

Моя профессиональная
карьера

ISSN

INTERNATIONAL
STANDARD
SERIAL
NUMBER

ISSN

2782-4365

Проверить
номер:



Научно-образовательный электронный журнал

ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ

Выпуск №74-1 (том 2)
(май, 2026)

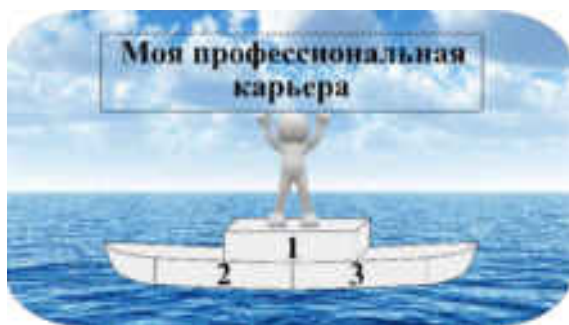


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Международный научно-образовательный
электронный журнал
«ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ»

ISSN 2782-4365

УДК 37

ББК 94

**Международный научно-образовательный электронный журнал
«ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ». Выпуск №74-1 (том 2) (апрель,
2026). Дата выхода в свет: 04.05.2026.**

Журнал объединяет авторов на территории стран СНГ и помогает обмениваться передовыми научно-образовательными исследованиями.

Содержит научные работы отечественных и зарубежных авторов по экономическим, техническим, философским, юридическим и другим наукам.

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Название публикации: «EXTRACTION OF OIL FROM MELON SEEDS (CUCUMIS MELO)»

Abstract

Melon seeds (*Cucumis melo L.*) are an underutilized agro-industrial by-product rich in lipids, proteins, and bioactive compounds. The oil content typically ranges from 25% to 40%, making melon seeds a promising source of edible and industrial oil. This study reviews conventional and advanced extraction techniques, including mechanical pressing, solvent extraction, and supercritical fluid extraction. The influence of process parameters on yield, oil quality, and oxidative stability is critically evaluated. The extracted oil is characterized in terms of fatty acid composition, physicochemical properties, and potential industrial applications.

1. Introduction

Growing demand for plant-based oils has stimulated interest in non-traditional oil sources such as melon seeds. Melon seed oil is rich in unsaturated fatty acids, particularly linoleic and oleic acids, and contains tocopherols with antioxidant activity. Efficient extraction technologies are essential to maximize oil recovery while preserving nutritional quality.

The objective of this study is to analyze and optimize oil extraction processes from melon seeds, focusing on yield, quality, and sustainability.

2. Raw Material Preparation

2.1 Seed Collection and Cleaning

- Separation from pulp

- Removal of impurities and damaged seeds

2.2 Drying

- Temperature: 40–60°C
- Final moisture content: 5–8%

2.3 Grinding

- Particle size: 0.5–1 mm
 - Enhances surface area and extraction efficiency
-

3. Oil Content and Composition

Melon seeds typically contain:

- Oil: 25–40%
- Protein: 20–30%
- Carbohydrates and fiber

3.1 Fatty Acid Profile

- Linoleic acid (C18:2): 50–65%
 - Oleic acid (C18:1): 20–30%
 - Palmitic and stearic acids
-

4. Extraction Technologies

4.1 Mechanical Pressing (Cold and Hot Pressing)

Principle

Mechanical force is applied to release oil from seed matrix.

Conditions

- Cold pressing: <50°C
- Hot pressing: 80–120°C

Advantages

- Solvent-free
- Preserves natural compounds (cold pressing)

Limitations

- Lower yield (60–75%)

- Residual oil in cake
-

4.2 Solvent Extraction

Solvents

- n-hexane (most common)

Process Steps

1. Mixing ground seeds with solvent
2. Diffusion of oil into solvent
3. Filtration and solvent recovery

Advantages

- High yield (90–98%)

Disadvantages

- Solvent residues
 - Environmental concerns
-

4.3 Soxhlet Extraction

- Continuous solvent extraction method
 - High efficiency but energy-intensive
-

4.4 Supercritical CO₂ Extraction (SC-CO₂)

Operating Conditions

- Pressure: 20–35 MPa
- Temperature: 40–60°C

Advantages

- Solvent-free oil
- High purity and stability

Limitations

- High capital cost
-

4.5 Ultrasound-Assisted Extraction (UAE)

Mechanism

Cavitation enhances mass transfer and cell disruption.

Benefits

- Reduced extraction time
 - Lower solvent consumption
-

5. Process Optimization

Parameter	Effect
Temperature	Affects viscosity and oxidation
Particle size	Influences diffusion rate
Solvent ratio	Determines extraction efficiency
Time	Impacts yield and degradation

Optimization approaches:

- Response Surface Methodology (RSM)
 - Kinetic modeling of oil diffusion
-

6. Oil Yield and Efficiency

Method	Yield (%)	Quality
Cold pressing	60–70%	High
Hot pressing	70–80%	Moderate
Solvent extraction	90–98%	Moderate
SC-CO ₂	85–95%	Very high
UAE	80–90%	High

7. Physicochemical Properties

7.1 Quality Parameters

- Acid value

- Peroxide value
- Iodine value
- Saponification value

7.2 Bioactive Components

- Tocopherols (Vitamin E)
 - Phytosterols
-

8. Industrial Applications

- Edible oil (cooking and salad oil)
 - Cosmetic formulations
 - Biodiesel production
 - Nutraceutical products
-

9. Environmental and Economic Considerations

- SC-CO₂ and UAE are environmentally friendly alternatives
 - Solvent recovery required in hexane extraction
 - Mechanical pressing suitable for small-scale production
-

10. Conclusion

Melon seeds are a valuable source of high-quality oil with significant nutritional and industrial potential. The choice of extraction method depends on the desired balance between yield, quality, and economic feasibility. Advanced extraction technologies offer improved efficiency and sustainability.

11. Recommendations

- Combine mechanical pressing with solvent extraction for maximum recovery
 - Adopt green extraction technologies where feasible
 - Standardize quality control parameters
-

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