Supplementary Material

**Zein nanoparticles and strategies to improve colloidal stability: a mini-review**

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Supplementary Figure 1: Summary of parameters that influence the zein nanoparticle stability: i) an increase in ionic strength decreases the nanoparticle stability; ii) an increase in pH above of 5 decrease the nanoparticles stability; iii) the use of thermal treatment increase the nanoparticle stability (75oC for 15 min); iv and v) coating agents and emulsifiers increase the nanoparticle stability in solution; vi) storage conditions in dark and at 6oC increase the colloidal nanoparticle stability.



**Supplementary Figure 2:** Proposed strategies to be used to increase the stability of zein nanoparticles. At the first moment is need to do the thermal treatment (protein denaturation) and after the use of coating agent in order to improve the zein nanoparticle stability.

Supplementary Table 1:Studies found in the literaturerelated to the production of zein nanoparticles as carriers for different active agents. The results and preparation methods employed are summarized. Note the absence of information concerning the stabilities of some of the formulations.

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| --- | --- | --- | --- | --- | --- |
| Zein NPs (ZNPs) | **Size (nm)** | **Encapsulation**  **efficiency (%)** | **Method of**  **preparation** | **Stability** | **References** |
| Curcumin ZNPs Curcumin zein-shellac NPs | 118 - 240.2 62.9 - 4280 | 82.7 93.2 | Antisolvent precipitation | - | Sun et al.(2017) |
| Curcumin ZNPs | 175 - 900 | 85 - 90 | Electrohydrodynamic atomization | 3 months in dark conditions | Gomez-Estacaet al.(2012) |
| Cranberry procyanidin ZNPs | 392-447 | 48 - 79 | Liquid-liquid dispersion | - | Zou et al. (2012) |
| Thymol and carvacrol ZNPs | 51.9 - 328.1 | > 50 | Liquid-liquid dispersion | - | Wu et al. (2012) |
| 5-fluorouracil ZNPs | 114.9 | 60 | Phase separation | ZNPs aggregated after 6 months at 25°C, but not at 4°C | Lai andGuo(2011) |
| Catalase and superoxide dismutase ZNPs | 255.21 | 31.36 - 44.99 | Phase separation | - | Lee et al. (2013) |
| Thymol and carvacrol ZNPs | 108 - 122 | 88.5 - 99.9 | Antisolvent precipitation | ZNPs precipitated after 2 months at 20°C, but not at 4°C | Da Rosa et al.(2015) |
| Chitosan coated retinol ZNPs | Retinol ZNP: 300 Chitosan retinol ZNP: 500 | 64.9 80 | Antisolvent precipitation | - | Park et al. (2015) |

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