TRANSESTERIFICATION AND AMIDATION REACTION OF ERUCA SATIVA SEED OIL

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Annotation

Eruca sativa refers to the family Brassicaceae, which includes a large number of plant species and is used for various purposes such as food and medicine. In the present study, Transesterification and amidation reaction of Eruca sativa seed oil was carried out and analyzed by TLC and IR Spectroscopy.

Key words: *Eruca sativa*, diethanolamine, fatty acid methyl ester, KOH.

Аннотация

Эрука сативная относится к семейству Brassicaceae, которое включает в себя большое количество видов данного растения и используется в качестве пищевых продуктов и медицинских целях. В настоящем исследовании была проведена реакция переэтерификации и амидирования масел семян Эруки сативы. Полученные эфиры идентифицированы методами ТСХ и ИК-спектроскопии.

Ключевые слова: Эрука сатива, диэтаноламин, метиловый эфир жирных кислот, KOH.

Annotatsiya

Eruca sativa, Brassicaceae oilasiga tegishli bo'lib, u ko'plab o'simlik turlarini o'z ichiga oladi. Oziq-ovqat va tibbiyot sohasida turli maqsadlarda ishlatiladi. Ushbu tadqiqot ishida, Eruca sativa urug'i yog'ini pereterifikatsiya qilish va metil efirini amidlash reaktsiyalari olib borildi, va YuQX va IQ spektroskopiyasi usullari bilan tahlil qilindi.

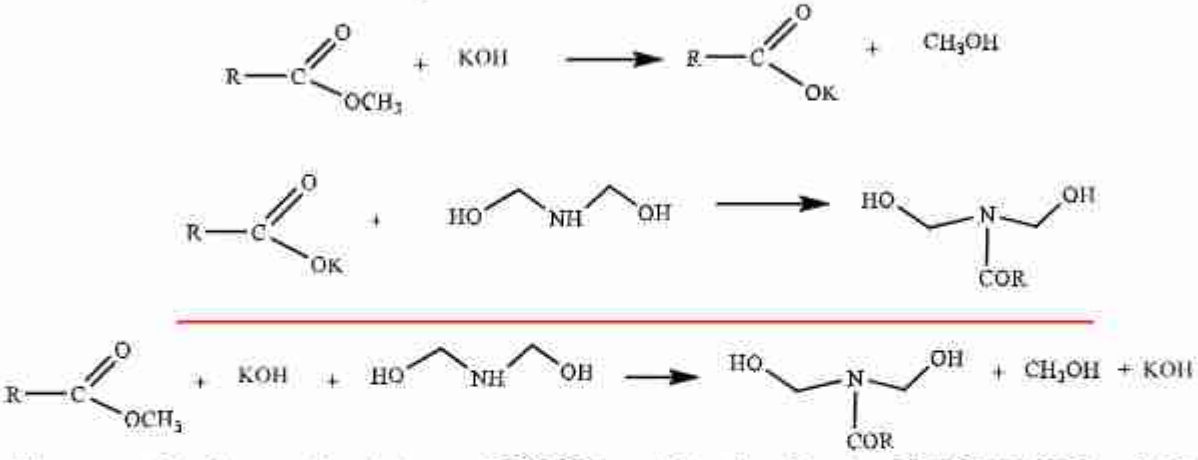
Kalit so'zlar: Eruca sativa, dietanolamin, yog ' kislota metil efiri, KOH.

INTODUCTION

Eruca sativa Mill. (Eruca vesicaria) includes a large number of plant species of the Brassicaceae family, which is commonly known as arugula, jarjeer or rocket leaves [1,2]. It is used for various purposes such as food and medicine. The colour of the plant is dark green with a height of about 20-50 cm. It is an annual or perennial herb and its flowers appear mostly in February-April (Morales and Janick, 2002). All parts of the plant are in use for different purposes such as **leaves** and **flowers** for salad making, E. sativa leaves are considered as a valuable source of nutrition due to the presence of several important nutrients, such as dietary fiber, oligosaccharides, amino acids, peptides, proteins, polyunsaturated fatty acids, vitamins, carbohydrates, L-ascorbic acid and mineral content. In addition to, it has been noticed that E. sativa is valued by dieticians for its low calorific content along with high nutritional values [3,4]. **The seeds** constitute the most valuable and useful part of the plant. On the other hand seed oil carries its importance and applications. The seed oil of Eruca sativa is mixed with mustered oil to decrease the pungency. The seed oil is composed of important constituents like fatty acids i.e. palmitic, stearic, oleic, linoleic, linolenic, eicoseneic and erucic acids. Eruca sativa plant is cultivated in different countries of the world but mostly in Mediterranean countries. In recent past, E. sativa has come into the focus attention due to its rich content of phytochemicals and its significance in various biological activities. Different parts of the E. sativa plant possess diverse phytochemicals, such as flavonoids, glucosinolates, phenolics, saponins, tannins and essential oils [5]. Additionally, several phytoconstituents were reported in various studies, namely, isothiocyanates, derivatives of butane, octane, nonane, 4-methylthiobutyl isothiocyanate, cis-3-hexen-1-ol,5-methylthiopentylisothiocyanate, cis-3-hexenyl 2-methylbutanoate, 5-methyl thiopentane nitrile [6], quercetin, kampferol, rutin, myricetin rhamnetin and kaempferol-3-O-galactoside [7,8], which indicates that E sativa is a rich source of flavonoids that possesses several other important bioactive compounds. Eruca sativa seed oil is used as hair tonic to prevent hair loss. The oil is also used for the treatment of burns, for eye infection as an ointment, and for the digestive problems [5]. It is also used as a future industrial oil source especially as biodiesel [6], and an alternative fuel for transport and as a lubricant [7]. In some areas of the world the plant is used as vegetable and spice and its seed oil is used for cooking. According to [8], various types of cancer growth and development can be reduced by using

Cruciferous vegetables. It was attributed to the presence of some active products, which offer resistance against cancer [9]. In the present study, Transesterification and amidation reaction of Eruca sativa seed oil was carried out and analyzed by TLC and IR Spectroscopy.

Effect of methyl ester ME Diethanolamine DEA ratio to MEDEA conversion. Observation of the effect of the methyl ester is reacted with DEA with a weight ratio reacting ME:DEA. In the substrate weight ratio varied with NaOH 3% and it appears that the conversion of methyl esters to erucic amide DEA tends to increase along with the increase in the substrate mole ratio to certain limits. The conversion in the mole ratio of methyl ester and dietanolamine 1:1 is lower then the conversion increases at a mole ratio of 1: 2 by higher yield. The best erucicamide DEA conversion was obtained at 1:2 weight ratio reacting ME:DEA with KOH 3% and 180° C of 85,37%. This is due to the mole ratio of the reagent will affect the shift of the reaction yield on balance. If the mole of one of the reactants is made excess, it reacts the balance will shift to the right so that dietanolamine is produced increase. The reaction mechanism of methyl ester and DEA with KOH catalyst can be describe as follows:



The second is the reaction between RCOOK and di-ethanolamine ($NH(C_2H_4OH)_2$) which forms di-ethanolamine. Ionized di-ethanolamine react with RCOOK.

The tools used are a three-neck flask, reverse cooler, thermometer, magnetic stirrer (scilogex), magnetic stirrer bar, water bath, stative clamp burette. the ingredients used include analytical grade of diethanolamine ($C_4H_{11}NO_2$), Eruca Sativa which comes from Surkhandaryo used as commercial oils. Methanol (CH_3OH), sulfuric acid (H_2SO_4) 4% w solution, potassium hydroxide (KOH) 1% w solution.

Transesterification of oils with methanol reaction has carried out at 60-70 °C for 3 hours and end of the reaction analyzed by TLC and IR spectroscopy. The amidification of ME eruca sativa with DEA using KOH catalyst were succeessfuly performed for 8 hours. From the results of the IR sample spectrum test, showing the absorption peak in the 1620 cm^{-1} wave area indicates the presence of groups C=O and 1064cm^{-1} indicates the presence of the CN group in this wave number region, absorption peak 2853 cm^{-1} for the -CH group, 3340 cm^{-1} for Groups – OH and 3008 cm^{-1} for Group NH Figure 1.

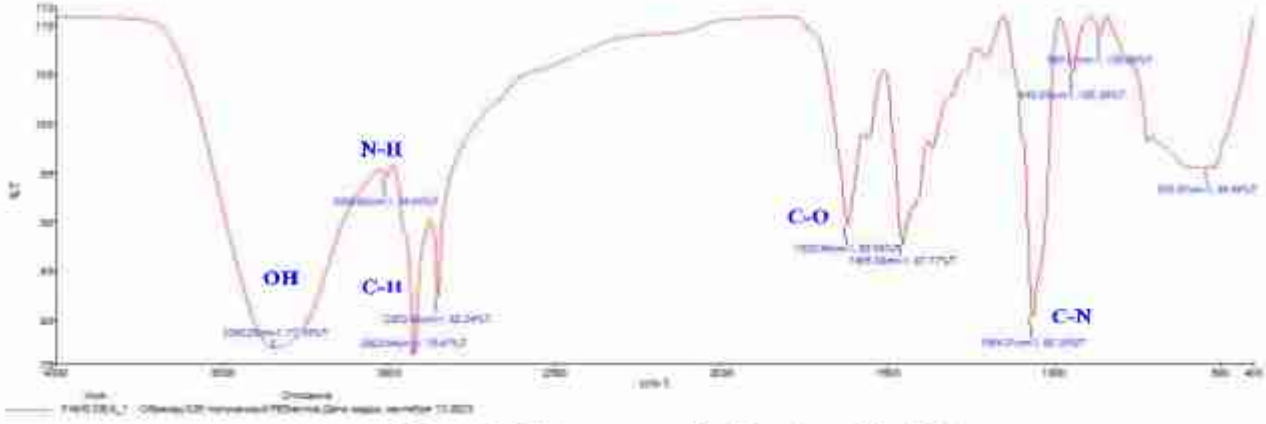


Figure 1. IR spectrum for Erucicamide DEA

Overall, based optimization of amidification of ME from eruca sativa seed oil with DEA using KOH catalyst was succeessfuly performed. The result illustrates that the transesterification process-amidase erucic amid DEA obtained optimum conditions.

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