



Effect of Sowing Density and Nitrogen Rate on Growth and Yield of Old Wheat Varieties in Organic Farming

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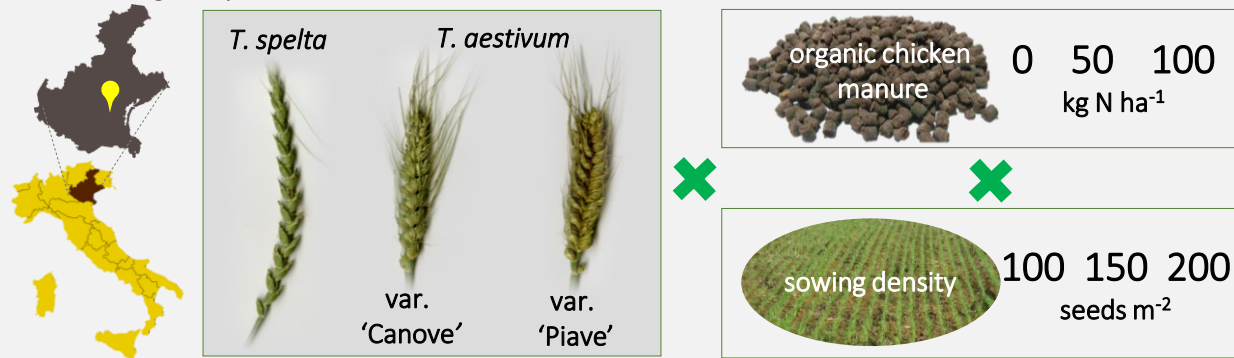
Introduction

This study reports preliminary results from the project REVAILOVGRA financed by the Rural Development Programme (PSR) of the Veneto Region and aimed at recovering old/ancient wheat varieties, by providing an agronomic protocol for their cultivation under organic farming. Particular reference was given to sowing density and fertilization. General objectives were: *i*) prevent lodging and *ii*) maximize yield and quality.



Materials and Methods

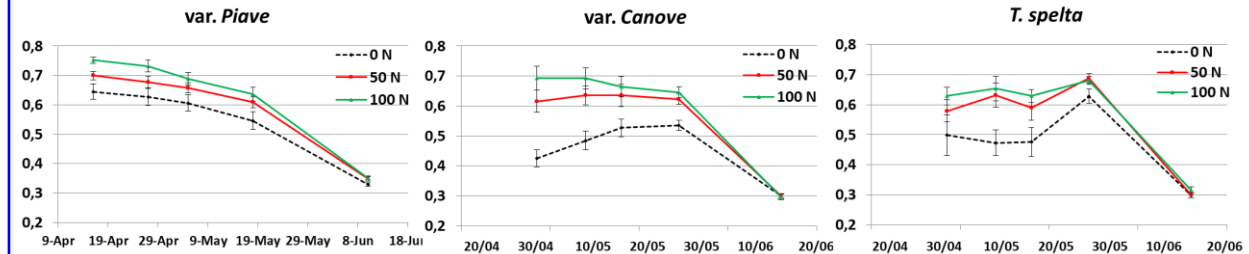
An open-field trial was carried out at the organic experimental farm of the University of Padova at Pozzoveggiani (Padova, NE Italy). Three varieties, three sowing densities and three topdressing nitrogen fertilization rates were combined in a completely randomized block design (n=3; 40-m² plot size). Sowing was performed on 28 October 2019, and harvest on 23 June 2020.



Results

Significant improvements of the vegetational index NDVI were detected in fertilized plots (50 and 100 kg N ha⁻¹) compared to unfertilized controls (0 kg N ha⁻¹) (Figure 1), due to greater growth and leaf greenness. There was a dose-dependent response in all the varieties.

Figure 1



Sowing density mainly affected grain yield, with better response at higher density (Table 1).

N fertilization significantly improved grain yield (Table 1).

A fertilization rate >50 kg N ha⁻¹ significantly increased plant height (Table 1).

Table 1

MAIN EFFECTS	Culm height (cm)	Yield (t ha ⁻¹)	GPC (%)	TKW (g)	Specific weight (kg hL ⁻¹)
Variety	< 0.001 ***	< 0.001 ***	< 0.001 ***	< 0.001 ***	< 0.001 ***
<i>var. Piave</i>	107.7 c	3.82 a	12.3 c	50.3 a	76.7 b
<i>var. Canove</i>	121.4 b	3.38 b	13.9 b	49.7 a	78.2 a
<i>T. spelta</i>	134.7 a	2.69 c	14.5 a	42.2 b	69.5 c
Sowing density (seeds m⁻²)	.0338 *	.0040 **	.4107 ns	.5943 ns	.7661 ns
100	120.9 a	2.95 b	13.7 a	47.2 a	74.5 a
150	124.1 a	3.40 a	13.6 a	47.1 a	74.6 a
200	120.5 a	3.51 a	13.5 a	47.6 a	75.1 a
Fertilization rate (kg N ha⁻¹)	.0054 **	.0039 **	.7202 ns	.7609 ns	.6228 ns
0 N	118.5 b	3.00 b	13.6 a	47.3 a	74.8 a
50 N	121.9 b	3.33 a	13.6 a	47.1 a	75.1 a
100 N	127.2 a	3.49 a	13.7 a	47.4 a	74.4 a

Conclusions

A moderate sowing density (150 seeds m⁻², a half of conventional) and nitrogen fertilization rate (50 kg N ha⁻¹) allow to achieve the maximum yield potential and grain protein content (GPC) in old high-size wheat varieties, reducing lodging risks.

These results allow to implement new food chains under organic farming.

