YIELD STABILITY IN FABA BEANS (VICIA FABA) UNDER DIFFERENT GROWING CONDITIONS IN NORTHERN EUROPE

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Introduction

Family Leguminosae constitutes the third largest family of flowering plants, including more than 750 genera and 20 000 species. Despite large number of accessions in gene banks, there is still lack a information on its performance (Upadhyaya et al. 2011). The role of legumes concerning human diet, animals' nutrition, and farming system is increasingly important. To contribute to the sustainability of traditional European legume crops, it is required to identify underexplored cultivars and landraces with potential to be included in the breeding programs and/or in the current European farming scheme.

Figure 1. Faba bean field

Plants in different conditions are exposed to many factors that interfere with the photosyntetic process, leading to declines in growth, development and yield (Kalaji et al. 2016). Faba beans have been unfairly forgotten, because farmers need better varieties with better quality and yield and protein stability. Thus, in order to overcome this situation, it is required an extensive multi location evaluation (Upadhyaya et al. 2011).

Figure 2. 'Fuego' seeds

The field experiment to evaluated yield stability and protein yield in nine local genotypes and commercial varieties of broad beans (Vicia faba var. major): 'VF_001', 'VF_002' (landraces, Latvia), 'Aqua Dulce' (variety, Greece) and field beans (Vicia faba var. minor): Fuego', 'Gloria' (varieties, Sweden), 'Bauska' (landrace, Latvia), 'Lielplatone' (old variety, Latvia), 'Favel' (variety, Portugal), 'Jogeva' (variety, Estonia) was conducted in four Europe countries for two years: Latvia (Institute of Agricultural Resources and Economics, Priekuli research centre and Pūre Horticultural Research Centre), Norway (NIBIO - Norwegian Institute of Bioeconomy Research), Estonia (Estonian Crop Research Institute) and Sweden (Swedish Research institute).

In each site a randomized design was used to test each genotype in 4 replications in organic ar conventional conditions according to field trial layout. Each plot was 2 m^2 large.

The main objective was to evaluate yield stability for genotypes of different origin and bead in diiferent periods to gain a further insight in the adaptability of gathered genotypes

Statistical anlysis: Data was analyzed according to Finlay and Wilkinson (1963). Genotypes with a slope larger than 1 are adapted to favourable environments, but the genotypes with a slope close to 1 would be stable in yield and might have wide adaptation frekvency. Genotypes with relatively high average yield and a slope lower than 1 perform relatively well under unfavourable growing conditions. Eberhart and Russell (1966) proposed to evaluate the deviation from regression (s^2d) as an alternative parameter of stability

Genotype	Reggresion analysis					
	m_i	b	H_0: β_1=1; H1:	s^2_{dj}	R2	p-value
Fuego	3.70	1.54	b>1	0.16	0.96	0.001
Local genotype VF_001 (Džūkstes)	2.43	1.01	b=1	0.31	0.82	0.001
Local genotype VF_002 (Zaigas)	2.56	0.70	b=1	0.47	0.60	0.003
Bauska	3.91	1.38	b=1	0.44	0.86	0.001
Lielplatones	3.78	1.61	b>1	0.49	0.88	0.001
Favel	0.92	0.30	b<1	0.08	0.61	0.002
Jõgeva	2.82	1.00	b=1	0.36	0.80	0.00
Gloria	2.79	1.34	b>1	0.23	0.92	0.00
Aqua Dulce	1.02	0.10	b=1	1.14	0.01	0.71
Yij/v	2.66					

Figure 3. Regresion analysis for faba bean yield

After two year monitoring in field sites, the significat influence on yield (Figure 3) was indicated by both agro climatic conditions between years and genotype (p<0.001).

The highest yield for two years showed field bean landrace 'Bauska' and varieties 'Fuego', 'Gloria' (Sweden) and Latvian genotype 'Lielplatone'.
We observed possitive effect to different environmental conditions. 'Bauska' showed same results in diffrente environments, but other genotypes had better yiel and protein in environments with better soil systems (b>1).
The south genotypes yield in Norden regions was lover than average, in some years we even harvest.

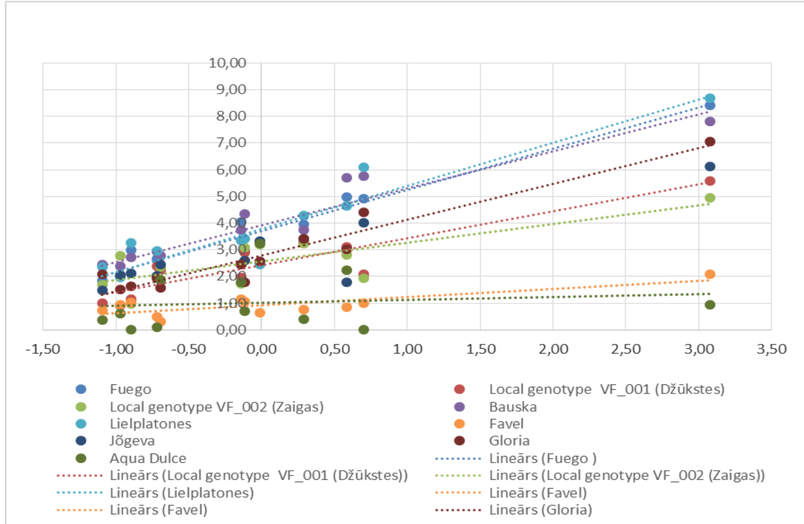

Figure 4. Yield stability in faba beans.

Conclusions

1. Yield stability was signifivcantly influenced by indicated by agro – climatic conditions between years and genotype.
2. The best results showed 'Bauska' 'Fuego', 'Gloria' nad 'Lielplatone'. The data obtained allow to select the most appropriate genotypes for further development of new cultivars as well as to obtain new food and feed products.

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Enhancing of legumes growing in Europe through sustainable cropping for protein supply for food and feed

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