



# EFFECT OF CANNABIDIOL ON CRYSTALLIZATION BEHAVIOR AND PHYSICAL PROPERTIES OF PALM OIL AND COCOA BUTTER

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## INTRODUCTION

Demand for lipid-based products containing cannabidiol (CBD) is increasing following the legalization of hemp production within the US. This study investigates the impact of CBD on the crystallization behavior and physical properties of cocoa butter (CB) and palm oil (PO), to aid in the development of food products containing CBD.

## MATERIALS AND METHODS

Cocoa butter and palm oil samples with 0%, 1%, and 2.5% CBD were crystallized at 22°C and 26°C, respectively, and the crystallization as a function of time was measured using a pulsed NMR for 165 min and 90 min, respectively. Melting behavior, crystal morphology, and viscoelasticity were measured at this time. Viscoelasticity and hardness were also measured after storing the samples at 5 and 26° C for 48 h for PO; and at 5 and 22° C for 48 h, after storage at 22° C for 2 weeks for CB.

## CONCLUSIONS

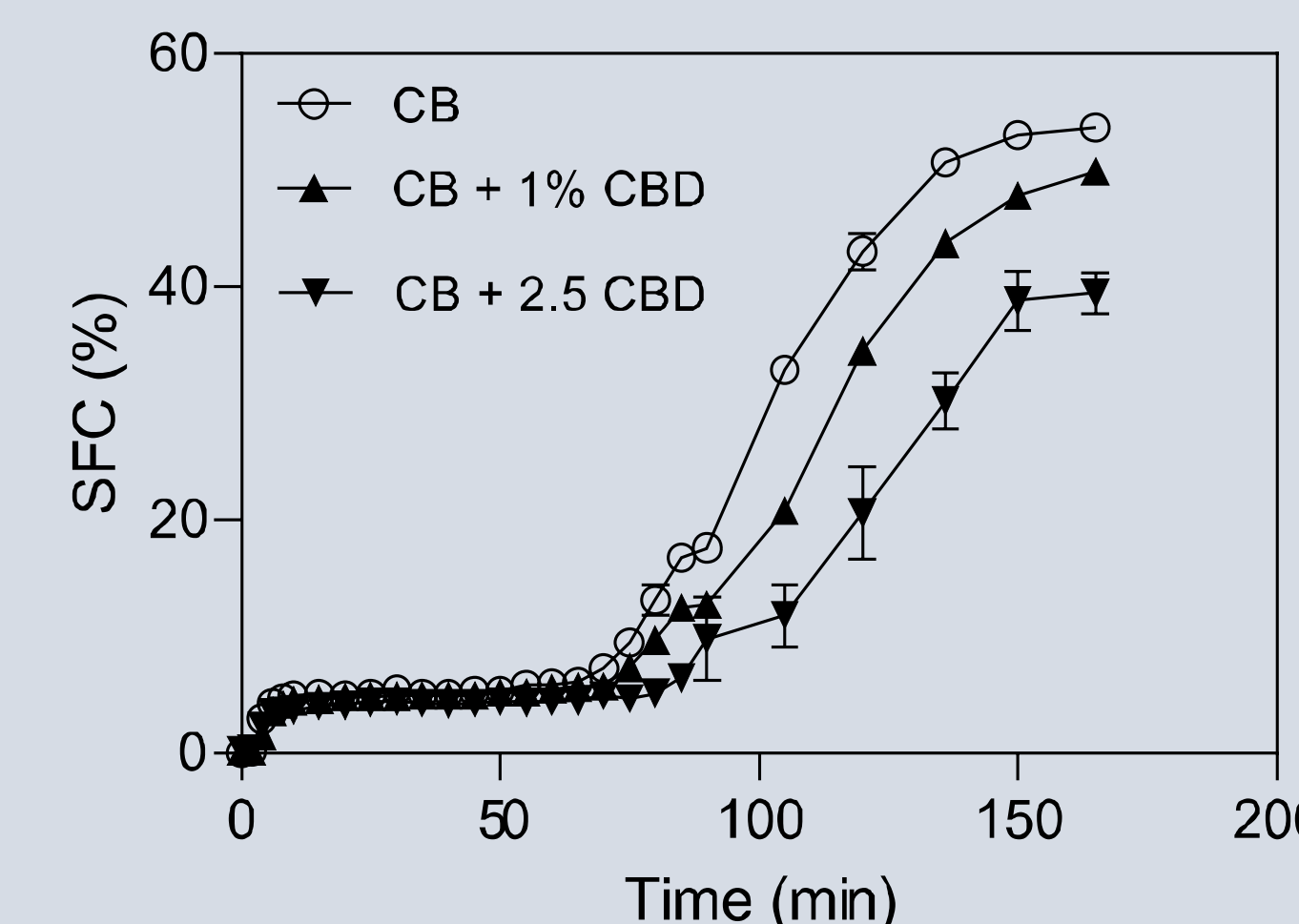
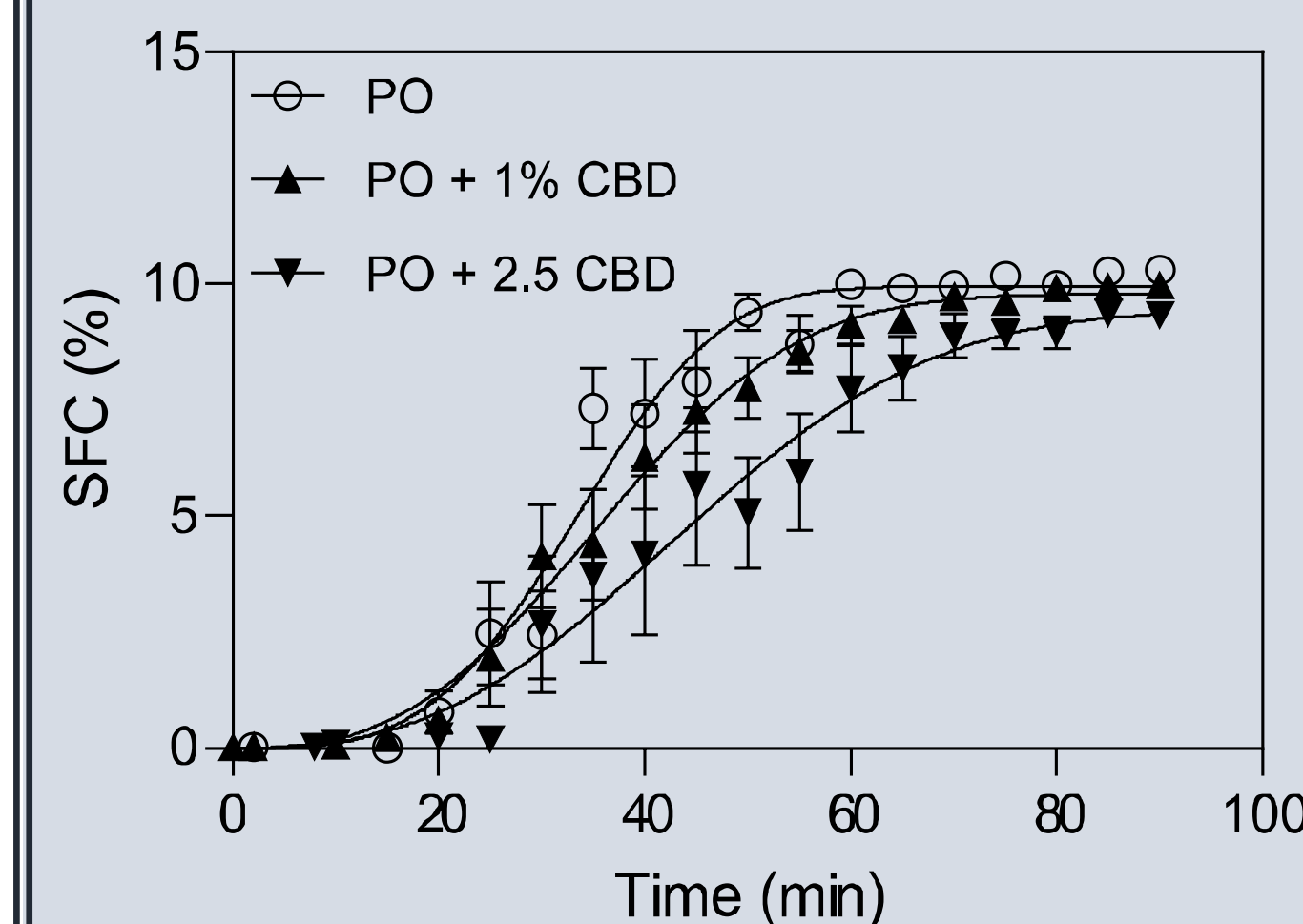
CBD reduces the crystallization rate of palm oil and cocoa butter, so food production processes (like chocolate tempering) might need to be adjusted for CBD content.

Crystal diameter is slightly larger as a result of slower solidification, which could lead to grainier textures in food products containing CBD.

Hardness and elasticity trends suggest that CBD increases inter-crystal consolidation for PO.

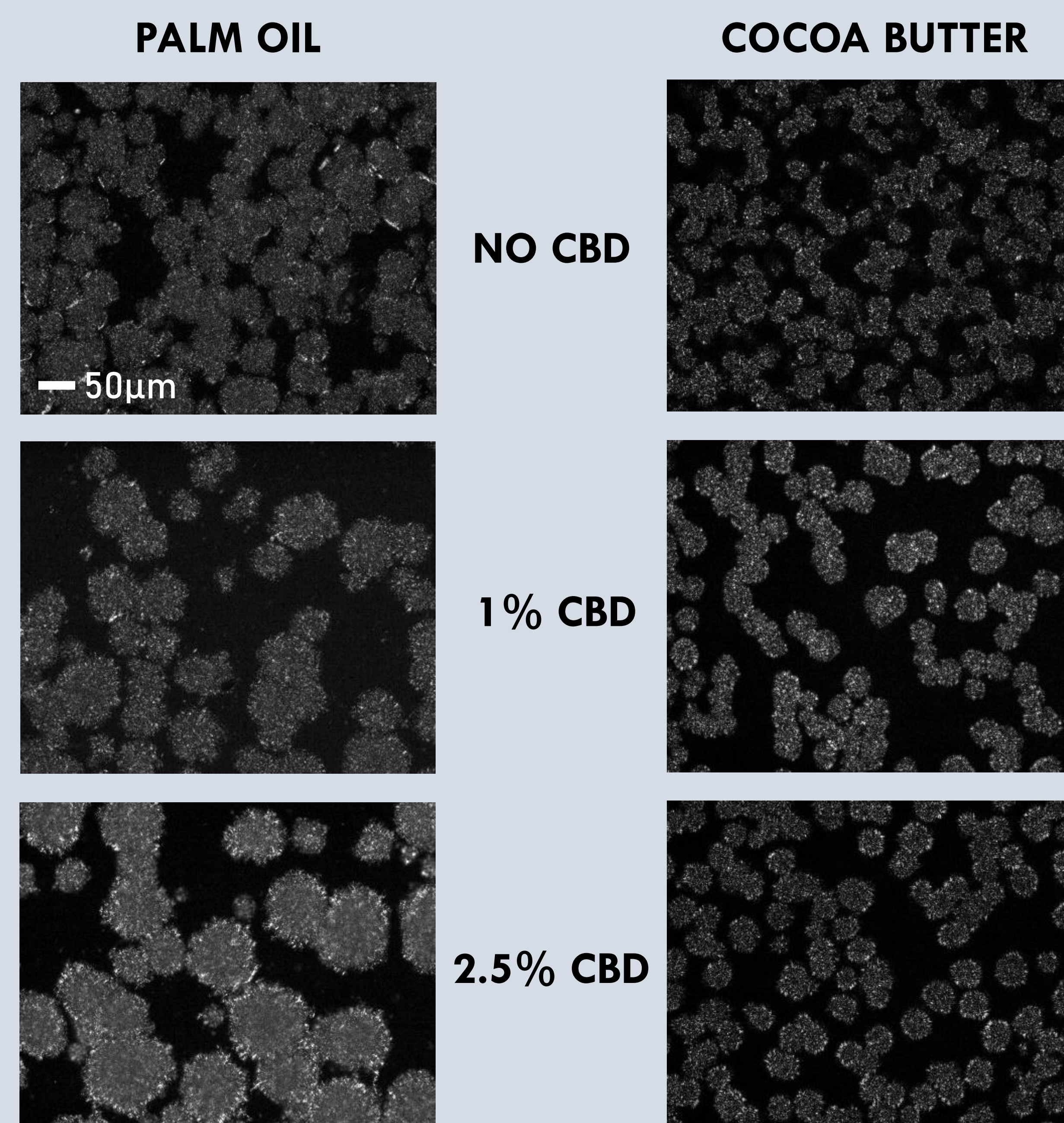
## ACKNOWLEDGEMENTS

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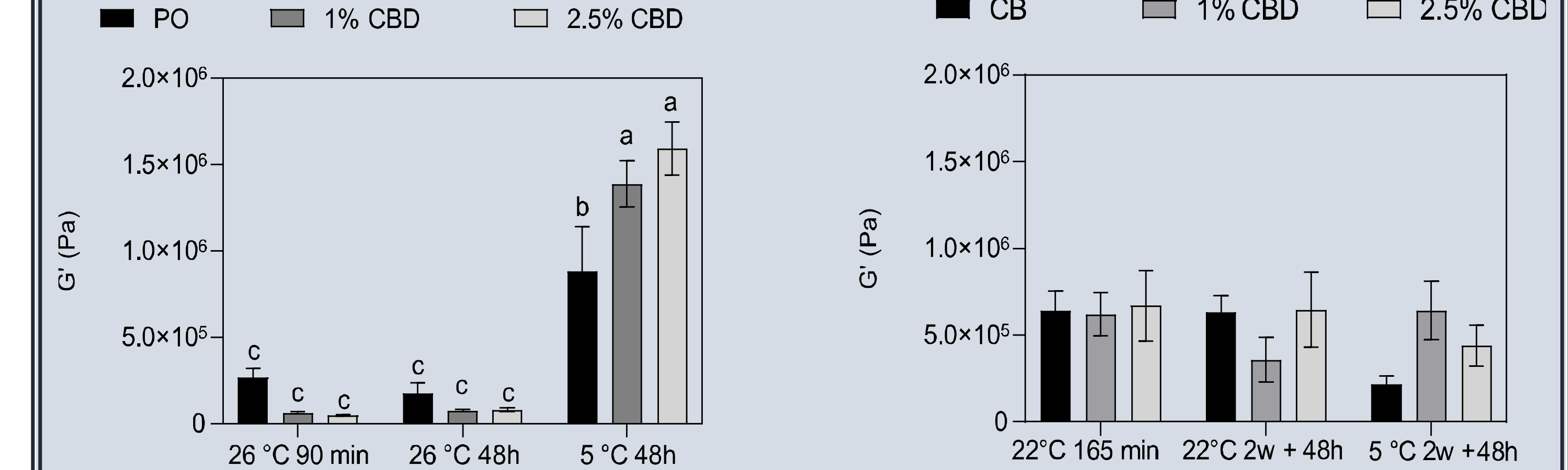
## SOLID FAT CONTENT

Both cocoa butter and palm oil have clearly-delayed solidification as a function of CBD concentration. PO arrives at the same SFC at different rates depending on CBD concentration. CB never arrives at the same SFC.



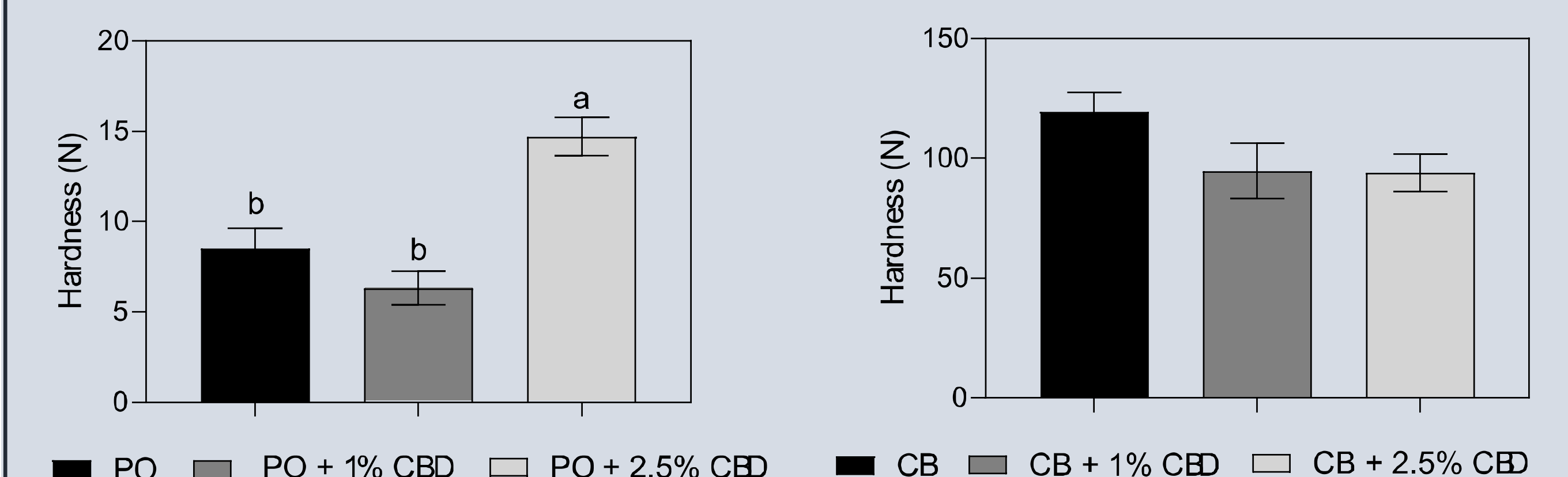
## POLARIZED LIGHT MICROSCOPY

After crystallization time, samples were imaged under a microscope to determine the effect of CBD on crystal diameter. CBD increases crystal diameter for both palm oil and cocoa butter, which makes sense given the slower crystallization rate associated with CBD presence.



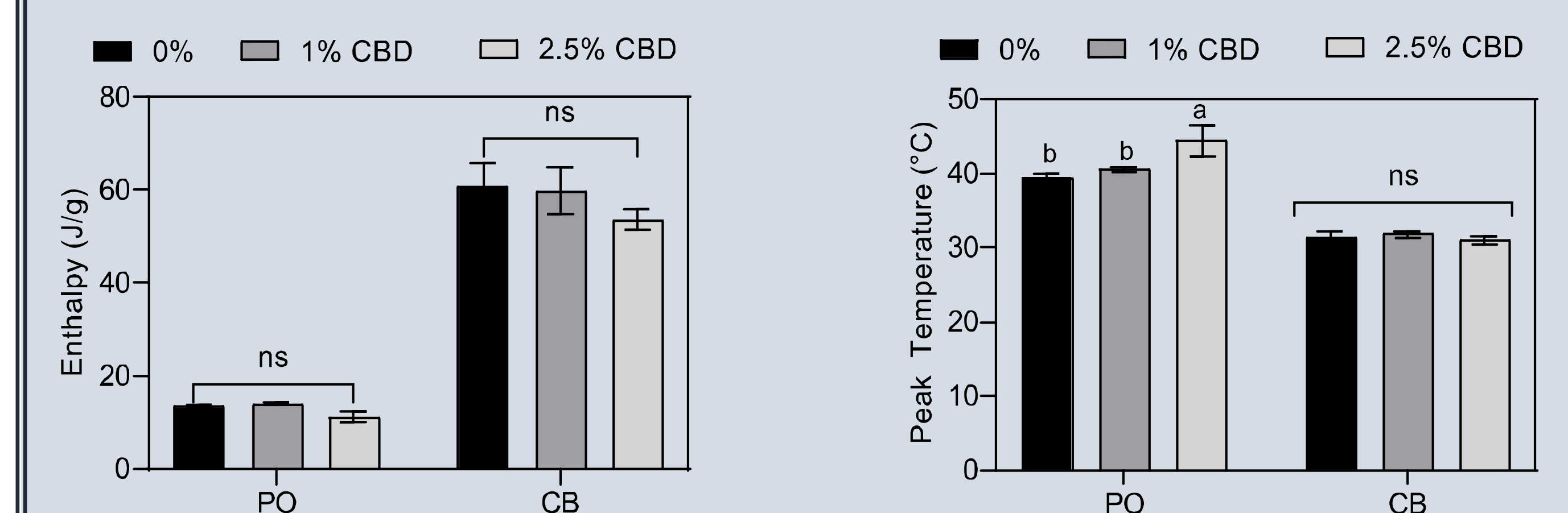
## ELASTICITY

The elastic modulus of palm oil is influenced by CBD, most significantly when it is chilled to 5°C. Cocoa butter elasticity has no consistent relationship with CBD concentration.



## HARDNESS

CBD hardens palm oil, potentially via promoting agglomeration. CBD may soften cocoa butter, but the effect is slight in contrast to PO.



## ENTHALPY & PEAK TEMPERATURE

CBD increases the peak temperature of palm oil slightly, which correlates with the change in hardness.

CBD has no significant effect on enthalpy in CB or PO.