Enzyme-assisted aqueous extraction of Kalahari melon seed oil: optimization using response surface methodology

ABSTRACT

Enzymatic extraction of oil from Kalahari melon seeds was investigated and evaluated by response surface methodology (RSM). Two commercial protease enzyme products were used separately: Neutrase® 0.8 L and Flavourzyme® 1000 L from Novozymes (Bagsvaerd, Denmark). RSM was applied to model and optimize the reaction conditions namely concentration of enzyme (20ï 50 g kgī 1 of seed mass), initial pH of mixture (pH 5ï 9), incubation temperature (40ï 60 °C), and incubation time (12ï 36 h). Well fitting models were successfully established for both enzymes: Neutrase 0.8 L (R 2 = 0.9410) and Flavourzyme 1000 L (R 2 = 0.9574) through multiple linear regressions with backward elimination. Incubation time was the most significant reaction factor on oil yield for both enzymes. The optimal conditions for Neutrase 0.8 L were: an enzyme concentration of 25 g kgī 1, an initial pH of 7, a temperature at 58 ℃ and an incubation time of 31 h with constant shaking at 100 rpm. Centrifuging the mixture at 8,000g for 20 min separated the oil with a recovery of 68.58 ± 3.39%. The optimal conditions for Flavourzyme 1000 L were enzyme concentration of 21 g kgī 1, initial pH of 6, temperature at 50 °C and incubation time of 36 h. These optimum conditions yielded a 71.55 ± 1.28% oil recovery.

Keyword: Enzyme-assisted aqueous extraction; Kalahari melon seed oil; Optimization; Response surface methodology; Central composite design (CCD); Neutrase 0.8 L; Flavourzyme 1000 L