

BIOCHEMICAL CHARACTERIZATION OF SOYBEAN GENOTYPES FOR GRAIN QUALITY IMPROVEMENT

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Introduction

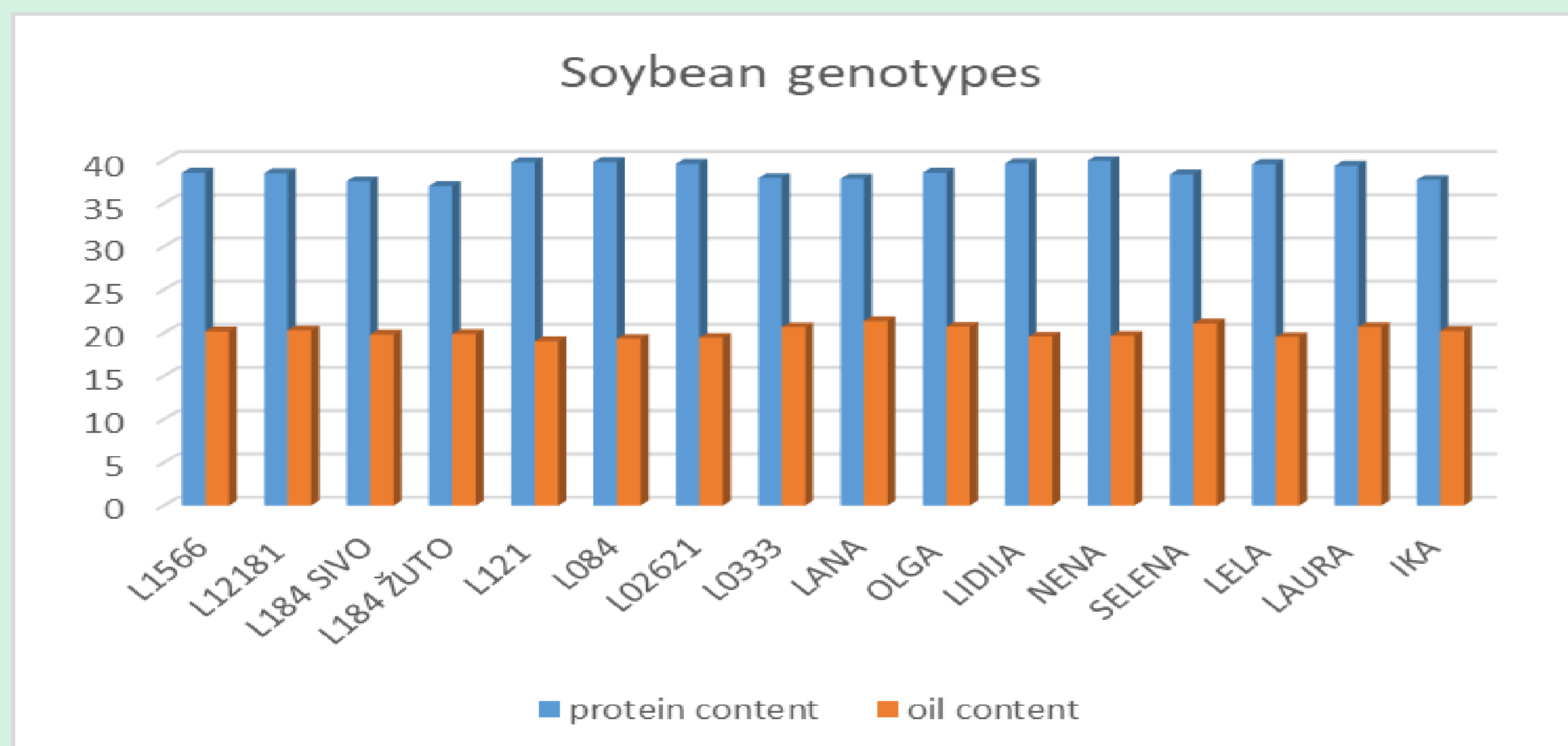
- Soybean is one of the most economically important grain crops. Seed protein and oil content are the two main seed quality traits in soybean. As the source of plant protein and vegetable oil, it is widely used as food and industrial crop. Quality of soybean oil is determined by fatty acid (FA) composition.
- Biochemical variation of different varieties significantly facilitates screening of kernel traits and grain quality attributes, thus leading to one of the most important breeding strategies - improvement of grain composition.

Materials and methods

- The main objective of this work was to evaluate whole kernel biochemical composition of eight commercial soybean varieties and eight lines from different breeding programs of Maize Research Institute „Zemun Polje“. The samples were harvested at the stage of full maturity. Phytochemical characterization was conducted for total protein according to Kjeldahl method and for oil content using Soxhlet extraction. Gas Chromatography/Flame Ionization Detector (GC-FID) was used for FA (e.g. palmitic, stearic, oleic, linoleic and linolenic acid) quantification and determination.

Results and discussion

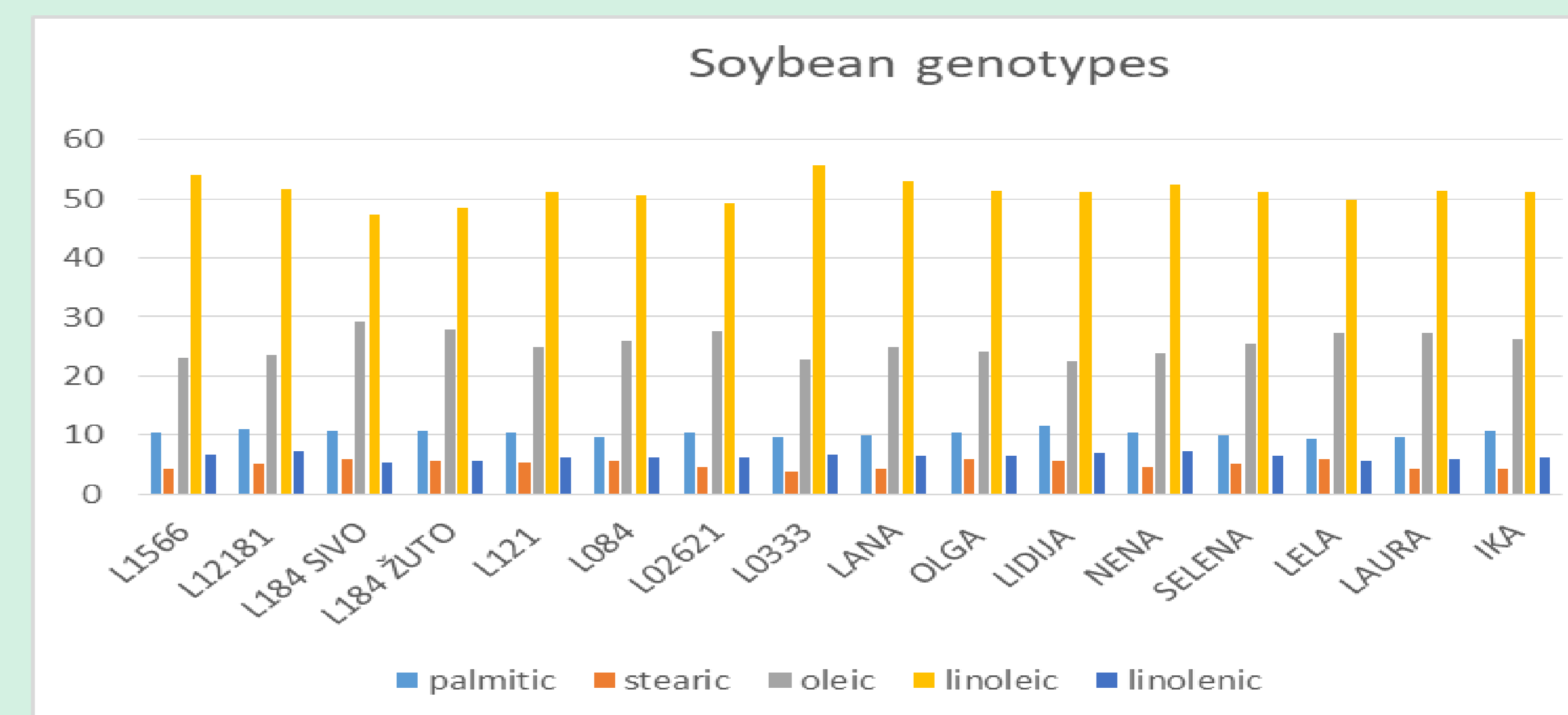
The results showed that protein contents across soybean genotypes ranged from 37.01 % to 39.91 % (Table 1). On the other hand, the lowest and the highest values for oil content were 19.00 % and 21.34 %, respectively. The most important were genotypes with medium protein-high oil and high protein-medium oil ratio, which includes all analysed genotypes. Those varieties are identified as a valuable source of breeding material for improvement of seed quality. The most abundant FA was linoleic acid with a range from 47.45 to 55.7 g/100g, followed by oleic acid with detected range from 22.59 to 29.07 g/100g of total FA content. Palmitic, linolenic and stearic FA showed a significantly lower level varied from 9.57 to 11.51 g/100g, 5.42 to 7.18 g/100g and 3.73 to 5.86 g/100g, respectively. Increased level of oleic acid in soybean seed (>23 g/100g) is significant for oxidative stability of oil. Also, genotypes with higher level of stearic acid (>4 g/100g) resulting in higher melting temperatures, which are preferred for human nutrition. Oppositely, reduced level of palmitic acid (<12 g/100g) is goal in improvement of grain composition, decreasing risk of cardiovascular diseases. All analysed genotypes had reduced level of linolenic acid (<8 g/100g) which is important for oxidative stability and reduced hydrogenation.



Proteins and oli content in analyzed soybean genotypes

Table 1. Phytochemical components

Soybean genotypes	Protein (%)	Oil (%)	Palmitic g/100g	Stearic g/100g	Oleic g/100g	Linoleic g/100g	Linolenic g/100g
L1566	38.53	20.14	10.63	4.39	23.06	53.95	6.86
L12181	38.48	20.26	10.98	5.04	23.57	51.49	7.24
L184 SIVO	37.55	19.79	10.69	5.9	29.07	47.45	5.42
L184 ŽUTO	37.01	19.84	10.72	5.75	27.99	48.45	5.59
L121	39.75	19	10.62	5.43	24.82	51.19	6.34
L084	39.78	19.29	9.81	5.66	26.12	50.54	6.13
L02621	39.56	19.41	10.55	4.77	27.64	49.29	6.35
L0333	37.92	20.63	9.79	3.73	22.7	55.7	6.83
LANA	37.86	21.34	9.86	4.29	24.84	53.08	6.62
OLGA	38.53	20.69	10.47	5.86	24.19	51.45	6.53
LIDIJA	39.63	19.54	11.51	5.7	22.59	51.16	7.16
NENA	39.91	19.63	10.45	4.76	23.88	52.42	7.18
SELENA	38.35	21.06	9.99	5.25	25.54	51.11	6.38
LELA	39.54	19.49	9.57	5.85	27.41	49.79	5.62
LAURA	39.35	20.65	9.62	4.27	27.44	51.32	5.98
IKA	37.71	20.19	10.69	4.48	26.39	51.02	6.13



Fatty acid content in analyzed soybean genotypes

Conclusions

- This study determined genotypes with a valuable protein-oil ratio.
- Soybean genotypes revealed a wide range of variation in fatty acid content. Ideal type of fatty acid profile of soybean seed are genotypes with lower palmitic and linolenic content and higher stearic and oleic acid content.
- This variability observed in kernel quality among soybean genotypes can provide valuable information for future breeding.