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CORRELATION OF YIELD AND YIELD COMPONENTS FOR AFILA AND NORMAL LEAVE PEA (*PISSUM SATIVUM* L.)

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In order to research the correlation of yield and yield components of Afila and normal leaf Pea, we conducted a three years research (1993 – 1995). We have researched a correlative junction of yield and yield components (number of pods, number of grains per pod, number of grains per plant and the absolute grain weight) of 8 Afila lines and 4 parent varieties. The results showed that the yield and yield components are highly related r – 0.82 – 0.95, while the absolute weight is not related to the yield r – 0, 19 and due to that it does not represent the yield component. The determined correlative values for all researched genotypes and parents were the same as previously researched by other authors, which leads us to the conclusion that the absence of leaves does not directly impact the change of correlative values.

Key words: pea, yield, afila

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INTRODUCTION

SOLOVEJEVA (1958) was the first scientist to describe the expression of *af af* gene as a spontaneous mutation from the variety Svoboda (GOLDENBERG, 1965). HANGILJDIN (1969), MAKASHEVA (1973; 1975) and BLIXT (1972) found that absence of leaves in pea is controlled by one pair of recessive gene. BLIXT (1972) located the *af* gene on the first chromosome and SNOAD (from 1980 – 1983) was the first to apply it commercially (COUSIN *et al*., 1986).

The *af* gene is recessive and leads to a phenotype expression only in homozygote recessive *af af* combination. It is expressed in transformation of pea leaves into vines, so the pea leaf does not have leaflets but only stipules and vines. This increases the resistance to lodging and decreases the total transpiration surface. The aim of this research was to determinate weather *af* gene effect the change of correlative values in afila plants for yield and yield components. Plants with *af* gene were compared to plants with normal leaves, having in mind that *af* gene causes the decrease of total leaf weight.

MATERIAL AND METHODS

In this research, we used homozygote afila lines of leafless pea, originating from various hybrid combinations of early, middle early and late maturing. Father lines were standard varieties with normal leaves and mother for all researched genotypes was Filigreen variety (*af* gene bearer).

Filigreen – is an English variety. In our crossing combinations the Filigreen was mother for all genotypes and at the same time the donator of *af* gene (responsible for leaf absence). This is a dark green variety, with a short steam and medium early maturing. It grows up to 45 – 55 cm and stands upright. It belongs to *var. medullare*.

Maja – father. This is an early Serbian variety, selected in the Centre for Vegetable Crops in Smederevska Palanka, dense and with stabile yield. Pods are strait, large with stabile number of grains in different seasons. It belongs to *var. medullare* with wrinkled grains.

Oskar – father. This is one of the best Serbian varieties created by crossing Frila x Frizet hybrid population. It has medium steam (75-80 cm) it is very dense and resistant to lodging. It belongs to *var. medullare*. Absolute weight: 160 – 180g.

Pegado – father. This is one of the best late Holland varieties, very popular in Serbia. It has been selected in "Slouis Groot" firm. Pods are strait, large and truncated. It has seven to eight large grains in a pod. It belongs to *var. medullare.*

In crossing combination E Filigreen x G Maja, FM – 2, FM – 5 and FM – 7 have been chosen for researching afila genotypes.

FM – 2 – early afila variety belonging to *var. medullare* is suitable for yield 64 days from germination. Plant is medium dense, 58 cm high. In the open filed during the technological maturity it is 48 cm high. Resistance to lodging is

79%. Pod is medium large with approximately 8 grains. Absolute weight of seed is approximately 270 g and it yields around 8000 kg/ha.

FM – 5 – is the earliest afila created by crossing Filigreen and Maja. It is suitable for yield 59 days from germination. Plant is dark green, 59 cm high and during the technological maturity 52 cm high with 84 % resistance to lodging. Pod is medium large, truncated, with approximately 8 grains. Absolute weight of seed is approximately 250 g and it yields 7- 8000 kg/ha. It belongs to *var. medullare*.

FM – 7 – medium early afila, created by crossing Filigreen x Maja. It is very resistant to lodging – 84%. Plant is dark green with large, truncated pods with nine grains. It is suitable for yield 66 days from germination and the average yield is 9000 kg/ha. The absolute weight is 270g.

In crossing combination ♀ Filigreen x ♂ Oskar, we selected three afila genotypes: FO-30, FO-34 and FO-42.

FO – 30 – medium late afila created from hybrid combination Filigreen x Oskar. It is one of the most productive and most lodging resistant afila (84.7%). Plant is dark green, dense, 78 cm high and during the technological maturity 66 cm high. It has long, sharp, slightly bended pod with 9 – 10 grains. It belongs to *var. medullare* with absolute seed weight 180g and average yield 10 000 kg/ha.

FO – 42 – medium late afila, created from hybrid combination Filigreen x Oskar. This is highly productive industrial variety with small, dark green grains. Plant is tough, 70 cm high and 57 cm high in the open field during the yield. Pods are small, slightly bended fulfilled with 7-8 grains. Grains are small, wrinkled and of 220 g absolute weight. It matures 75 days from germination and yields approximately 8-9000 kg/ha.

FO – 44 – highly productive industrial (afila), dark green variety. Plant is large, tough, 75 cm high, and in filed during the yield 57 cm high, and the lodging resistance index is 79%. It has medium large truncated pods. Grain is medium large, dark green, soft, delicious and sweet. There are 7 – 8 grains in a pod. It matures 79 days from germination and has 230 g of the absolute weight.

In E Filigreen x G Pegado two afila homozygote lines have been selected: FP – 80 and FP – 84.

FP – 80 – late variety (afila), created from hybrid combination %Filigreen x %Pegado. It matures 87 days from germination. Plant is light green, large, medium high (70cm) and during the technological maturity 50 cm high with lodging resistance 75%. Pod is strait, truncated, with 6 – 7 grains and the absolute weight of seed is 320 g.

FP – 84 – The latest known afila suitable for spring sowing and with the latest yield. It can be yield 92 days from germination. Plant is large, 75 cm high, dark green. Pod is strait, truncated, with 7 grains. Seed is medium large, wrinkled, absolute weight 340 g. Early grains are dark green, soft and delicious.

The experiment has been set up as three year research (1993 – 1995). Pea sowing in these years has been performed in the third decade of March. The germination for all three years lasted 15 – 20 days. The trial has been performed, applying the method of random block system in five replicas. The yield has been

measured on mature plants, so the factor of different maturity stadium has been eliminated. For 3 years of research, we analyzed 100 plants. The correlative relations are: yield and yield components (number of pods, number of grains per pod, number of grains per plant and the absolute grain weight). Data about the yield and the yield components have been proceeded statistically (HADŽIVUKOVIĆ, 1991) and the correlative coefficient according to CORREL program (Fig. 1).

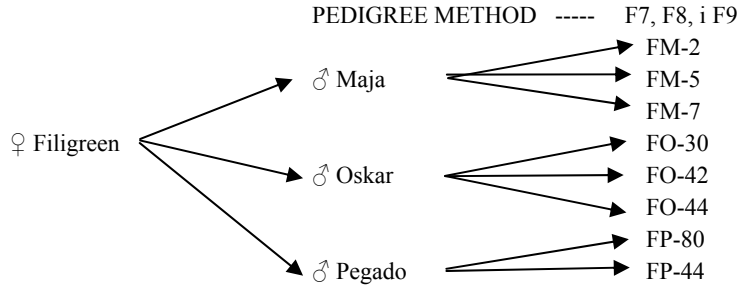

Fig. 1 – Scheme of the researched genotypes

r_{xy} = Cov(x,y) / σx σy, where
$-1 \leq r_{xy} \leq 1$ and
$Cov(x,y) = 1 / n\Sigma(x_i-\mu_x)(y_i-\mu_y)$

RESULTS

According to statistically proceeded data (HADŽIVUKOVIĆ, 1991) for yield and yield components (number of pods, number of grains per plant, number of grains per pod and the absolute grain weight) we found the correlation between the yield and the yield components and among the yield components (Table 1).

Table 1 - Correlation of yield – yield components for all the researched genotypes

Correlation	Yield	Pods	Grains/pod	Grains/plant	(AW)
Yield	1	0.932	0.958	0.823	0.187
Pods		1	0.889	0.907	-0.110
grains/pod			1	0.836	0.263
Grains/ plant				1	-0.143
(AW)					1

*AW – Absolute Weight

The results show that the number of pods per plant, number of grains per pod and number of grains per plant are highly correlated for all researched genotypes (afila and normal leaf) from $r = 0.187$ to $r = 0.95$. The absolute weight of grain is not in correlation with the yield $r = 0.187$, meaning that varieties with small grains have higher yield. RIBNIKOVA and RUDIKOVA (1985), and KLISHE (1988) had the same results regarding this subject.

The correlative coefficient for number of grains per plant (r = 0.823) and the number of pods per plant points to high causality among specific yield components which together impact the yield.

Correlation between the absolute weight and number of pods per plant (r = 0.110), and the absolute weight and number of grains per pod (r = 0.140) is negative, which means that the greater the number of grains in a pod, the smaller they are. Number of pods per plant correlated with absolute weight was positive but not significant (r = 0.260). Correlative coefficients for absolute grain weight show that this trait is not the yield component, which was also noted by MAKASHEVA (1973), POPOV (1989), and SIMAKOV *et al*. (1989).

All the researched genotypes (both afila and with normal leaves) did not change the correlative values for yield and yield components. This clearly points that reduced leaf surface in afila genotypes does not effect the yield (COUSIN, 1986) (Fig. 2).

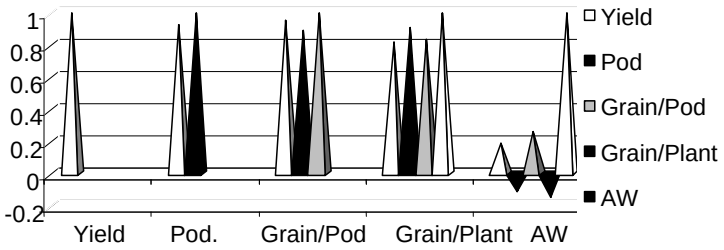

Fig. 2 - Correlation of yield, yield components and the absolute weight coefficients.

DISCUSSION

Researching four genotypes with normal leaves and eight afila genotypes we concluded:

- The researched traits for yield and yield components have no statistically significant difference between afila and normal leaf type
- There is a high positive correlation between yield components (number of pods, number of grains per pod and number of grains per plant).
- There is no correlation for absolute weight and yield and absolute weight and yield components.

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KORELACIJA PRINOSA I KOMPONENTI PRINOSA GRAŠKA (*PISUM SATIVUM* L.) AFILA I NORMALNOG TIPA LISTA

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I z v o d

U cilju utvrđivanja korelativnih vrednosti prinosa i komponenti prinosa graška Afila i normalnog tipa lista, urađena su trogodišnja ispitivanja (1993. – 1995.). Ispitana je korelativana povezanost kod 8 afila linija i 4 roditeljske sorte, na prinos i komponente prinosa (broj mahuna, broj zrna u mahuni, broj zrna po biljci i apsolutna masa zrna). Na osnovu dobijenih rezultata za korelacione koeficijente između prinosa i komponenti prinosa, utvrđena je visoko korelativna povezanost *r* – 0,82 – 0,95, dok apsolutna masa nije u korelativnoj povezanosti sa prinosom *r* – 0,19 i zbog svoje niske vrednosti, ne predstavlja komponentu prinosa. Utvrđene korelativne vrednosti za sve ispitivane genotipove i roditelje kretale su se u granicama prethodnih autora, što znači da bezlisnost ne utiče direktno na promenu korelativnih vrednosti.

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