

Effects of convective air drying temperature on nutritional quality and color of watercress (*Nasturtium officinale*)

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❖ Introduction

○ Watercress (*Nasturtium officinale*)

- Rich in vitamins, minerals, bioactive compounds
- Easily perishable
- Dried watercress: a novel product for soup, instant food or food supplement powder



○ Convective drying

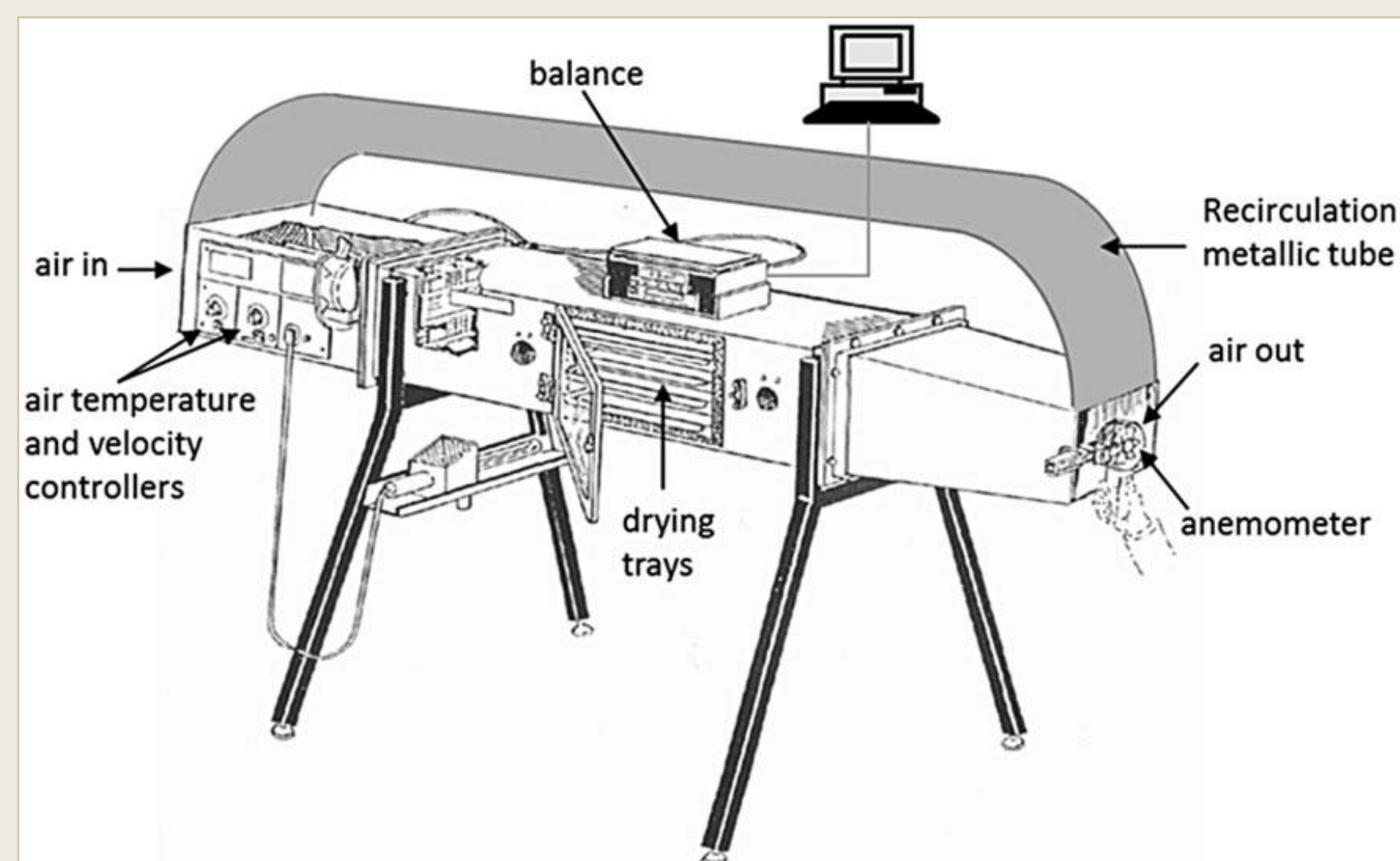
- Prolong shelf life, provide a convenient consumption and transportation
- Affordable process and widely used by food industries to dry fruits and vegetables
- Cause physical, chemical and nutritional degradation, including color changes → affect the overall quality of the dried products

○ Objective

- Evaluate the effects of drying temperature on drying characteristics and some quality attributes of watercress

❖ Materials & Methods

○ Drying equipment



50 g

Air velocity
1.20 ± 0.09 m/s
Drying temperature
40 – 70 °C



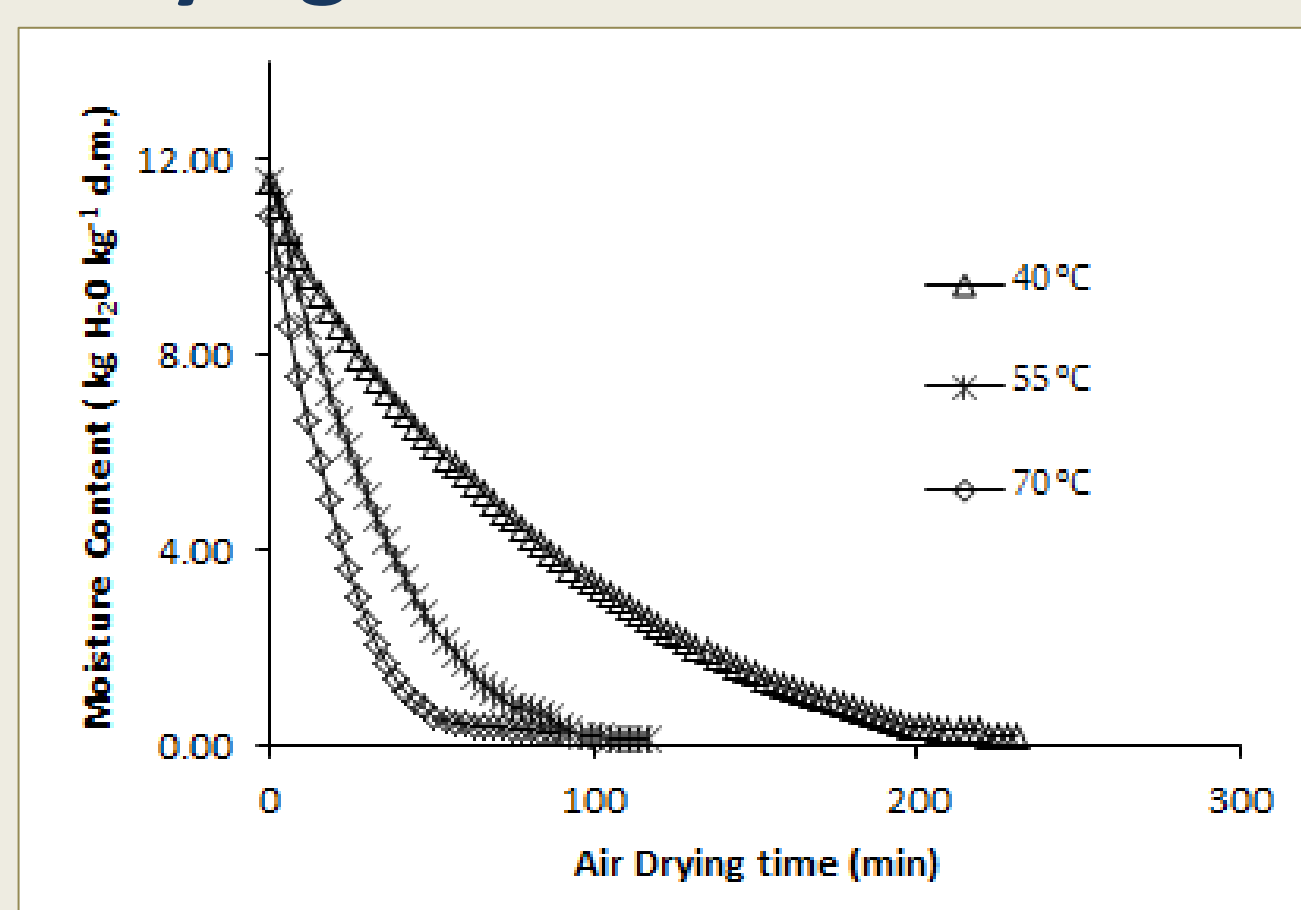
○ Quality parameters

- Water activity: water activity meter
- Color properties: colorimeter
- Chlorophylls: absorbance reading at 665.2 and 652.4 nm
- Vitamin C: HPLC analysis, reverse phase C18-silica analytical column
- Total phenolic compounds: Folin–Ciocalteu method
- Total antioxidant capacity (TAOC): direct production of ABTS chromophore

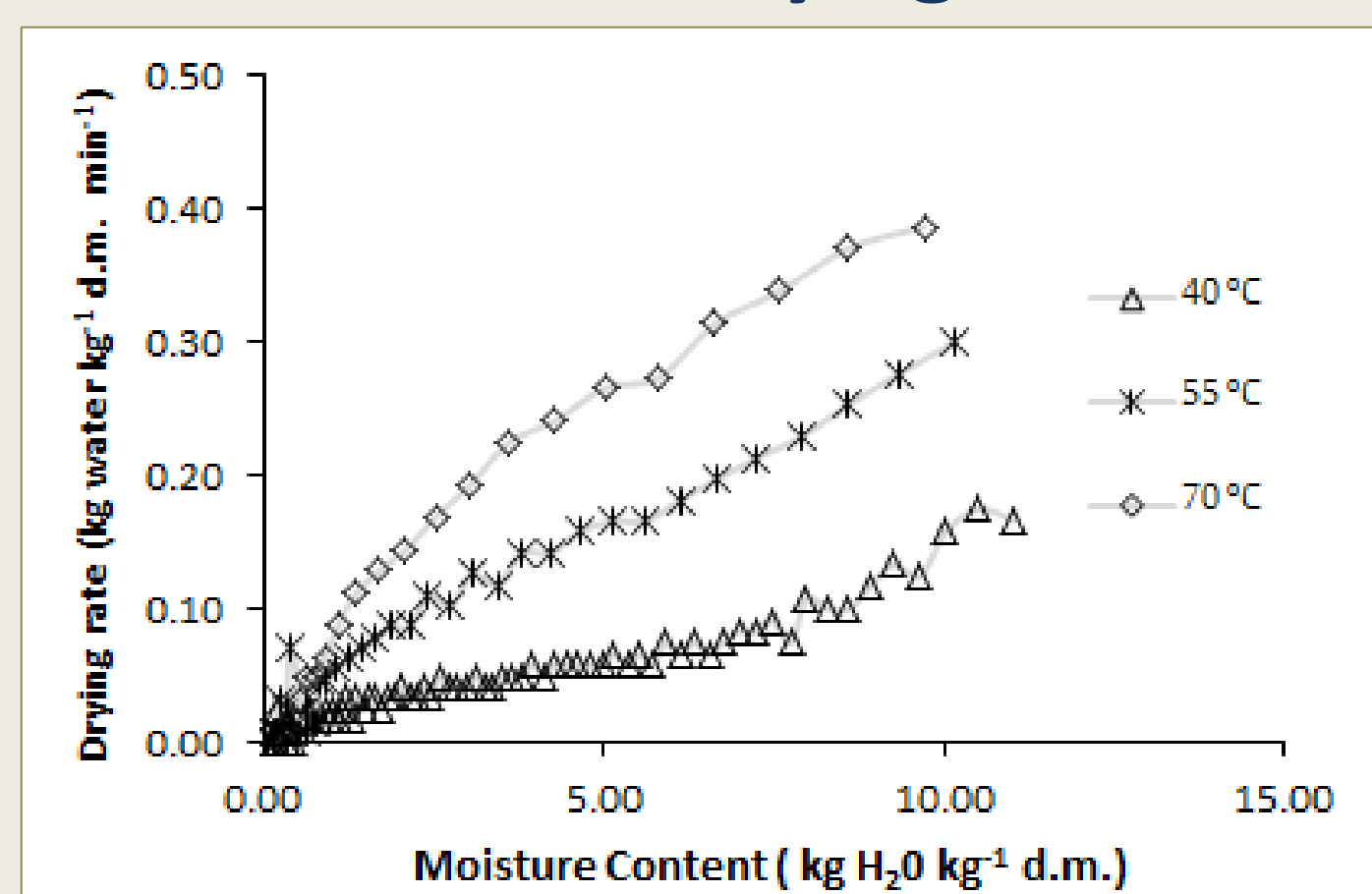


❖ Results & Discussion

○ Drying curve



○ Characteristic drying rate curve



○ Air relative humidity and watercress water activity

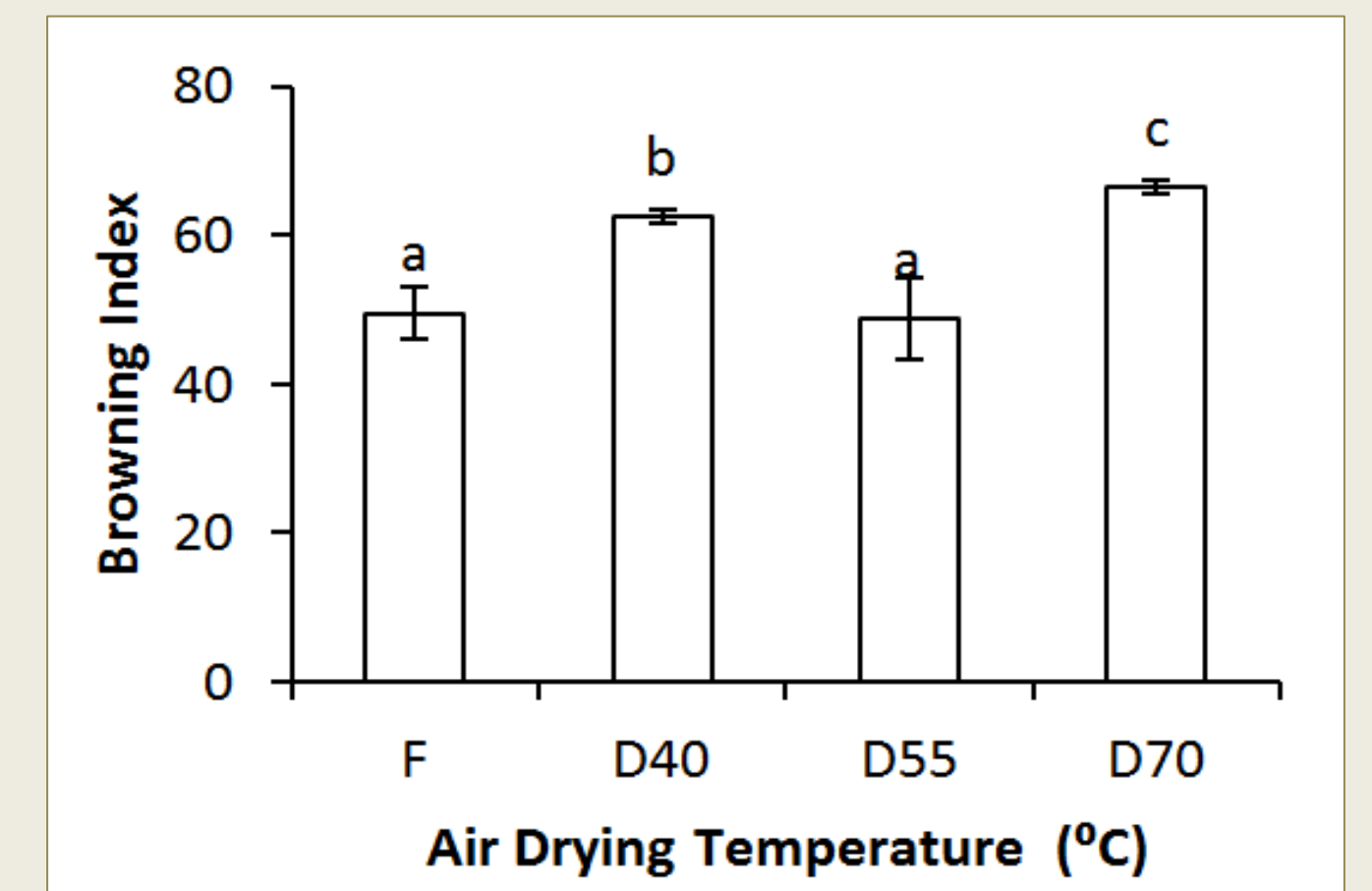
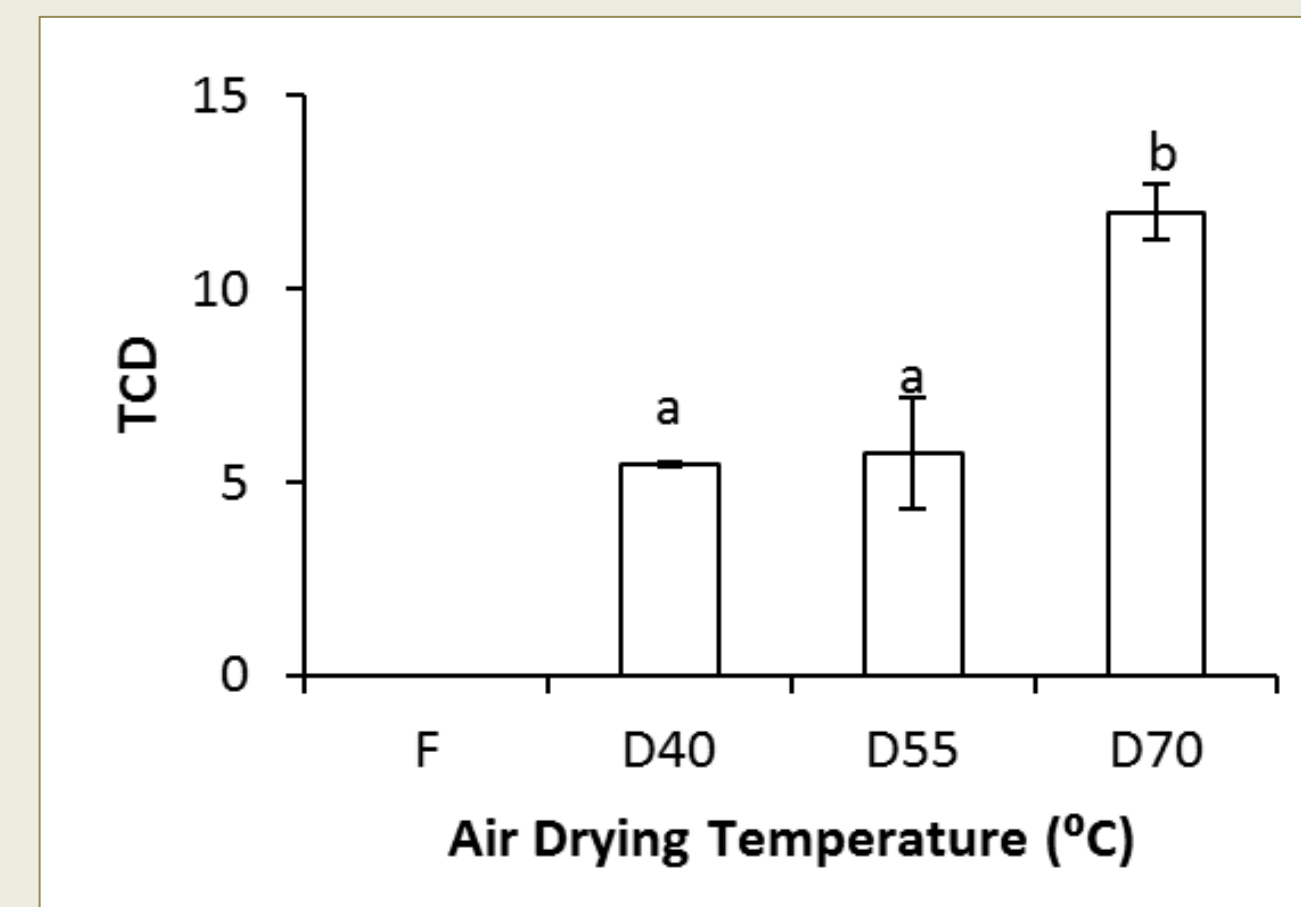
Drying temperature (°C)	Air relative humidity (%) ^a	Water activity ^b
40	38.4±1.5	0.463±0.002
55	24.4±1.7	0.401±0.002
70	16.1±1.2	0.474±0.003

^aValues expressed as mean ± standard deviation, n = 3.

^bValues expressed as mean ± standard deviation, n = 7.

❖ Results & Discussion (Cont.)

✓ Color parameters



Fresh



40 °C



55 °C



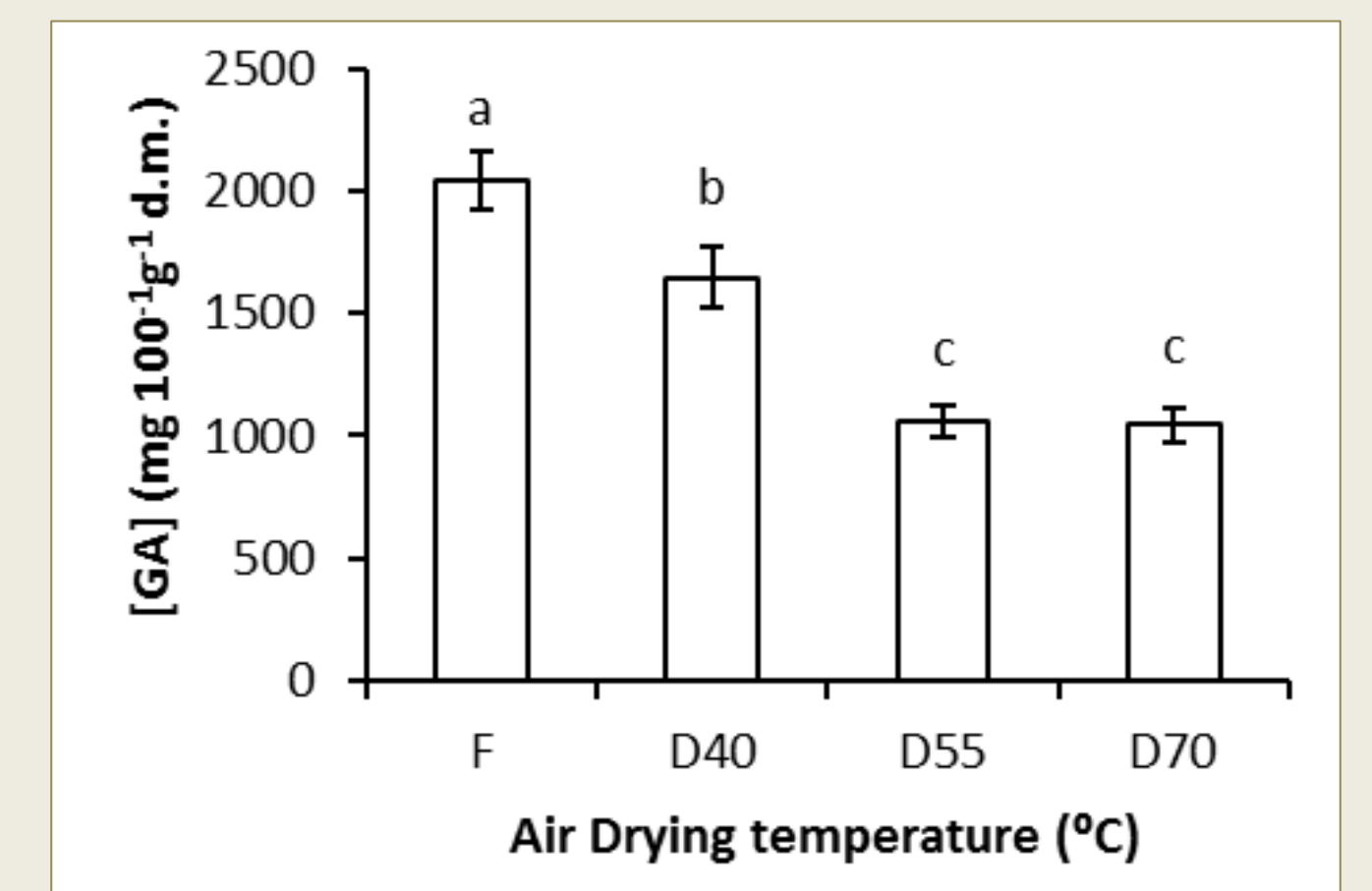
70 °C

○ Vitamin C

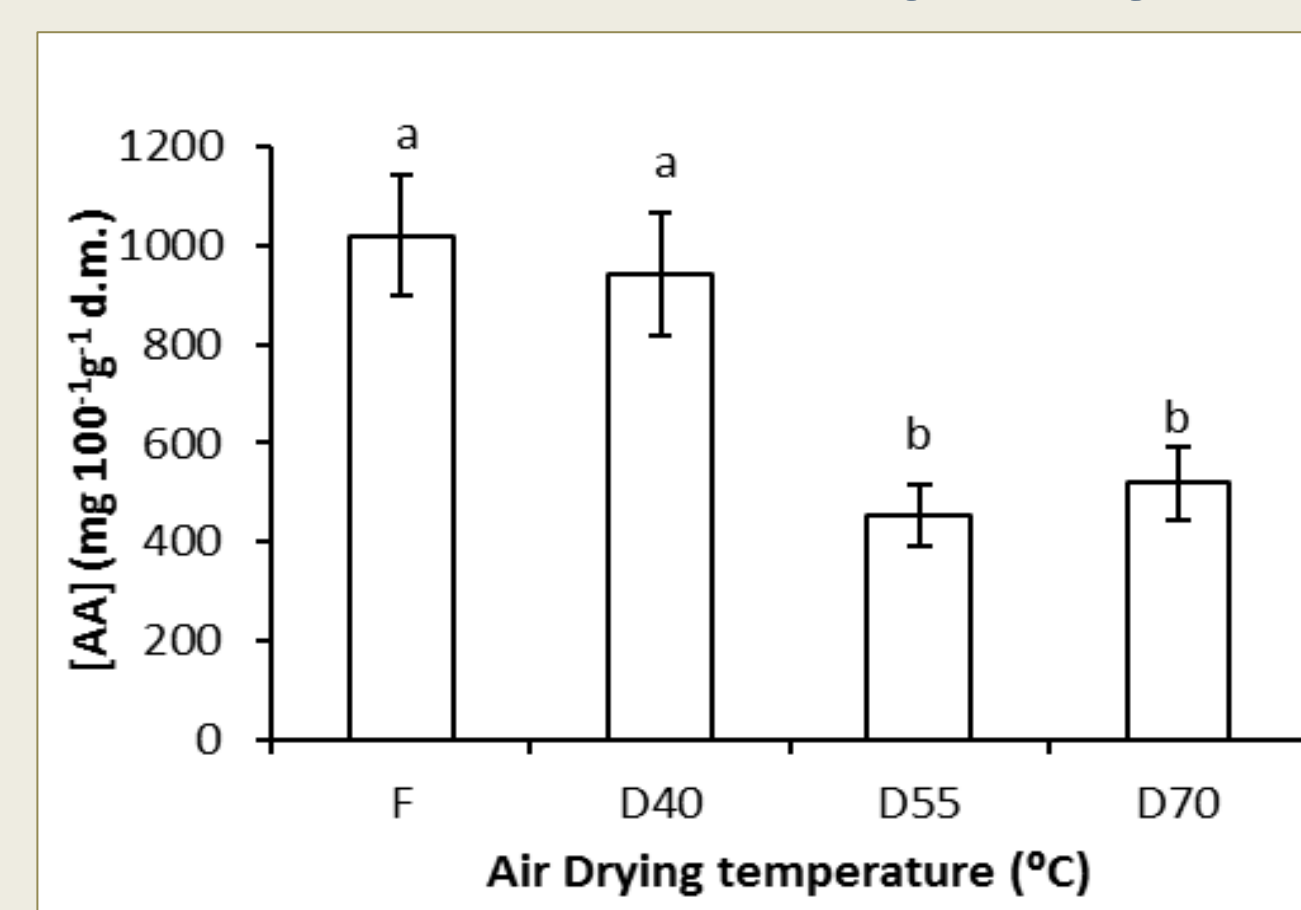
Drying temperature (°C)	Vitamin C [§] (mg 100 ⁻¹ g ⁻¹ d.m.)	Retention (%)
fresh	2305.1 ± 92.8 ^a	-
40	1678.4 ± 96.7 ^b	72.8 ± 4.2
55	1221.9 ± 312.2 ^c	53.0 ± 13.5
70	287.4 ± 88.6 ^d	12.5 ± 3.8

[§]Values are expressed as mean ± standard deviation, n = 4. Values with the same letter in the first column were not significantly different (P > 0.05).

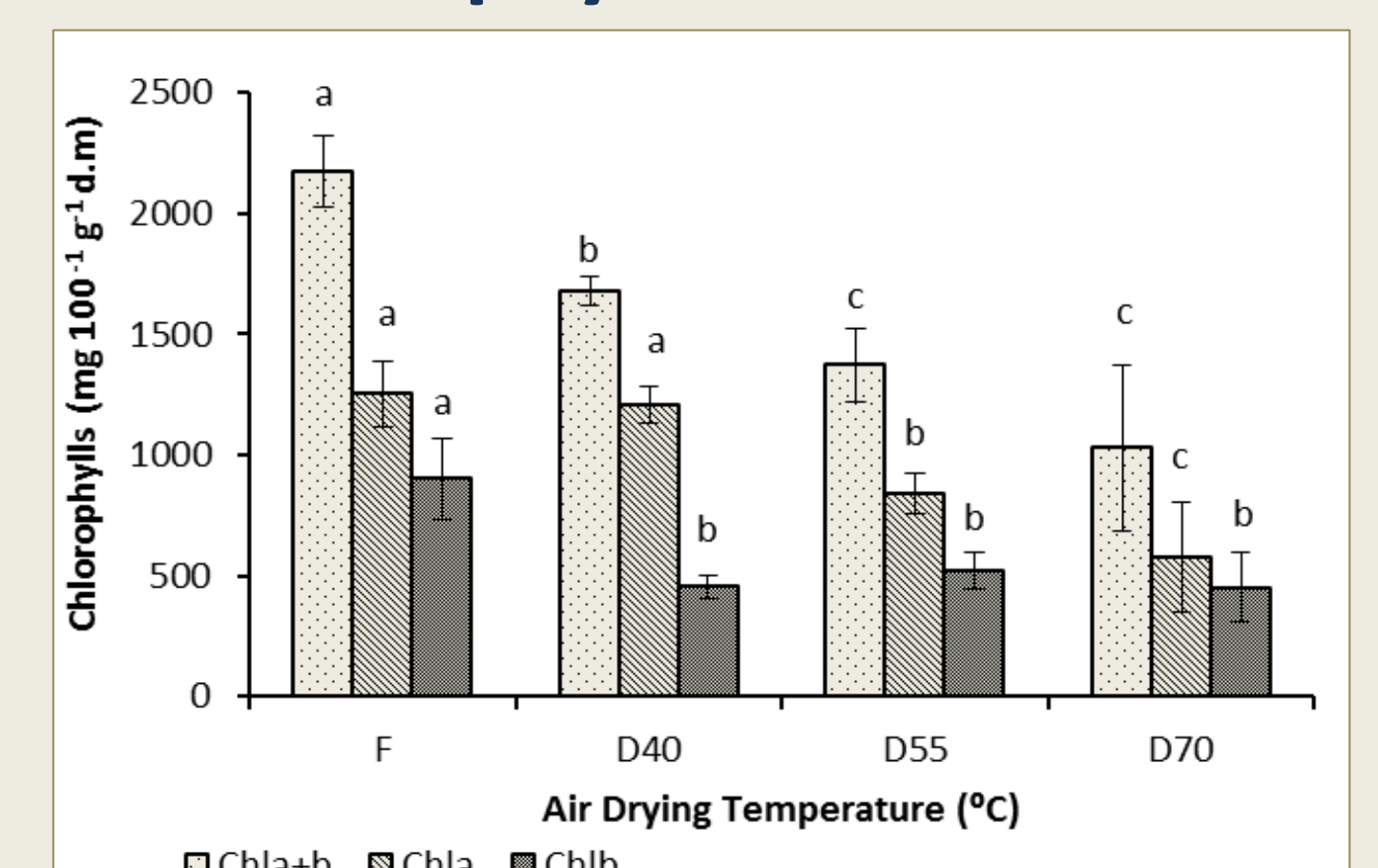
○ Total phenolic content



○ Total antioxidant capacity



○ Chlorophylls



❖ Conclusions

- Increasing drying temperatures
 - Decreasing drying periods, increasing drying rates
 - Reducing values of air relative humidity and watercress water activity
- Characteristic drying rate curve
 - Absence of constant rate period (CRP)
 - One falling rate period (FRP)
- Convective drying affected adversely the quality of dried watercress
 - Increasing degradation of vitamin C, phenolic compounds, total antioxidant capacity and total chlorophylls as the drying temperature increased
 - Color deterioration more noticeable when higher drying temperatures were employed

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