

Chickpeas vs. Mung Beans: Unlocking the Nutritional Potential of Seeds and Sprouts

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ABSTRACT

It is important to remember that a wide variety of food supplements are available today in the form of tablets and capsules to help combat various diseases and support overall health. Nutrient-rich legumes, in particular, have been demonstrated to provide numerous health advantages and indirectly facilitate a healthy immune response. However, individual dietary choices and overall dietary patterns are crucial to maintaining a healthy lifestyle and preventing illness. Eating a healthy and balanced diet is important to improve your immune system.

*In a recent study, two varieties of pulses, namely *Vigna radiata* (mung bean) and *Cicer arietinum* (chickpea), were analyzed in two distinct forms, namely crushed and soaked. The research centred on their nutritional composition, in vitro antimicrobial activity, and antioxidant properties, utilizing established protocols. The results revealed that the crushed form of *Cicer arietinum* contained the highest concentrations of Vitamin B1, Vitamin C, and carbohydrates, and demonstrated the strongest antibacterial activity among the four samples. In the interim, crushed *Vigna radiata* exhibited the most potent antioxidant properties, whereas soaked *Vigna radiata* displayed the highest protein content. These findings suggest that healthcare professionals should consider recommending these nutrient-rich legumes as a component of a balanced diet to enhance immune health.*

*Chickpeas possess a diverse array of phytochemicals, including proteins, carbohydrates, alkaloids, and flavonoids. *Vigna radiata* (mung bean) is renowned for its high protein content and potent antioxidant properties, with its extracts also demonstrating anti-angiogenic effects.*

*This study aims to evaluate the nutritional composition, antimicrobial activity, and antioxidant properties of *Vigna radiata* and *Cicer arietinum* in their crushed and soaked forms, providing insights for healthcare professionals to recommend these legumes for improved immune health.*

Keywords: Chickpea, Mung Bean, Antioxidant, Antimicrobial, Nutritional Analysis, Immunology.

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INTRODUCTION

Many medical conditions have long been believed to be preventable, mitigated, or curable through natural remedies (Mudryj et al., 2014). For example, many people have found that the health benefits of legumes and pulses are significant. Previous research and studies have shown the effectiveness of various pulses and legumes (Dent et al., 2019). An estimated 2.3 billion people worldwide suffer from one or more forms of malnutrition, associated with inadequate dietary intake and low nutrient content in food (Matonti et al., 2020).

Mung beans are *Vigna radiata* L., while chickpeas are *Cicer arietinum* L. Both mung beans and chickpeas belong to the Fabaceae family. Chickpeas, scientifically known as *Cicer arietinum* L., have little diversity and a small genetic base. On the other hand, mung beans, scientifically known as *Vigna radiata* L., have a wider genetic foundation and greater variability (Sertan et al., 2015). Compared to mung beans, chickpeas (*Cicer arietinum* L.) produced larger seeds and more robust seedlings (Shashikumar et al., 2013). *Cicer arietinum*: Chickpea, a high-protein legume of the chilly season.

Vigna radiata: A nutrient-dense, warm-season legume (*Cicer arietinum* (chickpea). (2022). [Dataset]. In *CABI Compendium*). Chickpea, *Cicer arietinum* L., was investigated for stability and heat tolerance (Niharika et al., 2014).

Chickpeas are one of the most consumed pulses worldwide, traditionally grown in many parts of the world, including Asia, Africa, Europe, and North and South America, and they contribute 15% to the world pulse harvest of about 58 million tons annually. The plant is self-pollinating and grows better in cool climates with optimum temperatures ranging between 15 and 25°C (Widmer et al., 2014). The majority of Asian households consume mung beans, another significant edible legume crop that is farmed on more than 6 million hectares of land globally (or roughly 8.5% of all pulse lands). It is a member of the Fabaceae family.

These are both economically and nutritionally significant leguminous crops. When it comes to mutagens, *Vigna radiata* is more susceptible than *Cicer arietinum* (Amol, & Nehul, 2020). *Cicer arietinum* L., or chickpeas, is the third most popular legume (Patel et al., 2014).

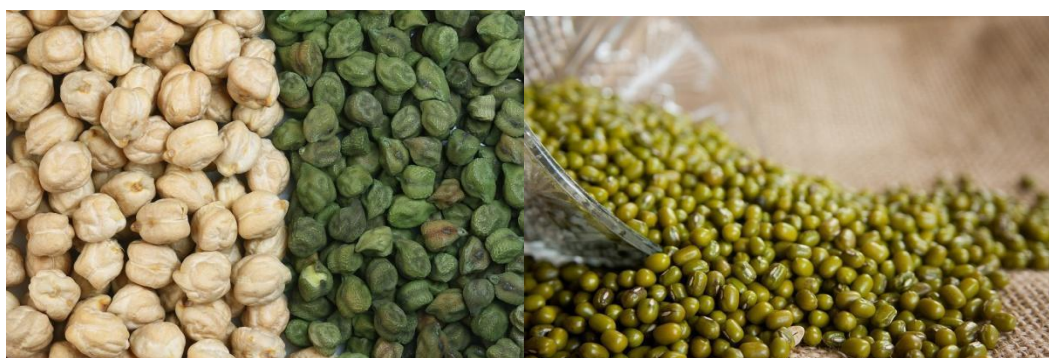


Fig 1: View of *Cicer arietinum* and *Vigna radiata*

The nutritional profiles and bioactive characteristics of *Vigna radiata* L (green gram) and *Cicer arietinum* L (chickpea) differ. Protein (25.51-26.82%), carbs (62.04-63.20%), and minerals including Na, K, Mg, and P are all abundant in chickpeas (Shahena et al., 2021). Conversely, green gram supports growth, stress tolerance, and metabolic processes by providing necessary amino acids,

linoleic and linolenic acids, and polyamines such as putrescine, spermidine, and spermine (Tresina et al., 2022). Chickpeas (*Cicer arietinum* L.): Possessing antimicrobial, anticancer, antidiabetic, and antioxidant properties. As *Vigna radiata* L., the green gram was investigated for glycemic excursion after meals (Xiren et al., 2020). Furthermore, *Vigna radiata* inhibits the growth of weeds by

exhibiting allelopathic activity through the substances colforsin and 9-amino-nonanoic acid (Mandal et al., 2013). Additionally, microgreens of *V. radiata* have a higher phenolic content and radical scavenging activity than microgreens of chickpeas, indicating that both species have the potential to be antioxidants (Roy & Roy, 2022). In conclusion, green gram provides vital amino acids, polyamines, and allelopathic chemicals, whereas chickpeas are high in macronutrients. *Cicer arietinum* provides harmless chemicals and benefits for the skin. *Cicer arietinum*'s cutaneous advantages were suggested by Avicenna and Razi (Mahjour et al., 2018). *Vigna radiata* L is more susceptible to biosynthesized silver nanoparticles.

The effects of nanoparticle phytotoxicity on *Cicer arietinum* L. have not been investigated (Najma Anwar et al., 2021). Chickpea, or *Cicer arietinum*, is a plant renowned for its rich phytochemical profile and many health advantages. draws attention to the existence of several substances, including proteins, carbohydrates, alkaloids, and flavonoids, and attributes pharmacological effects to the plant, such as anti-inflammatory, antioxidant, and anticancer capabilities (Al-Snafi, & Ali Esmail, 2016). Its significant

content of essential amino acids and its uses in both traditional and modern medicine (Xomidov et al., 2023). Mung beans, or *Vigna radiata*, are legumes high in bioactive chemicals that may have health advantages (Katoch et al., 2017). These phytochemicals include flavonoids, alkaloids, oligosaccharides, phytic acid, lectins, phenolics, saponins, and flavonoids. These substances, which were once thought to be antinutrients, have been demonstrated to have preventive benefits against chronic illnesses and are involved in plant defence systems (Priya et al., 2012). Research has indicated that extracts from *V. radiata* exhibit antibacterial characteristics against pathogens found in food, with methanol extracts exhibiting notable activity that is dependent on concentration (Qassim et al., 2020). Furthermore, *V. radiata* seed and sprout extracts both show anti-angiogenic action, with the sprout extracts showing a greater blockage of blood vessels. Vitexin and isovitexin, two distinct flavonoids, have been extracted from *V. radiata*.

MATERIALS AND METHODS

2.1 Sample preparation





Fig2. Displays the raw sample alongside its prepared form

C. arietinum and *V. radiata* seeds were extracted using water solvent and Sprouted samples were soaked in water then crushed and centrifuged at 2000 rpm in 2 minutes difference for 4 times.

2.2 Vitamin B1 estimation

A method for estimating Vitamin B1 involves using 0.8 mL of TX-100 solution, 18 mL of supporting electrolyte, and 0.4 mL of the sample solution. Standard addition is used to calculate the concentration. The thiamine ratio in the polarographic vessel should not be less than 0.25 mg/L, and the total content, including the standard additions, must not exceed 12.5 mg/L.

2.3 Vitamin C estimation

Vitamin C quantification assay using the potassium iodate and potassium iodine titration method (Sengupta, S. et al., 2023).

2.4 Protein estimation

Protein estimation was done using the UV spectrophotometric method, followed by

Bradford assay and Lowry assay (Sengupta et al., 2023).

2.5 Carbohydrate estimation

Carbohydrates of the samples were measured using the anthrone method. [Khatun et al., 2024].

2.6 In vitro antioxidant assay using DPPH

The stability of the extracts' DPPH (2, 2-diphenyl-2-picrylhydrazyl) free radical scavenging activity was assessed using the usual method (Sengupta et al., 2023).

2.7 In vitro antimicrobial assay

The antibacterial assay was performed using the disc diffusion method against Gram-negative bacteria (*Escherichia coli*). The bacteria were maintained in 100 mL of nutrient broth at 37°C and allowed to incubate overnight (Sengupta et al., 2023).

RESULT

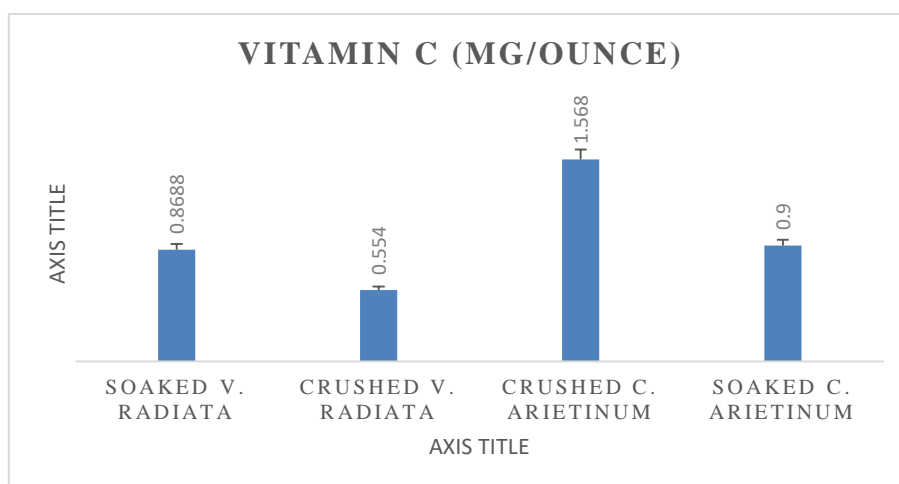


Fig. 3 depicts the comparative values of Vitamin C present in the samples. Here, crushed dry *C.arietinum* shows a significantly higher amount of vitamin C than the other samples. Among the two forms of *Vigna radiata*, soaked mug beans show higher Vitamin C content than dry mug beans.

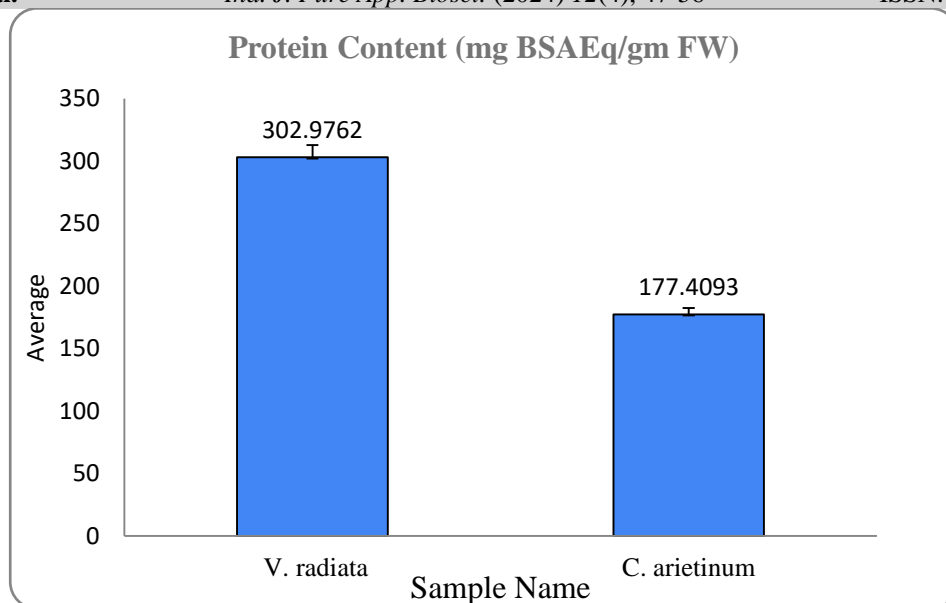


Fig. 4. Depicts the comparative values of protein content present in the samples. Here, only the crushed form is taken

The crushed form of *V. radiata* shows a significantly higher protein content than the crushed *C. arietinum*.

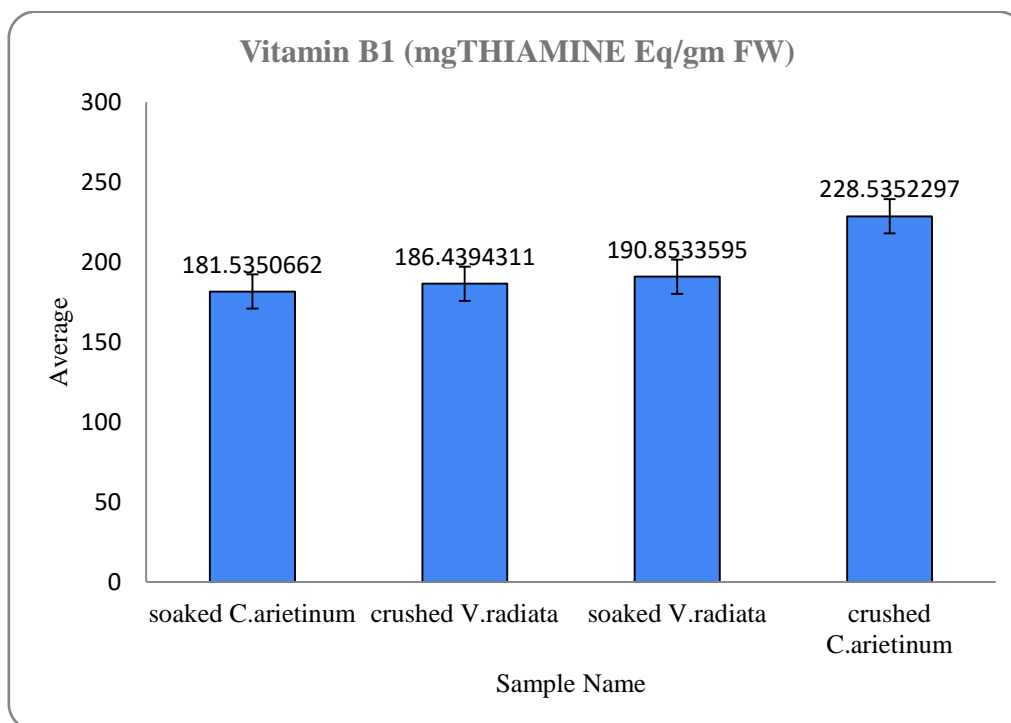


Fig. 5. Depicts the comparative values of Vitamin B1 (thiamine) in the soaked and crushed forms of *V. radiata* and *C. arietinum*

Among all the samples, the crushed *Cicer arietinum* contains relatively higher Vitamin B1. However, there is a minute difference

between the Vitamin B1 content in soaked *Vigna radiata* and crushed *Vigna radiata*.

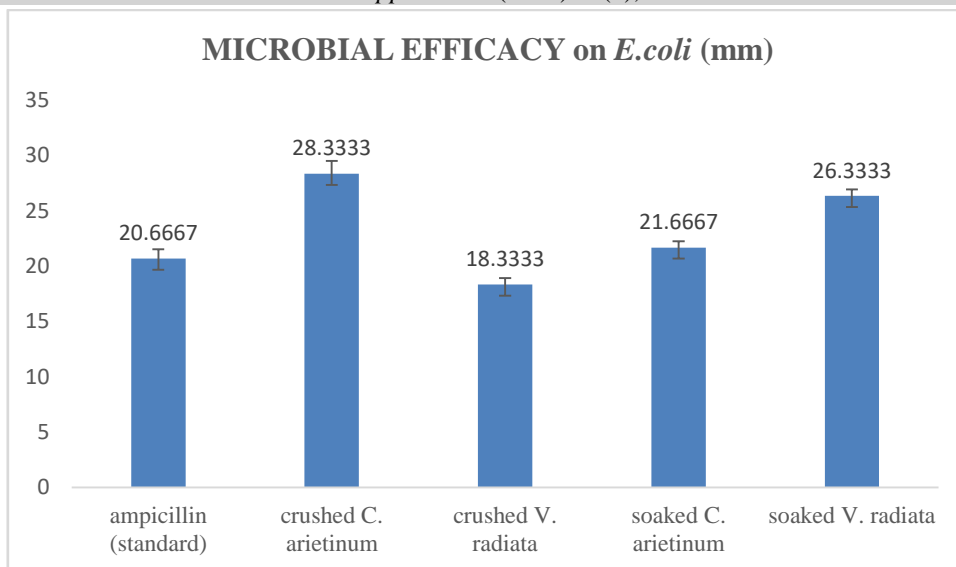


Fig. 6a. Shows the comparative microbial efficacy of all the samples against a standard antibiotic (ampicillin). Crushed chickpea is the most efficient, while crushed mung bean is the least efficient among all

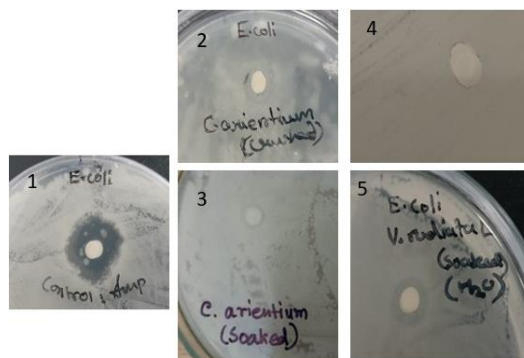


Fig. 6b. Pictorial representation of the microbial efficacy of all the samples against a standard antibiotic (ampicillin) through Kirby-Bauer disc diffusion method

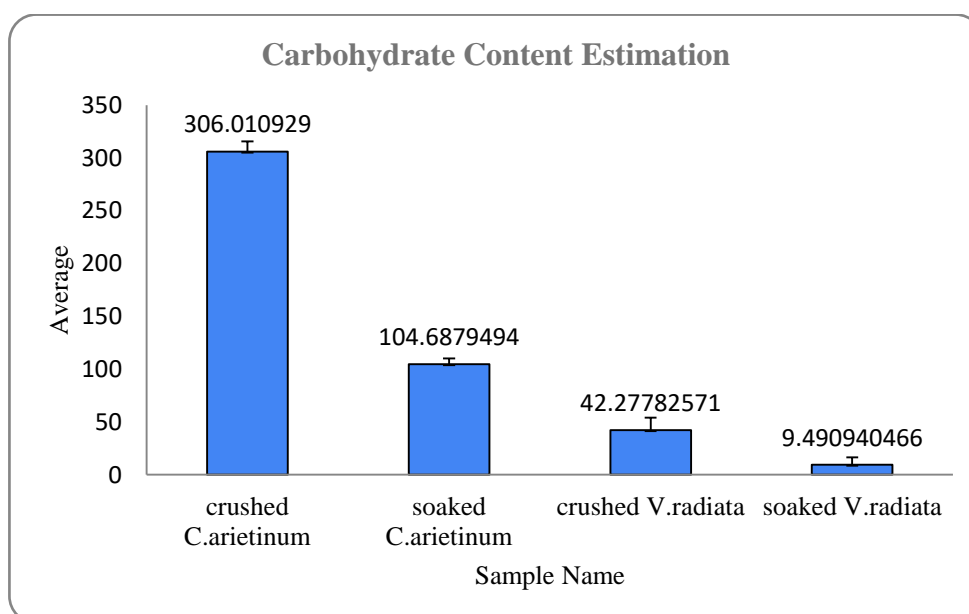


Fig. 7. Shows the comparative values of carbohydrate content in the crushed and soaked forms of *Cicer arietinum* and *Vigna radiata*

The crushed *C. arietinum* has the maximal amount of carbohydrate (roughly 300mg glucose/gm FW). In contrast, the soaked and crushed *V. radiata* both have an almost

negligible carbohydrate content (<50mg glucose/gm FW), with soaked mug beans having minimal value.

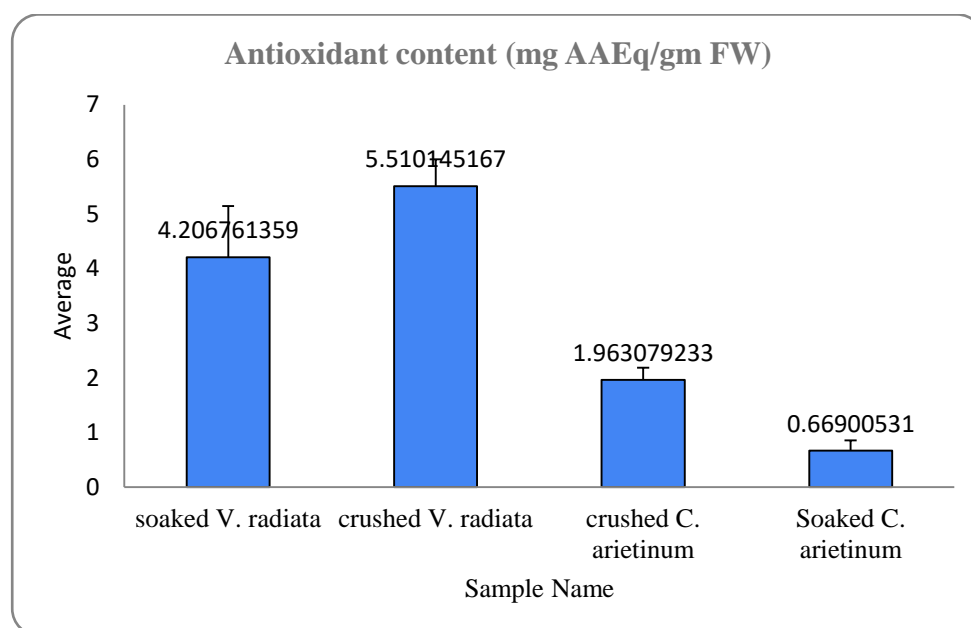


Fig. 8. Shows an evaluation of the comparative antioxidant activity of crushed and soaked forms of chickpeas and mug beans

Provided Below is a table for the comparative analysis of each of the components studied:

Sample	Vitamin C mg/ounce	Protein mgBASE/gFW	Vitamin B1 mgBASE/gFW	Microbial Efficacy millimeters	Carbohydrate mg glucose/gFW	Antioxidant mg AAE/ml DW
Crushed <i>C.arietinum</i>	1.568 ±0.4	NA	228.535±0.19	28.33±0.4	306.011±0.12	1.963 ±0.53
Soaked <i>C.arietinum</i>	0.900±0.32	177.409±0.4	181.535±0.20	21.66±0.12	104.687±0.19	0.669±0.4
Crushed <i>V.radiata</i>	0.554±0.4	NA	186.439±0.121	18.33±0.4	42.277±0.15	5.510±0.158
Soaked <i>V.radiata</i>	0.868±0.48	302.976±0.12	190.853±0.19	26.33±0.3	9.490±0.1	4.206±0.12

Both the soaked and the crushed mug beans have better antioxidant activity than the crushed and soaked chickpeas.

DISCUSSION

Owing to their high nutrient content, pulses, which include beans, peas, and lentils, have several health advantages. Mudryj et al. (2014) state that they are great providers of fiber, protein, vitamins and minerals. Frequent pulse consumption has been linked to improvements in blood pressure, glycemic control, and waist circumference, among other risk factors for metabolic syndrome (Mollard et al., 2012). Pulses are especially helpful for people with diabetes because they have a low glycemic index and can help maintain healthy blood glucose levels (Cuvelier et al., 2017). Moreover, bioactive substances found in pulses include proteins, polyphenols, and short-chain fatty acids, which have anticancer effects by reducing inflammation, DNA

damage, and cell growth (Rao et al., 2018). Additionally, these substances might specifically cause apoptosis in cancer cells.

The quantity of Vitamin C is higher in sprouted *Vigna radiata* than in seeds, and higher in seeds of chickpeas than in sprouted chickpeas. Studies have found that the antioxidant activity of sprouts is higher than that of seeds in Mung beans (*Vigna radiata*). Similarly, chickpeas have strong antioxidant qualities, with studies indicating that the antioxidant activity of seeds is higher than that of sprouts. On the other hand, soaked and sprouted *V. radiata* contains the highest protein content compared to soaked chickpeas. Additionally, Mung beans (*Vigna radiata*) have strong vitamin B1 content, with studies showing that the antioxidant activity of sprouts

is higher than that of seeds. In chickpeas, the vitamin B1 quantity is higher in seeds than in sprouts. As for carbohydrates, chickpeas have a significant amount of carbohydrates in seeds, which is higher than that of sprouts. *Vigna radiata* has a significant amount of carbohydrates in seeds, which is also higher than that of sprouts. The microbial efficacy of seeds of chickpeas Pulses has the potential to lower the risk of chronic diseases, and the evidence currently available supports including them in a healthy diet (Mudryj et al., 2014), even though more long-term studies with randomized control are required is higher than sprouted forms. On the other hand, sprouted mug beans have higher microbial efficacy than seeds.

CONCLUSION

The study concludes that the crushed form of *Cicer arietinum* is the most effective and beneficial for the immune system. Due to its diverse phytochemical profile, which includes proteins, carbohydrates, alkaloids, and flavonoids, *Cicer arietinum* is a valuable food source for humans and other species. These compounds contribute to their pharmacological effects, such as their anti-inflammatory, antioxidant, and anticancer properties. *Vigna radiata* is abundant in protein and antioxidants, making it highly recommended for individuals who suffer from poor digestive health, obesity, hypertension, and hyperglycemia. Furthermore, both the seed and sprout extracts of *Vigna radiata* have anti-angiogenic effects, with the sprout extracts showing a stronger ability to block blood vessel formation.

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Conflict of interest

The authors have no conflict of interest. No competing interest issues.

Ethical issues

No such ethical issues.

Author contribution

Authors 1, 2, 3, 4, and 5 have contributed equally to collecting data, writing, and editing.

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