

# SOLID DISPERSION AND FLOATING GEL IN SITU APPROACHES FOR IMPROVED SOLUBILITY AND SUSTAINED RELEASE BEHAVIOR OF $\beta$ -CAROTENE EXTRACTED FROM PALM OIL

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## BACKGROUND

Free radical has caused numerous serious diseases around the world.  $\beta$ -carotene is one of antioxidant agents used to overcome this issue. However, this compound possesses low aqueous solubility and low bioavailability. Therefore, it is critical to enhance the solubility and sustain the release profile of  $\beta$ -carotene, resulting in high bioavailability. With respect to source, palm oil has been reported to be the rich source of  $\beta$ -carotene. Here, we extracted  $\beta$ -carotene from palm oil using saponification reaction. To improve solubility and sustain the release,  $\beta$ -carotene was further formulated into solid dispersion and floating gel in situ.

## OBJECTIVES

Develop Solid Dispersion-Floating Gel In situ containing  $\beta$ -carotene from palm oil extract with high solubility and controlled dissolution profile

## CONCLUSION

Solid dispersion-floating gel in situ containing  $\beta$ -carotene extracted from palm oil was successfully formulated. This combination approach could improve the solubility and sustain the release of  $\beta$ -carotene over 24 h.

## REFERENCES

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## METHODS



Table 2. Solid Dispersion (SD) Formula Model

Independent Variable	Level		
	-1	0	1
PVP Concentration	0	1	2
PEG Concentration	0	1	2
CD Concentration	0	1	2



Physical Properties  
Chemical Properties  
Dissolution Profile

In-Vitro Drug Release

Physical Properties  
In-Vitro Gelation  
Viscosity  
 $\beta$ -carotene concentration

## RESULT AND DISCUSSION

Palm Tree Fruit  $\longrightarrow$   $\beta$ -Carotene Extract (yield value 6,36%)

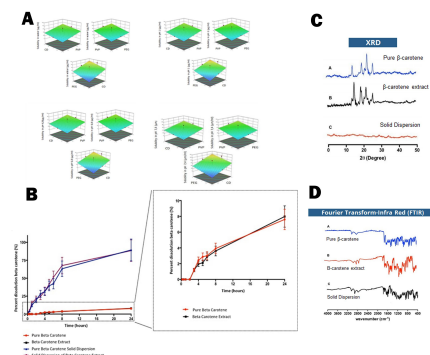


Figure 1. Solid Dispersion Evaluation: (A) SD Optimization; (B) SD Dissolution Profile; (C)XRD Profile; (D) FTIR Profile

Following optimization process, the final formulation of solid dispersion was PVP: PEG: cyclodextrin with the ratio of 0.334: 2: 0.983. The solid dispersion showed that there were no interactions between all compound in the formulation (Figure 1D) and the form of  $\beta$ -carotene changed from crystal to amorph (Figure 1C). Importantly, the dissolution profile of  $\beta$ -carotene was improved from  $7.98 \pm 0.51\%$  to  $88.81 \pm 6.91\%$  (Figure 1B)

Table 2. Composition of Solid Dispersion-Floating Gel In Situ containing  $\beta$ -carotene extract

	Solid Dispersion	Sodium Alginate	NaHCO <sub>3</sub>	CaCO <sub>3</sub>	HPMC	Pluronic F127	PVA
F1	0.875	1.5	0.75	0.5	0	0	0
F2	0.875	1.5	0.75	0.5	0.5	0	0
F3	0.875	1.5	0.75	0.5	1	0	0
F4	0.875	1.5	0.75	0.5	1.5	0	0
F5	0.875	1.5	0.75	0.5	2	0	0
F6	0.875	1.5	0.75	0.5	0	0.5	0
F7	0.875	1.5	0.75	0.5	0	1	0
F8	0.875	1.5	0.75	0.5	0	1.5	0
F9	0.875	1.5	0.75	0.5	0	2	0
F10	0.875	1.5	0.75	0.5	0	0	0.5
F11	0.875	1.5	0.75	0.5	0	0	1
F12	0.875	1.5	0.75	0.5	0	0	1.5
F13	0.875	1.5	0.75	0.5	0	0	2

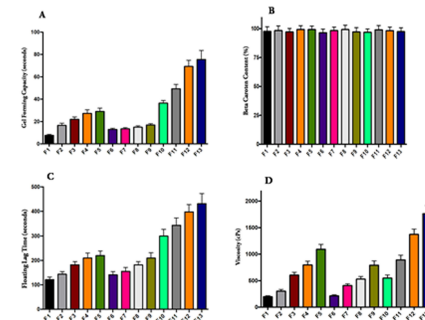


Figure 2. Floating Gel Evaluation: (A) Gel Floating Capacity; (B)  $\beta$ -Carotene Concentration; (C) Floating Lag Time; (D) Viscosity

All formulation were evaluated and result showed that formulation containing  $\beta$ -carotene solid dispersion, sodium alginate, sodium bicarbonate, calcium carbonate, and HPMC with the concentrations of 0.875, 1.5, 0.75, 0.5, and 1.5 % exhibited desired characteristics with optimum floating lag time

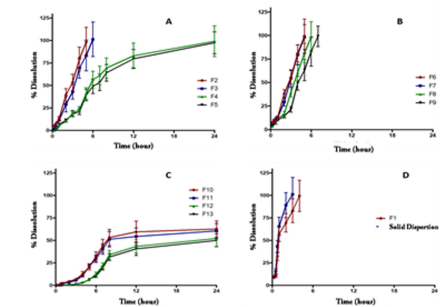


Figure 3. In Vitro Dissolution Study of Floating Gel In Situ Gel Formulation using (A) HPMC, (B) Pluronic F127, (C) PVA, (D) without controlled release polymer and  $\beta$ -SD, in FaSSGF.

Formulation containing  $\beta$ -carotene solid dispersion, sodium alginate, sodium bicarbonate, calcium carbonate, and HPMC with the concentrations of 0.875, 1.5, 0.75, 0.5, and 1.5 % was capable to sustain the release of  $\beta$ -carotene around  $99.28 \pm 17.11\%$  over 24 hour compared to solid dispersion formulation.