STRATEGIC POSITIONING OF WHITE OAT GENOTYPES IN THE ORGANIC SYSTEM

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ABSTRACT - The objective of this work was to select, under the Bayesian perspective, white oat genotypes that have high phenotypic adaptability and stability for the organic system. The study was carried out in four different environments Itapúa in Paraguay and Palotina, Candói and Três Passos in Brazil, in the 2019 crop season. The experimental design used was randomized blocks, organized in a 4x7 factorial scheme, with four environments and seven white oat genotypes (URS Taura, URS Corona, URS Brava, URS Altiva, UFPA Ouro, IPR Artemis and IPR Afrodite) arranged in 4 repetitions per environment. The following characters were evaluated: final plant population, plant height, days until flowering, days until maturation, lodging and grain yield. The use of the Bayesian method provides greater accuracy in the selection of white oat genotypes with high phenotypic adaptability and stability. The genotypes URS Brava, IPR Aphrodite and UPFA Ouro are classified as highly adaptable to unfavorable environments. The genotypes IPR Artemis, URS Corona and URS Taura exhibited high adaptability to favorable environments. The URS Brava genotype is the ideal genotype and can be placed in any environments. The characters plant height and days from emergence to flowering can be used in indirect selection for grain productivity.
Keywords: *Avena sativa* L., Annicchiarico, GGE, AMMI, adaptability.

POSICIONAMENTO ESTRATÉGICO DE GENÓTIPOS DE AVEIA BRANCA NO SISTEMA ORGÂNICO

RESUMO - O objetivo deste trabalho foi selecionar, sob a perspectiva bayesiana, genótipos de aveia-branca que apresentem elevada adaptabilidade fenotípica e estabilidade para o sistema orgânico. O estudo foi realizado em quatro ambientes distintos Itapúa no Paraguai e Palotina, Candói e Três Passos no Brasil, na safra 2019. O delineamento experimental utilizado foi de blocos casualizados, organizados em esquema fatorial 4x7, com quatro ambientes e sete genótipos de aveia branca (URS Taura, URS Corona, URS Brava, URS Altiva, UFPA Ouro, IPR Artemis e IPR Afrodite) dispostos em 4 repetições por ambiente. Foram avaliados os seguintes caracteres: população final de planta, altura de planta, dias até o florescimento, dias até a maturação, acamamento e produtividade de grãos. O uso do método bayesiano proporciona maior acurácia na seleção de genótipos de aveia branca com elevada adaptabilidade e estabilidade fenotípicas. Os genótipos URS Brava, IPR Afrodite e UPFA Ouro são classificados como altamente adaptáveis a ambientes desfavoráveis. Os genótipos IPR Artemis, URS Corona e URS Taura apresentaram alta adaptabilidade a ambientes favoráveis. O genótipo URS Brava é o genótipo ideal e pode ser posicionado em qualquer ambiente. Os caracteres altura de planta e dias da emergência ao florescimento podem ser utilizados na seleção indireta para produtividade de grãos.
Palavras-chaves: *Avena sativa* L., Annicchiarico, GGE, AMMI, adaptabilidade.

INTRODUCTION

White oat (*Avena sativa* L.) is characterized as the winter cereal with the highest nutritional quality, considered multifunctional for its benefits to human health, animal nutrition and land cover (VETVICKA et al., 2019). Through its chemical composition, in which beta-glycan is found, a compound that promotes the reduction of cholesterol levels and the need for consumers to seek healthy foods, this culture is highly appreciated by society. This demand is evidenced by increasing trends in production areas, especially in Brazil, followed by the development of improvement programs that seek ideotypes for certain regions (CONAB, 2020).

White oats have been cultivated throughout the southern region of Brazil (CONAB, 2020), this promotes difficulties in recommending genotypes, since those adapted to a certain environmental condition may not show the same performance in another cultivation environment. This differential behavior of genotypes to different environments is evaluated through the genotypes x environments interaction (CARVALHO et al., 2016). This interaction promotes a wide variation in the expression characters of productivity, which is one of the greatest

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difficulties faced in positioning genotypes (CARVALHO et al., 2017).

Thus, for the positioning of genotypes, the study of the genotype x environment interaction is substantial, with recent studies with crops such as white oats (SCHNEIDER et al., 2021), eucalyptus (SANTOS et al., 2018), cassava (BESTER et al., 2021) being verified, soy (CARVALHO et al., 2016), wheat (SZARESKI et al., 2021) and corn (NARDINO et al., 2016) that provide information that allows the identification of genotypes with high stability and adaptability.

Currently, the most used methodologies are those of Eberhart and Russell (1966), which are based on linear regression, as well as multivariate techniques, which are explanatory models that are easy to understand and reveal clear answers about the differential effects of the environmental genotype interaction (CARVALHO et al., 2016) as Main Additive Effects and Analysis of Multiplicative Interactions (GAUCH; ZOBEL, 1996), Genotype (G) by Interaction of Environments (E) (YAN et al., 2000). Although there are a large number of methods available for evaluating the G x E interaction, the application of a priori information in parameter estimation is of low use. In this sense, Nascimento et al. (2011) developed a Bayesian study of the Eberhart and Russell (1966) method and concluded that for the classification of alfalfa genotypes, this type of approach is efficient.

This approach is based on initial, a priori information about random parameters in its development, whose distributions can be informative or non-informative (RAMOS MOLINA et al., 2012). Although Bayesian inference is a robust statistical methodology with several possible applications, its applicability to plant genetic improvement is still low.

In this context, the use of the Bayesian statistical procedure in biometric methods can promote better positioning of genotypes and ensure better responses to yield with high phenotypic stability and adaptability. The objective of this work was to select, under the Bayesian perspective, white oat genotypes that present high phenotypic adaptability and stability for the organic system.

MATERIAL AND METHODS

The study was carried out in four different environments in the 2019 crop season, located in Itapúa, Paraguay (26°47'20.60" S and 55°40'15.16" W, altitude of 200 m); Palotina, Paraná, Brazil (24°17'38.81" S and 53°48'03.77" W, altitude 338 m); Candói, Paraná, Brazil (25°27'55.58" S and 51°56'31.27" W, altitude of 962 m) and Três Passos, Rio Grande do Sul, Brazil (27°29'52.30" S and 53°54'00.34" W, altitude of 438 m). The experimental design used was randomized blocks, organized in a 4 x 7 factorial scheme, with four environments and seven white oat genotypes (URS Taura, URS Corona, URS Brava, URS Altiva, UFPA Ouro, IPR Artemis and IPR Afrodite) arranged in 4 repetitions per environment. The experimental units were composed of rows 5 m long and 3 m wide, spaced 0.17 m apart. Sowing was carried out with a density of 300 seeds per square meter, and the cultivation was carried out organically.

The harvest was carried out manually in the physiological maturation of the plants according to each genotype and at the time of harvest the following evaluations were carried out: final plant population (POP, units) estimated by measuring the number of plants in 2 m and 5 m; plant height (pH, cm) obtained by measuring with a ruler; days until flowering (DUF, days), obtained by observing the period until flowering; days until maturation (DM, days), obtained by observing the period until maturation; lodging (LOD, %), attributed through notes by visual observation; grain yield (GY, kg ha^{-1}), obtained by weighing the grains.

Bayesian inference was applied using the Markov chain Monte Carlo methods (MCMC) via Gibbs sampler, first a priori distributions of the phenotype value of each genotype in each growing environment were built using the mean and variance. The posterior distribution was obtained through 1000000 observations, where the new phenotypic parameters were obtained. The posterior distribution data obtained were subjected to analysis of variance at 5% probability where the assumptions, model additivity, normality of residues and homogeneity of variances were verified. Subsequently, the interaction between genotypes x environments was identified at 5% probability.

In the presence of significant G x E interaction, the AMMI method was used, which combines the variances of the additive effects of genotypes and environments with the multiplicative effects of the interaction (G x E), which later obtained scores were represented in biplot graphs using the multivariate methodology of the main components (GAUCH; ZOBEL, 1996). The AMMI model was performed based on the phenotypic inferences of grain yield. Adaptation and stability methods, GGE (YAN et al., 2000) and Annicchiarico (1992), were also applied by Bayesian inference. The analyzes were performed using the R softer version 3.5.6 (R CORE TEAM, 2020).

RESULTS AND DISCUSSION

Figure 1 shows the descriptive analysis of the characters studied in the genotypes in each environment. In environment A (Itapúa), the IPR Artemis genotype exhibits the largest population of plants in relation to the other genotypes. The URS Corona genotype, on the other hand, shows the smallest plant population close to 250 plants per m^2. In Palotina-PR, the genotype URS Taura has a higher population of plants (200 plants per m^2) than the other genotypes, however it was the environment that showed the lowest density of plants together with the environment Candói. In the latter it is possible to perceive the superiority of plants per square meter of the URS Brava genotype, and the inferiority of the UPFA Ouro and IPR Artemis genotypes. Through the interpretation of the analysis of environment in Três Passos the largest plant population is evident for the IPR Artemis genotype, while the smallest population is attributed to genotype URS Corona. It should be noted that in the different environments there were changes in the populations of final plants, as in view

environments Palotina and Candói inferred in the reduction in the population of all genotypes, so in environments Itapúa and Três Passos, the superiority of the analyzed variable is evident.

From the plant height analysis, Figure 2, it is possible to verify the superiority of the URS Taura and IPR Afrodite genotypes when compared to the others in environment Itapúa, in addition, the lower plant height is perceived for URS Brava, URS Altiva. URS Brava and UFPA Ouro are characterized by their high stature of plants in environment Palotina, while URS Taura with 75 cm in height presents itself as the one with the lowest stature in the environment.
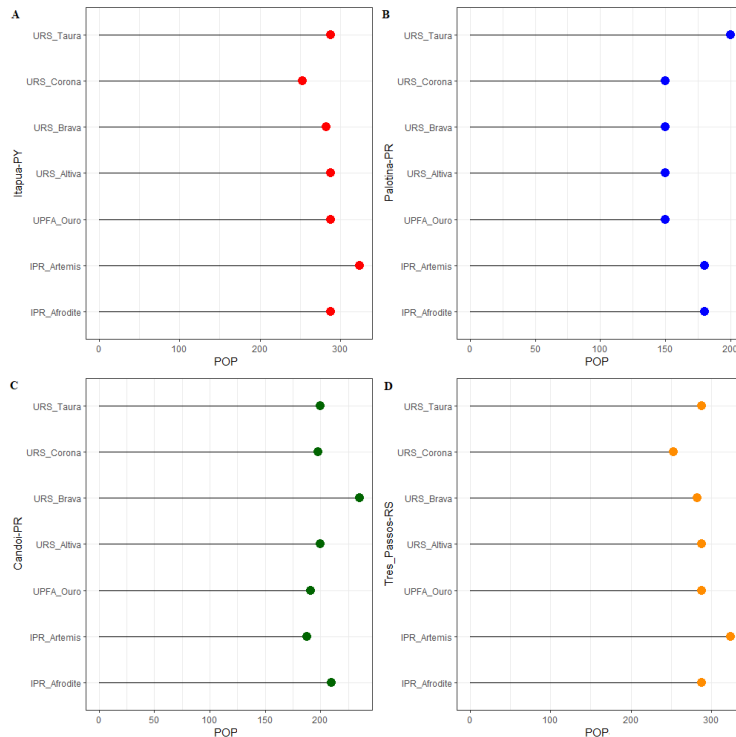

FIGURE 1 - Descriptive analysis of final plant population (POP) in different growing environments and white oat genotypes.
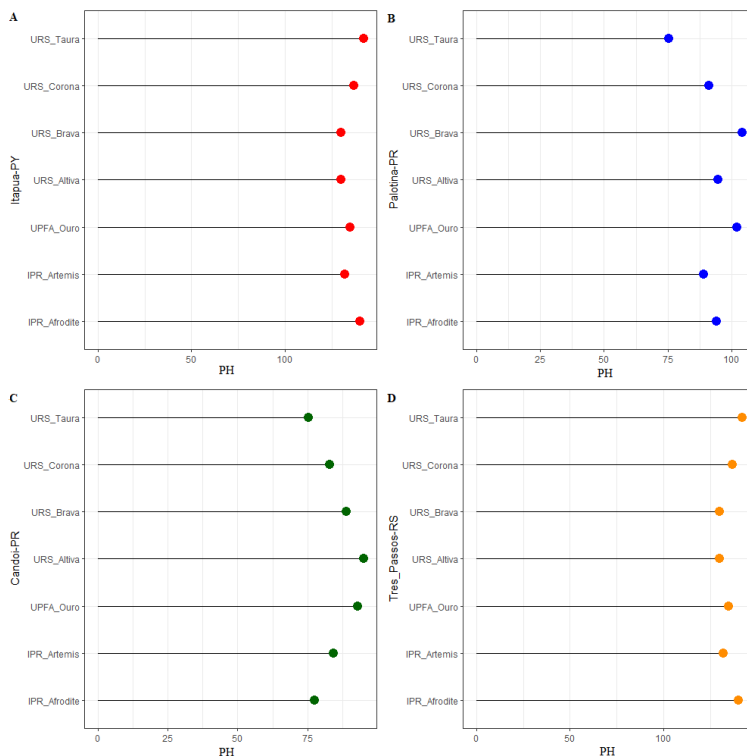

FIGURE 2 - Descriptive analysis of plant height (PH) in different growing environments and white oat genotypes.

It is observed the similarity in the longest period of the genotypes URS Taura, URS Brava, UFPA Ouro, IPR Afrodite from days to flowering (Figure 3) and opposite behavior in the genotypes URS Altiva and IPR Artemis characterizing them as more precocious genotypes than the others in environment Itapúa. In the same way as in environment Itapúa, the genotype URS Taura expresses the greatest number of days until flowering in environment Palotina, about 100 days, however the other genotypes show a period in days until less flowering, with URS Altiva being the genotype with the lowest length of the vegetative period, around 50 days. This change in the vegetative stage is due to high temperatures and a dry period during the entire cycle of growing of white oats.
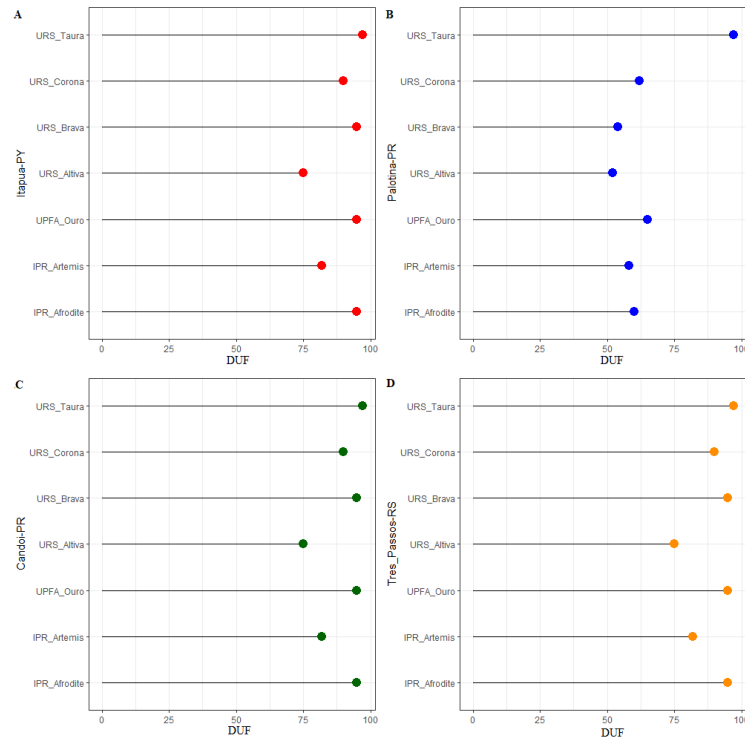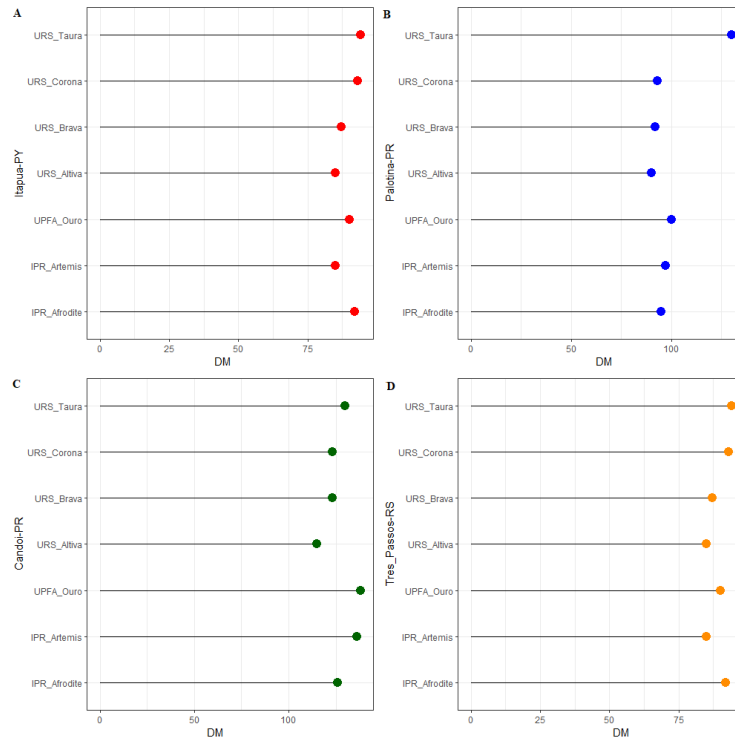

FIGURE 3 - Descriptive analysis of days until flowering (DUF) in different growing environments and white oat genotypes.

In environment Candói and Três Passos, the URS Taura, URS Brava, UPFA Ouro and IPR Afrodite genotypes have a longer vegetative period than the others, mainly opposed to genotype URS Altiva which exposed the least number of days until flowering. It is worth noting that, regardless of the growing environment, URS Taura did not change during the growing season. In the same way as in environments Itapúa, Candói and Três Passos, the genotypes did not change in the vegetative stage, as opposed to environment Palotina, which shows a reduction of days until the flowering of all genotypes, except URS Taura. In this sense, it is interesting to understand how these changes in the vegetative period are possible, as reported by Castro et al. (2012), the induction of flowering in oats is determined by temperature through the accumulation of degrees day. Degrees day, it consists of a way to evaluate the development of a plant, through the difference between the average daily temperature and the base temperature considered as a critical limit to development. It is noticed that regardless of climatic variations between environments, URS Taura exhibited a stable vegetative stage without external influence from the environment, which leads to the hypothesis that the genotype is less sensitive to the accumulation of degree days.

When analyzing the Itapúa and Três Passos environments, we can see the similarity between both, since they exhibit longer complete development cycles (Figure 4) in the URS Taura, URS Corona, UFPA Ouro and IPR Afrodite genotypes. In environment Palotina, the longest development period is perceived in the URS Taura with a cycle above 125 days, correlating with the duration of the vegetative stage, as it had a greater number of days until flowering than other genotypes. However, the other genotypes had cycles of less than 100 days. High altitude is characteristic of the Candói environment, this can be directly linked to changes in the genotype cycle, since they indicate the greatest increase in days necessary to reach physiological maturity with all genotypes expressing cycles greater than 110 days and UPFA Ouro, IPR Artemis and URS Taura above 125 days.

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FIGURE 4 - Descriptive analysis of days until maturation (DM) in different growing environments and white oat genotypes.

Regarding the lodging levels (Figure 5) of the genotypes in the different environments, it can be seen that the genotype URS Corona presented the highest levels in all environments, highlighting 100% lodging in the Candói environment. The genotype URS Brava showed lodging levels close to zero in all environments. The lodging relationship is related to the genotype, as it is clear that the URS Corona genotype does not exhibit the highest plant heights, though Sinniah et al. (2012), report that the plant's stature is one of the most important morphological characters in the plant's susceptibility/tolerance to lodging. Thus, this evidence can be explained due to the possible characteristic of having a smaller diameter and thickness of the stem, as it was the genotype that visually had the highest incidence of stem rust.

Superiority in grain yield of URS Corona (Figure 6), over the others is evident even with 25% lodging, reaching 2.500 kg ha^{-1} in environment Itapúa, followed by URS Brava with productivity above 2.000 kg ha^{-1}. However, URS Ouro exhibits the lowest grain yield, close to 1.275 kg ha^{-1}. In the environment Palotina, IPR Afrodite genotype with a result above 1.375 kg ha^{-1} stands out due to the higher grain yield, however in this environment, URS Corona, possibly due to the high lodging index (40%) showed productivity below 500 kg ha^{-1} consisting of the worst result in this environment. Likewise, URS Corona was responsible for lower productivity in environment Candói with grain yield below 500 kg ha^{-1} as a result of total lodging and IPR Afrodite again showed superior grain yield. However, when verifying environment Três Passos, it highlights the highest grain yield for URS Corona and the lowest for UPFA Gold, with yields close to 2.500 and 1.275 kg ha^{-1}, respectively. From the results presented, it is evident that URS Corona shows productive capacity even with 25% lodging. In environments Itapúa and Três Passos, it is possible to examine the highest grain yields for all genotypes studied.

The analysis of variance (Table 1) revealed a significant interaction between crop environments x white oat genotypes for grain yield at 5% probability, which indicates the presence of variability between genotypes and between the environments used, and also the occurrence of differential response of the genotypes to the environments, evidences the need to carry out stability analyzes. The main component (PC) was responsible for representing 98.6% of the general effects attributed to the G x E interaction, the magnitude of the effects according to Yokomizo et al. (2013), for the grain yield character is because it is expressed through a large number of genes, responsible for phenotypic expression and great effect of the production environment.

The approach to adaptability of genotypes to environments (AMMI) has an explanability of 100% of the differential effects of the G x E interaction (Figure 7 C and D). It is observed that the UPFA Ouro (6) genotype exhibits a higher performance in the environment Palotina (Env 2). Likewise, URS Corona genotype (5) shows greater potential in the Itapúa (Env 1) and Três Passos (Env 4) environments, in the same way that the Candói (Env 3) environment provides greater performance for genotypes Altiva URS (1) and IPR Afrodite (3).

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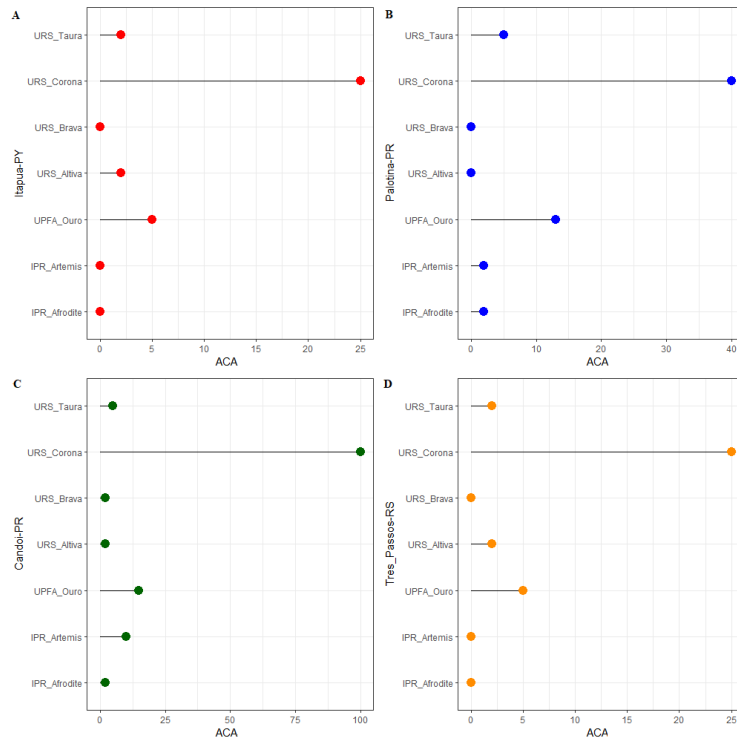
FIGURE 5 - Descriptive analysis of lodging (ACA) in different growing environments and white oat genotypes.
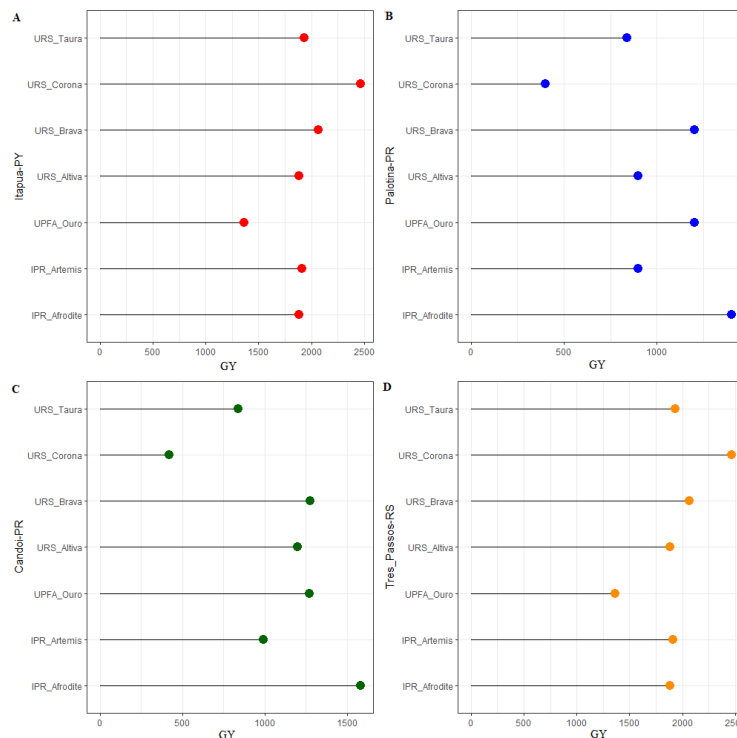
FIGURE 6 - Descriptive analysis of grain yield (GY) in different growing environments and white oat genotypes.

The mega-environment I made it possible to bring together the environments E2 (Palotina) and E3 (Candói), that is, they are similar enough to compose a high-performance mega-environment. In this situation, the genotypes URS Brava (2), IPR Afrodite (3) and UPFA Ouro (6) are positioned, with the second and third being distinguished as having high performance. Mega-environment II was composed of the E1 (Itapúa) and E4 (Três Passos) environments, both with low performance and brought together the genotypes IPR Artemis (4), URS Corona (5) and URS Taura (7), all of which are high performance with the exception of IPR Artemis (4). It took five genotypes to form the polygon that presupposes the indication of which genotypes show high productive

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performance, these being URS Corona (5), URS Taura (7), UPFA Ouro (6) and IPR Afrodite (3) and IPR Altiva (1), the

latter did not show any relationship with any of the mega-environments.

TABLE 1 - Analysis of variance (ANOVA) for grain yield of white oats, scores of adaptabilities and multivariate stability (AMMI), referring to seven genotypes of white oats in four environments in the states of Rio Grande do Sul, Paraná (Brazil) and Itapúa (Paraguay).

SV	DF	SQ	MS	F Value	PR(>F)	Percent	Accumulation
Env	3	79700000	26568806	235.82	0.0000	.	.
Rep (Env)	56	6310000	112668	1.28	0.0952	.	.
Gen	6	8310000	1384838	15.79	0.0000	.	.
Gen x Env	18	29500000	1639953	18.7	0.0000	.	.
Pc1	8	30300000	3792970	43.25	0.0000	98.6	98.6
Residues	322	29100000	87690	NA	NA	.	.
Total	415	153000000	368571	NA	NA	NA	NA

SV = Source variation, Env = Environments, Rep = Repetition, Gen = Genotype, Pc1 = Principal components, DF = Degree of Freedom, SQ = Sum of Square, MS = Mean of Square, F Value = F Calculated, PR = Probability, NA = no information.

Through the evaluation of the means of the genotypes (Figure 7A and 7B) in each environment it was possible to list the ideal genotype, characterized by the genotype URS Brava (2), since it proved to be of excellent stability and predictability for the grain yield variable. The genotypes URS Altiva (1) and IPR Artemis (4) were stable with high predictability, however with low expressiveness

to grain yield. The genotypes URS Corona (5) and IPR Afrodite (3) express phenotypic instability, however they present a higher performance when compared with the also unpredictable genotypes UPFA Ouro (6) and URS Taura (7). Likewise, all environments were considered unpredictable for the grain yield variable of white oats.
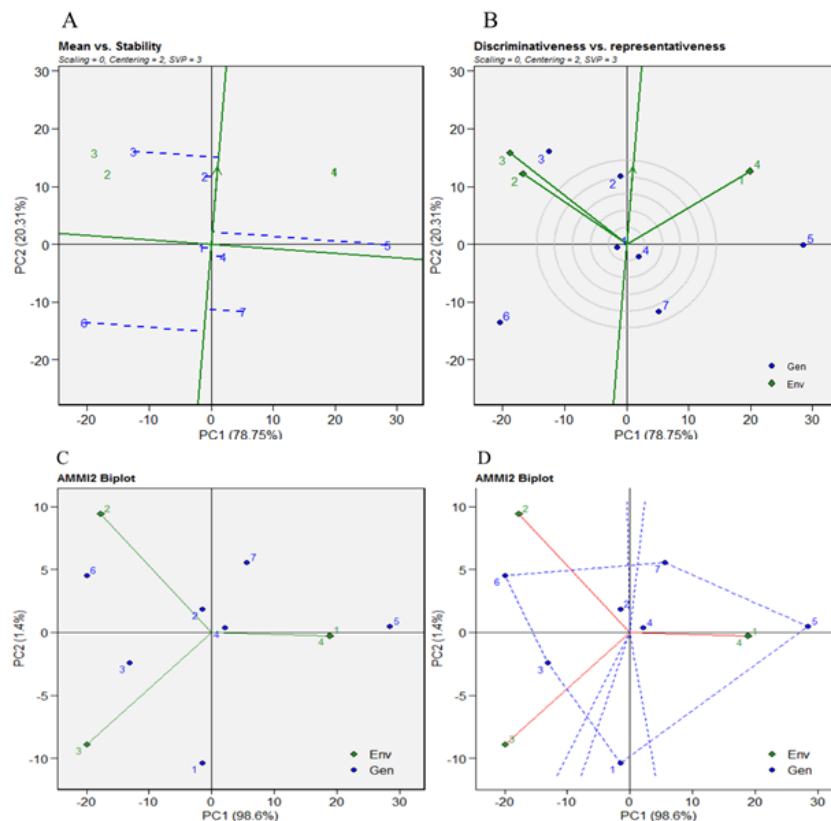
FIGURE 7 - A and B: GGE biplot indicating the ranking of the 7 oat genotypes (Gen), with their respective stability and for the discrimination and representativeness of the genotypes (Gen) and production environments referring to the grain yield variable. C and D: Plot of the scores of the main component EPCA I regarding the genotype x environment interaction obtained by the AMMI method for the grain yield of white oats, relative to seven genotypes (G) grown in four environments (E). Environments: Env 1 (Itapúa - PY), Env 2 (Palotina - PR), Env 3 (Candói - PR) and Env 4 (Três Passos - RS). White oat genotypes G1 (URS Altiva), G2 (URS Brava), G3 (IPR Afrodite), G4 (IPR Artemis), G5 (URS Corona), G6 (UPFA Ouro) and G7 (URS Taura).

In order to identify and distinguish genotypes in relation to the average effects of grain production environments, the differential effects of the interaction of grain yield, represented (PC I: 78.75% and PC II: 20.31 %) by 99.06%. Thus, there is a similarity in the behavior of grain yield between the genotypes URS Altiva (1) and IPR Artemis (4) located close to the source of the data. Similarity is also verified between the genotypes URS Brava (2) and URS Taura (7). The multivariate definitions show that URS Brava genotype (2) is indicated as the closest to the ideotype in the tested environments. Differing physiological performances were exposed through the genotypes IPR Afrodite (3), URS Corona (5), UPFA Ouro (6) and the environments Itapúa (1), Palotina (2), Candói (3) and Três Passos - RS (4), in which they showed high

changes for the analyzed variable and differ from the other variation factors.

The Table 2 shows that the Itapúa and Três Passos environments characterize the favorable development environments, however, the Palotina and Candói environments prove to be unfavorable environments. The measures of stability by the Annicchiarico method encompassing all the environments, express that URS Brava and IPR Afrodite exhibited a recommendation index above 100, that is, on average, they are the two to be indicated. The genotypes URS Corona, URS Brava and IPR Artemis presented a recommendation index above 100 for favorable environments, being, therefore, adapted to these environmental conditions.

TABLE 2 - Analysis of the environment and Grain yield adaptability and stability of white oat genotypes for all environments, favorable environments and unfavorable environments using the Annicchiarico method.

| Environmental class			
Environment	Mean	Environmental Index	Class
Itapúa – PY	1956.006	436.6837	Favorable
Palotina – PR	1026.382	-492.9399	Unfavorable
Candói – PR	1138.895	-380.4276	Unfavorable
Três Passos - RS	1956.006	436.6838	Favorable
All environments				
Genotype	GY (kg ha^{-1})	Standardization	Standardized Deviation	Ecovalence index	Ranking
URS Altiva	1500.165	99.3041	7.51346	94.23634	4
URS Brava	1674.014	112.1848	6.62652	107.71528	1
IPR Afrodite	1716.564	119.74845	25.44719	102.58459	2
IPR Artemis	1487.854	97.26905	3.89292	94.64331	3
URS Corona	1543.441	90.82784	43.97904	61.16443	7
UPFA Ouro	1312.867	93.46906	26.72848	75.44098	6
URS Taura	1365.868	87.1967	12.6114	78.69044	5
Favorable environments				
Genotype	GY (kg ha^{-1})	Standardization	Standardized Deviation	Ecovalence index	Ranking
URS Altiva	1914.978	97.90248	0.00000123	97.90248	4
URS Brava	2086.911	106.69249	0.00000181	106.69248	2
IPR Afrodite	1911.563	97.72785	0.00000051	97.72785	5
IPR Artemis	1968.468	100.6371	0.00000618	100.63709	3
URS Corona	2521.494	128.91036	0.00000486	128.91036	1
UPFA Ouro	1377.078	70.40254	0.00000132	70.40254	7
URS Taura	1911.549	97.72718	0.00009770	97.72717	6
Unfavorable environments				
Genotype	GY (kg ha^{-1})	Standardization	Standardized Deviation	Ecovalence index	Ranking
URS Altiva	1085.3509	100.70571	12.7082	92.13416	5
URS Brava	1261.1162	117.67711	3.3272	115.43295	2
IPR Afrodite	1521.5651	141.76906	1.7463	140.59117	1
IPR Artemis	1007.2393	93.901	0.2992	93.6992	4
URS Corona	565.3873	52.74532	1.1633	51.9607	7
UPFA Ouro	1248.6567	116.53558	3.8702	113.92519	3
URS Taura	820.1874	76.66622	5.7947	72.75775	6

GY = grain yield.

Therefore, when subjected to suitable conditions for development, these genotypes are responsive to improvements in the environment. It is worth mentioning

that URS Corona exhibited the highest average grain yield under these conditions. The genotypes IPR Afrodite, URS Brava and UPFA Ouro showed an index of recommendation

for unfavorable environments, therefore they are considered adapted, indicating that when in inadequate conditions of development these three genotypes should be indicated. Still, it is worth describing that URS Corona had the best result of grain yield in this environment.

Figure 8 shows the analysis related to Pearson's linear correlation. Through this analysis, it is possible to identify the correlations between the variables tested, so that the values of the correlation vary from: -1 (strong and negative correlation) to 1 (strong correlation) and 0 when there is no correlation. It is noticed that the days of emergence until the flowering of the oats are positively correlated with the grain yield, that is, genotypes that presented the longest vegetative period, exhibited better grain yields. Although precocity is an essential attribute for the introduction of oat genotypes in an expressive way in crop systems in properties in southern Brazil, in view of the succession of winter and soybean/corn crops. Negi et al. (2019), found a positive but not significant correlation between days of emergence until flowering with grain yield (r = 0.12).
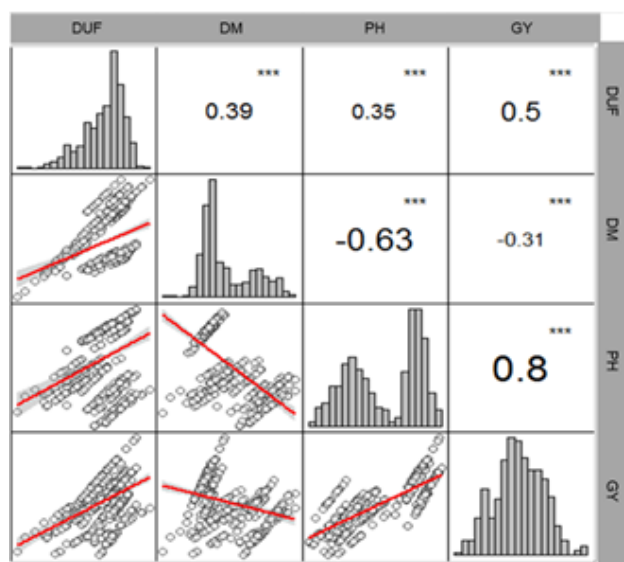
FIGURE 8 - Estimates of Pearson's linear correlation for characters evaluated in seven white oat genotypes in four different environments (Pearson's linear correlation coefficients (n = 10,000) significant at 5.00% probability of error. DUF: days until flowering; DM: days until maturation; PH: plant height; GY: grain yield).

Likewise, the days of emergence until flowering are positively correlated with the plant height, since the structure of the genotypes is defined in the vegetative stage. Corroborating this result, Bibi et al. (2012), states that days up to 50% flowering have a positive correlation (r = 0.28) with plant height and Tessema and Getinet (2020) who report a positive correlation of r = 0.57. Therefore, the authors and the present research confirm that the days until the flowering of white oats show tendencies to determine the plant height. Still, the days of emergence until flowering showed to be in an intermediate way positively correlated with the days of emergence until the maturation of oats due

to the sum of the two periods of development to measure the cycle until maturation, so if the DUF was probably extensive the DM will also be, unless the DM undergoes changes due to high temperatures, radiation and water deficit. Bibi et al. (2012), shows similar results for this correlation with r = 0.73.

The days of emergence until maturation correlates with grain yield in a negative way, that is, the longer the period of development of the genotype, late cycles, the lower the productivity will tend to be. This result may be due to the longer exposure of the genotype to diseases and weather conditions. In the same way, the days of emergence until the maturation of oats are correlated negatively with the plant height. This can be explained by the fact that height is related to nutritional, environmental conditions, management, population density and not to the days until maturation. Contradictory result was found by Bibi et al. (2012), who report an insignificant correlation (r = 0.075).

Plant height has a strong positive correlation with grain yield, in this sense, larger genotypes tend to have higher productivity than others of smaller statures. It can be explained by the high leaf mass and the consequent efficient interception of radiation, producing more photoassimilates to nourish the plant. Likewise, Hartwig et al. (2006), reported a positive correlation between these characters and explain that genotypes of high stature exhibit physiological superiority over their competitors. This situation is similar to Nirmalakumari et al. (2013), who showed a positive relationship between plant height and productivity, however it presented a low magnitude correlation (r = 13). Negi et al. (2019), also found a positive correlation, however without significance (r = 0.24).

CONCLUSIONS

The use of the Bayesian method provides greater accuracy in the selection of white oat genotypes with high phenotypic adaptability and stability.

The genotypes URS Brava, IPR Aphrodite and UPFA Ouro are classified as highly adaptable to unfavorable environments.

The genotypes IPR Artemis, URS Corona and URS Taura exhibited high adaptability to favorable environments.

The URS Brava genotype is the ideal genotype and can be placed in any environments.

The characters plant height and days from emergence to flowering can be used in indirect selection for grain productivity.

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