Supplementary materials

High doses of polypropylene and polyvinyl chloride microplastics affect the microbial community and nutrient status of vineyard soils

Erika Jez[1], Elisa Pellegrini[2], Melita Sternad Lemut[1], and Marco Contin[2]*

[1] University of Nova Gorica, Vipavska cesta 13, 5000 Nova Gorica, Slovenia

[2] Department of Agricultural, Food, Environmental and Animal Sciences. University of Udine, Via delle Scienze 206, 33100 Udine, Italy

[*] Corresponding author: Marco Contin

E-mail: marco.contin@uniud.it

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Calculation of Micro-Plastics Addition rate and comparison to real field applications

5 strips corresponding to about 10 g of plastic per plant are regularly used in vineyards with 5,000 plants/hectar
It means 10g x 5000 = 50 kg/Ha

if we change all of them every year because of mechanical ropture
in 1 year of cultivation 50 kg plastics per hectare (50 kg/y) are introduced to soil.

If we assume that they are mulched into topsoil surface (about 2 cm depth)
1 hectare correspond to about 200 m^3 (100 x 100 x 0.02 m)
With a soil bulk density of about 1.2 t m^{-3}
Correspond to a soil weight of 240 t /Ha (400 x 1.2)

With 1% w/w plastics addition rate (or 10 g/kg), it corresponds on field basis to an equivalente addition rate of 2,400 kg per hectare (240 t x 0.01),
That divided by 50 kg/y of annual input, correspond to 48 years of vine cultivation.

Figure S1 Plastic PVC ties (A) collected from the sampled vineyard have been grinned into random size of micro-PVC particles Figure (B) shows the micro-PVC fragments of irregular size that were sieved through a 1-mm sieve. The micro-PVC particles were inoculated into the soil sample (C) and homogeneously mixed at a concentration of 1% (w:w). In design of experiment we used control soil sample (no plastic addition), PVC new (microplastic from new PVC tie), PVC used (microplastic from collected PVC ties from vineyard) and PVC std (PVC microplastic purchased from Sigma Aldric). 120 days of incubation was done on calcareous and acid soil samples.

Figure 2

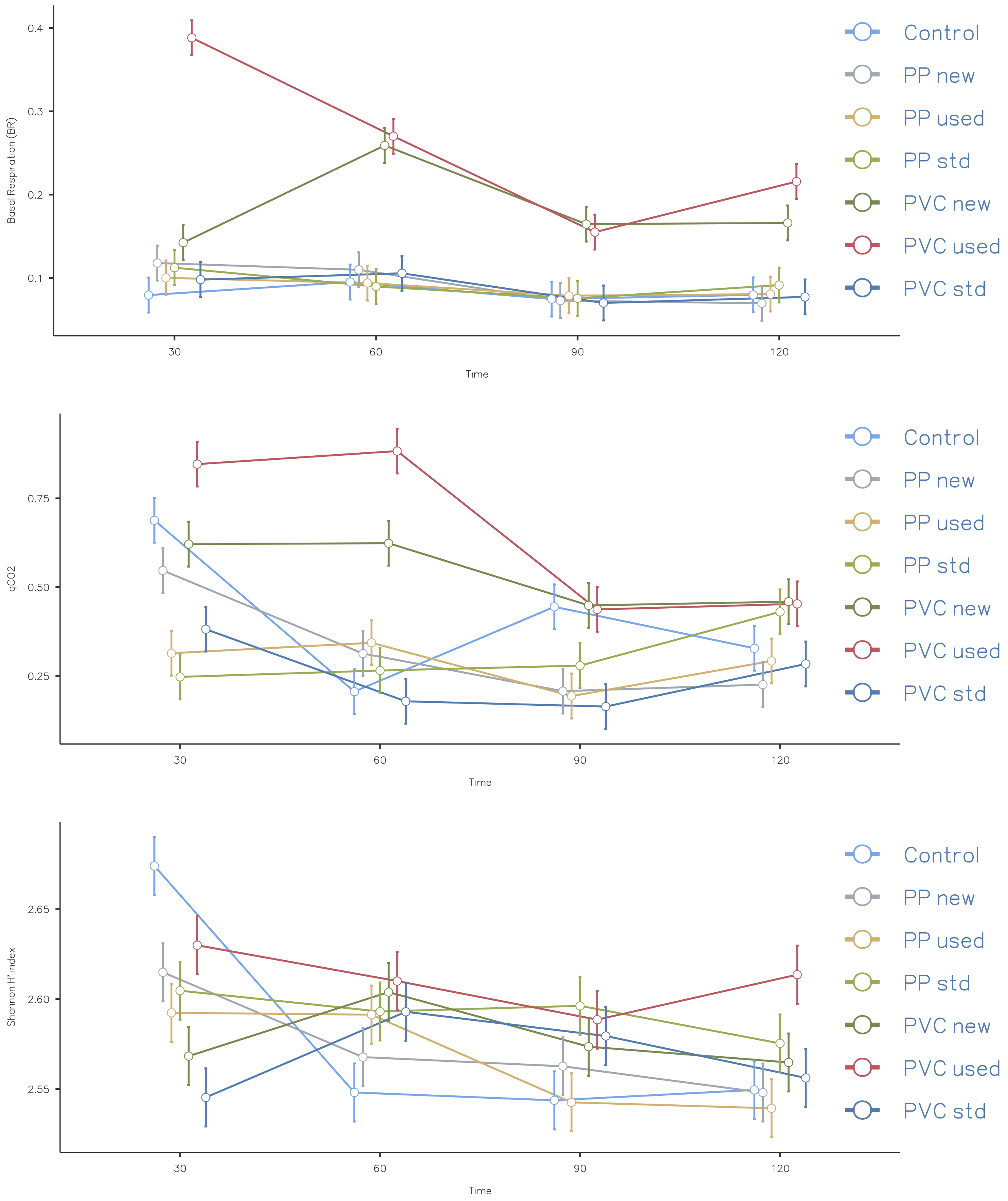

Figure S2 Basal respiration (BR), metabolic quotient (qCO_2) and microbial diversity, Shannon-Weaver index (H') of acid and calcareous soils. Error bars represent standard error of three replicates.

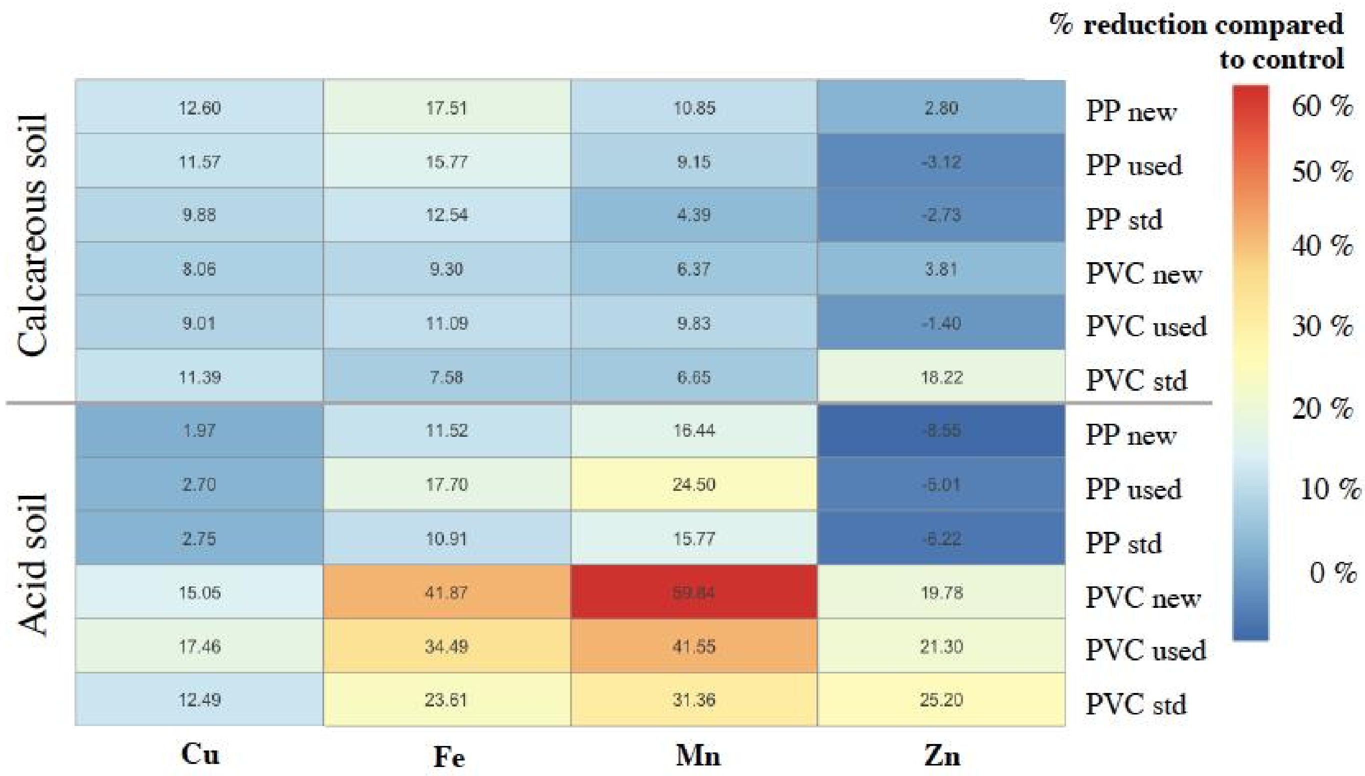

Figure S3 Heatmap showing the changes in micronutrient bioavailability (%) compared to control soils without MPs. Positive values represent a decrease in bioavailability and negative values represent an increase in nutrient bioavailability with the presence of different sources of PP and PVC MPs in two soil types (calcareous and acid soils).

Different types of polypropylene (PP) and polyvinyl chloride (PVC) plastic ties were used. New ties purchased from a local shop (PP/PVC new), used ties collected from the sampled vineyard (PP/PVC used) and polypropylene and polyvinyl chloride purchased from Sigma Aldrich (PP/PVC std).

Table S1. Soil Olsen P and bioavailability of macronutrients (K, Ca and Mg) in vineyard soils after 120 days of incubation for control (no MPs) and MPs polluted calcareous and acid soil. Grained PVC and PP ties used in vineyards were added to the soil: new ties purchased at a local shop (PVC/PP new), previously used ties from the sampled vineyard (PVC/PP used) and plastics purchased from Sigma Aldrich (PVC/PP std).

	Soil treatment	**Olsen P ($mg\ kg^{-1}$)**	**Available K ($mg\ kg^{-1}$)**	**Available Ca ($mg\ kg^{-1}$)**	**Available Mg ($mg\ kg^{-1}$)**
Calcareous soil	Control	55.9 ± 2.2 a	716 ± 33 a	4222 ± 89 a	165.5 ± 5.1 a
	PP new	50.7 ± 1.7 b	734 ± 22 a	4254 ± 41 a	176.2 ± 8.5 a
	PP used	50.1 ± 2.8 bc	697 ± 8 a	4143 ± 81 a	176.8 ± 5.2 a
	PP std	46.5 ± 1.2 c	720 ± 15 a	4152 ± 122 a	168.2 ± 5.1 a
	PVC new	47.3 ± 1.1 b	733 ± 8 a	4255 ± 67 a	172.3 ± 3.4 a
	PVC used	55.9 ± 0.8 a	690 ± 8 a	4162 ± 15 a	157.6 ± 1.1 b
	PVC std	50.2 ± 7.2 ab	697 ± 4 a	4251 ± 24 a	165.2 ± 1.2 b
Acid soil	Control	56.5 ± 6.2 a	823 ± 21 a	3025 ± 32 a	658.9 ± 5.4 a
	PP new	41.3 ± 5.8 b	676 ± 37 c	3014 ± 54 a	572.4 ± 15.1 b
	PP used	46.1 ± 2.1 b	736 ± 26 b	3095 ± 67 a	593.2 ± 23.0 b
	PP std	48.6 ± 0.9 b	767 ± 14 b	3104 ± 85 a	601.4 ± 22.9 b
	PVC new	46.1 ± 4.0 ab	773 ± 23 ab	3314 ± 95 a	602.6 ± 31.0 b
	PVC used	44.8 ± 7.0 ab	774 ± 24 ab	3259 ± 42 a	602.9 ± 11.8 b
	PVC std	41.5 ± 7.7 b	731 ± 34 b	2983 ± 33 b	588.0 ± 11.5 b

*Footnote: All data are expressed as average value ± standard deviation (n = 3).
a,b,c Different letters within the same plastic type (compared to control) indicate significant differences (Tukey test; $p < 0.05$). Letters in the left indicate differences for micro-PVC and letters on the right indicate differences for micro-PP particles.