

УДК 66.664

Exploring Chia Seeds as a Potential Adjunct in Alzheimer's Disease Management

Yaseen S.¹ (post-graduate student)

Scientific supervisor - PhD, Associate Professor Nadtochii L. A.

¹ITMO University

Shaziayaseen@itmo.ru

This work is completed within the NIRMA project No. 625119 “Sustainable processing of oilseed waste into functional protein and fiber supplements”.

Abstract

Neurodegenerative diseases are increasing day by day and Alzheimer's disease (AD) is the most common cause of dementia worldwide. Due to no pharmacotherapy for AD, there is growing interest in complementary and nutritional strategies targeting modifiable risk factors and underlying pathological mechanisms. The Chia seed (*Salvia hispanica* L.) is rich in α -linolenic acid (ALA), dietary fiber, high-quality protein, polyphenols, and micronutrients. This review will explore the mechanistic basis and emerging evidence supporting the role of chia seeds in modulating pathological processes associated with AD. It is anticipated that the results of this study will show the bioactive compounds of the chia seeds, especially omega-3 fatty acids and antioxidant polyphenols can be used strategically to regulate essential pathological processes that are associated with Alzheimer disease, such as oxidative stress and neuroinflammation. This research is aimed to determine the existing research gaps and give future research directions on the investigation of chia seeds as a nutritional supplement in the management of AD.

Keywords

Neurodegenerative diseases, Alzheimer's disease, Chia seed, Omega-3 fatty acids

Изучение семян чиа в качестве потенциального вспомогательного средства в лечении болезни Альцгеймера.

Ясин Ш.¹ (Аспирант)

Научный руководитель - кандидат наук, доцент Надточий Л. А.

¹Университет ИТМО

Shaziayaseen@itmo.ru

Работа выполнена в рамках проекта NIRMA №. 625119 “Устойчивая переработка отходов масличных культур в функциональные белковые и пищевые волокнистые добавки”.

Аннотация

Нейродегенеративные заболевания распространяются с каждым днем, и болезнь Альцгеймера (БА) является наиболее распространенной причиной деменции во всем мире. В связи с отсутствием фармакотерапии БА, растет интерес к дополнительным и диетическим стратегиям, направленным на модифицируемые факторы риска и лежащие в их основе патологические механизмы. Семена чиа (*Salvia hispanica* L.) богаты α -линоленовой кислотой (АЛК), пищевыми волокнами, высококачественным белком, полифенолами и микроэлементами. В этом обзоре будут рассмотрены механистические основы и новые данные, подтверждающие роль семян чиа в модулировании патологических процессов, связанных с БА. Предполагается, что результаты этого исследования покажут, что биоактивные соединения семян чиа, особенно омега-3 жирные кислоты и антиоксидантные полифенолы, могут быть стратегически использованы для регулирования основных патологических процессов, связанных с болезнью Альцгеймера, таких как окислительный стресс и нейровоспаление. Цель данного исследования — определить существующие пробелы в исследованиях и наметить направления будущих исследований семян чиа в качестве пищевой добавки при лечении болезни Альцгеймера.

Ключевые слова:

Нейродегенеративные заболевания, болезнь Альцгеймера, семена чиа, жирные кислоты омега-3,

Alzheimer's disease (AD) is the most common cause of dementia worldwide and represents a major public health challenge, affecting more than 57 million people globally [1]. Despite advances in pharmacotherapy, currently available treatments primarily offer symptomatic relief and do not effectively halt or reverse disease progression. There is evidence that dietary treatments high in omega-3 fatty acids, antioxidants, and anti-inflammatory agents lead to better cognitive performance and less neurodegenerative perspectives [2]. The key pathological features of AD include oxidative stress and chronic neuroinflammation [3]. The Chia seeds (*Salvia hispanica* L.) have become one of the functional foods of interest because of high level of a-linolenic acid (ALA), dietary fiber, high-quality protein, polyphenols, and micronutrients [4].

About 60-65 percent chia seed oil is made up of ALA, which is an omega-3 fatty acid of plant-origin that is known to calm down inflammatory processes and maintain neuronal membrane fluidity. Chia seeds are also rich in strong antioxidant elements like quercetin, kaempferol, and chlorogenic acid that could decrease the reactive oxygen species and lipid peroxidation [4]. The main focus of this review work is to:

1. To summarize the most important pathological processes of the Alzheimer disease, including amyloid- β aggregation, tau pathology, oxidative stress and neuroinflammation.
2. Provide nutritional content and bioactive factors of chia seeds with respect to neuroprotection.
3. Analyze critically, preclinical evidence and clinical evidence on omega-3 fatty acids and chia seed components in cognitive performance and Alzheimer disease.

This review will focus on the bioactive compounds of the chia seeds, especially omega-3 fatty acids and antioxidant polyphenols that can be used strategically to regulate essential pathological processes that are associated with Alzheimer disease, such as oxidative stress and neuroinflammation. These findings, therefore, could be used to offer a scientific foundation on the development of sustainable, nutrition-based adjunct interventions in the realm of neurological health and aging studies.

References

1. World Health Organization. Dementia fact sheet // WHO. 2023. Available at: <https://www.who.int/news-room/fact-sheets/detail/dementia>
2. Scarmeas N., Anastasiou C. A., Yannakoulia M. Nutrition and prevention of cognitive impairment // *The Lancet Neurology*. 2018. Vol. 17, No. 11. P. 1006–1015.
3. Heneka M. T., Carson M. J., El Khoury J., Landreth G. E., Brosseron F., Feinstein D. L., Jacobs A. H., Wyss-Coray T., Vitorica J., Ransohoff R. M., Herrup K. Neuroinflammation in Alzheimer's disease // *The Lancet Neurology*. 2015. Vol. 14, No. 4. P. 388–405.
4. Ullah R., Nadeem M., Khalique A., Imran M., Mehmood S., Javid A., Hussain J. Nutritional and therapeutic perspectives of Chia (*Salvia hispanica* L.): a review // *Journal of Food Science and Technology*. 2016. Vol. 53, No. 4. P. 1750–1758.