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ECO-FRIENDLY METHOD FOR ESTIMATION OF SAPONIFICATION VALUE

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ABSTRACT

A rapid, simple and accurate method for the determination of saponification values of fixed oils are reported under microwave irradiation. The saponification reaction was completed within 5 min. and similar results were obtained, when compared with conventional methods.

Key words: Microwave energy, Fixed oils, Saponification value

INTRODUCTION

In recent times, the use of microwave irradiation is a crucial matter in our scientific community. Most of the industrial as well as academic research groups are utilizing the techniques of microwave-assisted organic synthesis as the latest technology for rapid optimization of reaction, for the efficient synthesis of new chemical entities and also for discovering new chemical reactivity. It is a useful tool towards Green chemistry, which helps in minimizing environmental pollution. Microwave induced Organic Reaction Enhancement chemistry (MORE) is gaining popularity as a nonconventional technique for rapid organic synthesis. It can be termed as 'e-chemistry' because it is easy, effective, economic and ecofriendly and is believed to be a step towards Green chemistry[1]. Short response time and highly accelerated reaction rate are main advantages of MORE chemistry[2]. Microwave heating reduces side reactions, increases percentage yield and it improves reproducibility[3, 4]. In the proposed method, the microwave technique has been applied for the determination of saponification value of several fixed oils. The conventional pharmacopoeial procedure involves thirty minutes heating of the reaction

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mixture[5, 6]. Through this, we have developed a simple accurate and rapid procedure for the determination of saponification value.

EXPERIMENTAL

Fresh oils were obtained from the refineries of known source. A mixture of 2 g of oil sample and 25 mL of 0.5M alcoholic KOH was taken in an open Borosil beaker covered with a Petri dish containing few ice pieces (to avoid excessive evaporation of solvent). It was placed in a domestic microwave oven and subjected for irradiation at 60 watts microwave intensity for 5 min. A 500 mL beaker containing 200 mL water was placed in the oven next to the reaction beaker to serve as heating sink[7]. The reaction mixture was cooled and titrated against 0.5 M hydrochloric acid using phenolphthalein indicator. A blank was also carried out. The saponification value of each sample was determined using the formula given in the pharmacopoeia. The procedure was repeated thrice for each sample and mean values were compared with conventional and standard values[8-10] (Table 1).

Table 1: Determination of saponification value

Sample	Standard values	Conventional method	Microwave method
Cottonseed oil	190 – 198	192.20	192.92
Olive oil	185 – 196	189.32	188.98
Almond oil	183 – 208	204.42	205.18
Palm oil	190 – 209	194.36	192.18
Sesame oil	187 – 197	187.86	186.28
Corn oil	187 – 195	188.96	189.23
Cod liver oil	180 – 190	186.89	187.52
Groundnut oil	187 – 196	188.96	189.23
Safflower oil	186 – 198	191.84	190.62
Chaulmoogra oil	198 – 204	198.38	199.86

RESULTS AND DISCUSSION

Under microwave conditions, the reaction is rapid (5 minutes) compared to the conventional method (30 minutes). The saponification value for all the samples tested were

similar to their conventional and standard values. The developed method is a rapid, simple, accurate and efficient method for the determination of a large number of oil samples, waxes and surfactants. It can also be used in industries and academic institutions for the routine analysis and quality control of oils and waxes. It is expected that in this century, most of the chemists will probably use microwave energy to heat chemical reaction on a laboratory scale.

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