

Supplemental Results

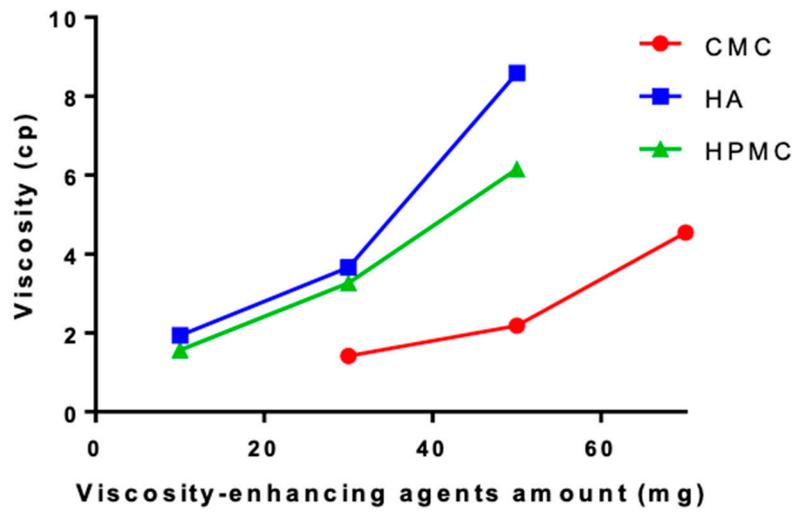


Figure S1. Effect of amount and type of lubricants on viscosity.

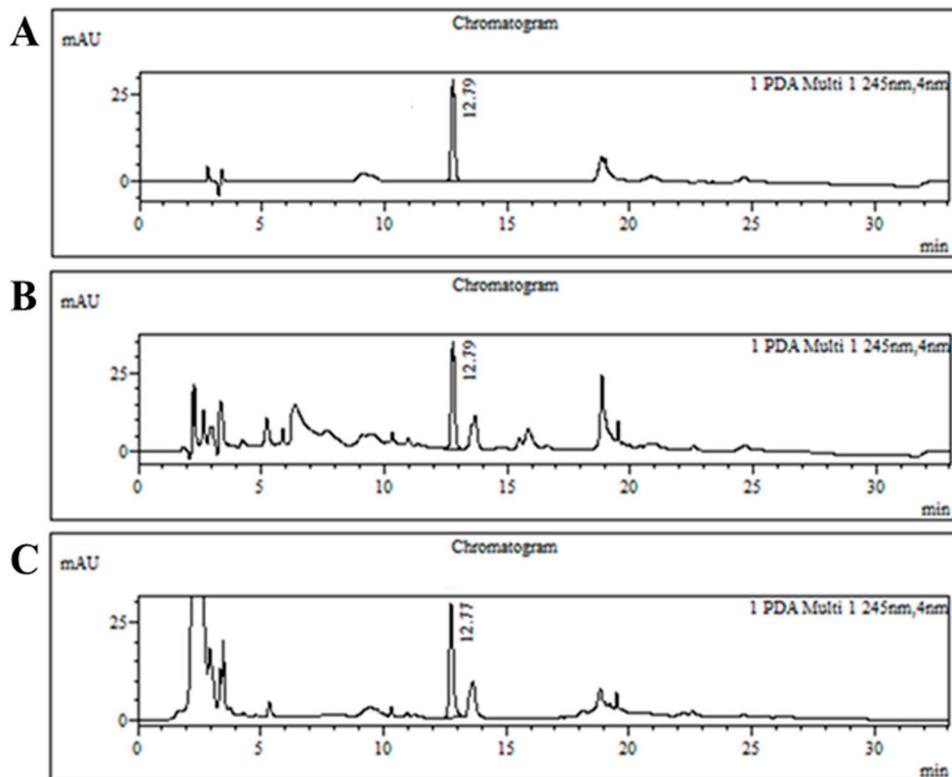


Figure S2. HPLC chromatograms of (A) ecdysterone marker compound, (B) USL 1% solution, and (C) F1.

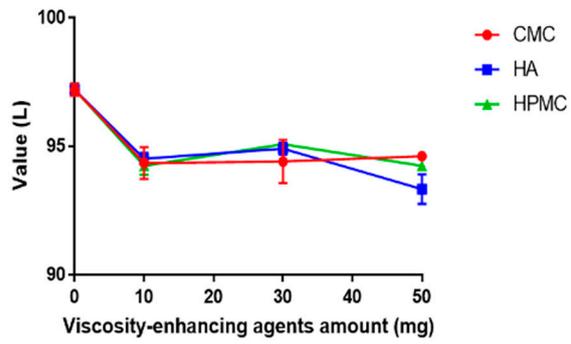
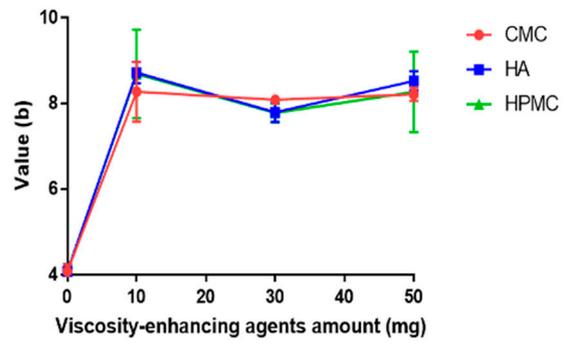
A**B**

Figure S3. Pigmentation evaluation by measuring the color change on the egg shell membrane according to lubricants amount (A) L* value, (B) b* value.

Table S1. The compatibility with additives data and stability evaluation of formulations in 40°C oven storage for 3 weeks

| | Ecdysterone content | Transmittance (600 nm) |
|---|----------------------------|-------------------------------|
| 1% USL and 0.3% HA | 100.3 ± 0.4% | 98.8 ± 0.1% |
| 1% USL and 0.3% HPMC | 99.8 ± 0.2% | 98.8 ± 0.5% |
| 1% USL and 0.5% CMC | 99.9 ± 0.8% | 98.8 ± 0.3% |
| 1% USL and 0.9% NaCl | 99.1 ± 0.3% | 98.6 ± 0.2% |
| 1% USL and 0.5% phosphate buffer | 99.8 ± 0.6% | 99.2 ± 0.3% |
| 1% USL and 0.01% BZK | 99.3 ± 0.2% | 82.2 ± 1.6% |
| F1 | 99.6 ± 1.3% | 99.5 ± 0.2% |
| F2 | 100.3 ± 0.5% | 98.7 ± 0.2% |
| F3 | 99.5 ± 1.0% | 99.1 ± 0.2% |
| F4 | 99.1 ± 0.2% | 99.3 ± 0.2% |

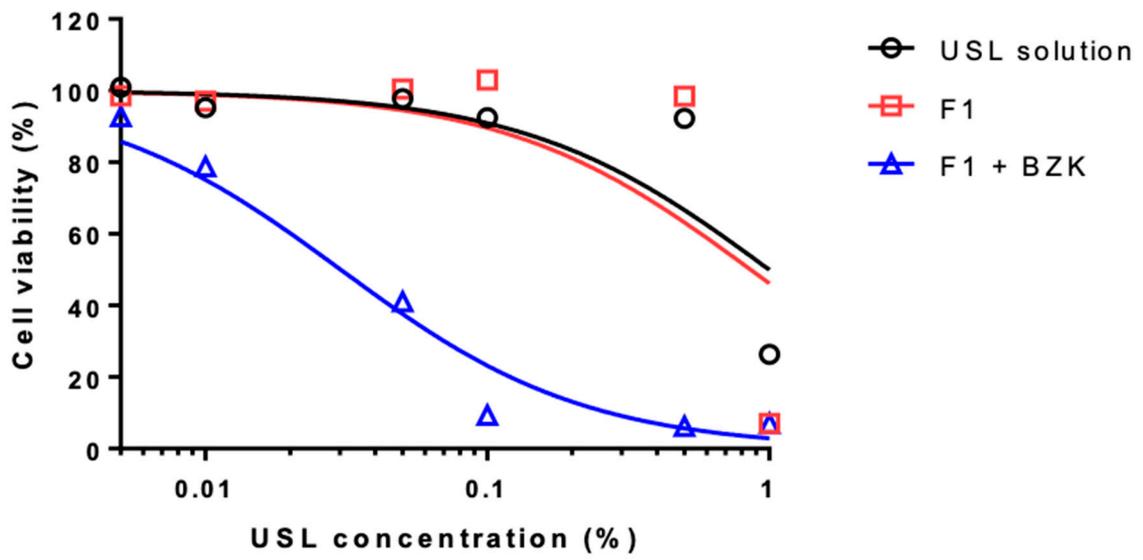


Figure S4. Cytotoxicity of USL, F1 and F1 + BZK in conjunctival epithelial cell for 12 h.

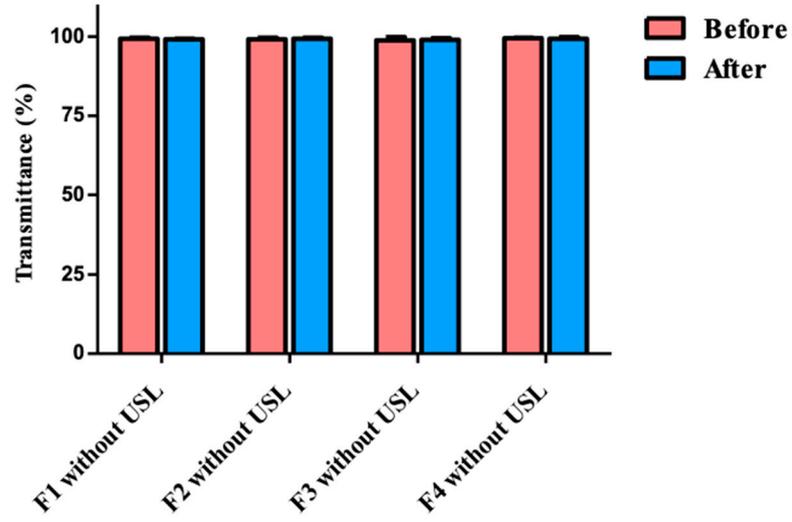


Figure S5. Stability evaluation of precipitation after thermal condition (121°C, 30 min) of each formulation without USL (n=3).