



Evoluzione dei sistemi agronomici in risposta alle sfide globali
Udine, 15-17 settembre 2021

Iron Biofortification By Foliar Spraying In Old Open-Pollinated Maize Varieties

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Introduction

Maize-based food is one of the principal human dietary component, but it contains a low amount of iron (27.1 mg 100kg⁻¹ kernel, USDA, 2012); as a consequence, a low meal Fe uptake causes anemia. In this contex, foliar fertilization is a suitable way of biofortification, with the aim of improving iron in edible plant organs, overcoming human Fe malnutrition. Within the PSR project GO-SEEDS on pre-germinated seeds for the food industry and financed by the Veneto Region, this study evaluated if foliar fertilization with iron, together with or without the addition of urea, could increase this mineral in grains of old maize varieties.

Materials and Methods

- Open field trial at the Experimental farm of the University of Padova (Legnaro, NE Italy)
- Two old open-pollinated maize varieties, **CORVINO** and **MARANO**, 7 pp m⁻², completely randomized design (n=3)
- Foliar spraying with **IRON SULPHATE (FeSO₄, 18% [Fe])** with or without 1% of dissolved **UREA (46% N, 3.6 kg N ha⁻¹)** at the end of silking

Table 1. List of treatments by foliar spraying. Irroration volume: 600 L ha⁻¹

Treatment	FeSO ₄ (18% Fe)		Fe
	g L ⁻¹	kg ha ⁻¹	
Control	-	-	-
Fe1	30	18	3.24
Fe2	60	36	6.48
Fe3	90	54	9.72

SPAD (Units) was measured in both flag and ear leaves

[Fe] (mg kg⁻¹) measured in both crop residues and grains by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectroscopy)

References:

Aciksoz S.B. *et al.* 2011. Biofortification of wheat with iron through soil and foliar application of nitrogen fertilizers. *Plant Soil*, 347:215-225.

U.S.D.A. Agriculture Research Services.2012. USDA National Nutrient database for Standard Reference, Release 25. Nutrient data Laboratory Home Page

Results

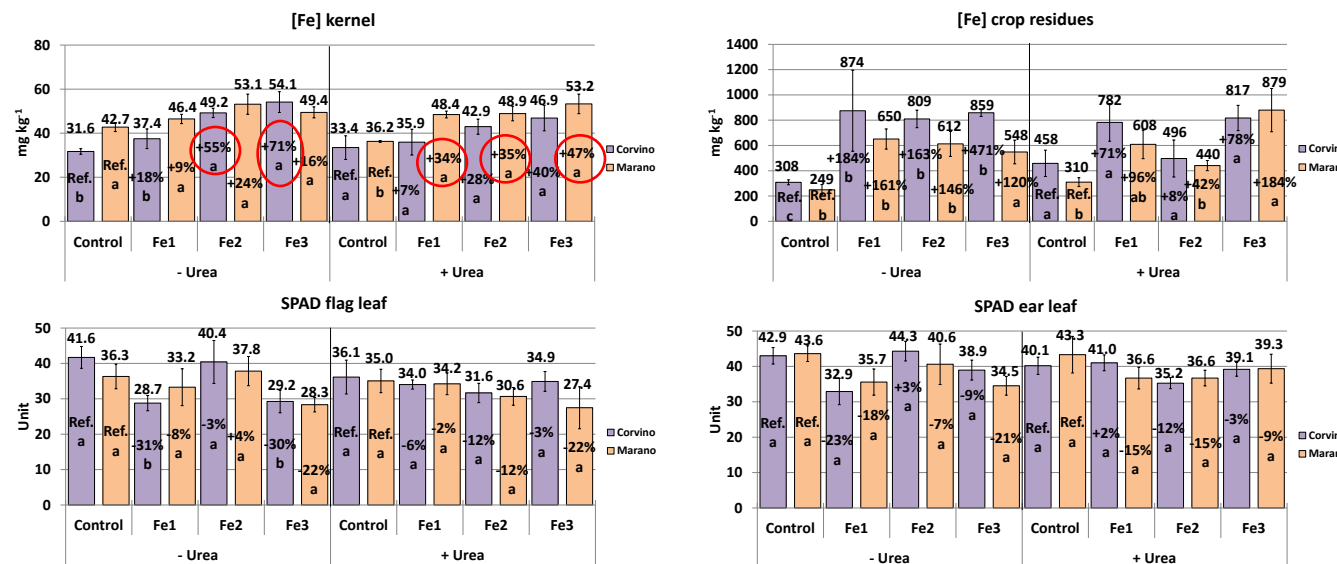


Figure 1. Seasonal average of SPAD (adimensional units) and iron content (mg kg⁻¹) in plant material harvest (n=3; ±S.E.) in Corvino (violet) and Marano (orange) treated with three doses of iron sulphate together with or without urea. Means with different letters are significantly different (Student Newman-Keuls test, P<0.05).

Conclusions

- ☐ Fe application caused a general impairment of leaf chlorophyll content (=SPAD values) but with no negative effects on grain yield;
- ☐ Increased grain [Fe] in var. Corvino can be achieved by dosages Fe2 and Fe3 alone, and in Marano by all treatments by coupling Fe with urea;
- ☐ Fe biofortification strongly depend on variety choice, while the addition of urea may seldom improve Fe accumulation likely through improved transport proteins (Ackiksoz *et al.*, 2011);
- ☐ It is suggested to investigate different chemical forms of Fe (e.g., chelates) to be used as foliar fertilizer.

Acknowledgments: the Veneto Region is gratefully acknowledged for financial support.

