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Autor	FILIPE KALIKOSKI COELHO
Orientador	CARLA ANDREA DELATORRE

OAT'S GRAIN-FILLING STAGE: DESCRIPTION AND IMPACT ON YIELD

Filipe Kalikoski Coelho[1]; Carla Andréa Delatorre[2].

[(1)]Undergraduate student at the Agronomy School, Federal University of Rio Grande do Sul (UFRGS).
[(2)]Professor at the Department of Crop Science, Agronomy School, Federal University of Rio Grande do Sul (UFRGS).

Oat (*Avena sativa* L.) is a cereal whose harvested area has shown increases for the past few years in Brazil. This species plays a key role in crop rotations under the no-tillage system, due to the fact that it is able to replace wheat during the winter. Therefore, improving oat yield is of paramount importance for sustaining crop development in the southern regions of Brazil. However, contrarily to wheat, oat does not hold the same broadness of studies concerning some physiological processes that are decisive to grain productivity. Regarding those processes that are lacking in research, the grain-filling stage stands out as one of them, accounting for the last yield component: grain weight. This work aimed to evaluate the grain-filling stage and its relation to grain yield in seven oat genotypes. The experiment was conducted at the Agronomic Experimental Station of the Federal University of Rio Grande do Sul, in Eldorado do Sul/RS (30º 06'S; 51º 40'W). The treatments were arranged in a randomized block design with four repetitions. Four cultivars (URS Taura, URS F Flete, URS Corona and URS Altiva) and three lineages (UFRGS_146173_1, UFRGS_146155_3 and UFRGS_137117_2) were subject to evaluation. The parameters analyzed were: **a)** Grain-filling rate (GFR), expressing the milligrams of dry matter per day that were accumulated on average in the grains during the grain-filling stage; and **b)** Grain-filling duration (GFD), expressing the days from flowering to physiological maturity, which comprises the period of grain-filling. To obtain the parameters, panicles from the genotypes were periodically collected and weighed from anthesis until physiological maturity. Grain yield ($Mg.ha^{-1}$) was measured as well. GFR was calculated by dividing the maximum grain weight by the GFD, expressing an average of dry matter that was accumulated per day in the grains. GFD was determined by the time span (days) from anthesis until the grains reached maximum weight. In addition, a three-parameter sigmoidal regression model (sigmoid type) was used to describe the relation between days after flowering and average grain weight for primary and secondary grains. Following analysis of variance (ANOVA), genotypes were compared by Tukey's test (significance level of $p < 0.05$). Regarding the grain-filling sigmoid curve, in most cases the secondary grains' curve had somewhat similar shapes and trajectories to their primary counterparts when analyzing each genotype individually, except for the fact that secondary grains had lighter weights. Interestingly, for the trait GFD no significant differences between genotypes were observed, averaging 38.8 days (ranging from 37.7 to 40.2 days). However, the trait GFR accounted for significant differences between the genotypes, averaging 1.02 $mg.day^{-1}$ (ranging from 0.86 to 1.15 $mg.day^{-1}$). In general, lower GFRs were associated with lower yields (i.e. URS F Flete had lower GFR than four others and inferior yield to three genotypes) and higher GFRs were associated with higher yields (i.e URS Taura had higher GFR than two others and superior yield to three genotypes). Furthermore, it is worth noting that the genotypes have different cycle lengths, leading to the conclusion that longer cycles do not imply longer grain-filling stages. Finally, as variability is imperative for genetic gain, oat breeders could only achieve increases in grain weight from these cultivars by selecting for heavier grains as consequence of GFR rather than GFD, given that differences were only observed for GFR and not GFD.