EVALUATION OF DIFFERENT OAT VARIETIES TO IDENTIFY PROSPECTIVE BREEDING LINES FOR ORGANIC AGRICULTURE

Agroresursu un ekonomikas institūts

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Different oat breeding lines prospective for organic agriculture showed significant variations in several quality traits. These traits such as grain size, test weight (TW), grain grades, groat percentage, groat yield and damaged groats are important for grain processors. In addition, the present study showed the possibility to develop improved oat varieties that possesses requirements to obtain qualitative organic oat products.

BACKGROUND AND OBJECTIVES

- Oat (Avena sativa L.) is one of the most popular cereal grains among organic cereal farmers. These growers aim producing high-quality products of consistent quality that are most desired by commercial grain processing companies. However, one of the main challenges for organic oat producers is that organically produced grains have to fulfil the same grain quality requirements like those of conventional origin.
- Evaluation and breeding of oat varieties for organic agriculture started in Latvia in 2009. Today organic oat breeding trials are underway as part of several ongoing projects. In the last years, effort has been made in assessment of traits important for grain processing. This has been carried out in collaboration among several grain processing companies such as Dobeles Dzirnavnieks Ltd, 'Rigas Dzirnavnieks Ltd, organic farm 'Kanepites' - the main stakeholders in Latvia involved in the production of organic oat products. The aim of the present study was to evaluate different oat varieties to identify prospective breeding lines for organic agriculture. The oat varieties were evaluated according to physical grain quality traits, particularly important for grain processing.

KEY RESULTS AND DISCUSSION

Table 1. Grain physical characteristics for oat genotypes grown under organic conditions, 2016, Stende RC, Latvia

Genotype	TGW,g	TW, g L^{-1}	Grains, 1.8-3.5 mm, %	Grains with two hulls,%	Hull content,%	Dehulling efficiency,%
34482	**39.6**a	521.0b	**97.0**a	2.0b	**24.8**bc	**83.1**ab
34495	**37.1**b	523.5b	**97.5**a	1.8b	26.8b	76.3c
34513	35.9c	522.0b	**96.9**a	1.9b	27.3a	81.9b
34525	35.4c	508.0c	95.0bc	7.4a	26.1b	74.3c
34541	35.4c	523.5b	94.9c	2.0b	27.6a	81.8b
32553	34.0d	**530.0**ab	**96.5**a	2.5b	**25.0**bc	79.7bc
Peppi	33.4ed	522.0b	93.1c	**0.1**c	**23.8**c	**88.3**a
Laima	32.4e	509.5c	95.5b	2.4b	27.1a	75.9c
LSD	*1.16*	*12.45*	*0.81*	*0.77*	*1.96*	*6.21*

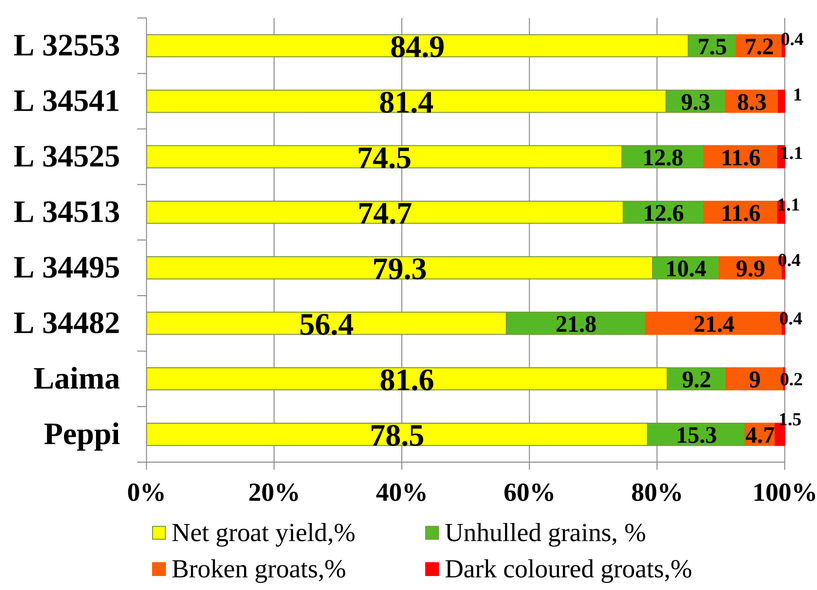

Fig.1 Proportion of groat yield fraction for oat genotypes after dehulling, 2016

Significant differences were observed among oat breeding lines according to all investigated traits. The proportion of grain size fractions between 1.8 and 3.5 mm sieve varied from 93-97% (Table 1). To ensure the quality of the total harvest and optimal outcome of grain processing fractions it is considered that 1000 grain weight (TGW) should be of 35-40 g. Results showed that there were possibilities to select oat lines that meet this criterion. All investigated oat genotypes formed test weigh (TW) higher than 480 g L-1 that is the national standard requirement for this trait in Latvia. Test weight is important for grain processing industry because of high correlation with the groat/grain size ratio as in accordance with the results of Doehlert et al. in 2006.

The oat groats of mature grain is covered by a hull. The kernels enclosed by two hulls are worthless for grain industry. This characteristic is environmentally as well as genetically determined (Decker et.al., 2014). In 2016 the grains with two hulls were found in all oat samples that could be the main reason of heightened hull proportion (>25%) for most genotypes. According to these both traits the best result was observed for the variety 'Peppi' that showed also the highest dehulling efficiency (88.3%). According to results under organic management conditions the best oat genotype is '32553' showing good grain quality characteristics required by food industry: test weight, dehulling efficiency, groat yield.

HOW WORK WAS CARRIED OUT?

- Six oat genotypes from Latvian oat breeding program with potential adaptability to organic farming were tested at the AREI Stende Research Centre in 2016:
  34482 (Dakot/Ivory), **34495** (Kirovec/Ivory), **34513** (STH-110/Katri//Abel),
  34525 (PI 53118/Stmara//Belinda/3Polonez), **34525** (PI53173/Skakun//Hecht/3Ivory), **32553** (Tomba/Fuch).
- Latvian oat variety '**Laima'** (occupies large areas in Latvia) and Finish oat variety '**Peppy'** were used as standards.
- Trials were established in the fields certified as organic.
- Oat harvest was cleaned on sieve 1.8x2.0 and subjected for grading.
- Grain physical traits 1000 kernel weight/TGW (g) was determined by ISTA method, test weight/TW (g L-1) by automatic grain analyzer Infratec Analysis 1241.
- Dehulling efficiency (%) was determined mechanically by small-scale grain dehuller (Heger, Germany) calculated as the ratio between the weight of dehulled kernels (both whole and damaged) and initial weight of the sample (25 g). (Grain moisture was 10 – 11 % before hulling).
- Groat yield, the proportion of damaged (dark coloured and broken) groats was determined as a percentage by weight of dehulled groats.
- Hull content (%) was determined by manual dehulling.
- All analyses were carried out in duplicates.

IMPORTANT REFERENCES

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