J Pharm Innov (2011) 6:88–96
DOI 10.1007/s12247-011-9106-6

RESEARCH ARTICLE

Application of Response Surface Methodology to Microwave-Assisted Extraction of Lysergol from *Ipomoea* Genus and Its Characterization by RP HPLC-UV

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Published online: 3 June 2011

Abstract

Objective *Ipomoea* genus is an excellent source of lysergol which is used as a hypotensive and psychrotopic analgesic. Microwave-assisted extraction (MAE) was employed to extract lysergol from *Ipomoea* seeds, and response surface methodology (RSM) was applied to predict optimum conditions for extraction.

Methodology Box–Behnken statistical design was used to monitor the effect of independent variables like temperature (A—50°C, 60°C, and 70°C), power (B—240, 350, and 700 W), and time (C—10, 20, and 30 min) on a dependent variable/percent yield of lysergol when microwaves were applied. Correlation analysis of the mathematical regression model indicated that a quadratic polynomial model could be employed to optimize the process.

Results The optimum extraction conditions in order to obtain the highest lysergol yield were temperature (60°C), power (350 W), and time (20 min). The average actual yield of lysergol under the optimum conditions was found to be 78.0%, whereas the predicted yield under similar conditions was 85.374%.

Conclusions The results verified our experiments and successful application of RSM to MAE of lysergol from *Ipomoea* seeds. The percentage purity of the extracted lysergol was found to be 90% with reference to standard lysergol (97%) with the help of RP HPLC-UV.

Keywords Lysergol · *Ipomoea* · Microwave · Response surface methodology · Box–Behnken · RP HPLC-UV

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Introduction

Lysergol is an alkaloid obtained from the genus *Ipomoea* (family Convolvulaceae). The seeds are commonly known as Kaladana in trade and has been found to be rich in ergolic alkaloids [1]. Lysergol (53%) and chanoclavine (37%) constitute the total ergolic alkaloids (0.49%) of the *Ipomoea* seeds. Lysergol (Fig. 1) is used as a hypotensive, psychotropic, analgesic, immunostimulant, analeptic, and uterus and intestine stimulating drug [2].

Lysergol being a heat and light sensitive drug, when extracted with the help of conventional methods, is obtained in low yields due to its long extraction times and high temperature and sometimes purity remains one of the concerns [3, 4]. Therefore, it was desirable to opt for a new extraction process to overcome the limitations of conventional extraction methods.

Microwaves are electromagnetic radiations which can penetrate biomaterials and interact with polar molecules such as water in the biomaterials to create heat. Water within the plant matrix absorbs microwave energy; cell disruption is promoted by internal super heating, which facilitates desorption of chemicals from the matrix, improving the recovery of nutraceuticals [5, 6]. Microwave-assisted extraction (MAE) has the advantage over the conventional methods as it results into better yields and highly pure products. Lower amount of solvents needed, drastic decrease in the extraction time, and operation at a relatively lower temperature are added advantages to the technique. Therefore, MAE is slowly replacing the conventional methods especially when laboratory scale extractions are needed to be performed for many natural drugs such as silymarin from *Silybum*