

Spreadability: Is there a correlation between sustainable emollients and topical formulations?

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INTRODUCTION: Safe and renewable emollients should address global sustainability challenges and should provide functionality as spreadability that can impact drug permeation, efficacy, and patient acceptance of topical formulations [1].

OBJECTIVE: This work aims to select the emollient that provides the best formulation practical spreadability. A correlation study between formulation practical spreadability and emollient theoretical spreadability was assessed.

METHOD: O/W topical skin emulsion was prepared with thirteen diverse emollients (15% emollient) with different polarities (very low, medium, high) and sources. A spreadability test was performed for all emulsions to obtain their practical spreadability values. The theoretical density and viscosity values of each emollient are introduced in a mathematical expression developed by Bom et. al. [2] to calculate a theoretically emollient spreadability value. A correlation, between practical (from formulation) and theoretical (from emollient) spreadability values was evaluated.

RESULTS: The practical and theoretical values were listed, separately, in ascendant order. Both lists are compared to find order matches. The regression analysis on practical and theoretical spreadability values shows a coefficient of determination (r^2) of 0.9562. There are four matches between the two spreadability lists. The three degrees of polarity are mixed in each list.

DISCUSSION: The coefficient determination denotes a weak relationship between the two spreadabilities. Only 4 emollients out of thirteen occupy the same position in the spreadability order lists. Two are non-polar, one medium-polar, and one high-polar. The emollient polarity is not a conclusive factor to predict the emulsion spreadability.

CONCLUSIONS: The formulations' spreadability cannot be predicted based on emollient's spreadability. The interaction between emollients and other excipients may also influence this parameter. Future rheological studies may elucidate the microstructure of these emulsions.

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[1] Draelos Z, Tanghetti E, Werschler W, Kircik L, Angel A, Lagmay E, Guenin E. In Vitro Rheology Predicts Improved Spreadability of Tazarotene 0.045% Lotion Versus Trifarotene 0.005% Cream. *J Drugs Dermatol.* 2022 Mar 1;21(3):250-257. doi: 10.36849/JDD.6703. PMID: 35254756.

[2] Bom, S., Gouveia, L. F., Pinto, P., Martins, A. M., Ribeiro, H. M., & Marto, J. (2021). A mathematical modeling strategy to predict the spreading behavior on skin of sustainable alternatives to personal care emollients. *Colloids*

and Surfaces B: Biointerfaces, 205, 111865. <https://doi.org/10.1016/j.colsurfb.2021.111865>.
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