



BREEDING EVALUATION OF FORAGE PEA VARIETIES AND HYBRIDS BY THE TRAITS NUMBER SEEDS AND SEED WEIGHT PER PLANT

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Abstract. Proved is the influence of the factors “genotypes” and “individual measurements” on the variability of the components of productiveness weight of seeds and number seeds per plant in investigated varieties and hybrids forage pea. Vastly is the influence of the factor “genotypes” in the common variation of the traits–weight of seeds and number seeds per plant as in parents so and in F₁ and F₂ hybrids. The highest productiveness of weight and number of seeds per plant is obtained in the hybrids Kerpo x Mir from F₁ and Mir x E.F.B.33 from F₂ that surpass parents.

Key words: breeding, pea, seed productivity

Introduction

The productiveness is main task in the selection programs as biological potentials, but also as capacity for realizing at various combinations the factors of the environment.

The is main parameters are: number fertile nodes and pods per plant, number of seeds per pod and seed weight per plant [КУМАНОВ и др., 1988, SAMFIRA et al., 2013].

As every quantitative trait, which is determined by high number of genes, they are influenced in high degree by environment conditions.

The success of the selection about these indicators is depended no insomuch on their main exhibition but from their optimum that will ensure high yields and qualitative production [BOURION et al., 1998].

The knowledge for the genotype of the parental forms, the conditions of the environment and the interaction between them determines the good choice and direction of selection.

The objective of this study was to determine importance of the genotype and the individual specimen in the general variation of the main productive components and the character of the interrelations between them.

Material and methods

The experimental study was conducted during the period 2009–2011

in second experimental field of the Institute of Forage Crops, Pleven.

As parental component are using the following varieties forage pea: spring form Kerpo (*P. sativum* subsp. *Sativum* L.) and winter types pea–Pleven 10, Mir and EFB33 (*Pisum sativum* ssp. *sativum* var. *arvense* L.).

These forms were crossed by hand in 2009.

The parental forms (P₁ and P₂) and first and second generation (F₁ and F₂) are sown at scheme P₁, F₁, F₂, P₂ on a row spacing 20 cm and distance in row 5 cm. Hand planting was applied with depth of sowing 5 cm.

The forage pea is grown by approved technology of the Institute of forage Crops–Pleven.

In the hybridization were included all direct and reciprocals crosses.

The follow quantitative traits was analyzed–number seeds per plant and seed weight per plant (g) of parental components (P₁ and P₂) and crosses of first and second hybrid generation (F₁ and F₂).

The individual number measurement of the each trait on one plant is respectively: from F₁, F₂, P₁ and P₂ 40 plants.

Data were processed statistically by classical two factors analysis of variance (ANOVA) with using MS Excel for Windows XP.



Results and discussion

The results of carry out analysis of variance (Table 1) show that watched variation of the traits is determined from high level of significance ($p \leq 0.001$)

inherited talents on included varieties and hybrids forage pea.

The exception made pods per plant ($F=1.25254$) in F_1 hybrids at that differences are not significant for factor "individual measurement".

Table 1.

Two-way analysis of variance on the investigated traits

Parental forms (P_1 and P_2)						
Seeds weight per plant						
Source of Variation	SS	df	MS	F	P-value	F crit
Genotypes	1 118,20	3	372,73	147,72	1,265E-39	2,68
Individual measures	898,57	39	23,04	9,13	5,383E-21	1,50
Error	295,23	117	2,52			
Total	2 312,00	159				
seeds per plant						
Source of Variation	SS	df	MS	F	P-value	F crit
Genotypes	211 073	3	70 357.7	1 016.7	1.350E-83	2.68
Individual measures	40 794.2	39	1 046.01	15.12	2.24E-30	1.50
Error	8 096.53	117	69.20			
Total	259 963.73	159				
F_1 hybrids						
Seeds weight per plant						
Source of Variation	SS	df	MS	F	P-value	F crit
Genotypes	7 302.21	11	663.84	57.07	6E-77	1.811
Individual measures	679.09	39	17.41	1.50	0.031	1.427
Error	4 989.69	429	11.63			
Total	12 970.99	479				
seeds per plant						
Source of Variation	SS	df	MS	F	P-value	F crit
Genotypes	271436.3	11	24676	48.4885	2E-68	1.811
Individual measures	24859.53	39	637.424	1.25254	0.1478	1.427
Error	218320.1	429	508.905			
Total	514615.93	479				
F_2 hybrids						
Seeds weight per plant						
Source of Variation	SS	df	MS	F	P-value	F crit
Genotypes	7619.243	11	692.658	26.436	6.765E-42	1.810
Individual measures	3408.608	39	87.4002	3.33572	6.255E-10	1.427
Error	11240.37	429	26.2013			
Total	22268.221	479				
Seeds per plant						
Source of Variation	SS	df	MS	F	P-value	F crit
Genotypes	585495.1	11	53 226.8	48.32	3.664E-68	1.81
Individual measures	129155.8	39	3 311.69	3.01	2.143E-08	1.43
Error	472576	429	1 101.58			
Total	1187226.9	479				

Legend: SS–Sum of squares; df–degree of freedom; MS–Mean square; F–criterion on Fisher; P–value–probability;

The cause for this is probably due of the smaller genetically diversity on included selection material in the study in

this trait. In all others traits for varieties and hybrids criterion F–experimental exceeds the corresponding values of F–



crit. The accurate value of the (P) on sources of variation is lower than 0.05 that show considerable influence of the factors.

Established is that the source of variation "genotypes" is being on first from the factors influencing.

Into variation of the investigated traits. It exceeded at sum of the squares the factor "individual measurement" for weight and number seeds per plant as parents so and F_1 and F_2 (Table 2).

The factor "genotypes" in F_1 proves larger influence in the traits toward F_2 .

Table 2.

Influence of the factors of variation in the morphological traits seeds weight per plant (A) and seeds per plant (B) of the varieties and hybrids forage pea

Source of Variation	A		B		A		B	
	Parental forms		F_1 hybrids		F_2 hybrids			
Genotypes	55.45%	83.80%	91.49%	91.61%	69.09%	81.93%		
Individual measures	44.55%	16.20%	8.51%	8.39%	30.91%	18.07%		
Total	100%	100%	100%	100%	100%	100%		

The productive possibilities of the varieties as regards of weight of the seeds and number seeds per plant are varied from 7 g. (Kerpo) to 13 g. (Mir and

Pleven 10) and respectively from 29 (Kerpo) to 116 (Mir) number seeds (Figure 1 A and B).

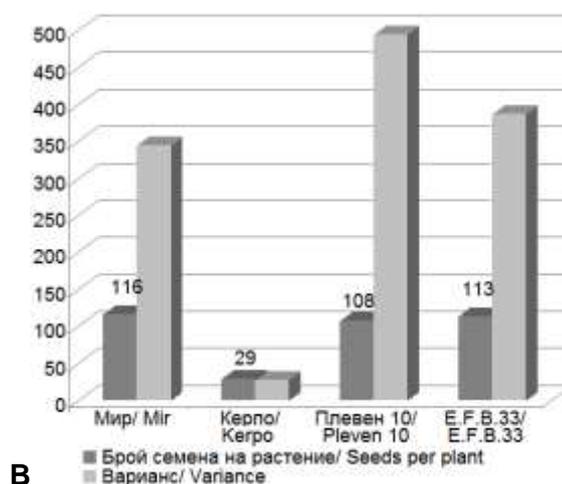


Figure 1. Average value on A—seeds weight per plant and B—seeds per plant in parental forms

The made relative assessment of the hybrids of the two generations (Figure 2) shows that they are characterized with higher productiveness toward parental components.

This can due of genetic transgression or heterosis actions.

In cases in which the inbred depression in F_2 is not significance the explanation must seek in behaviour of genetic transgression.

Established is that in hybrids F_1 with the highest weight seeds pre plant are Kerpo x Mir and Kerpo x E.F.B.33, Mir x Kerpo and Pleven 10 x Mir are with the lowest.

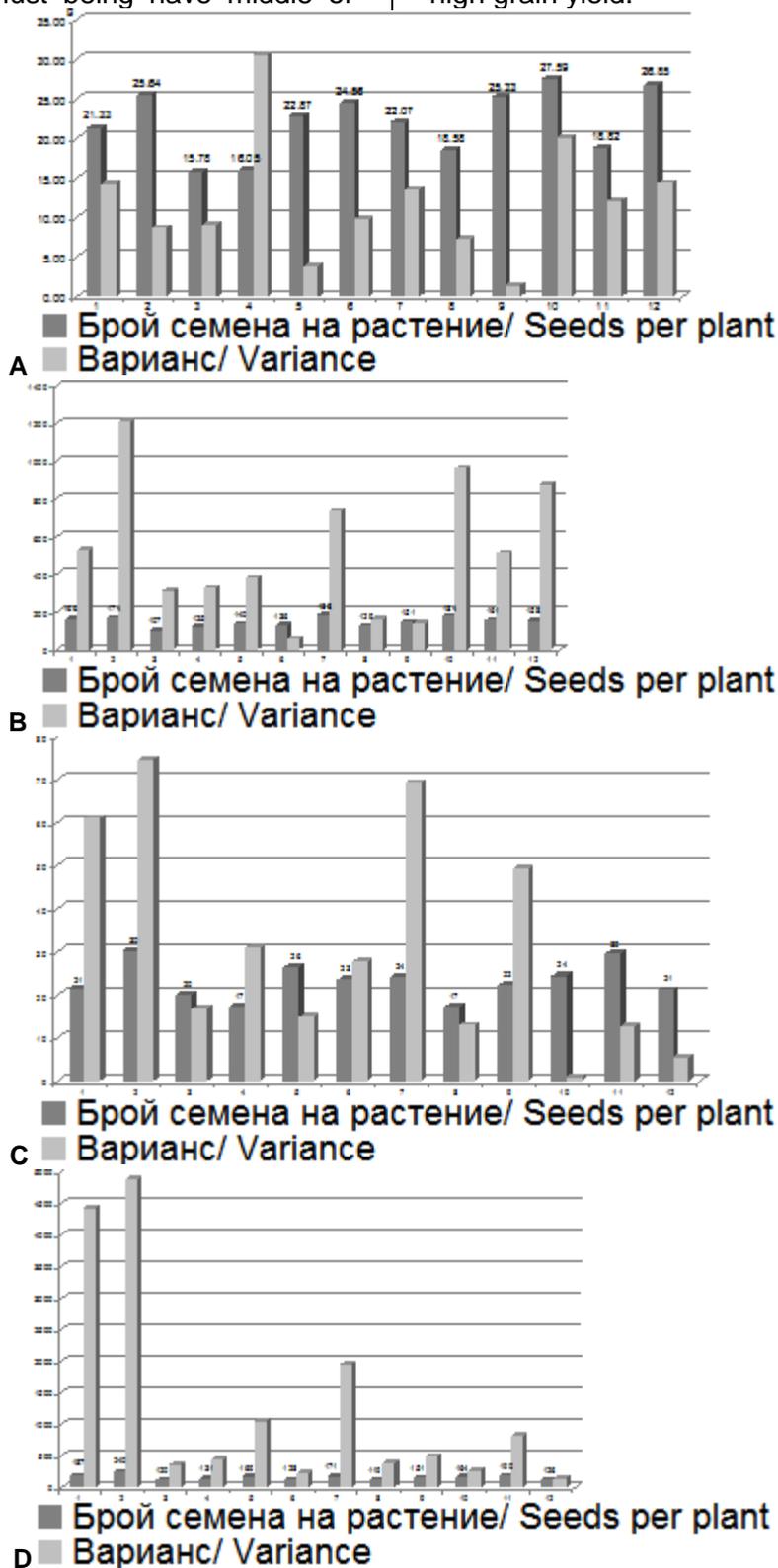
The almost same tendency is watched in number seeds per plant. Mir x Kerpo and Pleven 10 x Mir are with the smallest number of seeds, E.F.B.33 x Mir (188) and Kerpo x Mir (184) have the most seeds per plant. Kerpo x Mir E.F.B.33 x Mir (188) form the most seeds (Figure 2). In F_2 is god the larger variation due disintegrating of the trait.

With the highest values as seed weights so and number seeds per plant is characterized Mir x E. F. B. 33.

The observed for hybrids good reproductive ability is import quality for all annual forage leguminous varieties, which except high quality and stability of yield



green mass must being have middle or | high grain yield.



1–Mir x Pleven 10; 2–Mir x E.F.B.33; 3–Mir x Kerpo; 4–Pleven 10 x Mir; 5–Pleven 10 x E.F.B.33; 6–Pleven 10 x Kerpo; 7 E.F.B.33 x Mir; 8–E.F.B.33 x Pleven 10; 9–E.F.B.33 x Kerpo; 10–Kerpo x Mir; 11–Kerpo x Pleven 10; 12–Kerpo x E.F.B.33

Figure 2. Average value on A–seeds weight per plant and B–seeds per lant in F₁; C–seeds weight per plant and D–seeds per plant in F₂



This reduce the costs for sowing material on making of mix green forage [ALEKSIIEVA, NAIDENOVA, 2012, GHICA *et al.*, 2012]

The obtained results show that differences in the components of productivity are due on genetic diversity of varieties and genetic combinations and recombination's in hybrids. The results are similar with these from other researchers [RANALLI *et al.*, 1997, ABDOU *et al.*, 1999, SHARMA *et al.*, 2000, BUTU *et al.*, 2014]. According to Жученко [Жученко 1980] the character of interaction genotype–year, independently from of phenotypic plasticity of organisms is under genetic control. This force bear in mind influence and this factor in variability of investigated traits in creation on more adaptive selection forms. From obtained results can be done the next conclusions:

Proved is influence of factors “genotypes” and “individual measurements” on variability of components of productiveness weight of seeds and number seeds per plant in investigated varieties and hybrids forage pea. Vastly is influence of factor “genotypes” in common variation of traits–weight of seeds and number seeds per plant as in parents so and in F₁ and F₂ hybrids. The highest productiveness of weight and number of seeds per plant is obtained in the hybrids Kerpo x Mir from F₁ and Mir x E.F.B.33 from F₂ that surpass parents.

Conclusions

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