

Foliar application of nano-Zn and mycorrhizal inoculation enhanced Zn in grain and yield of two barley (*Hordeum vulgare*) cultivars under field conditions

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Supplementary Table 1. Description and abbreviation of 15 measured traits (physiological traits, and yield parameters) of barley.

Trait	Abbreviation	Description	Units
Chlorophyll total	CH.T		mg g ⁻¹ fw
Soluble sugar	SS		mg g ⁻¹ dw
Carbonic anhydrase	CA	Enzyme units on leaf	units cm ²
Grain phytase activity	GPH		mg units ⁻¹ fw
Grain zinc	GZN		mg kg ⁻²
Grain number	GN	number per plant	no plant ⁻¹
Flag leaf Area	FLA		cm ²
Thousand Kernel weight	TKW	g m ² in field	g
Grain yield	GY	g m ⁻² in field	g
Biological yield	BY	g m ⁻² in field	g
Harvest Index	HI	Grain yield/ Biological yield	%
Straw Yield	SY	Biological yield- Grain yield	g

Supplementary Table 2. Analysis of variance for physiological traits of leaves and grains in two cultivars of barley, Yusuf and Julgeh with and without inoculation with commercial mycorrhizal inoculum and Zn foliar application.

Treatments and traits	Chl T (mg g ⁻¹ fw)	SS (mg g ⁻¹ dw)	CA (units cm ²)	GPH (mg units ⁻¹ fw)	GZN (mg kg ⁻¹ dw)
Cultivars	**	**	**	**	**
Mycorrhizal inoculation	**	**	**	**	**
Zn (Z)	**	**	**	**	**
C × M	**	**	**	**	**
C × Z	ns	**	**	**	**
M × Z	*	**	**	**	**
C × M × Z	*	**	ns	**	**
LSD	0.07	0.85	4.21	0.002	0.51

Chlorophyll total (Chl T), soluble sugar (SS), carbonic anhydrase (CA) in leaves and grain phytase activity (GPH), and Zn (GZN) concentrations in grains. * significant at P<0.05; ** significant at P<0.01; ns, not significant.

Supplementary Table 3. Analysis of variance for shoot traits and yield parameters in two cultivars of barley with and without inoculation with mycorrhizal fungi.

Treatments and traits	GN (no plant ⁻¹)	FLA (cm ²)	TKW (g)	GY (g m ⁻²)	BY (g m ⁻²)	HI (%)	SY (g m ⁻²)
Cultivars	**	ns	**	**	**	**	**
Mycorrhizal inoculation	**	**	**	**	**	**	**
Zinc (Z)	**	**	**	**	**	**	ns
C × M	**	**	**	**	**	**	**
C × Z	**	ns	ns	**	ns	**	**
M × Z	**	ns	ns	**	**	**	**
C × M × Z	**	ns	ns	**	**	**	*
LSD (0.05)	5.52	8.48	4.36	0.24	50.34	0.36	56.81

Number of grains per plant (GN), flag leaf area (FLA), thousand kernel weight (TKW), grain yield (GY), biological yield (BY), % harvest index (HI), straw yield (SY).

* significant at P<0.05; ** significant at P<0.01; ns, not significant.