Artificial Intelligence and Predictive Models in Pharmaceutical Technologies

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Drying of Canagliflozin Nanosuspension by Top Spray Granulation and Spray Drying Methods and Optimizing the Procedure

poster number 1231

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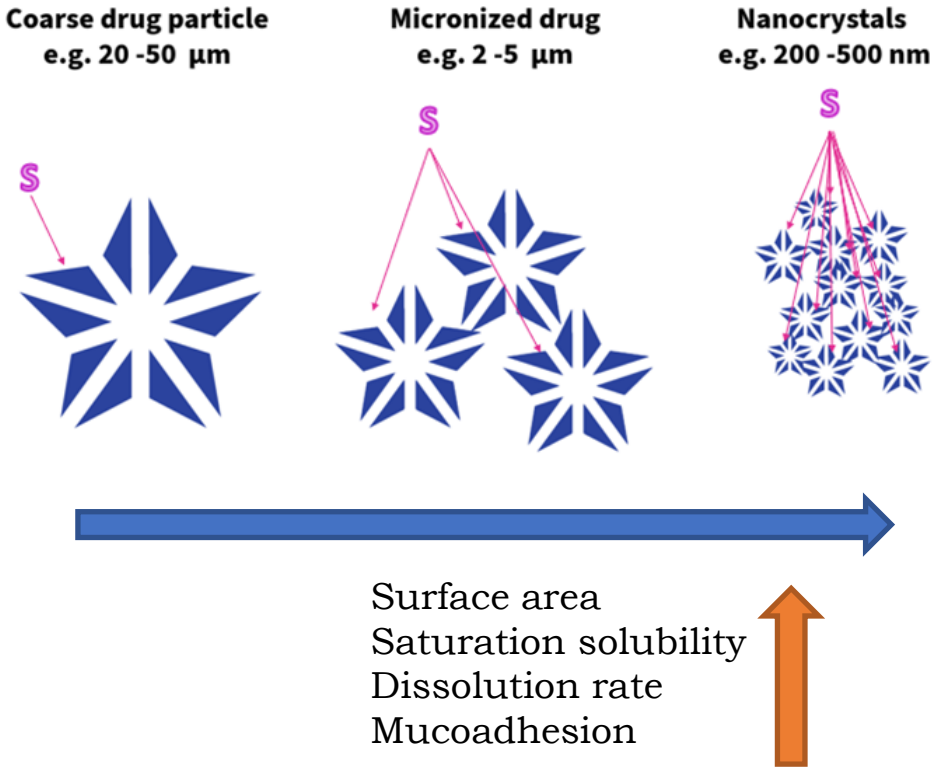
What is nanosuspension?

Drug nanocrystals with a range of 200-500 nm in the liquid medium.



often convert into solid phase in order to increase stability and patience compliance.

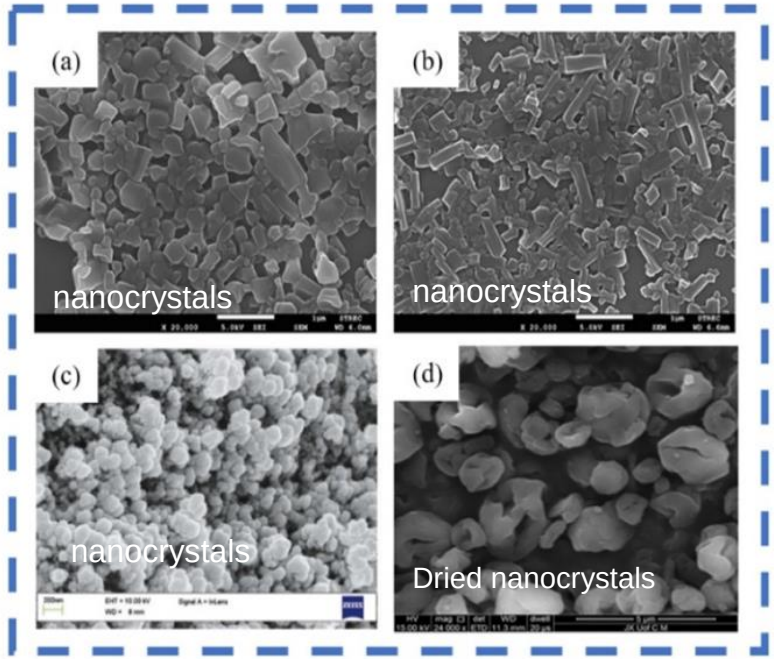


Fig. 1: SEM micrographs of clarithromycin nanocrystals (a,b,c), Spray dried nano-crystal (d) (1).

1. Ran, Q.;Wang, M.; Kuang, W.; Ouyang, J.; Han, D.; Gao, Z.; Gong, J. Advances of Combinative Nanocrystal Preparation Technology for Improving the Insoluble Drug Solubility and Bioavailability. Crystals **2022**, 12, 1200.

Methods

❖ Solidification of Canagliflozin Nanosuspension

Top-Spray Granulation

Spray Drying

❖ Characterization of Dried Nanosuspension

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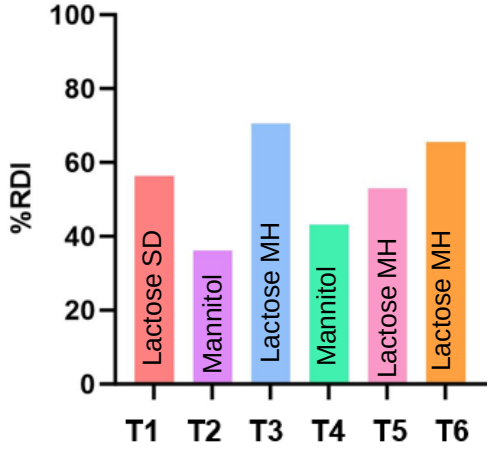
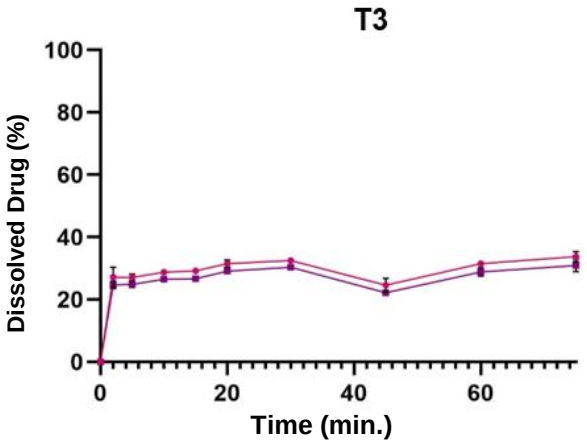
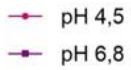
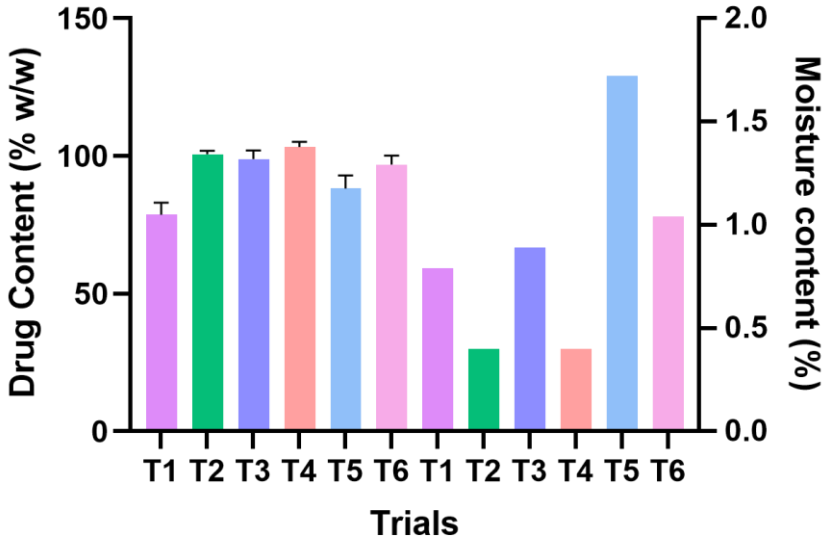
Process Development of Top-Spray Granulation





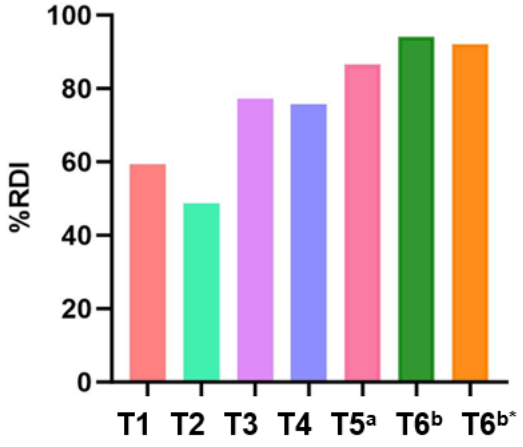


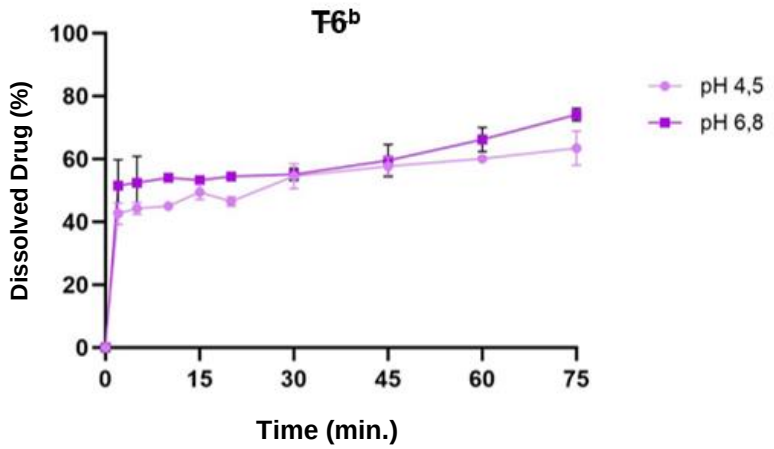


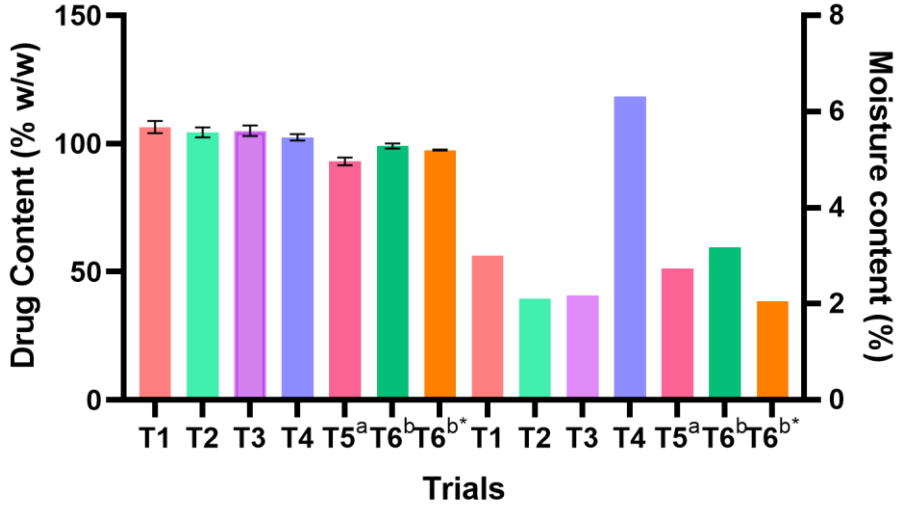
- Redispersibility index (%) is manntiol < lactose, respectively.
- The increase in inlet air temperature and moisture content caused the particle size of the nanocrystals to increase.
- A reduction in the feed rate resulted in an increase in the redispersibility index (%) of up to 77 %.

Process Parameters	Test No.			
	T1 - T2	T3	T4	T5 -T6*
Inlet air temperature (°C)	75-65	60-50	55	55-45
Air stream (bar)	0.35 – 0.65	0.30 – 0.40	0.25 – 0.30	0.25 – 0.28
Atomization pressure (bar)	1.0 – 1.3	1	1	1.0 – 1.25
Feed rate (rpm)	10	8	10	10
Outlet air temperature(°C)	24 - 28	23 - 25	25	24 - 25
2:1 mannitol solution was added to the T6* experiment to prevent crystal growth.				

Process Development of Spray Drying



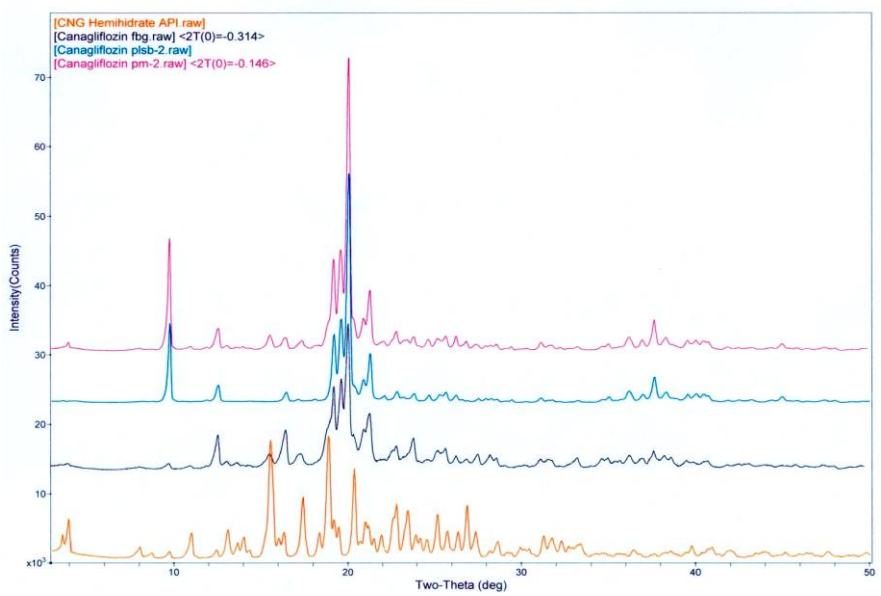


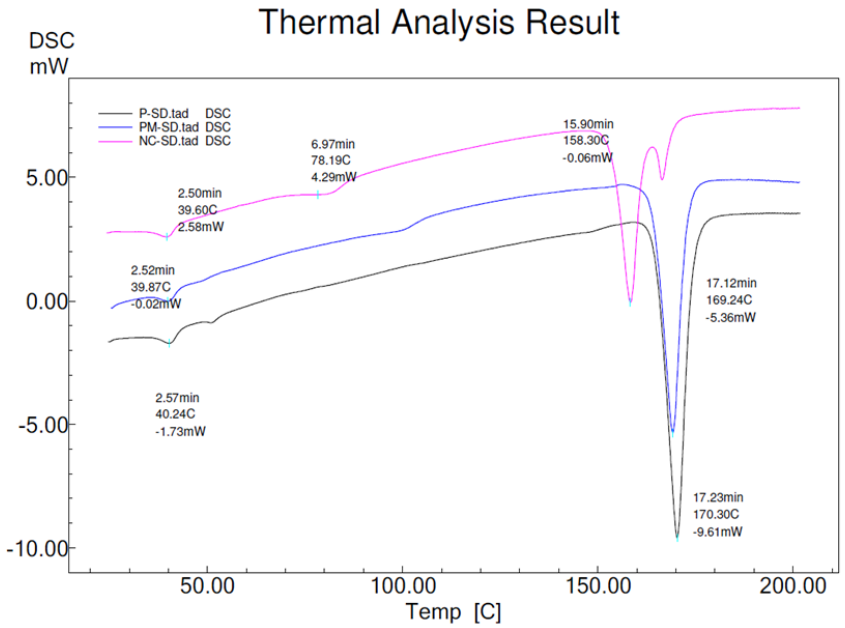


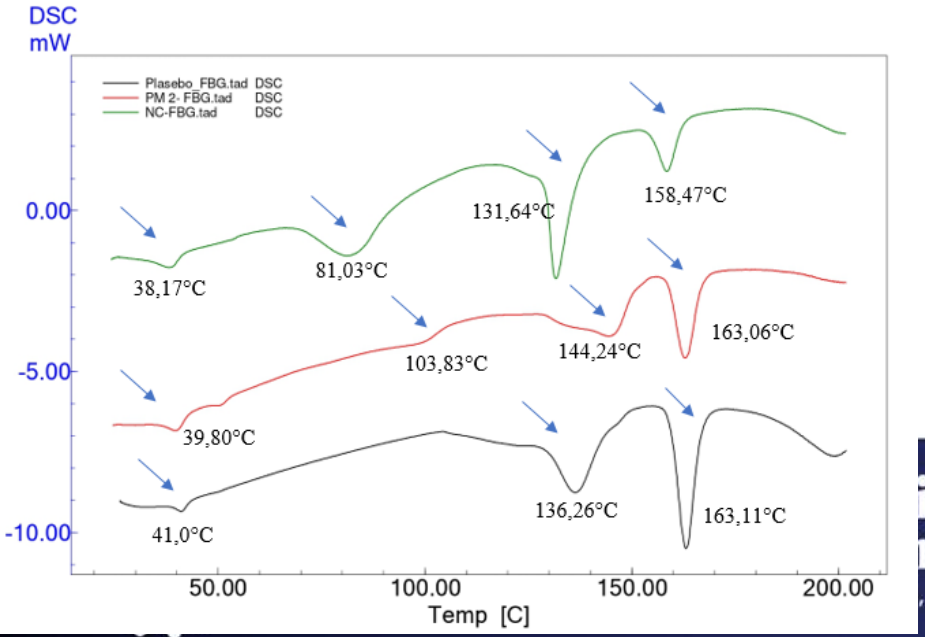
- Inlet air temperature and feed rate influence the outlet air temperature and thus trigger the agglomeration of nanocrystals.
- % RDI increased with the addition of mannitol.
- %RDI was increased to 94% by increasing the ratio of mannitol to API by 2:1.

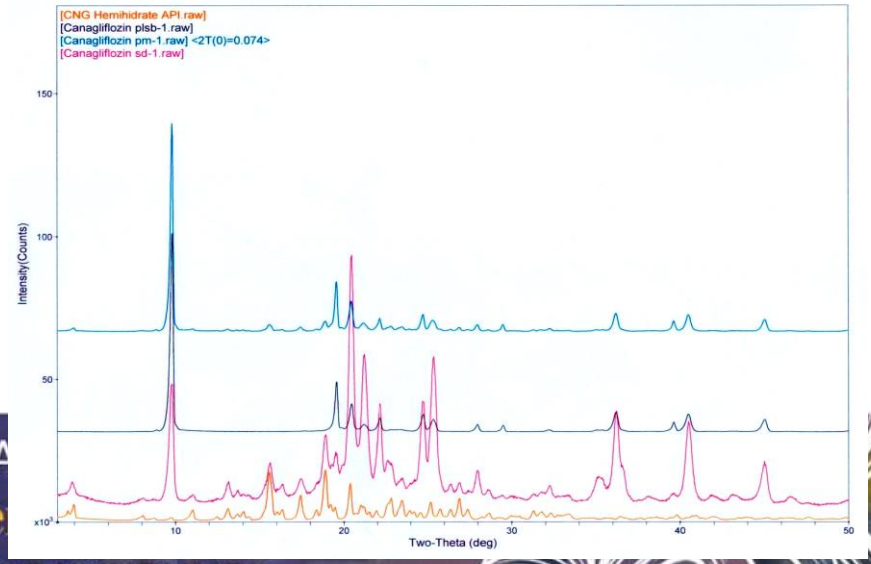
Process Parameters	Test No.						
	T1	T2	T3[a]	T4[a]	T5[a]	T6[b]	T6[b*]
Inlet air temperature(°C)	130	130	130	100	70	70	70
Aspiration(%)	100	100	100	100	100	100	100
Air stream	30	30	30	50	50	50	50
Feed rate (%)	30	20	20	10	10	10	10
Outlet air temperature (°C)	44	52	51-52	56-55	42-41	40	40

Comparison of Drying Methods









Conclusion

- In our study, spray drying method provided an effective means within the highest re-dispersibility index (94%) and in vitro dissolution rate under the *non-sink* condition. (63% and 74% in the media of pH 4.5 and pH 6.8, respectively).

- However, drying of CFZ nanocrystals by top spray granulation resulted in dramatic particle growth, reducing the increased dissolution rate to 42%.

- Therefore, determining the appropriate drying method is really crucial to preserve the advantages of nanocrystals against the thermal stress of the drying process.

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ABDİİBRAHİM

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