Proximate, functional, and biochemical analysis of *Ziziphus nummularia* seeds: A valuable ingredient for the food industry

Running title: Analysis of *Ziziphus nummularia* Seeds

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Abstract: This study aimed to evaluate the properties of *Ziziphus nummularia* seeds. The seeds of *Ziziphus nummularia* were analyzed for proximate, functional, and biochemical analysis to estimate crude fat, protein, ash, oil, water holding capacity, total polyphenols, and fatty acids. The seed has a high protein content of 38.7% and a relatively high lipid content of 23.1%. It also has a good mineral content of 3.5% ash. The seed has high water-holding capacity and good oil absorption capacity, making it suitable for use in the food industry. The seed exhibits strong antioxidant activity and contains a diverse range of compounds such as fatty acids, esters, and alkanes. The nutritional and functional properties of Ziziphus nummularia seeds make them a valuable ingredient for various food products.

Keywords: *Ziziphus nummularia* seeds; nutritional value; functional properties; protein content; lipid content.

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1 Introduction

Ziziphus nummularia, also known as wild jujube or jhahrberi, is a fruit tree that is native to India. It has been continuously grown for centuries in North Indian plantations, making it one of the oldest fruit trees in the region. The plant is highly versatile and has been used for erosion control, windbreaks, and as a microhabitat for other plants to grow (Mesmar et al., 2022). *Ziziphus nummularia* is a species that is dispersed from Iran to India, but it is extensively present in India, ranging from Punjab, Rajasthan, Gujarat, and Uttar Pradesh. The plant is commonly found in arid areas, hills, plains, and agricultural fields. *Z. nummularia* is a shrub that can grow up to 6 meters or more, branching to form a thicket. The leaves are rounded like those of *Ziziphus jujuba* but differ from those in having a pubescence on the adaxial surface (Pandey et al., 2010). The plant serves various purposes, prized for its delicious fruits, leaves for foraging, wood for fire, buildings, furniture, and traditional medicine. The leaves of the plant are utilized as feed for livestock, and the fruit is consumed as food, especially during times of food shortage in several parts of the world (Singh and Meghwal, 2020).

The plant has great commercial value, and its fruit is consumed as food around the world and used for its medicinal values such as anti-inflammatory, antioxidant, and hepatoprotective activities (Khan et al., 2020). The plant produces small, woody, black-red drupes that are about 0.8 cm in diameter when

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