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Benefits of low-temperature spray drying technologies on maintaining both flavor integrity and intensity

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Introduction: Flavor remains consumers' top criterion for choosing foods and beverages. Spray drying is the most widely used method for microencapsulation flavor in the food industry, due to its ease of processing and low operating cost. Conventional spray drying feeds liquid slurry into hot air at 150 to 2200C to remove water, thus flavor loss and oxidation are inevitable during the drying process. Maintaining flavor intensity and integrity during spray drying has been a substantial challenge in the food industry. Low-temperature spray drying technologies may reduce flavor loss and oxidation.

Methods: Three low-temperature spray drying technologies spray cooling, spray freeze drying and supercritical CO₂ spray drying were investigated and compared with conventional spray drying technology in parallel. Size and surface morphology of flavor microcapsules were observed by SEM. Flavor loading level, encapsulation efficiency and wet delivery capacity were measured by GC-MS and APCI-MS. Flavor intensity and integrity were evaluated by sensory using potato chips as matrix.

Results & Discussion: Based on the same flavor microencapsulation formulation, supercritical CO₂ spray drying shows the highest flavor loading capacity, while maintaining the highest flavor integrity among the three technologies. Spray cooling maintains flavor integrity well, with the slowest flavor release. But spray freeze drying generates a porous structure that can't hold flavor well. Low temperature spray drying technologies, particularly supercritical CO₂ spray drying and spray cooling, offer superior capability of loading and preserving flavor, compare to conventional spray drying.

Conclusion: Low-temperature spray drying technologies, particularly supercritical CO₂ spray drying and spray cooling, offer superior capability of loading and preserving flavor, compared to conventional spray drying. This finding will enable the food industry to maximize flavor usage in both snacks and beverages, to save cost

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