

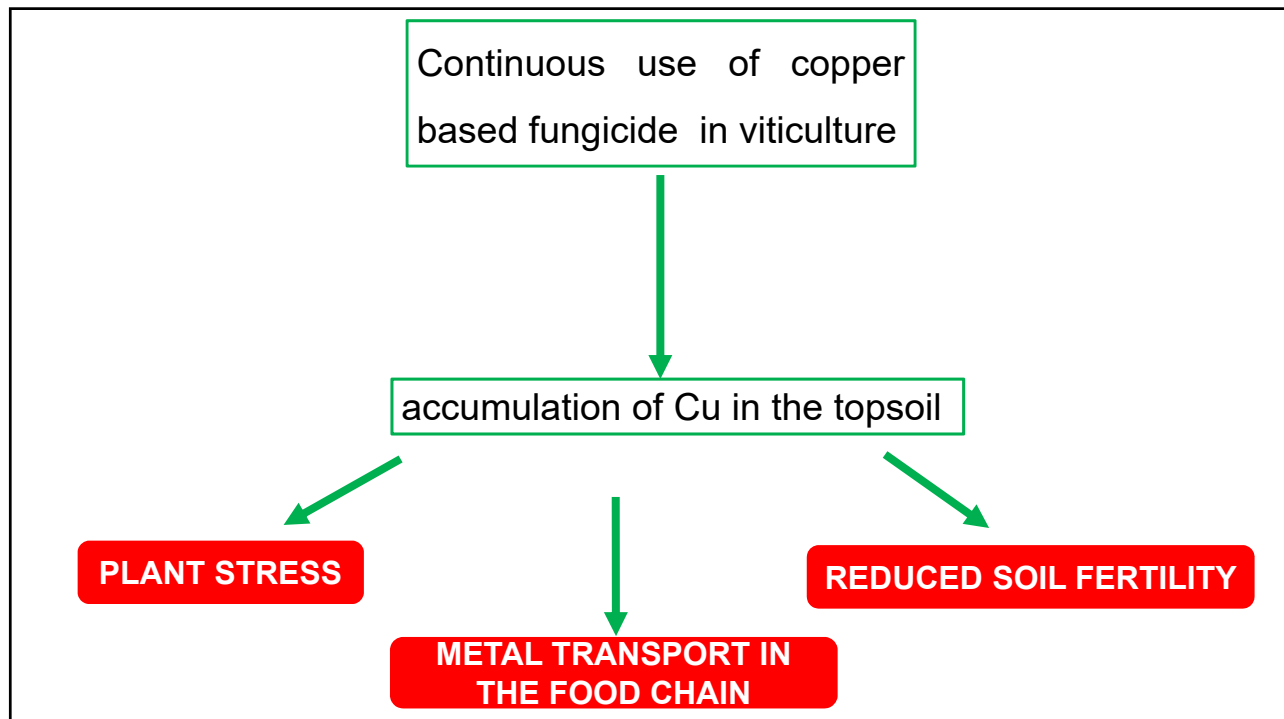
Effect of soil P addition on growth, nutritional status and photosynthesis of potted grapevine plants grown with copper excess

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- pH alteration, OM addition and phytoremediation are possible techniques to achieve soil Cu remediation.
- Phosphate immobilize heavy metals in contaminated soil by creating stable metal forms with low bioavailability

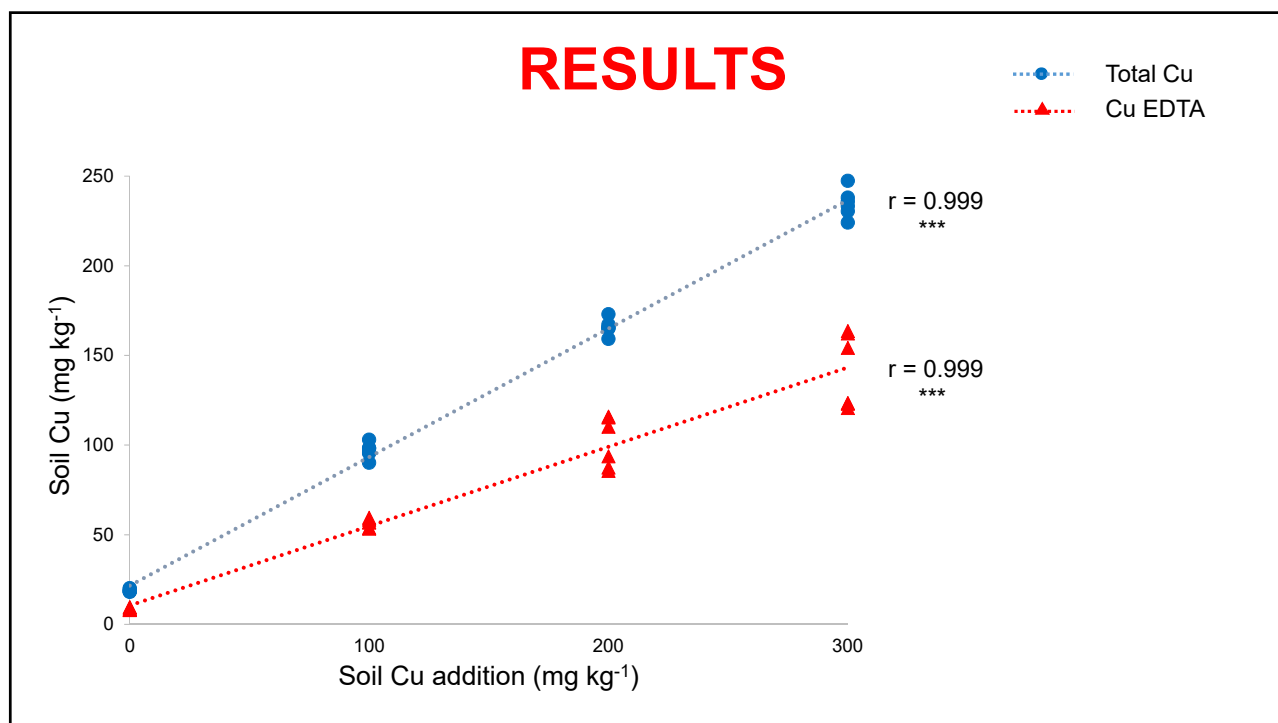
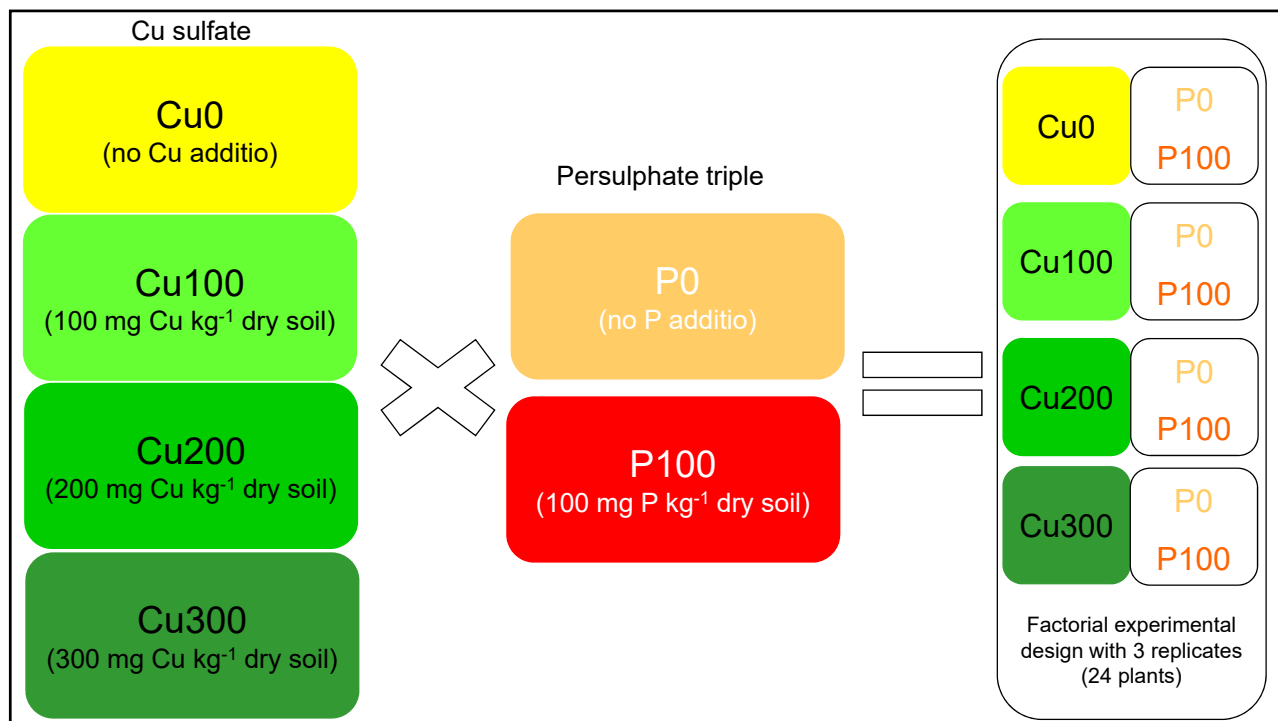
EVALUATE THE EFFECTIVENESS OF P SOIL ADDITION TO MITIGATE THE TOXIC EFFECT OF Cu EXCESS ON GRAPEVINE PLANTS

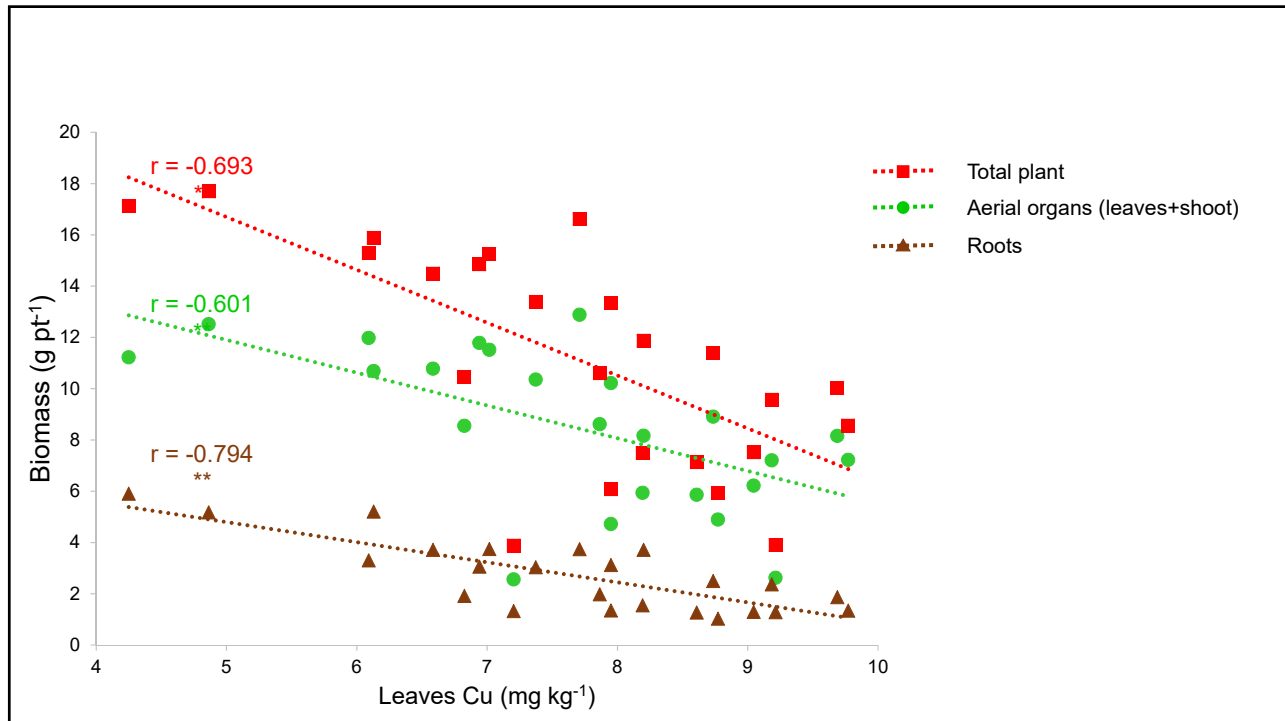
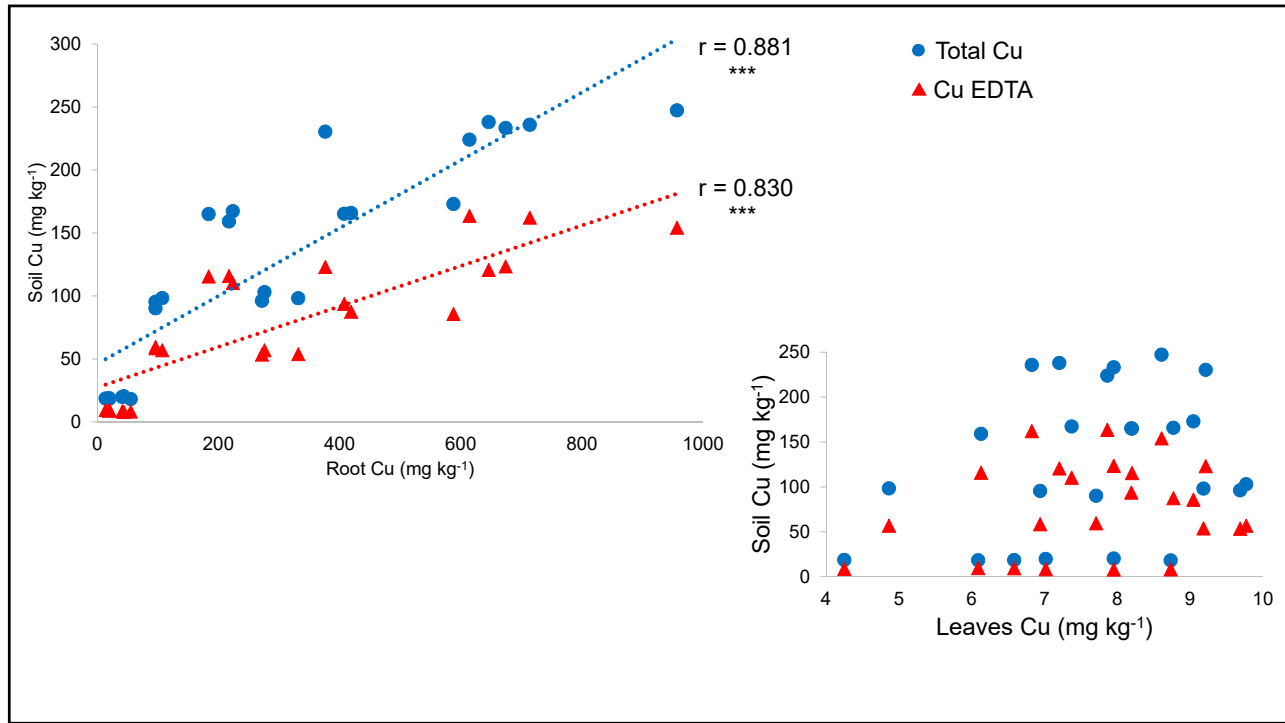
MATERIAL and METHODS

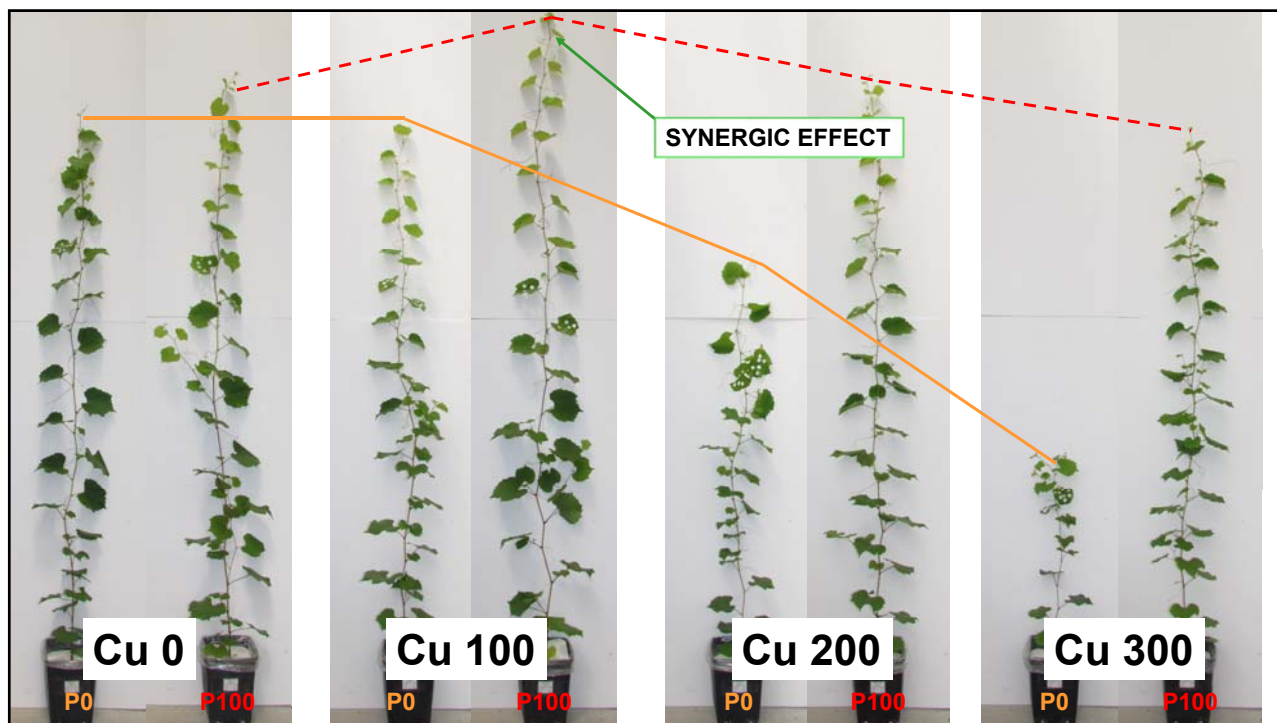
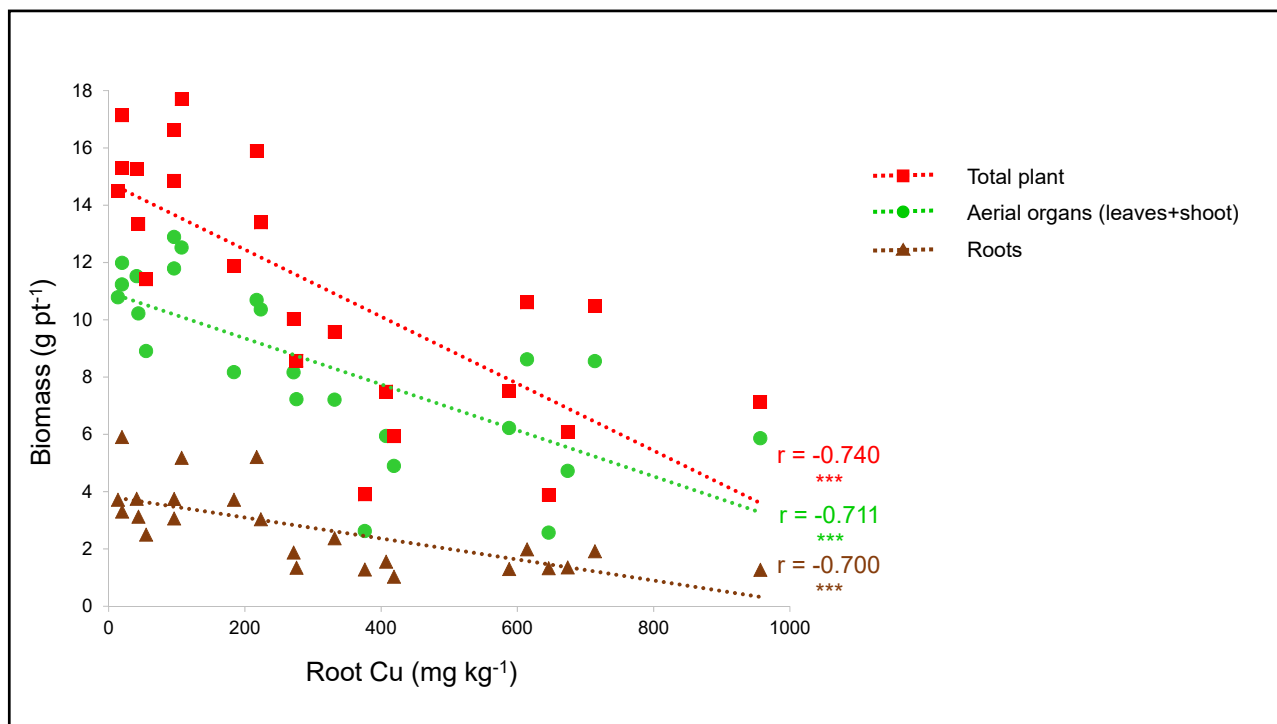
- Greenhouse experiment
- Micro-propagated plant Paulsen 1103

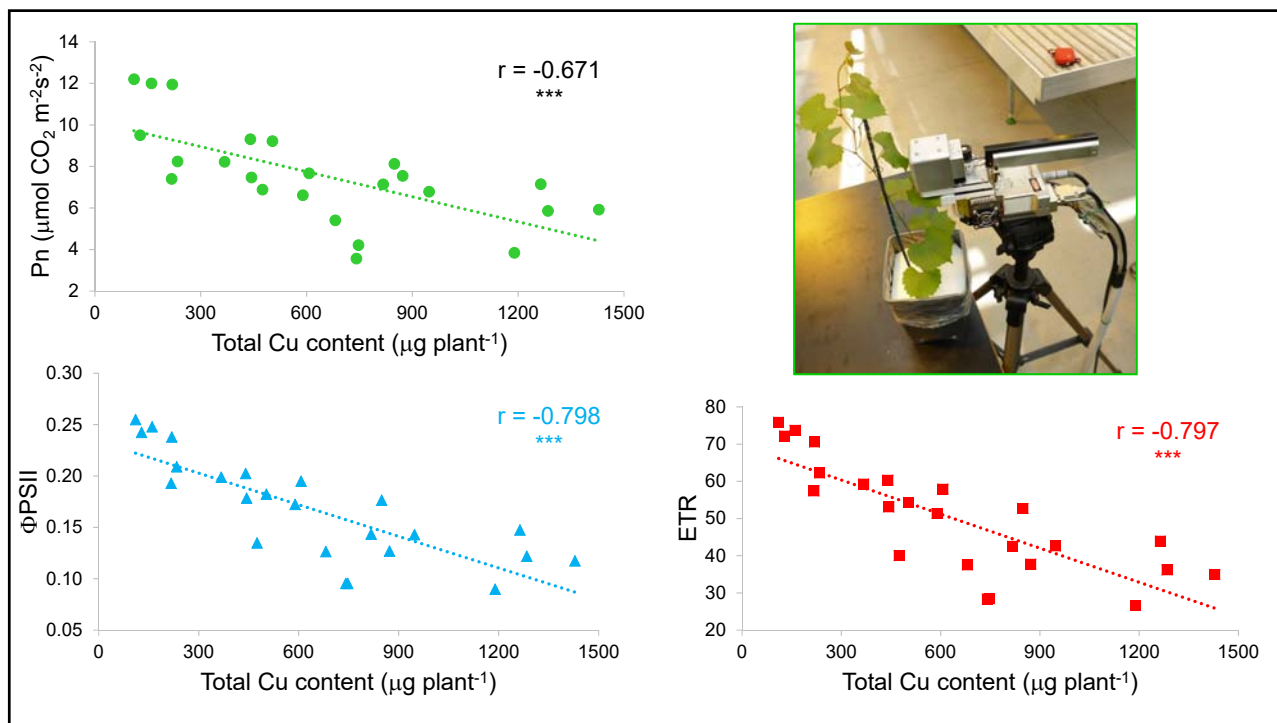
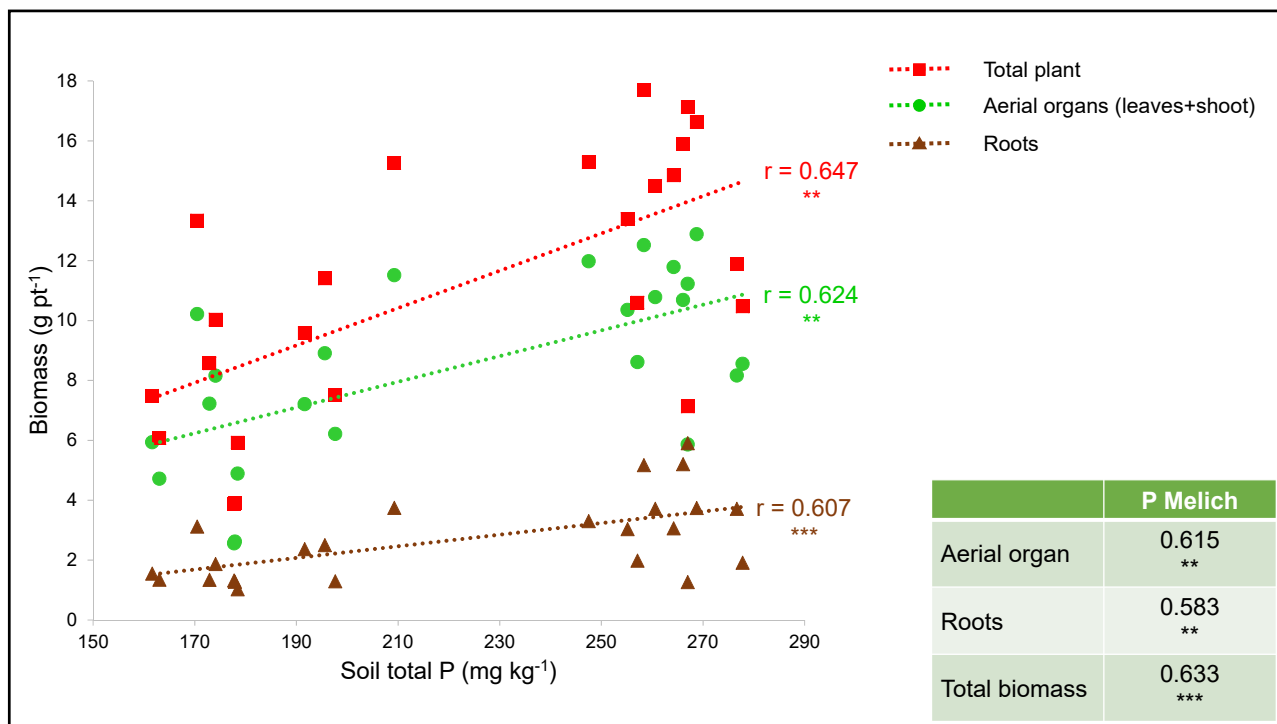


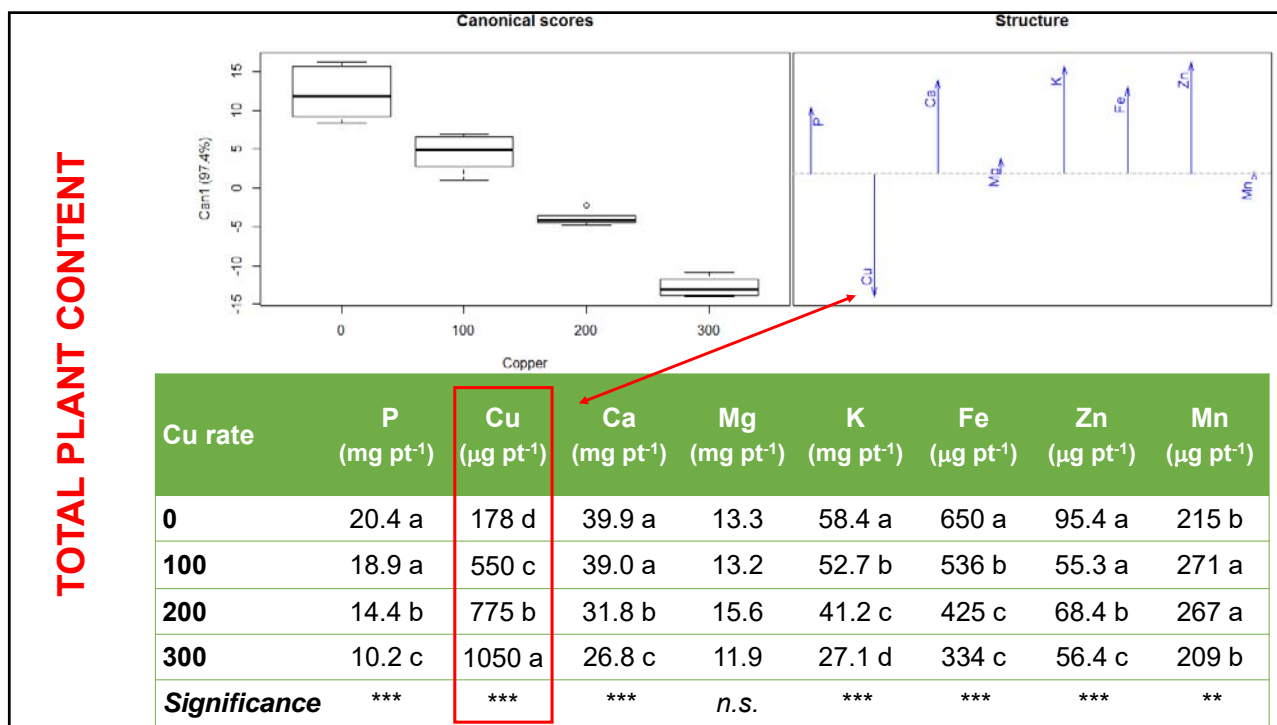
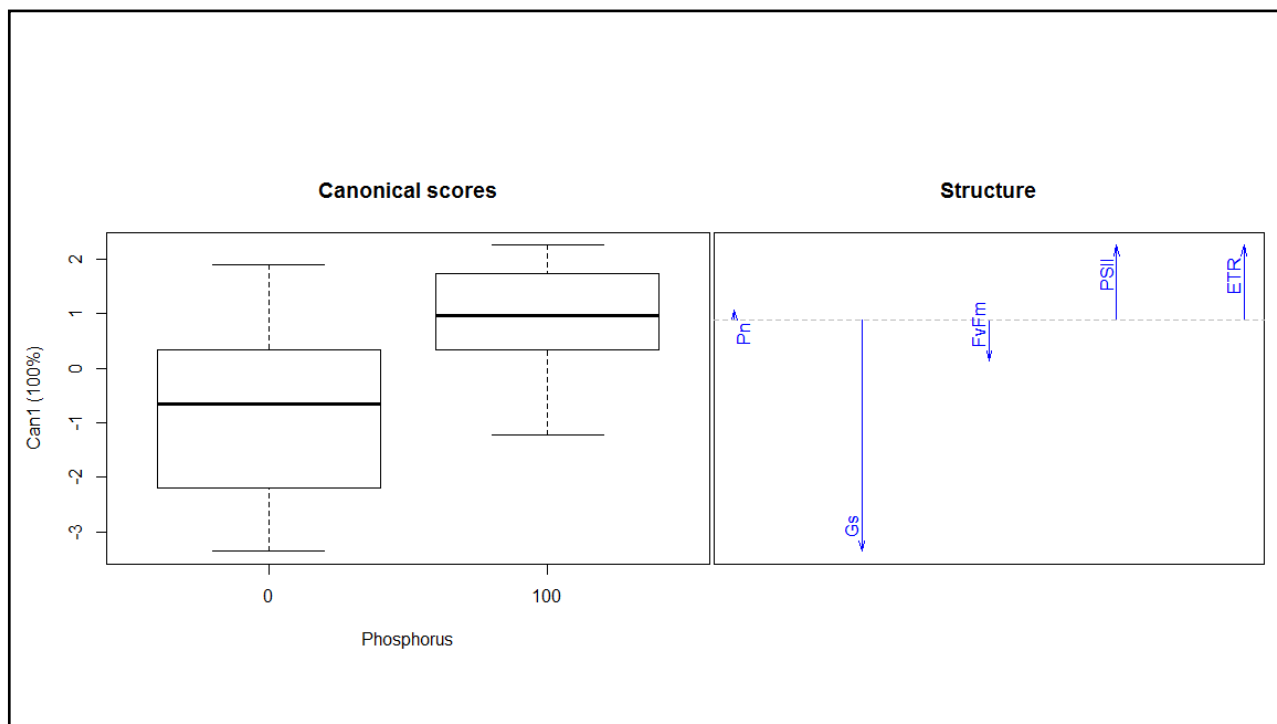
- Non calcareous soil from Lainburg + 30% silica sand
- Potted plants



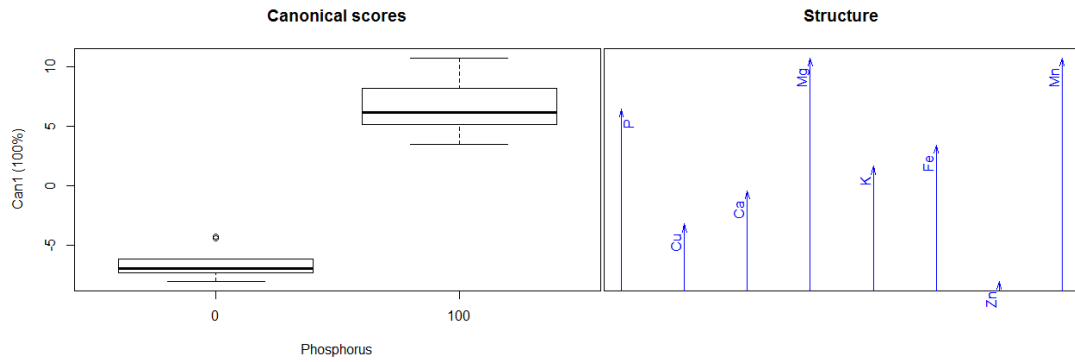








TOTAL PLANT CONTENT



P rate	P (mg pt ⁻¹)	Cu (µg pt ⁻¹)	Ca (mg pt ⁻¹)	Mg (mg pt ⁻¹)	K (mg pt ⁻¹)	Fe (µg pt ⁻¹)	Zn (µg pt ⁻¹)	Mn (µg pt ⁻¹)
0	9.68	571	30.9	9.25	35.8	370	74.6	129
100	22.2	706	37.9	16.3	53.9	603	79.7	353
Significance	***	*	***	***	***	***	n.s.	***



Rate of Cu	Root length (cm)	Root diameter (mm)	Number of apex
0	165 a	0.119 a	115 a
100	147 ab	0.036 b	106 b
200	116 b	0.038 b	78.7 ab
300	61.8 c	0.039 b	58.2 b
Significance	***	*	
P rate			
0	117 b	0.036 b	76.2 b
100	145 a	0.103 a	124 a
Significance	*	*	**
Cu*P	n.s.	n.s.	n.s.

Transfer factor → measure the effectiveness of plant in translocating Cu from roots

Cu rate	TFL	TFS
0	0.196 a	0.154 a
100	0.033 b	0.027 b
200	0.020 b	0.017 b
300	0.012 b	0.010 b
Significance	***	***
P rate		
0	0.044	0.045
100	0.086	0.059
Significance	***	*
Cu*P	<i>n.s.</i>	<i>n.s.</i>

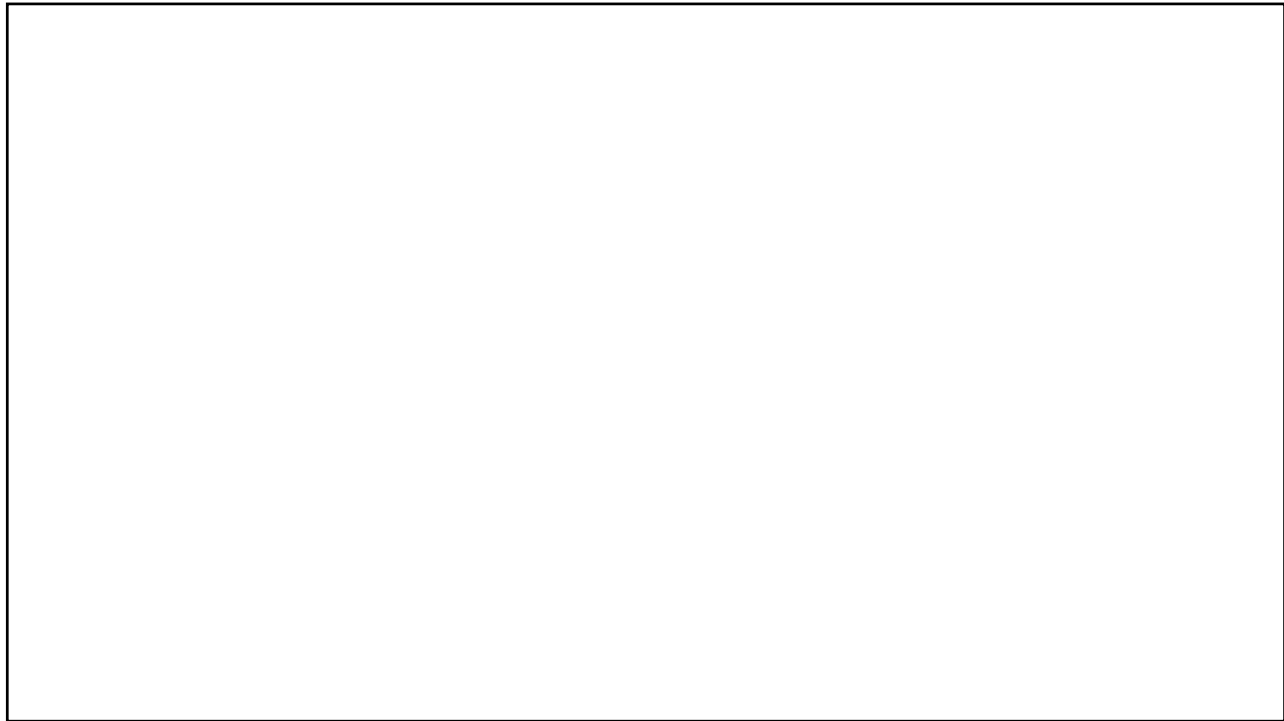
$$\text{TFL} = \frac{\text{Cu leaves concentration}}{\text{Cu root concentration}}$$

$$\text{TFS} = \frac{\text{Cu shoot concentration}}{\text{Cu root concentration}}$$

Cu ABSORBED REMAINS MAINLY
IN THE ROOTS → grapevines
adopt the “exclusion strategy” to
avoid toxic effect of Cu

CONCLUSIONS

- ❑ Soil Cu (total and fractions) gives little information on its bio-availability.
- ❑ In sandy soil leaf Cu can give useful information on Cu toxicity.
- ❑ P100 mitigated the negative effect of Cu toxicity by stimulating uptake of nutrients, plant growth and photosynthesis.
- ❑ Cu absorbed remains mainly in the roots.
- ❑ The application of P seems to be a valuable strategy to reduce Cu toxic effects.



RESULTS

Soil analysis

Cu rate	Total Cu	Cu EDTA	Total	
	mg kg ⁻¹			
0	18.9 d	8.09	9.22	22.5
100	96.9 c	54.7	58.2	22.5
200	166 b	88.9	114	22.5
300	235 a	122	160	22.5
Significance	***	2SEM = 2.79		n.s
P rate				
0	130	-	18.0	
100	128	-	26.0	
Significance	n.s.	-	***	
Cu*P	n.s.	***	n.s	

