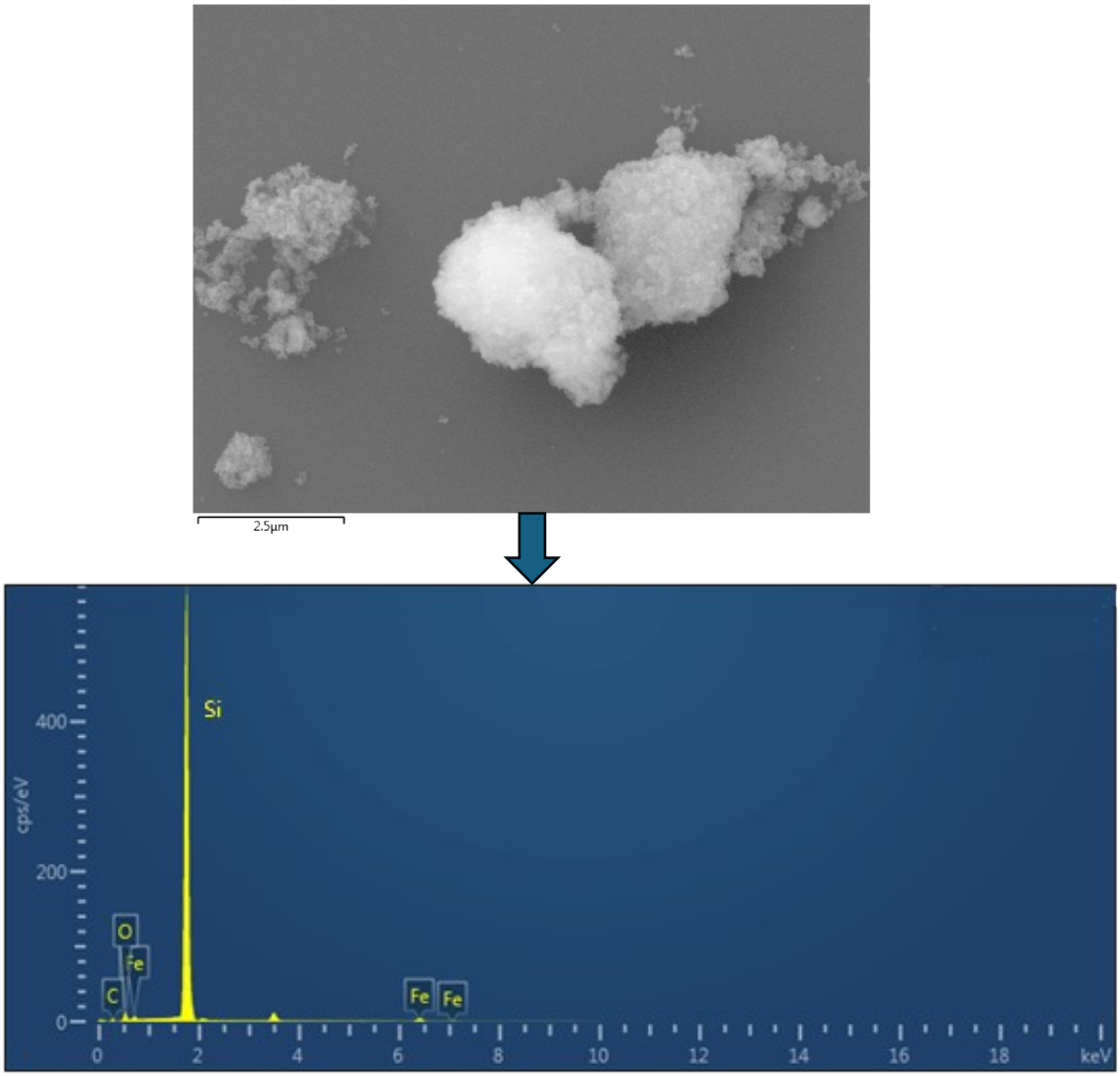
Supplementary materials for

Graphene oxide composited with nano-Fe_3O_4 for enhancing the root reducibility of ryegrass (*Lolium perenne* L.)

Fig. S1 Energy-dispersive spectrometry analysis for GaO/Fe_3O_4 of Fe, C and O for GO/Fe_3O_4 in total image area

Fig. S2 The percentage of EL (a), and MDA content (b) in roots and shoots of ryegrass treated with different concentrations of GO/Fe_3O_4

Table S1 Genes and its primers for RT-qPCR



The spectrum of total area				
Element	Type of line	Percentage by weight	Wt % Sigma	Percentage by atomic
Fe	K line	47.2	0.65	18.34
C	K line	21.78	0.60	39.41
O	K line	31.10	0.51	42.25
In total		100.00		100.00

Fig S1 Energy-dispersive spectrometry analysis of Fe, C and O for GO/Fe_3O_4 in total image area (The effect of silicon substrate is ignored.)

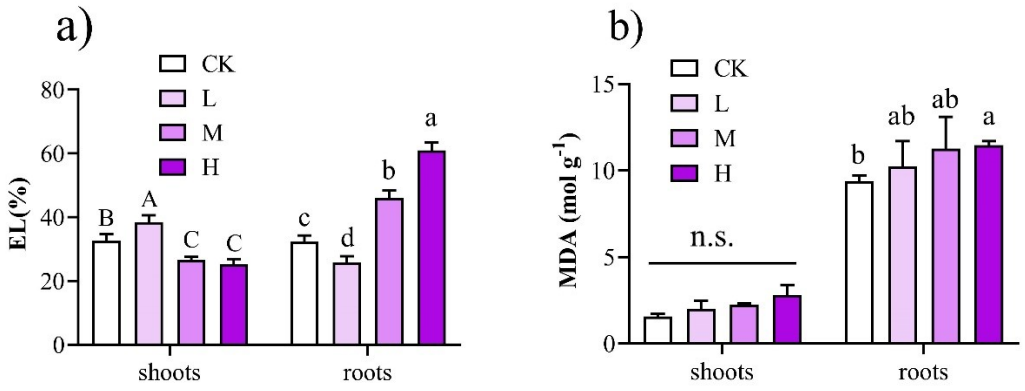


Fig.S2 The percentage of EL (a), and MDA content (b) in roots and shoots of ryegrass treated with different concentrations of GO/Fe_3O_4

Table S1 Genes and its primers for RT-qPCR

Gene ID	Gene name	Primer sequence（Forward/Reverse）
Reference gene	*LpeEF1*	CCGTTTTGTCGAGTTTGGT
		AGCAACTGTAACCGAACATAG
		C
V3.Lp_chr1_0G15150	*LpProB*	CTGTTGAGTCGTTGTTAGAG
		CACTGAGTAGAAGAAGGAGAT
V3.Lp_chr3_0G20086	*LpProA*	AGTGGATTCGTGGTAGATAG
		TTCTGTAGATGCCGTGAG
V3.Lp_chr1_0G15638	*LpRAB7*	TTAGTCGGGAACAAGGTC
		CTTCATCGTGCTCATTCTC
V3.Lp_chr3_0G24148	*LpProC*	GAAGCAGGTCCTAGTTGA
		GGGAGTGTTTGGCATTAC
V3.Lp_chr1_0G17216	*LpPip*	ACCTTCGGATTCACACTT
		CAGACATCATAGGACAACAAG
V3.Lp_chr6_0G19672	*LpGR*	CAGACATCATAGGACAACAAG
		AACTCCAATAGGCTGAACT
V3.Lp_chr4_0G18442	*LpGPX4*	ATGAGAGCAACAGGTGTAA
		TTGGTTCAAGAATCAAGTGGAA
V3.Lp_chr3_0G1886	*LpGST6*	ACGGAGTAGTCGCAGTTG
		CTGAACCTCAAGGGCATC
V3.Lp_chr1_0G1322	*LpDHAR1*	CGATGTACTCCAGGATGAC
		TAACAGCGGTGATGGTAA
V3.Lp_chr1_0G2314	*LpGCLC*	TTCCGTGATGGCTATGTAA
		GTTCCACTTCGTCTCGTA
V3.Lp_chr2_0G688	*LpAPX2*	AAGATGCCACAAGGAGAG
		CTCATCAGTCAGGAGGAC
V3.Lp_chr5_0G18806	*LpMDHAR3*	AAGGAGTCAAGATCGTCAA
		CCAACACCAACAACAACA