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## OPTIMASI FORMULA DAN UJI AKTIVITAS ANTIOKSIDAN NANOEMULSI MINYAK BIJI LABU KUNING (*Cucurbita moschata* D.)

### ABSTRAK

**Latar Belakang:** Biji labu kuning memiliki kandungan metabolit sekunder yang berperan sebagai antioksidan. Optimasi formula nanoemulsi minyak biji labu kuning menggunakan *design expert* dapat memberikan komposisi optimum untuk menghasilkan sediaan nanoemulsi stabil dan optimal. Penelitian ini bertujuan untuk menentukan formula optimum nanoemulsi minyak biji labu kuning dengan karakteristik fisik yang memenuhi persyaratan dan aktivitas antioksidan yang kuat.

**Metode:** Penelitian eksperimental laboratorium dengan formulasi minyak biji labu kuning sebagai fase minyak, aquadest sebagai fase air, tween 80 dan span 80 sebagai surfaktan, dan PEG 400 sebagai kosurfaktan. Nanoemulsi dikarakterisasi fisik dengan parameter ukuran partikel, PDI, persen transmitan, organoleptis, pH, viskositas, tipe nanoemulsi dan uji aktivitas antioksidan metode DPPH. Data dianalisis menggunakan *software* SPSS Versi 25.

**Hasil:** Nanoemulsi minyak biji labu kuning memiliki komposisi optimum dengan minyak biji labu kuning, kombinasi surfaktan tween 80 7,032%, span 2%, dan kosurfaktan PEG 400 2,968%. Nanoemulsi minyak biji labu kuning memiliki karakteristik yang memenuhi persyaratan meliputi ukuran partikel dengan rata-rata  $42,36 \pm 8,518$  nm, nilai PDI dengan rata-rata  $0,410 \pm 0,036$ , persen transmitan  $90,469 \pm 0,186\%$ , organoleptis bentuk cair, tidak berbau, berwarna putih susu, dan homogen. pH dengan rata-rata  $5,173 \pm 0,025$ , viskositas dengan rata-rata  $12 \pm 0$  cP, dan tipe nanoemulsi O/W. Hasil  $IC_{50}$  kuersetin  $9,535 \pm 0,055$  ppm,  $IC_{50}$  minyak biji labu kuning  $9,466 \pm 0,072$  ppm, dan  $IC_{50}$  nanoemulsi minyak biji labu kuning hasil optimasi sebesar  $10,557 \pm 0,109$  ppm.

**Kesimpulan:** Formula optimum nanoemulsi minyak biji labu kuning yang dihasilkan *design expert* memiliki karakteristik fisik yang memenuhi persyaratan dan aktivitas antioksidan sangat kuat.

**Kata kunci:** optimasi, *simplex lattice design*, minyak biji labu kuning, nanoemulsi, antioksidan DPPH.

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**OPTIMIZATION OF FORMULA AND TESTING OF ANTIOXIDANT ACTIVITY OF NANOEMULSION OF YELLOW PUMPKIN SEED OIL (*Cucurbita moschata* D.)**

**ABSTRACT**

**Abstract:** Pumpkin seeds contain secondary metabolites which act as antioxidants. Optimizing the pumpkin seed oil nanoemulsion formula using a design expert can provide the optimum composition to produce a stable and optimal nanoemulsion preparation. This research aims to determine the optimum formula for pumpkin seed oil nanoemulsion with physical characteristics that meet the requirements and strong antioxidant activity.

**Method:** Laboratory experimental research with the formulation of pumpkin seed oil as the oil phase, distilled water as the water phase, Tween 80 and Span 80 as surfactants, and PEG 400 as cosurfactant. The nanoemulsion was physically characterized by the parameters of particle size, PDI, percent transmittance, organoleptic, pH, viscosity, type of nanoemulsion and the DPPH method of antioxidant activity test. The data was analyzed using SPSS Version 25 software.

**Result:** Pumpkin seed oil nanoemulsion has an optimum composition with a pumpkin seed oil, a combination of surfactant Tween 80 7,032%, Span 2%, and cosurfactant PEG 400 2,968%. Pumpkin seed oil nanoemulsion has characteristics that meet the requirements including particle size with an average of  $42,36 \pm 8,518$  nm, PDI value with an average of  $0,410 \pm 0,036$ , percent transmittance of  $90.469 \pm 0.186\%$ , organoleptic liquid form, odorless, white in color milk, and homogeneous. pH with an average of  $5,173 \pm 0,025$ , viscosity with an average of  $12 \pm 0$  cP, and nanoemulsion type O/W. The  $IC_{50}$  result of quercetin was  $9,535 \pm 0,055$  ppm, the  $IC_{50}$  of pumpkin seed oil was  $9,466 \pm 0,072$  ppm, and the optimized  $IC_{50}$  of pumpkin seed oil nanoemulsion was  $10,557 \pm 0,109$  ppm.

**Conclusion:** The optimum formula for pumpkin seed oil nanoemulsion produced by design experts has physical characteristics that meet the requirements and very strong antioxidant activity.

**Keywords:** optimization, simplex lattice design, pumpkin seed oil, nanoemulsion, DPPH antioxidant.