RESEARCH ON VARIABILITY AND ON THE CORRELATIONS OF SOME QUANTITATIVE FEATURES TO TRIENNIAL ONION

Ştefănescu Elena *, Milovici Elena Liliana *, Heitz Minerva **

***The Resort of Research and Development from Iernut, Energiticianului str. 1A, Iernut, Romania, 545100, elenastef14@yahoo.com*

Abstract

In the onion seed production, the quantitative characteristics that are important to the selection of biological material, after the Ist year of the biennial onion and the IInd year of triennial onion are: the weight of the bulb, the longitudinal diameter (height), the transversal diameter and also the index of shape (longitudinal diameter / transversal diameter). The index of shape (IF) is an important characters of the cultivar onion (variety, hybrid and parental shape).
To define the quantitative variability of these characteristics have been studied: in different years on different populations in the same environmental conditions (at the same time and same place), on variants - chives downward of different sizes (different qualities), on variants to which the seed source was seed plants with different numbers of flower stems and on mother plants obtained directly from the parent plants.
The correlations between features reveal a particular importance in the selection of biological material.

Key words: chives, the parent plant, weight, diameter, vegetative buds

INTRODUCTION

The genotypic and phenotypic knowledge of the biological material that is used in the process of improvement and multiplication of cultivars is a basic element (Craciun T. 1970). The variability of biological material's features and the correlations between characteristics expressed the phenotypic cultivar manifestation in certain environmental conditions (Choi & co. 1974, Kellner and Varga, 1964). The variability of characteristics was appreciated by the sequence variation and histograms (Potlog and Velican, 1971). Through the variability study, from the statistical calculation were established intervals of confidence for selection grids of biological material in the maintenance process for maintaining genetic purity and authenticity of the cultivar. Establishing correlations between the important characteristics of the cultivar has facilitated the selection of biological material.

MATERIAL AND METHOD

The research was conducted at the Research Institute for Vegetable and Floriculture Development Vidra, during 1994-2000, on the biological chives' material and on parent plants of Liliana variety. The paper presents some of the conducted research.
Experimental variants were studied in different years on the bulb size groups, on downward. The layout of the experiences has been chosen according to the methods of the experimental field (Săulescu N., 1968).
The biometrical data were statistically processed. So, in this way, were determined the indices of variability: the arithmetic mean (x ~), standard deviation (Sx), the coefficient of

variability (S%), the confidence interval [k = x ~ ± (1-2) s] and the correlation coefficient (r).
The statistical calculation and the interpretation of results were made according to the experimental techniques (Ceapoiu N., 1968).

RESULTS AND DISCUSSION

a. The results on the variability of quantitative features of onion bulbs in different environmental conditions.

From the study on the variability of the main features (bulb weight, the longitudinal diameter and transversal diameter) of bulbs - mother plants, it appeared that under the conditions of 1995th year and 1998th (Table 1): the medium weight of the bulb was 57.78 g in 1995 and 135 g in 1998, occurring in the feature:
-"Bulb weight - high variability in both years,
-"Longitudinal diameter" - less variability in 1995 and high variability in 1998
-" Transversal diameter "and" index of shape "- mid variability in those two years

Table 1

The variability of quantitative features of the bulbs (mother plants), in 1995 and 1998

Year	Features	Variability indices				Variability
		x	s2	s	s%	
1995	G.(g)	57.78	580.00	24.00	41	High
	∅.L.(cm)	3.37	0.07	0.27	8	Low
	∅.T.(cm)	5.40	0.78	0.87	16	Middle
	I.F.	0.62	0.06	0.08	12	Middle
1998	G.(g)	135.00	2070.00	45.50	34	High
	∅.L.(cm)	4.80	0.47	0.69	14	Middle
	∅.T.(cm)	7.03	0.86	0.92	13	Middle
	I.F.					

∅.L – longitudinal diameter
∅.T – transversal diameter
G – Weight
IF – index of shape

b. The results of the variability of quantitative onion bulbs' features studied in different populations, under the same environmental conditions.

Table 2

The variability of the quantitative features of the bulbs from different populations under the same environmental conditions

Variant	Quality	Features	Variability indices				Variability
			x	s2	s	$s_{\%}$	
V.1	I(114g)	∅.L.	4.40	0.36	0.60	14	Mid
		∅.T.	7.16	1.18	1.09	15	Mid
	II(50g)	∅.L.	3.41	0.18	0.42	12	Mid
		∅.T.	5.55	0.82	0.90	16	Mid
	III(30g)	∅.L.	2.89	0.18	0.43	15	Mid
		∅.T.	4.17	0.21	0.46	11	Mid
V.2	I(101g)	∅.L.	4.29	1.58	1.26	29	High
		∅.T.	6.60	1.01	1.00	15	Mid
	II(50g)	∅.L.	3.28	0.10	0.30	9	Low
		∅.T.	4.90	0.22	0.47	9	Low
	III(23g)	∅.L.	2.63	0.12	0.34	13	Mid
		∅.T.	3.60	0.79	0.89	25	High
V.3	I(111g)	∅.L.	4.15	0.74	0.86	21	High
		∅.T.	7.37	0.77	0.88	12	Mid
	II(55g)	∅.L.	3.27	0.19	0.44	13	Mid
		∅.T.	5.07	0.13	0.37	8	Low
	III(23g)	∅.L.	2.54	0.27	0.52	19	Mid
		∅.T.	3.79	0.45	0.67	18	Mid
V.4	I(121g)	∅.L.	4.39	0.40	0.63	14	Mid
		∅.T.	7.37	1.31	1.14	15	Mid
	II(60g)	∅.L.	3.27	0.08	0.29	9	Low
		∅.T.	5.07	0.22	0.46	9	Low
	III(13g)	∅.L.	2.54	0.51	0.72	28	High
		∅.T.	3.79	0.36	0.60	16	Mid
V.5	I(130g)	∅.L.	4.16	0.35	0.59	14	Mid
		∅.T.	7.22	1.20	1.10	15	Mid
	II(46g)	∅.L.	3.18	0.14	0.38	12	Mid
		∅.T.	5.07	0.34	0.58	12	Mid
	III(17g)	∅.L.	2.39	0.09	0.31	13	Mid
		∅.T.	3.45	0.40	0.63	18	Mid
V.6	I(94g)	∅.L.	4.02	0.19	0.44	11	Mid
		∅.T.	7.16	0.50	0.71	9	Low
	II(38g)	∅.L.	2.78	0.11	0.34	12	Mid
		∅.T.	4.54	0.19	0.440	9	Low
	III(22g)	∅.L.	2.18	0.10	0.32	15	Mid
		∅.T.	3.30	0.29	0.54	16	Mid
V.7	I(92g)	∅.L.	3.90	0.08	0.29	7	Low
		∅.T.	6.55	0.99	0.99	15	Mid
	II(45g)	∅.L.	3.04	0.13	0.36	11	Mid
		∅.T.	4.84	0.11	0.33	7	Low
	III(22g)	∅.L.	2.30	0.16	0.40	11	Mid
		∅.T.	3.50	0.39	0.63	18	Mid
V.8	I(84g)	∅.L.	3.99	0.11	0.32	8	Low
		∅.T.	6.40	0.67	0.82	13	Mid
	II(36g)	∅.L.	3.60	0.10	0.32	9	Low
		∅.T.	4.92	0.07	0.27	6	Low
	III(11g)	∅.L.	2.28	0.32	0.57	25	High
		∅.T.	3.00	0.88	0.94	31	High

∅.L=longitudinal diameter of the bulb

∅.T.=transversal diameter of the bulb

In 1999 was made, in the same environmental conditions, the study of variability of onion bulbs' features from different populations (Table 2). Each variant has represented a family from studied field of progenies. Biological material was divided in three grades (after stass).
It appears that only variants V1 and V5 showed a mid variability (uniform) to the characteristics "transversal diameter" and "longitudinal diameter".
To the others variants was showed a different variability between those three fractions, showing the cross-fertilized character and warning the choice of the size of confidence intervals [K = x ~ ± (1-2) s].

c. The results regarding the variability of quantitative studied features of the onion bulbs from downward variants' chives with different size (from standard qualities view)

From the variability study of the quantitative features of the bulbs, descended variants from different chives' size (Table 3) shows that all three analyzed features presents mid variability in the case of those three groups of chives: ∅.T. >22 mm, ∅ . T. = (7-14) mm, ∅.T. = (14-22) mm, ∅.T.= (7-14)mm. The onion bulbs descended from the chives with ∅.T. <7mm, were characterized by mid variability to the longitudinal diameter and high variability to the other features.

Table 3

The variability of quantitative bulbs' features to the descendant variants of chives with different sizes (after standard qualities)

Source (∅.T mm	∅.L (cm)			∅.T (cm)			G (g)		
	x	$s_{\%}$	Mid variability	x	$s_{\%}$	Mid variability	x	$s_{\%}$	Mid variability
>22	3.57	14		5.62	14		106.9	15	
14-22	3.40	17	Mid	5.40	13	Mid	89.02	18	Mid
7-14	3.08	11	Mid	4.96	13	Mid	49.07	15	Mid
<7	3.29	14	Mid	4.77	20	High	35.01	34	High

∅.L – longitudinal diameter
∅.T – transversal diameter
G - Weight

d. The results upon the variability of quantitative studied features of the bulbs obtained directly from seed which was sown at different densities

From the variability analysis of quantitative features of onion bulbs obtained directly from the seed (Table 4) showed that the weight of the bulbs had a mid variability in all three variants regarding density, but the longitudinal diameter showed a mid variability in V1 (970 thousand plants / ha) and V3 (520 thousand plants / ha) and a high variability in V2 (640 thousand plants / ha), unlike the transversal diameter which showed high variability in all three variants, and the number of buds was characterized by mid variability in V1 (970 thousand plants / ha) and low variability in the variants V2 (640 thousand plants / ha) and V2 (520 thousand plants / ha). It follows that the density factor influences the variability of quantitative features of the bulb.

Table 4

The variability of the bulbs obtained directly from seed at different densities

Features	970.000 pl./ ha (7.5kg/ha seed)			640.000 pl./ ha (5kg/ha seed)			520.000 pl / ha (4kg seed)		
	x	$s_{\%}$	Variability	x	$s_{\%}$	Variability	x	$s_{\%}$	Variability
G.(g)	2.94	13	Mid	2.73	18	Mid	2.78	13	Mid
∅.L.(cm)	4.14	17	Mid	3.71	23	High	3.68	13	Mid
∅.T.(cm)	25.40	46	High	20.2	47	High	20.3	40	High
No. of buds	1.53	14	mid	1.51	7	Low	1.51	7	Low

G= weight
∅.L= longitudinal diameter
∅.T= transversal diameter

e. The results regarding the variability of the bulbs from the seeds originated from seed plants with different number of flower stems (Table 5).

Table 5

The variability of weight and number of buds / bulbs with different origin

Feature	Variant	Variability indices				Variability
		x	s2	s	$s_{\%}$	
Weight / bulb	V_1	68.0	307.0	17.0	26	High
	V_2	79.7	144.0	12.0	15	Mid
	V_3	76.3	174.0	13.0	18	Mid
	V_4	135	2070.0	45.0	34	High
No.of buds/ bulb	V_1	4.17	0.8	1.2	30	High
	V_2	3.98	2.7	1.6	41	High
	V_3	3.83	2.0	1.4	37	High
	V_4	5.1	3.8	1.9	38	High

V_1= The seed obtained from seed plants with one flower stem
V_2= The seed obtained from seed plants with two flower stem
V_3= The seed obtained from seed plants with three flower stem
V_4= witness

The "bulb weight" features showed a high variability to the variants V1 and V4 and mid variability to the V2 and V3 variants.
The "number of buds / bulbs" features showed a high variability to all variants.

The correlations' study of quantitative onion features

The correlation between the quantitative characteristics of the bulb has a particular importance in the selection of biological material and in the process of onion seed production. Also the correlations between the features of those three biological sequences have an important role in the selection of proper biological material. Special work includes the maintenance process which helps to keep the cultivar in the conditions in which was created. Marking the elite plants in a number larger than necessary (usually double), because after the elimination was made throughout the growing season by biological purification to remain in selection only the proper plants. The elimination of all individuals from the downward in which appeared untypical plants from the cultivar or sensitive plants to the environmental factors (including pathogens).If throughout the growing season by biological purification it's eliminated the untypical plants after phenotypic appearance of the organs' plant above the ground, to chives (little bulbs or bulbs) and onions (bulbs), the selection of biological material is crucial. The knowledge of the correlations between quantitative characteristics (weight, longitudinal diameter, transversal diameter, index of shape, number of buds, etc..) of the bulbs and of chives are greatly helps in their selection.

From the chives harvested in 1997 (with biometric measurements) were obtained onion bulbs in 1998. The correlations presented (Table 6) were calculated using the biometrical data of biological material from 1997 and 1998, resulting:
a) If the weight between onion bulb and longitudinal diameter is a significant correlation - positive (r = 0.930 *) between weight and transversal diameter is a distinctly significant correlation -positive (r = 0.970 **), which shows that together with the increasing of the chives weight the growth rate of the transversal diameter is greater than the growth ritm of the longitudinal diameter. The correlation between chives' weight and the index of shape is significant- negative(r =- 0.9300). From these correlations shows that as chives' weight increases, the index of shape decreases, meaning the chives bulb become more squat and vice versa.
b) Between the quantitative characteristics of onion' bulbs are weak positive correlations, insignificant. It follows that the index of shape remains almost unchanged.
c) The chives' weight is positively correlated with the weight of onion bulbs (r = 0.859 *). Between the index of shape of the chives and the onion bulbs the correlation is extremely weak, almost insignificant.

Table 6

The correlation of some quantitative onion's features

Correlation	The correlation coefficient (r)	F	t
a) chives			
G x ∅.L.	0.930*	19.20	4.382
G x ∅.T.	0.970**	47.67	6.905
G x I.F.	-0.930^{o}	19.20	4.382
∅.L x ∅.T	0.990***	147.75	12.155
b) bulbs (mother plant)			
G x ∅.L.	0.730	3.42	1.850
G x ∅.T.	0.660	2.31	1.522
G x I.F.	0.190	0.11	0.332
∅.L x ∅.T	0.750	3.85	1.964
c)chive and mother plant			
Gchive x G mother plant	0.859*	8.44	2.906
IF chive x IFmother plant	0.093	0.03	0.162

$LSD_{5\%}$ = 2.78
$LSD_{1\%}$ = 4.60
$LSD_{0,1\%}$ = 8.61

CONCLUSIONS

Onion is a typical cross-fertilized species. The number of biotypes that make up the genotype of a cultivar is different from one cultivar to another and from one species to another. Environmental conditions influence the phenotypic expression of a cultivar. Therefore in the above examples we can see the different manifestation regarding the variability of the studied features from the chosen variants. It follows that it is mandatory to ensure optimal conditions in the producing process of biological material for multiplication in order to achieve the correct selection of biological material through phenotypic manifestation. Correlations between the features of a cultivar facilitate the selection activity of biological material regarding the improvement and multiplication.

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