ORIGINAL PAPERS

STUDIES ON GENETIC STRUCTURE VARIABILITY AT "DOINIȚA", *LACTUCA SATIVA* L. VARIETY

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Key words: *population, genotype, coefficient of variability*

INTRODUCTION

Diverse landraces and local varieties are cultivated in different regions, with a broad spectrum of landraces and old varieties held in the world's genebanks (Lebeda et al. 2007). Conventional and modern breeding methods are providing new cultivars well tailored for the specific needs of producers and consumers.

The association mapping technique is a useful tool for detecting markers linked to the genes underlying the variation of a trait among elite cultivars. To avoid false-positive results due to unrecognized population structure in the analysed set of individuals, the subpopulations need to be identified. (Simko and Hu, 2008).

Within the autogamous populations, a certain variability is exhibit, and its size differs depending on the influence of the factors, as well as due to the existence of heterozygotes that contribute to the increased variability. The existence of variability within populations (varieties) gives the possibility of natural selection and different environmental and cultural conditions to favour or disadvantage some genotypes, modifying their frequency, and as such, the genetic structure of the population.

Through the process of seed production, it is sought to prevent biological depreciation of varieties that may occur as a result of genetic variability and modification of the initial genetic structure. Knowing well the initial genetic structure of the variety, (the ratio between biotypes and the frequency of genotypes), through the conservative selection, based on the individual choice of elites and the study of the descendants in the selection field, (which allows the elimination of non-typical forms, due to biological or mechanical impurities on different ways in the process of seed production), the variety can be maintained at the level of the initial production potential.

The varieties of the different autogamous species differ, according to the genetic variability they contain, depending on the homozygosity of the elite plant from which they originate, as well as the percentage of allogamy and the frequency of mutations. In some varieties, more genotypes with obvious morphological differentiations can be identified.

Within the autogamous species, the cultivated varieties can be of a high degree of homozygotes, as a result of repeated individual selection (pedigrees) and which are very valuable, on a small area with less adaptability.

They may be varieties with a lower degree of homozygosity, with more pronounced heterogeneity, consisting of different biotypes or the mixing of a large number of different lines from a genetic point of view, but phenotypically similar and with a higher ecological plasticity.

As such, the heterogeneity of autogamous populations is important for breeding and seed production. Compared to pure lines with a restricted genetic basis and reduced adaptability to variable environmental conditions, heterogeneous varieties with wide genetic variability have high adaptability and constancy, in the context of changed environmental conditions (Olaru C., 1987). By its usual multiplication a cultivar loses some properties under the conditions of production, due to biological and mechanical impurities, the decrease of vitality or other causes that reduce the agronomic value.

Regardless of the conditions created by the cultivator for the propagation of a variety, the environment can act on the development of the plants by certain factors that cannot be influenced by man and which can cause numerous changes in the structure of the variety. (Ambarus et al.,, 2010). In general, the varieties have a mixture of forms or genotypes, although the individuals of the population appear to be alike.

The degree of variability of these forms depends on the nature of each variety. Thus, the varieties obtained by repeated individual selection from a relatively homogeneous starting material, are much more uniform than the varieties obtained by individual selection from a complex hybrid population.

As more as the parents used to obtain the hybrid population are genetically different, the greater possibility of distant segregation exists.

In the case of varieties with perfect autogamy, the frequency of genotypes in the population does not remain constant, but there is a tendency to gradually eliminate heterozygous genotypes. (Mureşan, 1972).

Thus, if following a crossover in which individuals differ in a single trait, determined by a pair of genes (AA × aa) by self-pollination for several generations, the percentage of heterozygotes is greatly reduced. In F2, in this case, individuals with genotypes 25% AA, 50% Aa and 25% aa appear. 50% homozygous (AA - aa) and 50% heterozygous (Aa). The percentage of heterozygotes decreases with each in X generation, only 0.20. (Monoliu et al., 1976). The knowledge of the genetic structure has importance in appreciating the value of the population (given by the genes and genotypes) that constitutes it.

MATERIAL AND METHODS

The studies were performed on the homogenized biological material from the field of PB (pre-base), where phenological observations were made. The total period of vegetation (number of days), the sum of the temperature degrees and the precipitation on each phenophase were registered and are presented in (Table 1).

The mass selection was the selection method applied in our investigations.

There were accomplished phenological observations and biometrical measurements as follows:

- head's height (cm),
- head's diameter (cm),
- index's shape,
- head's weight (g),
- weight of seed / plant (g).

There were marked elites and we kept only the seeds from the plants whose values of studied characters were within the limits of variation of variety.

The limits of variation results from the calculation of statistical data from measurements made on a sample of 100 individuals (sample survey) randomly selected on the diagonals of the field.

Vitamin C content was extracted according to the modified method of Abdulnabi et al. (1997).

Soluble solids – refractometry.

Cellulose content - principle of the method by Kürschner-Hanack (cited by Šušterčić, 1979; Tehnologija hrane, 1987).

RESULTS AND DISCUSSIONS

In table 1 data related the regime of temperature (sum of degrees of temperature) and rainfall for each phenophases are presented.

Table 1. Maine phenophases at "Doinita" - *Lactuca sativa* L. variety

No	Phenophases	Period	Days /phenophases	Sum of (^{0}C) degree	Rainfall (mm)
1.	Sowing - emergence	20.04-28.04	8	58	-
2.	Emergence - head development	29.04-23.05	25	500	50
Vegetation period: sowing to head development			33	558	62
4.	Head development - flowering stem appearance	24.05-14.06	22	528	95,1
5.	flowering stem appearance – mass flowering	15.06-24.07	41	1066	68,7
6.	Mass Flowering – seeds maturation	25.07-22.08	29	754	20,6
Total vegetation period: emergence-physiological maturity of seeds		**20.04-22.08**	**125**	**2906**	**296,4**

Statistical interpretation of data collected after measurement reflected the trait's variability (table 2)

- low variability for head's height (cm) and index shape,
- medium variability at head's diameter (cm) and head's weight (g),
- high variability at weight of seed plant $^{-1}$ (g).

Table 2. Variability study of some traits at "Doinița" lettuce variety

No	Trait	X	s	s%	Limits of variation	Significati on %
1	head's height (cm)	15,10	1,03	9,80	11,50 - 18,70	Low variability
2	head's diameter (cm)	27,15	1,03	15,95	21,40 - 32,90	Medium variability
3	index shape	0,56	0,06	5,36	1,06-1,18	Low variability
4	head's weight (g)	245	26,25	12,12	190-300	Medium variability
5	weight of seed plant $^{-1}$ (g)	10,37	2,12	20,44	8,25-12,49	Hight variability

<10 - low level of variability
10-20 - medium level of variability
>20 - high level of variability

For each investigated trait histograms of variation are displayed as follow (Figure 1-3).

Quality parameters of Doinita variety are presented in figure 4. Vitamin C content = 19.6 mg 100 g-1 fresh product, 1.57% sugar content, 0.75% cellulose content.

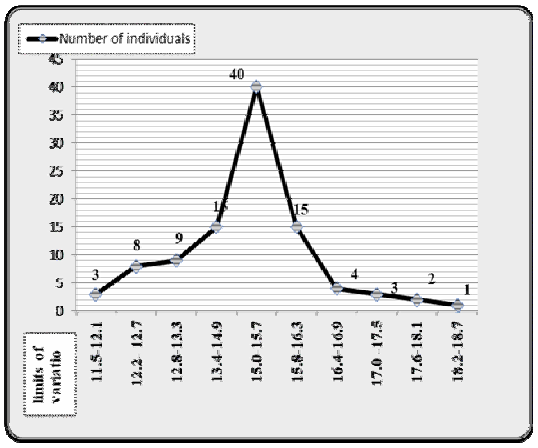

Fig. 1. Histogram of head's height variation (cm)

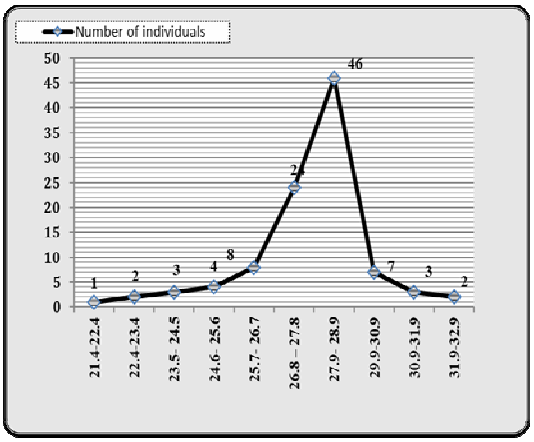

Fig. 2. Histogram of head's diameter variation (cm)

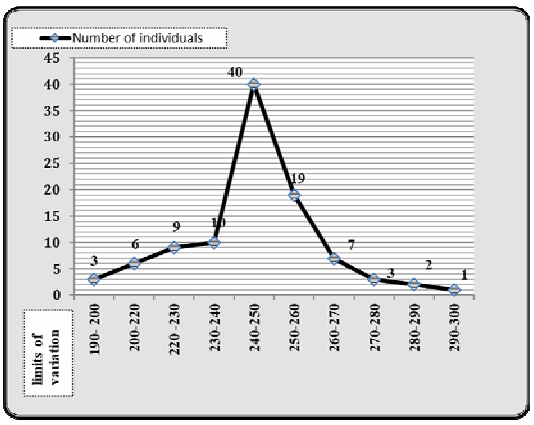

Fig. 3. Histogram of head's weight variation (g

The content of vitamin C, soluble solids and celulose content were determinated at leaves after head development. Vitamin C content = 19.6 mg 100 g-1 fresh product, 1.57% sugar content, 0.75% cellulose content. (figure 4)

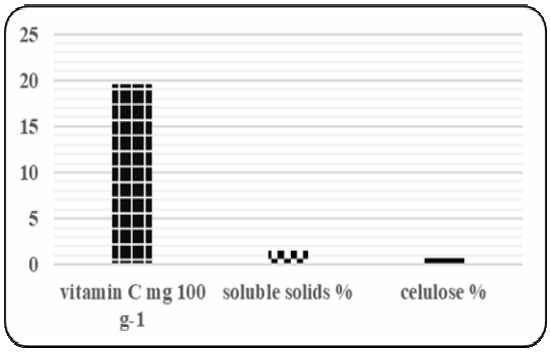

Fig. 4. Quality parameters of Doinita variety

Our breeding activity entitle us to be in consens with other conclusions. In contrast to other major crops, where significant increases in yield have been obtained by selecting for the harvested organ (seed, fruit, and tuber), higher lettuce biomass is not a trait generally present in the ideotypes of plant breeding programs (Still, 2007). For these species, the appearance of high-yielding modern varieties (i.e., producing a higher biomass per unit area of the harvested organ) seems not the principal factor driving the substitution of lettuce landraces, as has been the case for most other horticultural crops (van de Wouw et al., 2010). Other characteristics such as postharvest shelf life or resistance to pest and diseases have been more important in this process. Resistance to downy mildew (*Bremia lactucae* Regel) and lettuce aphid [*Nasonovia ribisnigri* (Mosley)] are currently the main characteristics driving lettuce breeding (Mou, 2008).

CONCLUSIONS

'Doinita' variety was within the normal range of variation.

The variability of features like index shape, head's height, weight of seed per plant, head's weight and head's diameter:

- low variability for head's height (cm) and index shape.
- medium variability at head's diameter (cm) and head's weight (g).
- high variability at weight of seed plant $^{-1}$ (g).

ABSTRACT

Lettuce variety DOINIȚA was created and patentated at SCDL BACĂU.

The purpose of the paper is to present a study on the variability of the main traits and their significance for breeding. The main characteristics of the Doinița lettuce variety are: semi-early, with the 85-day vegetation period, for the field, the leaves are green color. High tolerance to flowering, recommended for summer - autumn crops

Resistance to aphids attack (*Pemphigus bursarius* – lettuce root aphids and *Nasonovia ribisnigri* – lettuce leaves aphids).

The head: it is rounded, easly flattened, 15 cm high, 27-28 cm in diameter and 245-250 g in weight. Qualitatively it is noticed by smooth leaves, with pleasant taste.

The investigated qualitative parameters were: Vitamin C content = 19.6 mg 100 g-1 fresh product, 1.57% sugar content, 0.75% cellulose content. The annual maintenance of the quantitative and qualitative characteristics of the variety within its own limits of variability, ensures the identity of its uniformity and stability and is carried out through conservative selection works, carried out by the breeder. Statistical interpretation of data collected after measurement reflected the trait's variability:

- low variability for head's height (cm) and index shape;
- medium variability at head's diameter (cm) and head's weight (g);
- high variability at weight of seed plant $^{-1}$ (g).

The data presented in the paper emphasize that the DOINIȚA lettuce variety is correctly maintained in the process of conservative selection, the variability limits being the normal ones.

ACKNOWLEDGEMENTS

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