	-0.059	0.865
Factor variance (%)	51.8	26.0	14.3	92.1