



URS F FLETE - THE FIRST OAT CULTIVAR FOR FORAGE PRODUCTION IN SOUTHERN BRAZIL

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Abstract: The oat cultivar “URS F Flete” (*Avena sativa*) registration number 32980 from the Brazilian Ministry of Agriculture, Livestock and Food Supply (MAPA), was developed from the cross ‘LA 9339E17 x LAO-591-NZ 0553’ and is the first cultivar bred for the environmental conditions which predominate in southern Brazil. The cultivar has high forage production and good resistance to the main diseases that occur in the region.

Keywords: *Avena sativa*, forage yield, oat breeding program.

Introduction

There are several species within the genus *Avena*, but in Brazil only *A. sativa* (white oat) and *A. strigosa* (black oat) are usually grown. Black oat is traditionally used as a forage crop while white oat produces grain for the food industry. UFRGS has a strong breeding program and has released >30 cultivars, which account for the majority of white oats grown in Brazil. However, due to foliar and stem fungal diseases, more white oats are sown for animal forage, due to the release of dual-purpose cultivars. These cultivars can be grazed or conserved as hay or silage.

Avena sativa is an allohexaploid plant with genomes "A", "C" and "D" from ancestral diploid species (Latta et al., 2019). The hexaploid genome is challenging to sequence and the oat genome sequencing project initially focused on diploid species. Species within *Avena* can hybridize and genes introduced from other "A"

genome species. This has contributed many valuable traits, such as crown rust (*Puccinia coronata*) resistance (Maughan et al., 2019).

In Rio Grande do Sul, white oat is recommended for establishment from March to May for pasture, and from May to July, for grain production. It can be sown in mixtures with species including ryegrass, vetch, white clover, red clover, arrowleaf clover and subterranean clover (Fontaneli and Freire Junior, 1991) to create winter active pastures. The objective of this work is to present the pedigree, breeding method, and agronomic performance of the new released oat cultivar “URS F Flete”.

Pedigree and breeding method

The cultivar “URS F Flete” was obtained from the crossing carried out at the Experimental Station of the University of Florida of Quincy under the Quaker Oats International Nursery



Program (QOIN) in 1999. The immediate parents are LA 9339E17 x LAO-591-NZ 0553 and the genealogy of the two parental lines are LA 9339E17 = X414 / T91AB3256 and LAO-591-NZ0553 = ACMedallion / OT257. It was introduced in Brazil in May 2000 in the F₃ generation. Due to the procedures and quarantine requirements sowing was delayed until June 2001 at the UFRGS Experimental Agronomic Station. The selections were carried out from 2001 to 2009, using a pedigree modified breeding method described previously by Nava et al. (2016).

In 2001, the F₂ generation was sown in two rows 2.0 m long with the number Q00/242. In these rows, plants were selected based of the cycle, height and health, with five panicles being harvested. In the laboratory, the grains were evaluated and two panicles were discarded, with the remaining three panicles giving rise in 2002 to two double lines of 2.0 m long. From "line 1" four panicles were selected, which were sown in double lines of 2.0 m length in 2003, These gave rise to four double lines of 2.0 m length in the field in 2004 called 04Q26-1 to 4. In 2004, 10 panicles were selected in the field based on plant height, cycle and resistance to diseases from line 04Q26-2.

At each subsequent segregating generation, only whole panicles were selected in the field, and later threshed individually. The grains were screened in the laboratory for size, grain filling, uniformity and absence of diseases, such as black spots (*Phaeosphaeria avenariaf.sp. avenaria*) and fusarium (*Fusarium graminearum*) (Pacheco and Federizzi, 2020).

In the laboratory, four panicles were discarded and the remaining six were selected based on the quality of the grains. These were sown in 2005 under numbers 05Q03-1 to 6. In 2005,16 panicles were selected at the field from line 05Q03-4, based on plant height, cycle and disease resistance. After selection, 10 panicles remained, which in 2006 gave rise to the 06Q8004 family, with 10 strains, named 06Q8004-1 to 06Q8004-10. In the line 06Q8004-6, six panicles were selected and afterlaboratory analysis three panicles remained.

These panicles were sown in 2007 and were named 07Q9017-1 to 3. In line 07Q9017-2, five panicles were selected in the field based on cycle and disease resistance. After selection in the laboratory for grain quality, four panicles remained. These panicles were sown in double lines 2.0 m long and were called 08Q10011-1 to 4. In line 08Q10011-1, six panicles were selected. After laboratory testing, three panicles remained. These were sown in the field in 2009 and were called 09Q11004-1 to 3. These strains were phenotypically uniform and the line 09Q11004-1 was harvested in bulk giving rise to line 0911004-1.

From 2011 to 2013, line 09 11004-1 was tested for forage yield in three locations in Rio Grande do Sul/Brazil (Table 1), Coronel Barros/RS (lat. 28° 22' 59"S, long. 54° 04' 09" W, alt. 311 m a.s.l.), Bagé/RS (lat. 31° 21' 09"S, long. 54° 00' 57" W, alt. 230 m a.s.l.) and Eldorado do Sul/RS (lat. 30° 05' 26" S, long. 51° 40' 42" W, alt. 41 m a.s.l.).

Table 1. Characterization of the evaluation sites of the cultivar "URS F Flete".

City/State*	Altitude	Latitude	Sowing	Soil Type
Coronel Barros/RS	311	28°22'59"	April 2011	Haplortox
Coronel Barros/RS	311	28°22'59"	April 2012	
Bagé/RS	230	31°20'52"	May 2011	Alfisol
Bagé/RS	230	31°20'52"	May 2012	
Eldorado do Sul/RS	40	30°06'22"	May 2011	Ultisol
Eldorado do Sul/RS	40	30°06'22"	May 2012	

*Rio Grande do Sul (RS), Brazil.

Performance

"URS F Flete" is the first white oat cultivar for forage production, developed for the conditions of southern Brazil that. In addition to high forage yields, it also has good resistance to the

main foliar diseases that occur in the region, early forage production and also a reasonable seed yield. The oat cultivar "URS F Flete" is recommended for the three southern states of Brazil, climate classified as Cfb and Cfa (Köppen, 1948). Accumulated fresh matter yield (kg FW

t/ha) and dry matter production (kg DM/ha) of cultivar “URS F Flete” in three locations and for two years compared to two commercial cultivars is presented in Tables 2 and 3.

Table 2. Accumulated fresh matter yield (kg FW t/ha) of cultivar “URS F Flete” in three locations and for two years compared to two commercial cultivars.

Location	Year	URS F Flete	FAPA 43	IGUAÇÚ
Coronel Barros/RS	2011	85505	80514	80615
Coronel Barros/RS	2012	38100	37256	31955
Bagé/RS	2011	35566	36133	32733
Bagé/RS	2012	39674	36652	37744
Eldorado do Sul/RS	2011	49635	46124	46732
Eldorado do Sul/RS	2012	42751	29312	39312
Mean		48539	44332	44849

Table 3. Dry matter production (kg DM/ha) from cultivar “URS F Flete” in three locations and for two years compared to two commercial cultivars.

Local	Year	URS F Flete	FAPA 43	IGUAÇÚ
Coronel Barros/RS	2011	10434	10323	10290
Coronel Barros/RS	2012	6345	5790	5326
Bagé/RS	2011	5050	5021	4953
Bagé/RS	2012	5088	4410	5045
Eldorado do Sul/RS	2011	6469	5950	5461
Eldorado do Sul/RS	2012	5909	4973	5764
Mean		6549	6078	6140

Seed production

“URS F Flete” is recognized by the Brazilian Ministry of Agriculture, Livestock and Food Supply (MAPA) under registration number 32980 (09/12/2016) and the protection number 0170172 (01/23/2017). Genetic seeds stock is maintained by Universidade Federal do Rio Grande do Sul, Faculdade de Agronomia, Av. Bento Gonçalves 7712, CEP 90001-970, Porto Alegre, RS, Brazil. Certified seed are produced by the South-Brazilian Association for the Pro-

motion of Forage Research – SULPASTO and is available for sowing on commercial properties in the season 2020.

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