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## Reformulation of dry sausages with natural plant extracts prevents oxidation even in the absence of nitrates

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## Background & objective

Dry sausages are part of French gastronomy and represent 8% of the total food consumed weekly in France. Reducing people's exposure to nitrites, nitrates and nitroso compounds is a public health issue. Therefore, reformulation provides technological leverage to reduce or even exclude nitrite/nitrate inputs in processed meats. Known for their antioxidant and anti-nitrosating properties, polyphenols can be provided by plant byproducts like grapeseed or olive pomace from olive oil extraction. Nitrite/nitrate in dry-fermented pork sausages/salamis can be replaced through formulation with a grapeseed/olive pomace mixture, while controlling microbiological safety, albeit with possible color or taste alteration. Preliminary studies have defined an acceptable concentration from a sensory point of view, set at 6 mM eq gallic acid. **The aim of the present study was to investigate different sources of polyphenols, alone or in combination with nitrates, to highlight possible synergistic effects on oxidation and prevention of nitrosation.**

## Materials and Methods

Seven types dry sausages were manufactured using fruit extract, green tea or polyphenol-rich olive/grape extracts combined or not with nitrate (160 ppm)

### Dry sausages making:

87% of porcine shoulder meat + 13% of porcine back fat.

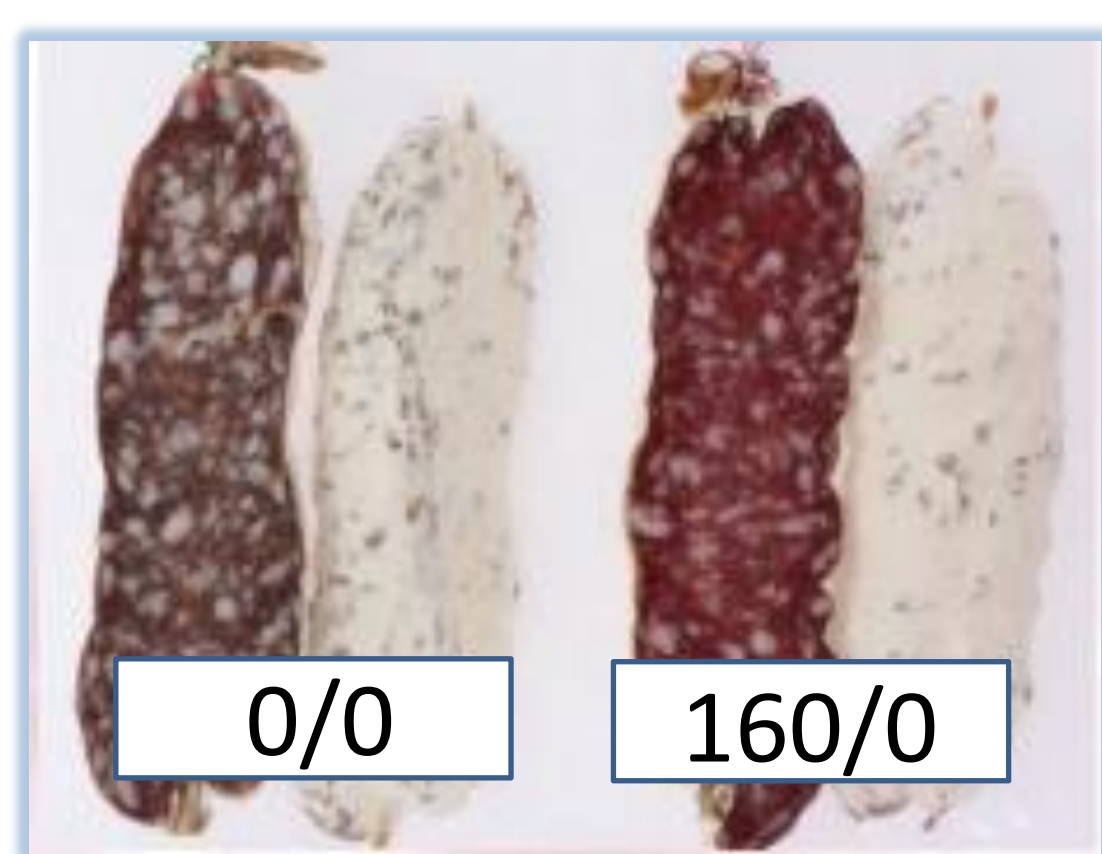
Grinding at 6 mm diameter and stuffing in porcine casings of 55 mm diameter. Addition of 160 mg/kg NaNO<sub>3</sub> and/or 6 mM polyphenol extracts: green tea GT, olive grape OG, fruit cocktail FC.

Flavoring with 1.50 g/kg of ground grey pepper

Starters 0.15 g/kg : *Lactobacillus sakei*, *Staphylococcus carnosus*, *Staphylococcus xylosus* (Lallemand, France)

Addition of dextrose and lactose (5.50 g/kg and 6.00 g/kg, respectively) to acidify the sausages during the fermentation step.

After drying, weight loss is 44%, similar whatever the formulation pH is comprised between 5.1 and 5.2



Added nitrate 160 ppm (160/0)	160/0 ; 160/0 - GT ; 160/0 - OG ; 160/0 - FC
Without nitrate (0/0)	0/0 ; 0/0 - GT ; 0/0 - OG

### Biochemical characterization

Lipid oxidation, Iron nitrosylation, residual nitrites, residual nitrates, nitrosothiols, non-volatile nitrosamines (Keuleyan et al., 2022).

### Statistical analysis

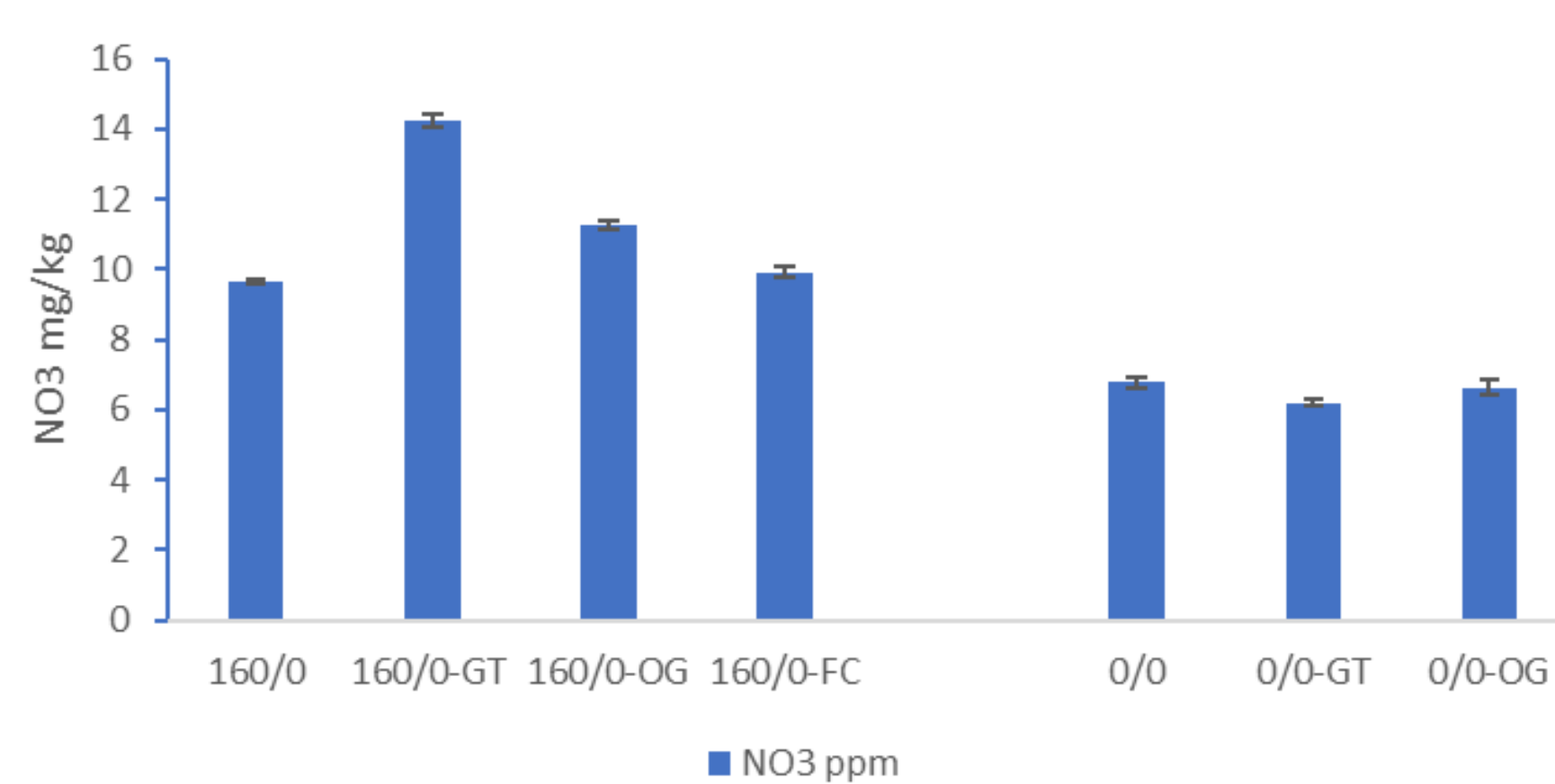
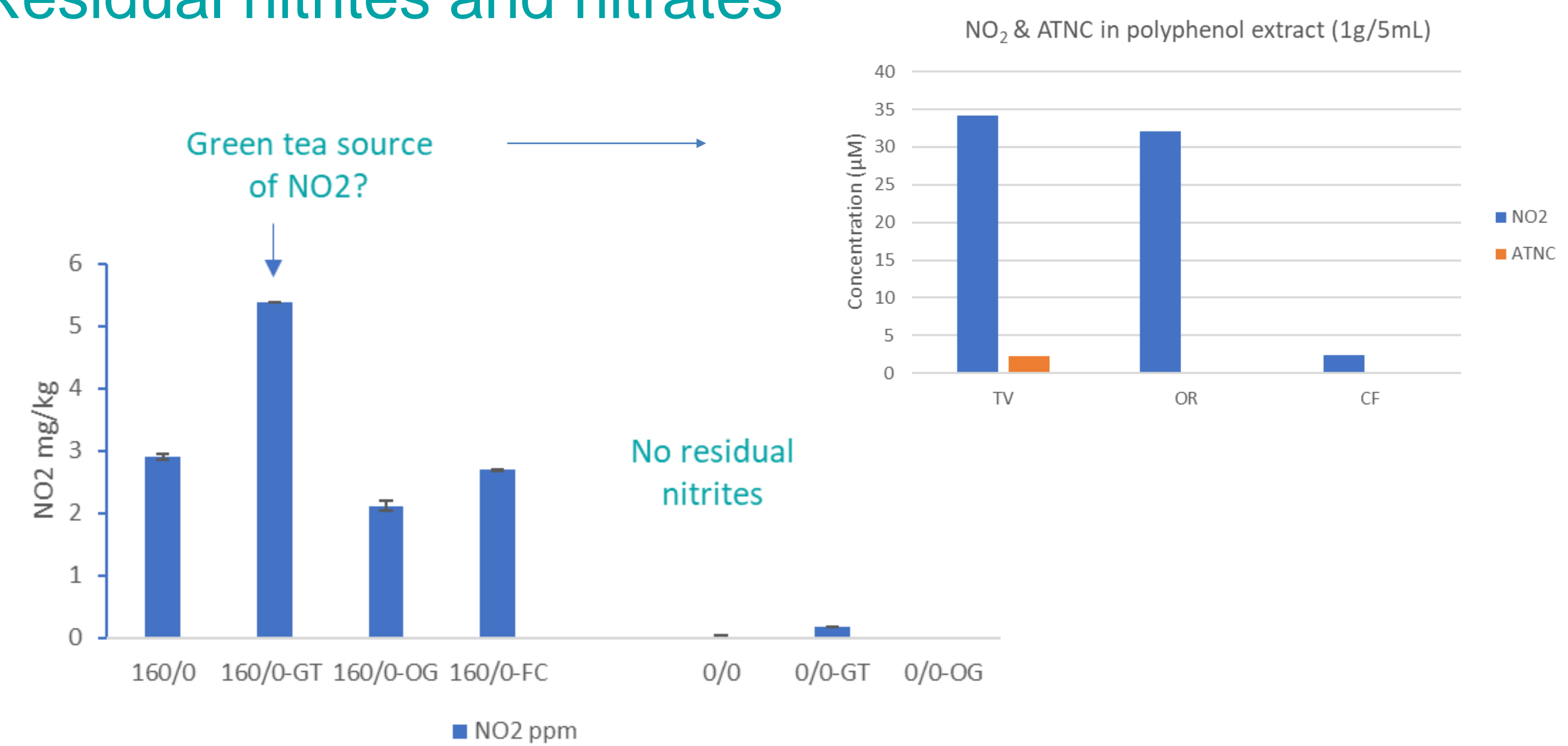
ANOVA and Tukey *post-hoc* tests performed on variables (Jamovi software). Data with nitrate (160/0) analysed separately from those without nitrate (0/0)

## Conclusions

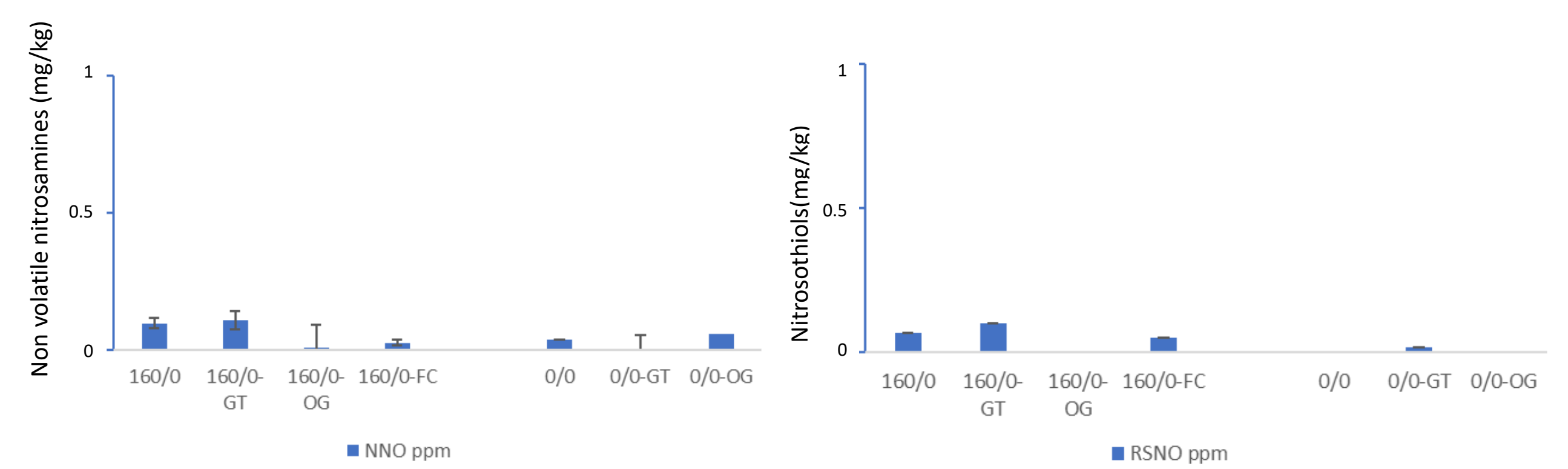
- ❑ Dry sausages did not contain meaningful amount of harmful nonvolatile nitrosamines, which is a public health result worth mentioning.
- ❑ Replacing nitrates in dry sausages is possible with 6 mM plant extract (green tea and olive grape), with limited lipid oxidation.
- ❑ The combination with nitrates highlighted a synergistic action on lipid oxidation, therefore ensuring better preservation of the food product.
- ❑ Further investigations are planned to evaluate how the polyphenol extracts protect against oxidation and nitration in digestive conditions, which are known to increase oxidation and the release of NO.
- ❑ Possible synergistic action of polyphenols with lower nitrite levels must be investigated in greater depth.

## Results

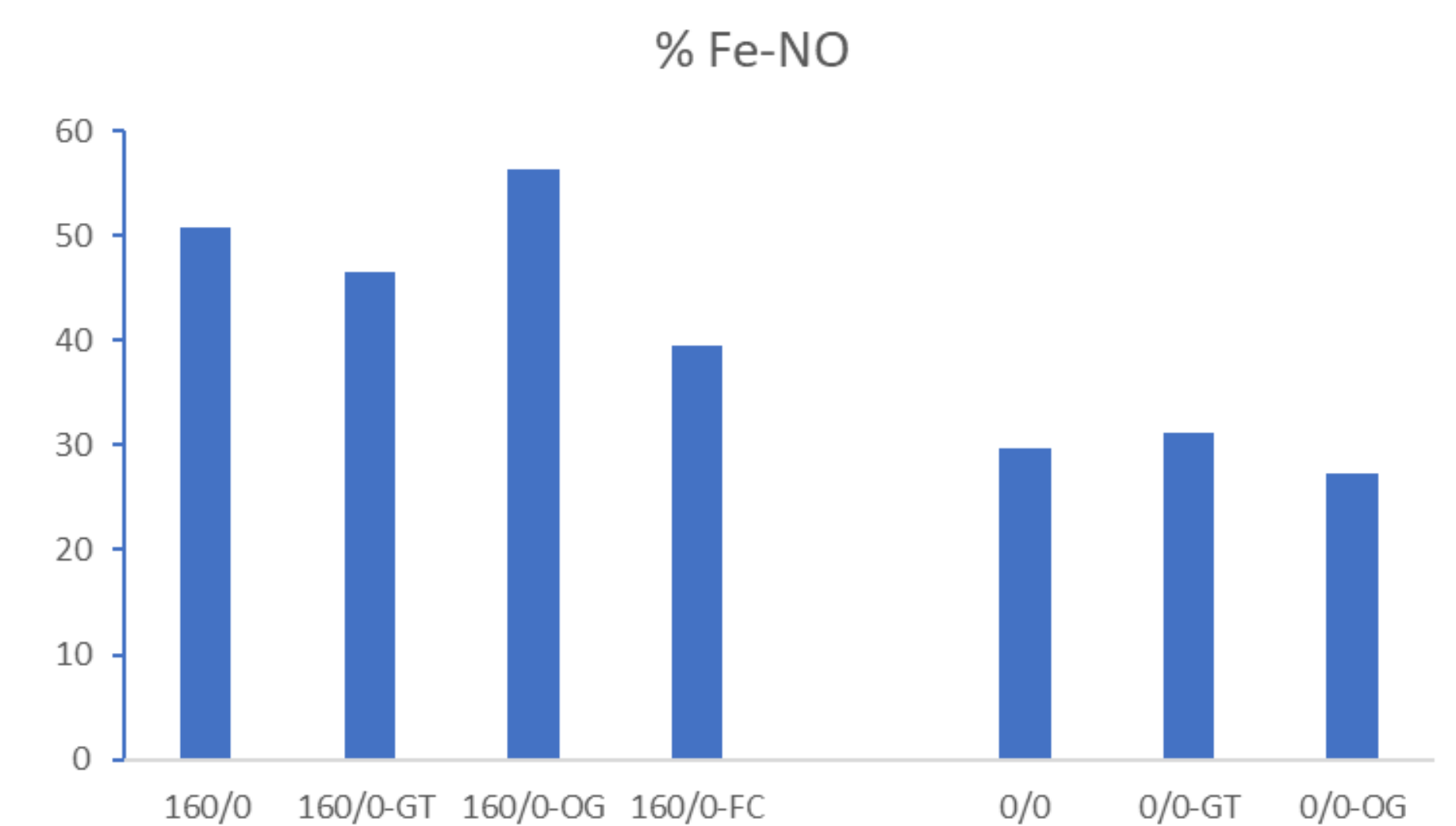
### Residual nitrites and nitrates



### Absence of nitrosamines NNO and nitrosothiols RSNO



### Less formation of Fe-NO in absence of NaNO<sub>3</sub>



### Strong reduction of lipid oxidation in dry sausage formulated with plant extracts

