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# ESTIMATION OF ADAPTIVE FEATURES OF NEW VARIETIES OF PEAS

*The article presents the results of the analysis of varieties of peas (Pisum sativum L.) domestic and foreign selection for protein content, the weight 1000 seed and yield. The regularities of changes in these traits were investigated according to environmental conditions. The varieties with high levels of adaptability and promising for selection and practical use.*

***Keywords:*** *peas; variety; stability; flexibility; adaptability.*

**Introduction.** The varieties of agriculture crops is the basis of agricultural production**.** Adaptability variety (hybrid) is the balanced combination of a large number of features, where preference is given the most valuable of them. The degree of adaptability grade depends not only on his adaptability, but also on the specific environmental conditions created in agrocenoses. The role of variety as a biological system that provides stabilization of high yields, is particularly important in a diversity of soil and climate and economic-economic conditions of agricultural production.

The main requirement for the variety is high yield. The newly created variety can be widely used in manufacturing only if it gives a high and stable yields than the best existing varieties of this crop. Thanks to achievements of genetics, genetic yield potential breeders of new varieties of generations is significantly increased.

Most modern varieties of peas have a high potential productivity, the implementation of which is hampered by their low homeostatic and sensitivity to adverse environmental factors [2–5]. Choosing of the best varieties for households of different soil-climatic zones and subzones microzone with unstable weather conditions is crucial to increase productivity and improve product quality. It must be scientifically justified with regard to account of the characteristics of ecological plasticity, stability and adaptability potential of new varieties.

Therefore, the study of agroecological plasticity and stability, which evaluate the potential adaptability of new varieties of peas are important for food safety and economic independence of Ukraine. Certain degree of genetic stability and their yield can be predict due to the basis of testing varieties of peas [6].

**The aim** of our research was studying environmental sustainability of productivity and stability and plasticity of basic cereal characteristics new high productivity plant varieties of peas of different eco-geographical origin and isolation among these most promising varieties.

**Materials and methods.** The material for the research serve to peas 3 sorts of different eco-geographical origin: Mecenat (Ukraine), Slovan (Czech Republic),

Salamanka (Germany0 included in the State Register of varieties suitable for dissemination in Ukraine in 2014. Experimental studies were carried out in institutions expertise (steppe zone: Kirovograd RBS, Konstantinovka RBS, Pervomaysk RBS, forest-steppe zone: Chernivtsi RC, Vinnitsa RC, forest area: Priluki RBS, Gorodenka RBS, Rivne RC, Volyn RC) according to the method State testing of plant varieties [7], during 2011-2012, and analysis of ecological plasticity and stability characteristics of performance, weight of 1000 seeds and protein content in grain varieties of peas were assessed by the standard technique Eberhard-Russell [1]. It allows to evaluate varieties not only on averages, but also ductility (b), which reflects the variety regression to changing environmental conditions and stability (W) of this reaction. The authors have proposed to divide the sum of squares of interaction each class of environmental conditions in two - component linear regression (b) and nonlinear part, defined standard deviation from the regression line (W).

The variety is stable, whose regression coefficient is 1, and the deviation from the regression line is minimum. With this combination options and high average yield grade the variety can be considered like ideal. Regression coefficient for yield grade on indexes environment ecological factor is called plasticity, dispersion and relative regression is called stability [1].

During using regression models to assess the reaction of varieties to changing environmental factors regression coefficient (b) serves as a measure of the plasticity of the variety. To predict a linear relationship between genotypic and environmental effects, it can be used regression of this signs on environmental indexes, evaluated through the average of all varieties that were grown under these conditions. Genotypes with factor b> 1 belongs to high plasticity (relative to the group average). At 1> b = 0 grade attributed to a relatively low plasticity. If the indicator of plasticity grade was not significantly different from unity, then variety by reaction to changing environmental conditions is not different from the average group.

Except evaluation and magnitude of the reaction of varieties on changing environmental conditions, stability of this reaction of the degree of deviation (W) is calculated. Low plasticity varieties with low value of W is widely adapted genotypes, as they do not reduce the value of the sign in terms of environmental factors limit and no-limit environment but they are unprofitable for cultivation and related to the extensive varieties. High plasticity varieties with low value of W belong to varieties of intensive type, with stable positive reaction to improve growing conditions.

Researches on ecological plasticity and stability programs were conducted by using Excel and MathCAD.

**The results** are showed that in some agro-climatic zones varieties yield formed in most cases is quite unstable and unpredictable because it is difficult to find a high plasticity , versatile variety that would fit for different soil and climatic zones. The priority is to identify varieties that would be suitable for growing in different soil and climatic zones (steppe, forest-steppe, forest area).

Indicators stability and plasticity were received on the bases of analysis of new pea varieties.

*Table*

**Indicators of plasticity and stability of the main yield signs, weight 1000 of seeds, the protein content of pea varieties in different soil-climatic zones**

| № s/n | Variety | Productivity, t/ha | | Weight of 1000 seeds, g | | The protein content, % | |
|---|---|---|---|---|---|---|---|
| | | b | W | b | W | b | W |
| 1 | Mecenat | 1,024 | $1{,}093 \times 10^{7}$ | 1,029 | $1{,}049 \times 10^{9}$ | 1,005 | $1{,}018 \times 10^{7}$ |
| 2 | Slovan | 0,923 | $1{,}185 \times 10^{7}$ | 0,803 | $1{,}129 \times 10^{9}$ | 1,1 | $9{,}734 \times 10^{6}$ |
| 3 | Salamanka | 1,054 | $1{,}124 \times 10^{7}$ | 1,168 | $1{,}089 \times 10^{9}$ | 0,894 | $9{,}612 \times 10^{6}$ |

Some varieties of peas in importance plasticity yield signs, weight of 1000 seeds and protein content did not differ from group standard, and this figure is within the unit or is very close to unity. However, you can highlight and high plasticity varieties due to sings of yield and weight of 1000 seeds, such as Salamanka, Mecenat.

These findings are confirmed graphic material - namely, analysis of deviations from medium group dispersion (Fig. 1, Fig. 2, Fig. 3). Thus, the above named varieties differ significantly from the rest of the material, and their dispersion is at the top of the scale.

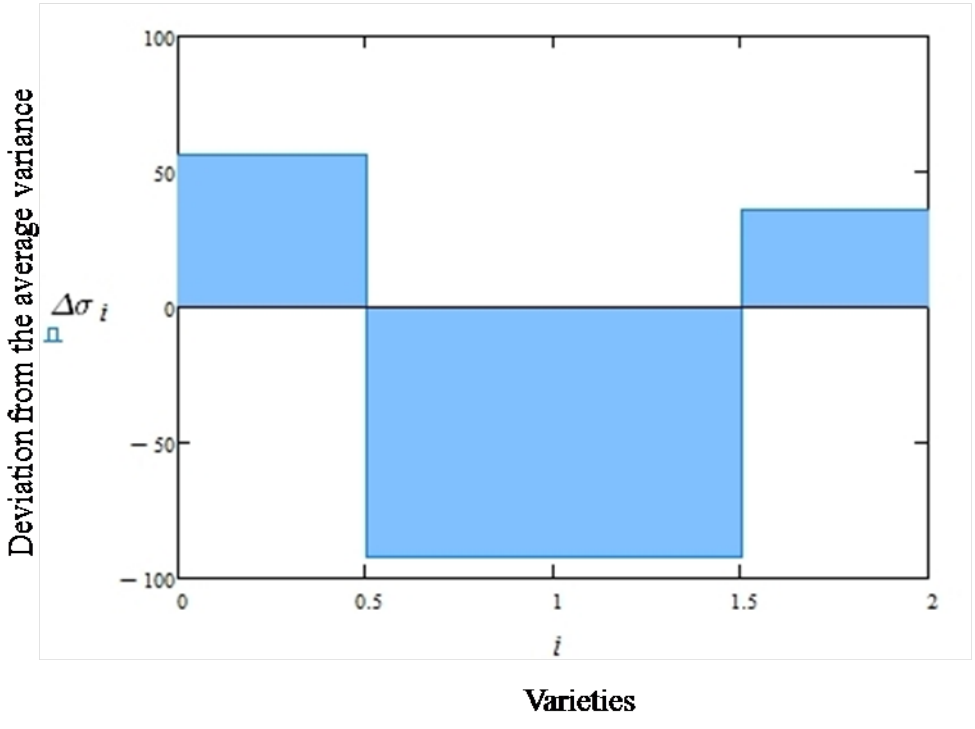


*Fig. 1.* **Deviation of signs of stability yield varieties of peas the average group value**

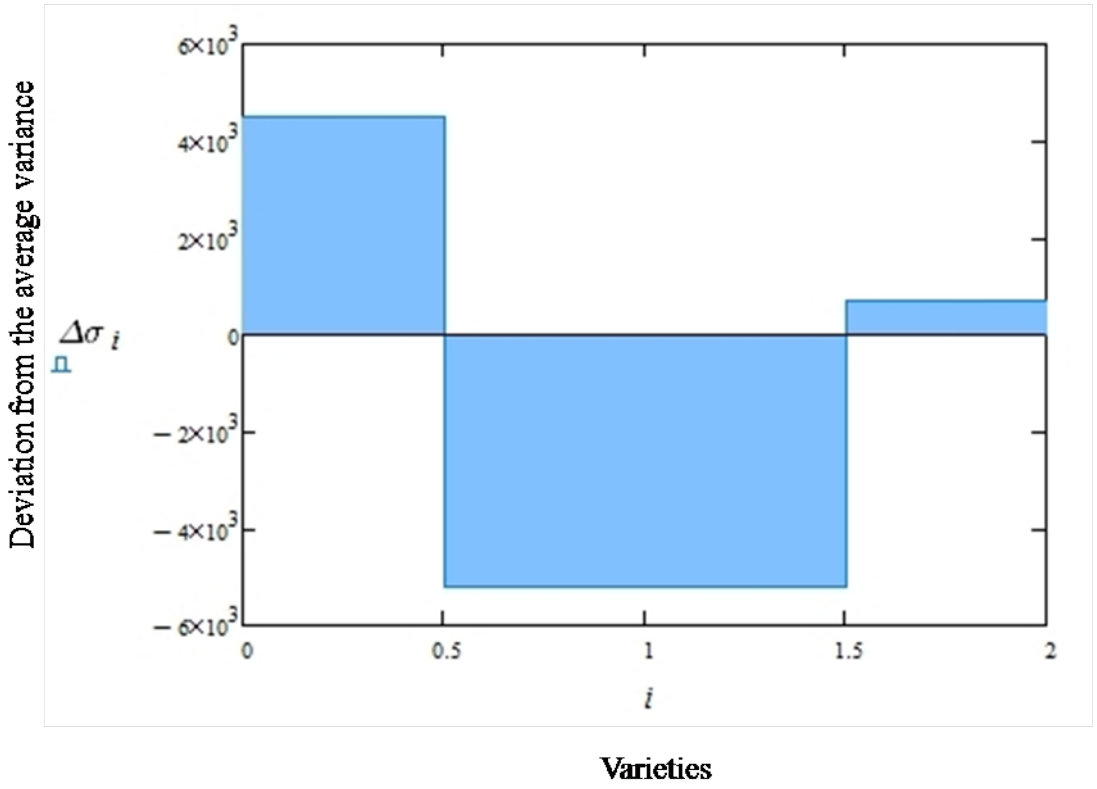


*Fig. 2.* **Deviation of signs of weight of 1000 seeds of varieties of peas the average group value**

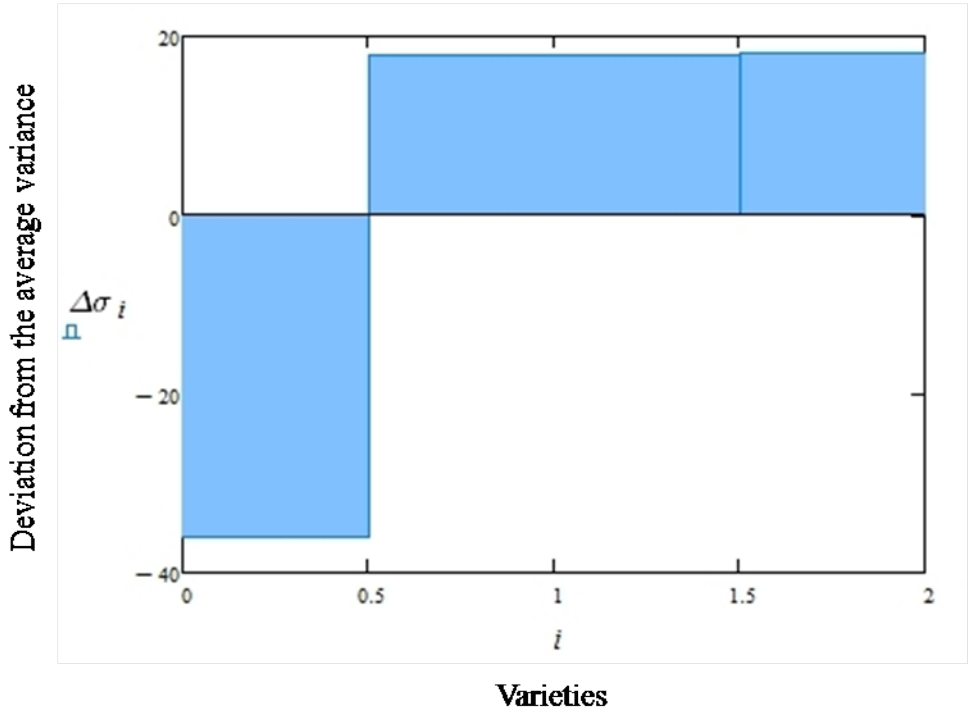


*Fig. 3.* **Analysis of deviation from the average dispersion characteristics of protein content in peas grain in different soil and climatic zones of Ukraine**

For protein content in grain varieties Mecenat Slovan have been found highly plastic but significantly higher than the group average dispersion varieties Slovan and Salamanka. Graphic analysis of response surfaces shows that these two varieties for protein over two years is highly stable, especially Slovan variety, referred to intensive type of positive reaction protein accumulation in different soil and climatic zones. low plasticity variety is Salamanca of small value stability, which can be attributed to well-adapted genotypes, but it certain extent belong to varieties of extensive type.

Based on the study three-dimensional graph was constructed of the yield of investigated varieties of peas in growing conditions and varietal characteristics in different soil and climatic zones. Graphic analysis of response surfaces confirms that the above mentioned high plasticity pea varieties in furthering several years forming a stable high yield and weight of 1000 seeds instead of some varieties marked of instability by these indicators (*Fig. 4–5*)

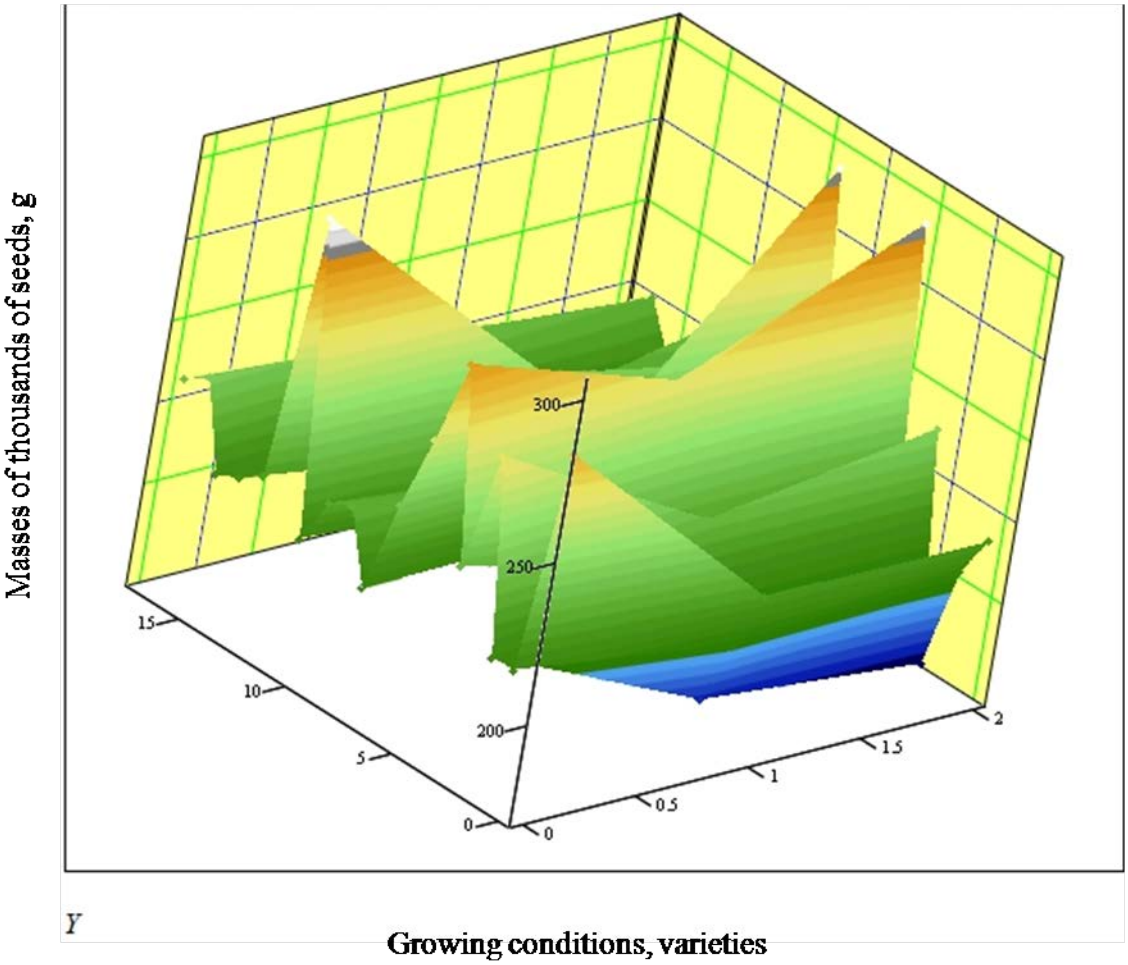


*Fig. 4.* **Dependence between weight of 1000 seeds and growing conditions, varietal characteristics of studied varieties of peas**

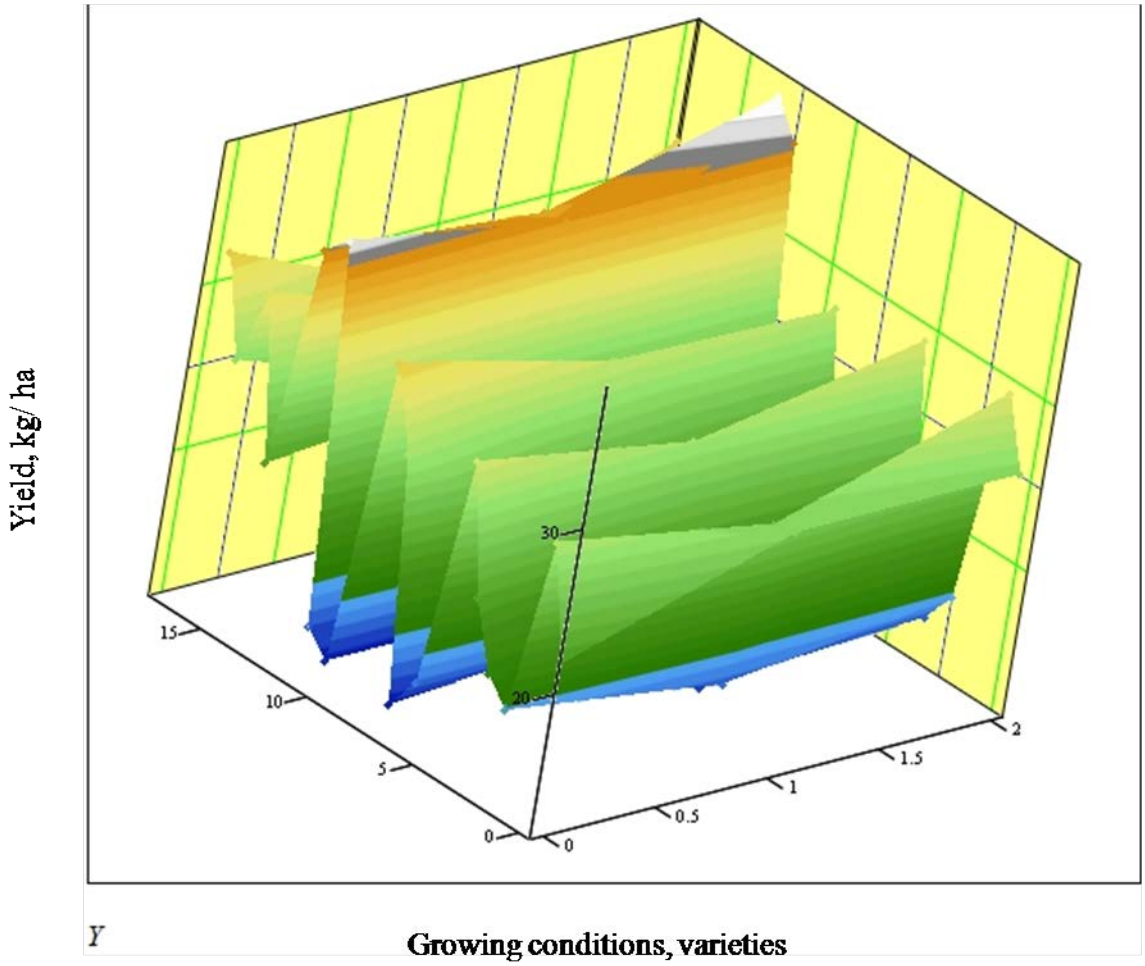


*Fig. 5.* **Dependence between yield and growing conditions, varietal characteristics of studied varieties of peas**

Results of the study indicate that that varieties Mecenat and Salamanka belongs to the varieties of intensive type on the basis of yield and weight of 1000 seeds.

Indexes of deviations signs of protein content for variety Mecenat, 1000 seeds weight, yield for Slovan, Salamanka in different soil-climatic zones of the average variance confirmed that the figures are significantly different from the others, and its dispersion at the top of the scale (*Fig. 6–8*).

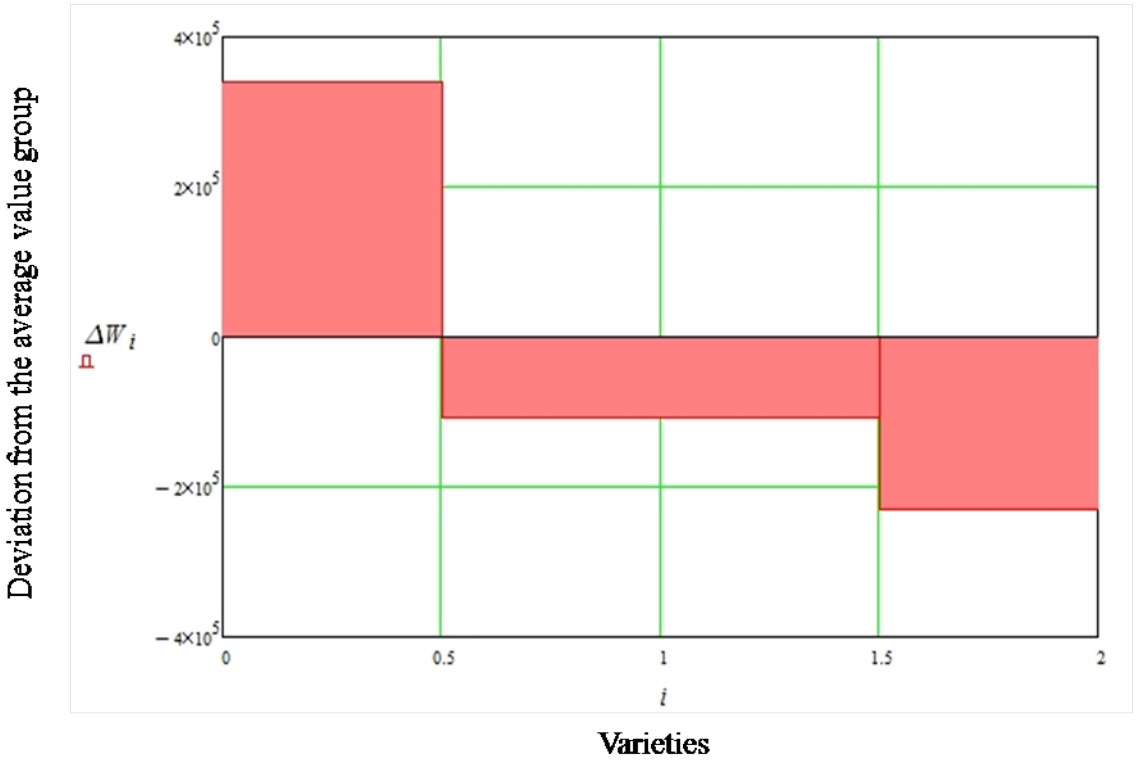


*Fig. 6.* **Deviation of signs of stability protein content of pea plants in the average value group**

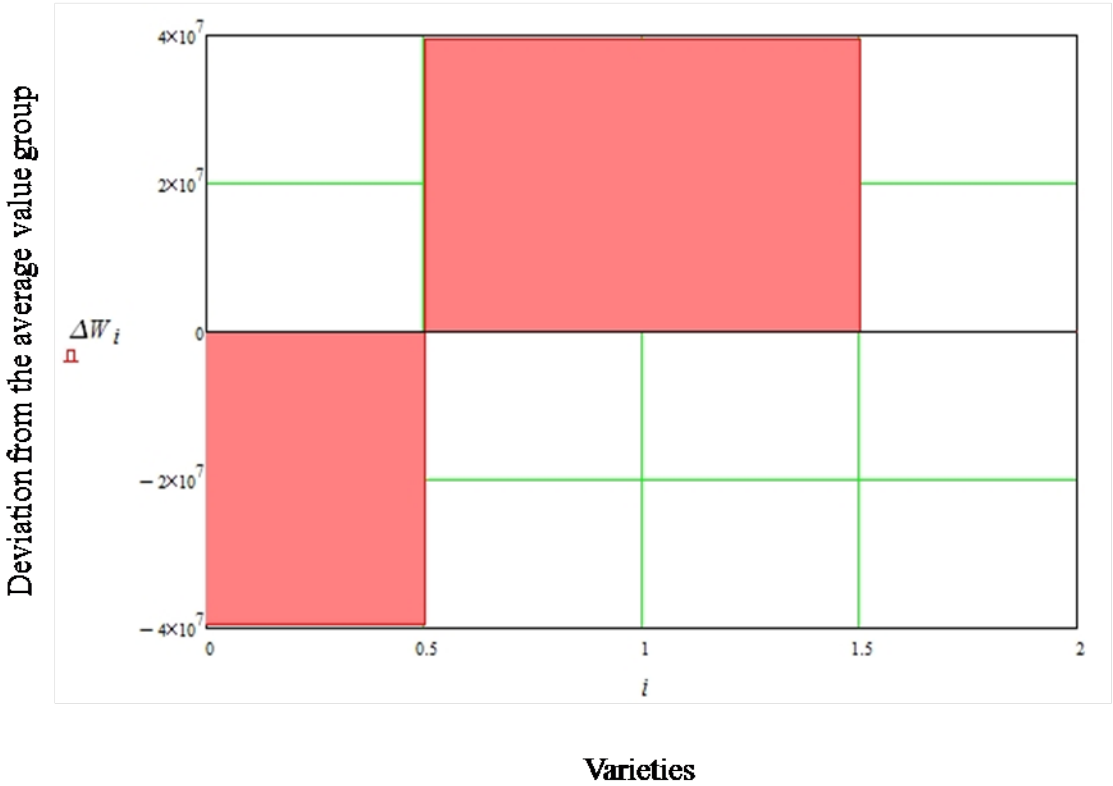


*Fig. 7.* **Deviation of signs of stability mass of 1000 seeds of pea plants in the average value group**

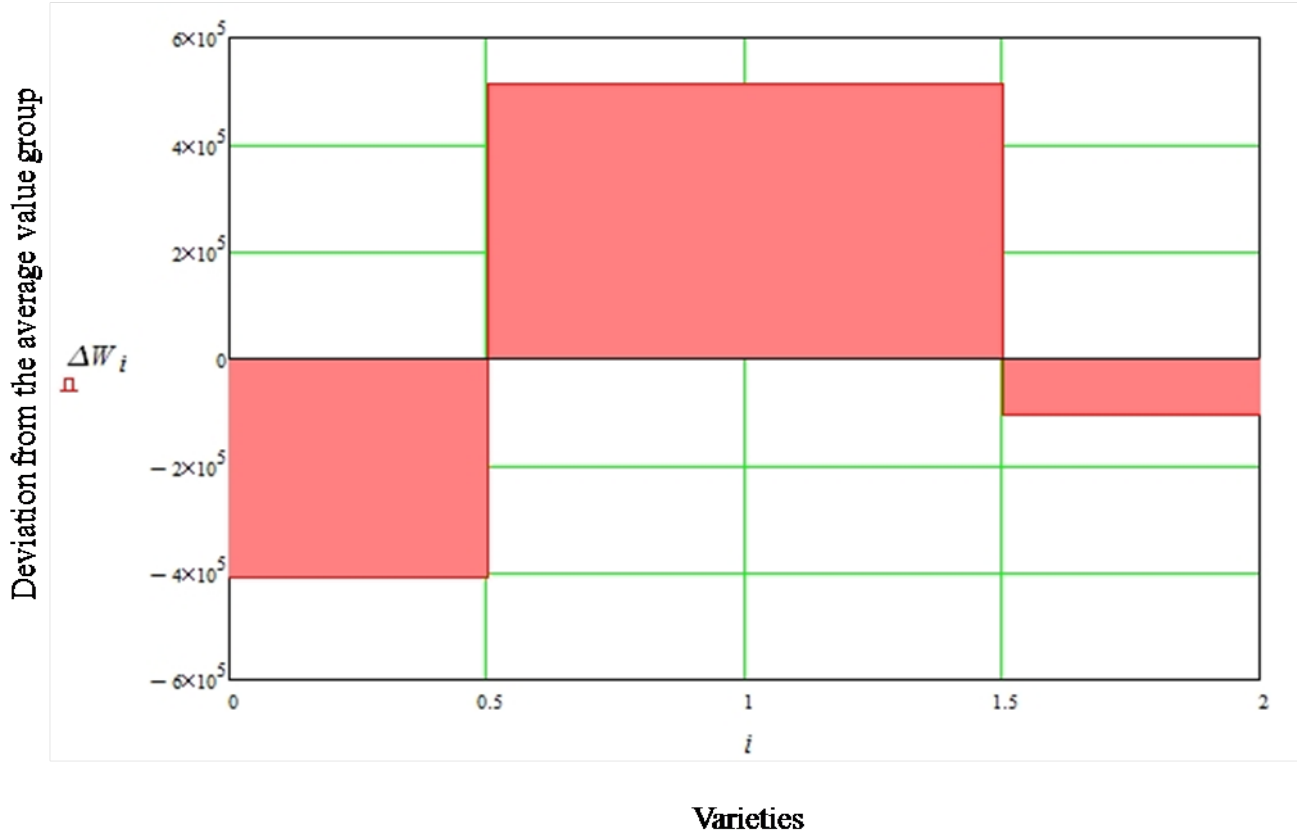


*Fig. 8.* **Deviation of stability characteristics of pea plants in the average value group**

Based on the analysis of stability and plasticity of investigated varieties of peas can make recommendations on the use of high intensity grades in different soil-climatic zones of Ukraine, particularly yield and weight of 1000 seeds: Mecenat and Salamanka protein: Slovan.

According to the research it was found that varieties of Mecenat belongs to intensive type, which positively responds to the changing of technology of growing and is forming a grain with more protein in it.

**Conclusions.** According to results of research high plasticity varieties of peas were investigated that can successfully adapt to limiting life support factors and stressful events in different soil and climatic zones.

High plasticity varieties: Mecenat and Salamanka are advised for using due to sings of yield and weight of 1000 seeds, protein content – Slovan in different soil and climatic zones.

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***Анотація***

***Присяжнюк О.І., Король Л.В.***

***Оцінка адаптивних особливостей нових сортів гороху***

*Наведено результати аналізу сортів гороху (Pisum sativum L.) вітчизняної та іноземної селекції за вмістом білку, масою 1000 насінин та врожайністю. Досліджено закономірності зміни цих показників залежно від умов навколишнього середовища. Виділено сорти з високими показниками адаптивності перспективні для селекційного та практичного використання.*

***Ключові слова****: горох, сорт, стабільність, пластичність, адаптивність.*

***Аннотация***

***Присяжнюк О.И., Король Л.В.***

***Оценка адаптивных особенностей новых сортов гороха***

*Приведены результаты анализа сортов гороха (Pisum sativum L.) отечественной и зарубежной селекции по содержанию белка, массы 1000 семян и урожайности. Исследованы закономерности изменения этих показателей в зависимости от условий окружающей среды. Выделены сорта с высокими показателями адаптивности – перспективные для селекционного и практического использования.*

***Ключевые слова:*** *горох, сорт, стабильность, пластичность, адаптивность.*