

ZACHODNIOPOMORSKI UNIWERSYTET TECHNOLOGICZNY W SZCZECINIE

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**Skład chemiczny i wartość odżywcza białka różnych form owsa,
ze szczególnym uwzględnieniem form krótkosłomych
z wprowadzonym genem karłowatości *Dw6***

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Chemical composition and nutritious value of protein from various oat forms, with a particular consideration given to short-shoot forms with the *Dw6* dwarfness gen introduced

Summary

Nutritive value of different forms of oat was determined with a particular consideration of the short-line strains where the *Dw6* dwarf gene was introduced. Chemical composition of grain from two standard cultivars with the traditional shoot length (the naked 'Polar' and the hulled 'Krezus'), four traditional hulled cultivars and 21 strains with the *Dw6* dwarf gene from 'Bandicoot' cultivar (nine short-line strains of naked-grain oat and 12 short-line strains of hulled oat) from four subsequent harvest years was performed. The selected strains with the *Dw6* dwarf gene (STH 7205 – naked, short-line, and STH 6106 – hulled, short-line) and, for comparison, standard cultivars (the naked 'Polar' and the hulled 'Krezus') were subject to biologic tests, where the nutritious value of the protein and concentration of lipid components in rat serum were determined.

Compared to the hulled oat grain, the naked oat grain contained more of the total protein (at $p \leq 0,01$), ether extract (at $p \leq 0,05$) and Phosphorus and β -glucans (at $p \leq 0,01$), while there was less (at $p \leq 0,01$) of the crude fiber and its fractions: cellulose, hemicellulose, NDF, ADF and ADL, as well as crude ash, including Calcium. In the naked grain oat, fat presented a more favorable composition – a lower content of unsaturated fat acids (at $p \leq 0,01$), whereas it contained a higher (at $p \leq 0,05$) concentration of unsaturated acids, including monosaturated ones, as well as neutral and hypocholesterolemic acids, when compared to the fat of the hulled oat. Compared to hulled oat, naked-grain oat protein contained more (at $p \leq 0,01$) exogenous amino acids (EAA), including lysine and Sulphuric amino acids, and presented a higher quality, defined with ratings calculated on the basis of its amino acidic composition (*CS*, *EAAI* and *PER*; $p \leq 0,01$ and $p \leq 0,05$).

Compared to the short-line oat, the oat cultivars with the traditional shoot length contained more (at $p \leq 0,05$) total protein, lignin (ADL) and hemicellulose, but less ($p \leq 0,05$) ether extract and nitrogen-free extract (NFE). The profile of fatty acids did not differentiate substantially the fat contained in grains of both forms. Compared to the traditional oat, the short-line oat protein contained more Sulphuric amino acids (at $p \leq 0,01$) and less (at $p \leq 0,05$) threonine and more of the endogenic amino acids. Coefficients calculated based on its amino acids composition did not differentiate substantially the nutritious value of the protein extracted from the above mentioned forms. The amino acid, which impaired the quality of the protein in all the oat forms concerned was lysine.

Introduction of the *Dw6* dwarf gene into both the naked-grain and hulled oat form increased (at $p \leq 0,01$) the grain content of the total protein, ether extract and Phosphorus, while reducing at the same time (at $p \leq 0,01$) the content of the crude fiber and its fractions: cellulose, NDF, ADF or ADL and Calcium, compared to the grains of the traditional, standard cultivars (the naked 'Polar' and the hulled 'Krezus').

Obtained in experimental studies on rats, values of the growth efficiency coefficient PER for oat grain fluctuated within the range 2,38–2,45 and had no significant effect the quality of protein in the standard cultivars concerned (the naked ‘Polar’ and the hulled ‘Krezus’) or in the strains (the naked and the hulled forms with dwarf gene). The biologic values of protein (BV) in grain of all the oat cultivars tested were similar and quite high (between 76 and 80). The evaluated oat forms presented different true digestibility (TD) of protein. The highest TD value (88%, at $p \leq 0,05$) was recorded for grain protein in the lineage of STH 7205 (naked, short-line), while the it was the lowest (83%, at $p \leq 0,05$) in protein extracted from the traditional hulled cultivar of ‘Krezus’. TD value of the protein from the traditional, naked cultivar of ‘Polar’ was higher (at $p \leq 0,05$) then the one taken from the traditional hulled cultivar of ‘Krezus’. TD of the protein from STH 7205 strain (naked with dwarf gene) was higher (at $p \leq 0,05$) then the one for STH 6106 strain (hulled with dwarf gene). Naked oat had a noticeably more positive influence on lipids management in the rat blood than the hulled oat (lower content of TCH, LDL, at $p \leq 0,05$ and TGC, while higher HDL, at $p \leq 0,05$).

The test results show higher nutritious value (chemical composition and nutritious value of the protein) of the naked oat than of the hulled oat. Grain of the oat forms with the *Dw6* dwarf gene, introduced from ‘Bandicoot’ cultivar, presented a more favorable chemical composition and a higher nutritious value of protein, especially, the true digestibility (TD), comparing to the standard cultivars of the hulled and naked forms.