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WINTER WHEAT PERFORMANCE IN THE GREAT ISLAND OF BRĂILA DURING 2025–2026 IN RELATION TO IRRIGATION TIMING CULTIVAR AND SOWING DENSITY

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Abstract: *Winter wheat grain yield and quality were evaluated across eight irrigation regimes, four cultivars and two target sowing densities in the Great Island of Brăila during 2025–2026. Mean grain yield, corrected to 14% moisture, was 8,520 kg ha^{-1}. Autumn irrigation alone (A2) had the highest regime mean (9,726 kg ha^{-1}), 60.9% above the non-irrigated control. Miranda led for yield, whereas Pitar and Voinic led for different grain-quality traits. Increasing target sowing density from 300 to 500 germinable seeds m^{-2} increased mean yield by 5.9%. Results describe one site and season. Each treatment combination occupied one plot, with three harvest subsamples per plot.*

• Introduction

Irrigation timing and sowing density influence winter wheat productivity, while tillering capacity can modify the response to plant population. Grain quality also responds to water management in a genotype-dependent manner. This study aimed to describe yield and grain-quality patterns across irrigation regimes, cultivars and target sowing densities under the conditions of the Great Island of Brăila.

• Material and method

The ARDS Brăila trial comprised 64 combinations in an 8 × 4 × 2 arrangement. Cultivars were Abund, Miranda, Pitar and Voinic, at 300 or 500 germinable seeds m^{-2}. Each combination occupied a 4 × 18 m plot. Sowing took place on 1 October 2025 and harvest on 9–10 July 2026. Three 4.8 m^2 harvest subsamples per combination provided 192 yield and quality records. Yield was corrected to 14% moisture by conserving dry matter, then averaged within plots and across factor levels with equal weight.

A1 was non-irrigated. A2 denoted autumn establishment irrigation (200 m^3 ha^{-1}). A3 and A4 denoted nominal stem-elongation and grain-filling irrigation (400 m^3 ha^{-1} each, applied on 11 March and 19 May 2026). Combined regimes received 600–1,000 m^3 ha^{-1}. A2 was applied on 23 October or 6 November depending on regime. Growth-stage labels follow the field plan and lack treatment-specific BBCH verification.

• Results and discussions

Irrigation regimes. A2 averaged 9,726 kg ha^{-1}, compared with 6,046 kg ha^{-1} under A1. All irrigated categories exceeded the control. The A2A3A4 mean was 8,675 kg ha^{-1}, showing that greater irrigation input did not consistently correspond to greater yield. Application dates, field position and harvest heterogeneity limit interpretation of these contrasts.

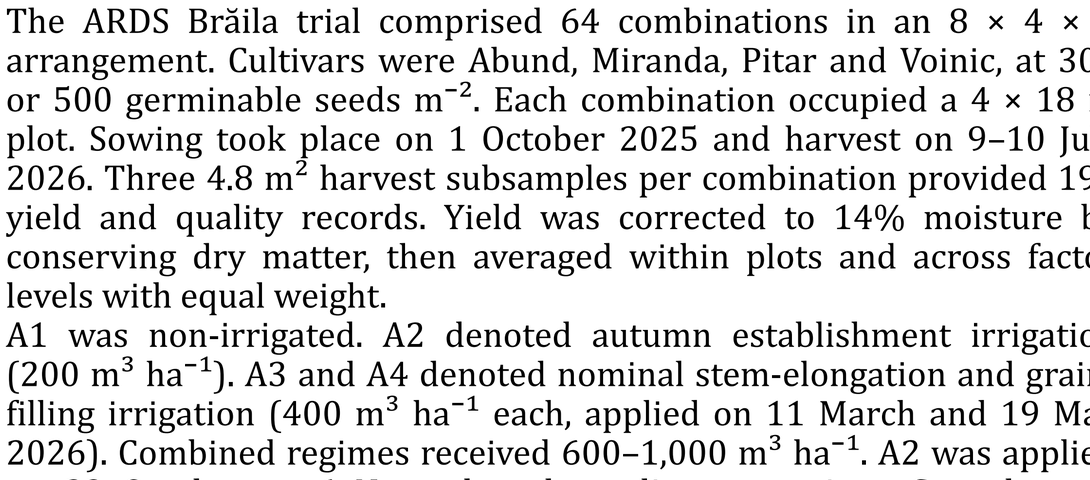


Figure 1. Mean grain yield by irrigation regime, averaged across four cultivars and two target densities. A1 = non-irrigated; A2 = autumn; A3 = nominal stem elongation; A4 = nominal grain filling.

Cultivar performance. Miranda had the highest mean yield, exceeding Abund by 528 kg ha^{-1} and Pitar by 824 kg ha^{-1}. Yield and grain-quality rankings differed.

Table 1. Cultivar means for yield and selected grain-quality traits.

Cultivar	Yield kg ha^{-1}	Protein %	Gluten %	Sed. ml	TW kg hl^{-1}	TGW g
Abund	8,505	13.61	28.79	49.93	78.51	44.77
Miranda	9,033	12.77	26.27	39.72	77.89	46.07
Pitar	8,209	13.95	29.55	49.60	79.36	47.74
Voinic	8,331	13.93	29.79	51.14	81.01	43.15

Pitar had the highest protein concentration and thousand-grain weight. Voinic led for gluten, sedimentation and test weight. Miranda had the lowest cultivar means for protein, gluten, sedimentation and test weight. These observations support considering quality alongside yield, without assigning commercial baking classes.

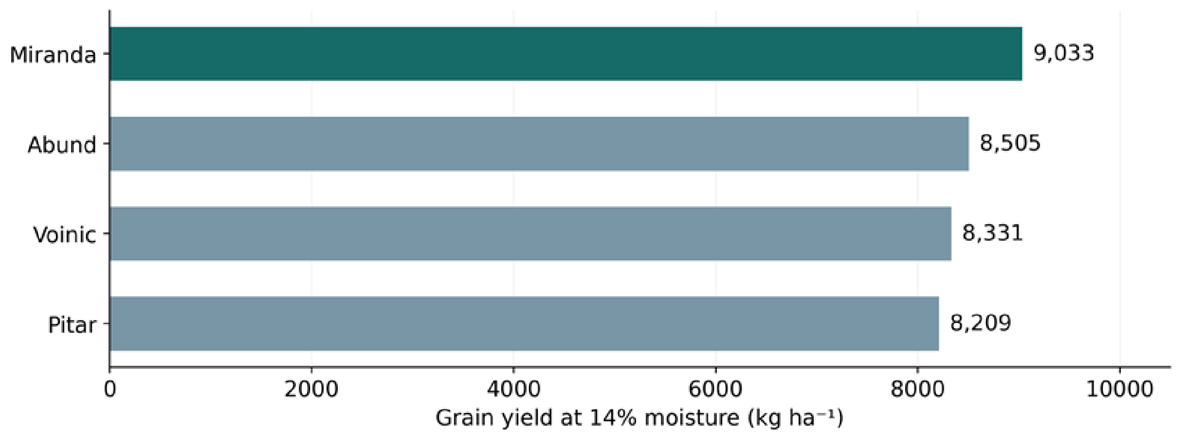


Figure 2. Cultivar mean grain yield at 14% moisture, averaged across eight irrigation regimes and two target sowing densities. Bars show descriptive means, without inferential error bars.

Table 2. Yield and thousand-grain weight at two target sowing densities.

Target density germinable seeds m^{-2}	Yield kg ha^{-1}	TGW g
300	8,274	46.00
500	8,765	44.86
Difference 500 – 300	+491	−1.14

Sowing density. The 500 seeds m^{-2} target increased mean yield by 5.9% and had a higher observed mean under every irrigation regime. Cultivar-level yield gains ranged from 184 kg ha^{-1} for Voinic to 711 kg ha^{-1} for Miranda. Target sowing densities do not establish final plant populations.

Highest combination mean. A2 × Miranda × 500 germinable seeds m^{-2} reached 10,556 kg ha^{-1}. Four of the five leading combinations included autumn irrigation alone. A2 × Abund × 300 seeds m^{-2} combined 10,001 kg ha^{-1} with 14.17% protein and 30.37% gluten.

• Conclusions

Autumn irrigation alone had the highest observed irrigation-regime mean. Miranda led for grain yield, Pitar for protein and thousand-grain weight, and Voinic for gluten, sedimentation and test weight. The higher target sowing density increased mean yield while reducing thousand-grain weight. These findings identify combinations for replicated evaluation across additional seasons.