Dear Selected Editors,

I would like to submit a manuscript titled “Curious Fringe around a Beet Slice Following Tanner's Law” by Z. Liu, K. Kumar, Y. Fu, A. Maitra, J. Chen and S. Jung for publication as a research article in Physical Review Fluids.

If a slice of beet is placed in a thin layer of juice, a clear fringe will be observed around the beet, the color of which is weaker than the rest of the juice film. This phenomenon is commonly observed in kitchen and has been published as a curious observation in 1956 [1]. Although various hypotheses have been proposed to explain this phenomenon [1,2], the cause is still unclear due to a lack of quantitative experiment. In particular, we believe that the idea of Reynolds ridge is a misinterpretation [2,3,4,5]. While there is an obvious suction flow towards the beet slice, two questions remain open: (i) how does the suction effect arise? (ii) how does the suction generate the fringe pattern? This article answers these questions by combining quantitative experiments with theoretical models. We find that the suction flow is induced by wetting, and the suction flow causes a dimple, i.e. a concave depression, to form right next to the meniscus, which makes the fringe pattern. Although surface tension always tends to smooth out the dimple, viscous drag can slow down this process in thin films, so that the fringe pattern can be observed. The scaling relation between the dimple lifetime and the initial film thickness is close to the Tanner's law, suggesting that this phenomenon could be understood as a generalization of droplet spreading [6,7,8,9]. We seek to resolve the inconsistent interpretations of a commonly observed phenomenon by quantitative experiments and simulations.

All authors believe that the research article would be perfectly suitable for Physical Review Fluids. The research article contains 3742 words, 12 figures, and 22 references. An appendix details the definitions used, example oscillations, natural frequencies measured, and equation derivations. This manuscript has not been published or is currently submitted for publication in other journals. All authors listed above have approved of the manuscript.

Based on their past proficiency in this subject, here is a list of suggested reviewers,

Prof. Thomas Salez, thomas.salez@cnrs.fr

Prof. **Mesfin Tsige, mtsige@uakron.edu**

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Thank you for your consideration. I look forward to hearing from you,

Sunghwan (Sunny) Jung on behalf of all the authors

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