High-throughput SNP Genotyping of Oat Landraces Originated from Turkey

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Cultivated Oats (A. *sativa* and A. *byzantina*) are native to Turkey.

Located between 37° 53' N Latitudes and 36° 58' E Longitudes

**Precipitation** 600-700 mm (this year 350 mm)

**Elevation** 560 m in city center

**Climate** Mediterranean
Oat Materials

Turkish Origin landraces obtained from various gen banks;

- USDA-National Small Grains Collection 101
- BDIARI-Bahri Dağdaş International Agricultural Research Institute, Konya 28
- AARI- Aegean Agricultural Research Institute, İzmir 12
- IPK- Leibniz Institute of Plant Genetics and Crop Plant Research 33

A Total number of 174 landraces
Widely distributed across Turkey
## Current Oat Genomics Toolbox

<table>
<thead>
<tr>
<th>Marker</th>
<th>Loci (OT)</th>
<th>Throughput</th>
<th>Diversity</th>
<th>MAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFLP</td>
<td>343</td>
<td>Low</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>RAPD</td>
<td>22</td>
<td>Low</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>AFLP</td>
<td>40</td>
<td>High</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>STS</td>
<td>26</td>
<td>Medium</td>
<td>?</td>
<td>Yes</td>
</tr>
<tr>
<td>DArT</td>
<td>398</td>
<td>High</td>
<td>Yes</td>
<td>?</td>
</tr>
<tr>
<td>SSR</td>
<td>60 (*44 new)</td>
<td>Medium</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SNP</td>
<td>6073**</td>
<td>High</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Dumlupinar et al. 2016, Plant Breeding*

** 2014 Illumina, 4063 GbS (on selected OT RILs)
Development of A High Density Oat SNP Genotyping Platform

The 6K SNP Genotyping Platform developed by the work done by Tinker et al. 2014*

iSelect Oat 6K SNP Chip Development
SNP Sources: DArTs, cDNAs and GBS tags.
• Infinium genotyping assay – both SNP interrogation reactions and signal detection are carried out on slides.
• Bead types and Infinium I and II assays, 
  - Infinium I assays A/T, G/C, requires two bead types.
  - Infinium II assays G/A, C/T, G/T, C/A, requires one bead type.
• Oat 6K chip contains 5743 SNPs.

*Tinker et al. 2014, The Plant Genome
iSelect Oat 6K SNP Chip Content

- SNPs selected from OPA = 2018
- New SNPs added = 3725

• 768 SNPs (13%) failed at the manufacturing stage.

• A total of 4975 SNPs can be assayed.
Dendogram

4599 SNP markers were found polymorphic among the oat landraces.

A dendogram created with the data generated from 6K SNP Genotyping of 174 oat landraces.
Population Structure

Population structure analysis also detected four subpopulations based on allele frequency and indicated a similar grouping with diversity analysis.
Phenotyping

Plant Height,
Heading Date,
1000-Kernel Weight,
Protein Ratio,
Oil Content,
BYDV,
Crown Rust,
Stem Rust
Association Analysis

GWAS will be conducted with the 6K SNP data and the phenotypic data
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