

Figure S1. Peroxiside of the fat extracted from different chocolate spreads over 31 days of storage at 288.15 K (A), 303.15 K (B), 313.15 K (C) and 323.15 K (D).

RB Reference brand; NPNS No palm no sugar spreadable chocolate; NPNS- VD No palm no sugar chocolate spreadfortified with vitamin D; NPNS- VDCa No palm no sugar chocolate spreadfortified with vitamin D and Mg-CaCO₃ nanoparticles; NPNS-Ca No palm no sugar chocolate spreadfortified with Mg-CaCO₃ nanoparticles.

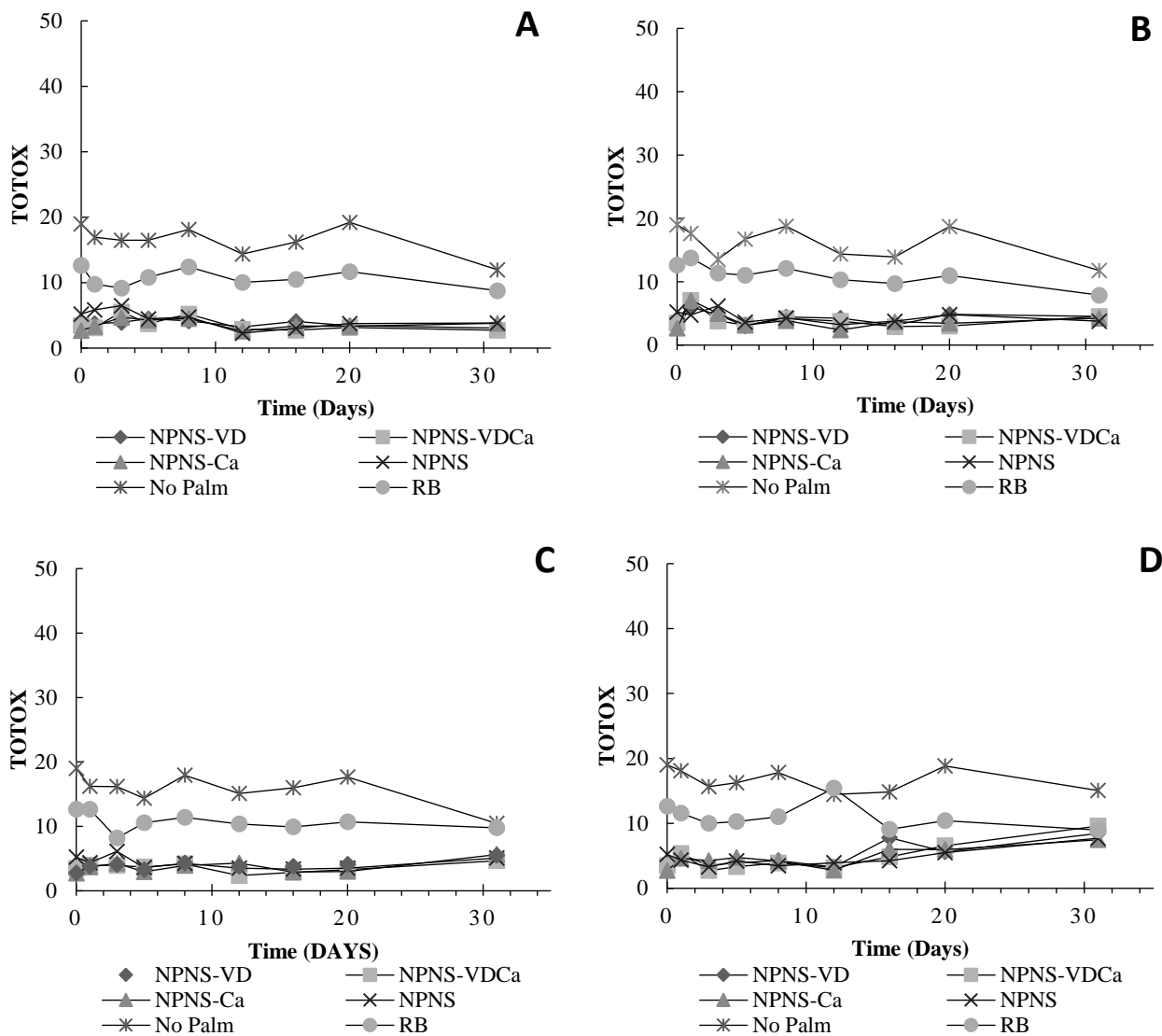


Figure S2 .TOTOX of the fat extracted from different chocolate spreads over 31 days of storage at 288.15 K (A), 303.15 K (B), 313.15 K(C) and 323.15 K (D).

RB Reference brand; NPNS No palm no sugar spreadable chocolate; NPNS- VD No palm no sugar chocolate spreadfortified with vitamin D; NPNS- VDCa No palm no sugar chocolate spreadfortified with vitamin D and Mg-CaCO₃ nanoparticles; NPNS-Ca No palm no sugar chocolate spreadfortified with Mg-CaCO₃ nanoparticles.