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NUTRIMORINGA SUPER FOOD: EXPLORING ITS POTENTIAL BIOLOGICAL PROPERTIES IN COMBINATION WITH CHAMOMILE HERBAL TEA

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Abstract

Moringa, often referred to as the "Miracle Tree" or the "Tree of Life," is a highly nutritious plant that has been gaining more popularity in recent years due to its medicinally important nutrition profile,. It is abundant in essential nutrients such as vitamin C, vitamin A, potassium, magnesium, calcium, iron, proteins, and antioxidants. This plant has been cultivated in various regions, including Pakistan, India, and Bangladesh, owing to its numerous potential health benefits, moringa is recognized as a super food with potential anticancer properties. However, it is crucial to consider both the benefits and potential drawbacks of incorporating moringa and chamomile flowers into regular diet, particularly in relation to specific health conditions. Moringa also contains a variety of phytochemicals, such as Gallic acid, Quercetin, Kaempferol, glucosinolates, Niazimicin, moringine, caffeic acid, ascorbic acid, and ellagic acid, which may offer potential immunity boosting, anticancer, anti-inflammatory, and anti-aging effects. On the other hand, chamomile flowers are rich in epigenin, a compound known for its significant anticancer properties, functioning through mechanisms like apoptosis induction, autophagy promotion, and immune function enhancement. This review article address the potential health benefits of moringa, including its anti-inflammatory, anticancer, anti-aging, cardiotonic, antidiabetic, anti-obesity properties, while also addressing its combination with other dietary supplements, such as chamomile flower infusion tea, and their collective immunity boosting, anti-insomnia and anticancer benefits when integrated into the diet.

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Graphical Abstract:



Figure 1: Moringa, also known as the "**Miracle Tree**" or "**Tree of Life**" is a nutrient-enrich plant This figure is depicting the amazing nutrition profile of Moringa enriched with Vitamin A, C, Ca, Fe, fibers , antioxidants etc, while Moringa Chamomile Infusion Tea, is a powerful blend known for its ability to aid in treating insomnia, promoting relaxation, and facilitating a restful night's sleep. This unique tea is also loaded for its capacity to enhance metabolism, increase energy levels, and alleviate inflammations from the body

Introduction:

Moringa, also known as the "Miracle Tree" or "Tree of Life" is a nutrient-rich plant that has gained tremendous popularity in recent of years. Native to the sub-Himalayan regions moringa is now cultivated in various parts of the world due to its numerous potential health benefits. loaded with essential minerals, vitamins, and antioxidants, this super food offers a wide range of advantages for both physical and mental well-being. However, as with any dietary supplement, it is important to be aware of the potential advantages, disadvantages (pros and cons) of incorporating moringa into your diet.[1] [Fig 1],Table [1.1-1.3]

Fresh leaves of moringa are packed with essential nutrients. It contains three times more iron than spinach, twice the amount of proteins compared to yogurt, seven times more vitamin C than oranges, four times more vitamin A than carrots, four times more calcium than milk, and three times more potassium than bananas.

1 Nutritional Profile of Moringa:

Table 1: Showing the nutrition profiles of macromolecules in Moringa

USDA National Nutrient Database. Daily recommended values of Moringa as per 100 grams.		
Nutrition content	**Nutrient in Pods**	**Nutrient in Leaves**
Protein	2.10 g (4%)	9.40 g (17%)
Carbohydrates	8.53 g (6.5%)	8.28% (6%)
Total Fats	0.20 g (1%)	1.40g (7%)
Cholesterol	0.mg (0%)	0 mg (0%)
Dietary Fiber	3.2g (8%)	2.0 g (5%)
Energy	37 Kcal (2%)	64 Kcal (3%)

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

1.2 Vitamins in Moringa Plant:

Table 2: Showing the nutrition profiles of vitamins in Moringa

USDA National Nutrient Database. Daily recommended values as per 100 grams of plant.		
Vitamins	**Pods nutrients Value**	**The Nutritional Benefits of Leaves**
Vitamin A	74 IU (2.5%)	7564 IU (252%)
Vitamin C	141 mg (235%)	51.7 mg (86%)
Pyridoxine	0.120 mg (9%)	1.200 mg (92%)
Niacin	0.680 mg (4%)	2.220 mg (14%)
Thiamin	0.053 mg (4.5%)	0.257 mg (21.5%)
Folates	44 mcg (11%)	40 mcg (10%)
Riboflavin	0.074 mg (6%)	0.660 mg (51%)

1.3 Minerals in Moringa Plant:

Table3: Showing the nutrition profiles of minerals in Moringa

USDA National Nutrient Database. Daily recommended values as per 100 grams.		
Electrolytes	**Nutrient in Pods**	**Nutrient Value of Leaves**
Potassium	461 mg (10%)	337 mg (7%)
Sodium	42 mg (3%)	9 mg (0.5%)
Magnesium	24 mg	42 mg
Calcium	30 mg	44.0 mg

2 Health Benefits of Moringa:

Moringa leaves are well-known for their exceptional nutritional content, containing high levels of essential vitamins like vitamin C and vitamin A, as well as minerals such as potassium, magnesium, calcium, and iron. Additionally, moringa is a significant source of proteins and antioxidants. These nutrients are important for boosting the immune system, promoting strong bones and joints health, and improving eyesight. The antioxidants in moringa are effective for combating oxidative stress, which can help to reduce the risk of chronic diseases like heart disease, various type of cancers. and inflammations, Moringa also helps to manage cholesterol levels and to regulate blood sugar. Some individuals may experience digestive issues when consuming moringa, so its recommended to eat in less quantity, its anti-inflammatory properties may offer to relief from the symptoms related to arthritis and other inflammatory conditions. The potential health benefits of moringa may include potential anti-cancer acivity, increased energy levels, enhanced vitality, reduced fatigue, improved work productivity and overall well-being of individuals, better digestion, relief from constipation, support for improved gut health and better nutrients absorption, it accelerates wound healing, helps to regulate blood glucose levels for individuals with insulin resistance & diabetes, it is beneficial for individuals who are suffering from asthma, and supports to improved lungs function. It also protects against kidney disorders, reduces high blood pressure, improves eye health, and aids in the treatment of anemia and sickle cell disease by increasing iron absorption. Moringa enhances mental health by addressing mood swing disorders, it also treat stress, anxiety, depression, and body fatigue [2-6].

2.1 Pros and Cons of Moringa Consumption:

Moringa offers a multitude of potential health benefits, it is essential to consider both the advantages and potential drawbacks before incorporating it into your regular diet.[7]

Volume 4, Issue 3, 2026

Frontier in Medical & Health Research

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2.2 Advantages (Pros) of Moringa Consumption:

Moringa plant contains compounds which possess potential antimicrobial and anthelmintic activities, antiasthmatic activity, anticancer, antitumor activity antidiabetic and wound healing activity cardiac and circulatory stimulant and antidiuretic, analgesic, antipyretic activity, hepatoprotective activity [7]

2.2.1. Nutrients powerhouse:

Moringa contains essential vitamins, minerals, and antioxidants which support overall health and well-being.[7]

2.2.2 . Weight management:

Moringa leaves are low in calories and high in fiber, which makes it an excellent addition to a weight loss or weight management plan. Consuming moringa can help to controlled appetite, boost of energy levels, and enhance endurance. It aids in improving digestion, relieving constipation, and addressing stomach issues such as gastritis and ulcerative colitis [7]

2.2.3. Blood sugar regulation:

Some studies suggest that moringa may help to lower blood sugar levels and improve insulin sensitivity, which is beneficial for individuals with, insulin resistance, prediabetese & diabetes.[7]

2.2.4. Anti-inflammatory Property:

The anti-inflammatory compound GABA (gamma amino butyric acid) found in moringa may help to reduce symptoms associated with chronic inflammatory conditions. Its anti-inflammatory characteristics controlled the inflammatory biomarkers and inhibit abnormal cell proliferation while promotes normal cell growth make it a valuable ingredient for overall well-being and vitality, as it is highly effective for treating edema due to its potent anti-inflammatory properties [7] Figure [2].

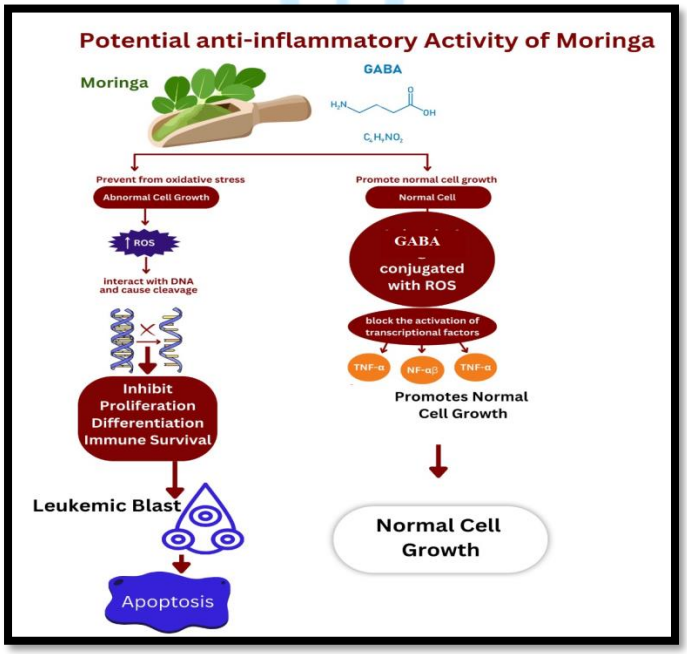


Figure [2]: showing that GABA from moringa exhibits an anti-inflammatory mechanism of action by inhibiting abnormal cell proliferation while fostering normal cell development, thereby preventing the activation of transcription factors

Frontier in Medical & Health Research

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2.2.5. Good for Heart Health:
Moringa has been shown to lower the cholesterol levels and reduce the risk of heart diseases.[7]

2.2.6 Beneficial for Skin, Hairs, and Nails Well-being:
Moringa is a miraculous plant which has incredible benefits for the health of skin and hairs, thanks to its protein-rich, moisturizing, and deep cleansing properties. It protects skin cells, promotes healthy skin growth, and nourishes the hair. Additionally, it has the extraordinary ability to heal skin infections and wounds effectively. Moringa is also well-known for its anti-aging property, which helps to reduce the appearance of wrinkles and fine lines in the way promote youthful skin. It stimulates hair growth and helps to maintain strong and healthy hairs.[7]

2.2.7 Anti-cancer Properties:
Moringa not only protects the liver but also aids in detoxifying the body from harmful toxins and waste products. It contains properties that help to regulate cholesterol levels and is recognized for its cancer-fighting abilities, with niazimicin compound which inhibits the growth of cancer cells. [7]

2.2.8 Immunity Booster:
Moringa also strengthens the immune system, which fights against bacterial & viral infections, promotes strong and healthy bones formation, potentially aiding in the treatment of arthritis and bone damage, and safeguards the cardiovascular system, promoting a healthy heart. It is believed to act as an aphrodisiac, enhancing libido, and its antioxidant properties contribute to overall health and well-being.[7]

2.3 Disadvantages (Cons) of Moringa Consumption:
2.31. Potential Drug Drug Interactions DDI: Moringa may interact with certain medications, including blood thinners (anticoagulants), diabetes medications, and high blood pressure drugs. consult with a healthcare professional before consuming moringa if you are taking any medications.[7]

2.3.2. Interference with Thyroid function:
Some animal studies suggest that moringa may affect thyroid functions. Individuals with thyroid conditions should exercise caution and seek medical advice before consuming moringa.[7]

2.3.3 Digestive issues:
Moringa is generally well absorbed and tolerated, some individuals may experience digestive discomfort, such as stomach upset or diarrhea, especially when consumed in large quantities.[7]

2.3.4. Allergic reactions:
Although rare, allergic reactions to moringa have been reported. If you have known allergies with the plants of Moringaceae family, such as cabbage or broccoli, it is advisable to avoid moringa. [7]

2.3.5 Moringa Supplements Available Brands:
Table 4: is highlighting a range of various brands that offer nutritional supplements made from moringa

SNO	Moringa Nutrition supplements brands	SNO	Moringa Nutrition supplements brands
1	Morganica 500mg by Nutrifactor	6	Bio-Moringa 500 by biogena brands
2	Moringa 500 Mg Capsules by herbiotics	7	Moringa - iHerb by iHerb
3	Moringa poweder by himalayan	8	Newherbs Organic Moringa capsules
4	Moringa capsules by caveman organics	9	Moringa Oleifera Capsules 1000mg

Frontier in Medical & Health Research

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			By moringa pure
5	ABS Moringa Extract	10	Pura vida moringa capsules

3 Chamomile flowers Infusion with Moringa Tea:

Chamomile flowers infusion and moringa tea both are popular herbal beverages known for their potential health benefits. following are some of the benefits associated with it Figure [3]. Chamomile flowers are rich in various beneficial compounds, including *myristin, proazolene*, *luteolin*, and derivatives of *coumarin*, alongside an array of flavonoids like flavones and flavonols. Their florets are particularly notable for containing *rutin*, *apigenin*, and free *quercetin*. Research indicates that apigenin plays a significant role in restraining the migration and invasion of melanoma cells. It has been observed to inhibit cell proliferation while promoting the death of cancer cells, a process that is influenced by both the concentration and the duration of exposure. Moreover, *apigenin* aids in triggering apoptosis and autophagy by interfering with the PI3K/Akt/mTOR signaling pathway (8).



Figure [3] :Showing Moringa Chamomile Infusion Tea, a powerful blend known for its ability to boost immunity, help in treating insomnia, promoting relaxation, and facilitating a restful night's sleep. This unique tea is also loaded for its capacity to enhance metabolism, increase energy levels, and alleviate inflammation

3.1 The significance of Apigenin in cancer research:

Apigenin compound exhibits a range of biological effects in various mammalian systems, both in laboratory settings and within living organisms. This is primarily attributed to its antioxidant capabilities and its effectiveness in neutralizing free radicals. Moreover, apigenin is known for its potential as anti-mutagenic, anti-inflammatory, antiviral, and laxative properties. Nevertheless, its influence on inhibiting the cell cycle, mitigating oxidative stress, boosting detoxification enzyme activity along with promoting apoptosis and enhancing immune response is somewhat limited. (9) Fig [4].

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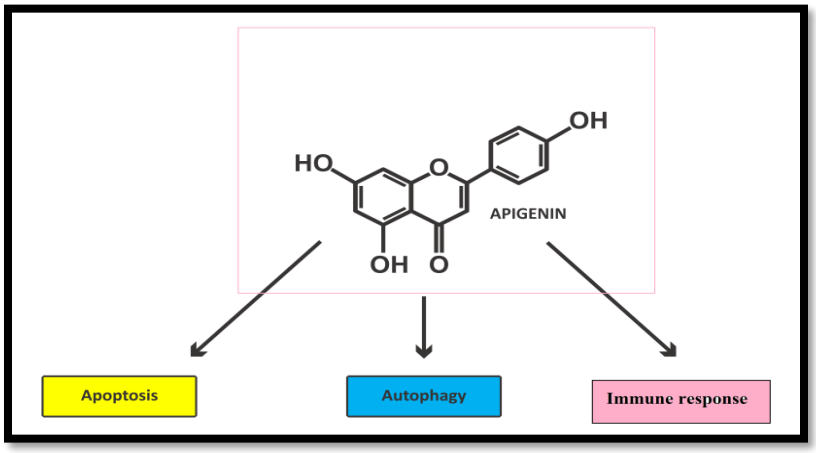


Figure [4]: Illustrating the potential anti-cancer effects of apigenin, (a compound richly present in chamomile flowers), through mechanisms such as the induction of apoptosis, promotion of autophagy, and enhancement of immune function

3.2 Mechanism of action of Apigenin:

Apigenin initiated apoptosis in U937 cells in a manner that was both dose-dependent and time-dependent, resulting in the activation of caspases and the cleavage of PARP. Treatment of U937 cells with apigenin led to a significant reduction in the expression of Bcl-2 and Mcl-1 proteins. Additionally, this treatment caused the inactivation of Akt and a marked increase in JNK activation. Apigenin promoted apoptosis in leukemia cells via a caspase-independent pathway characterized by the suppression of Akt and the activation of JNK. Moreover, it triggered apoptosis in these leukemia cells through mechanisms reliant on mitochondrial function. Similar outcomes were noted in other leukemia cell lines; however, normal peripheral blood mononuclear cells (NPBMNCs) did not display these effects.

The inactivation of Akt was identified as a critical factor for the activation of both JNK and caspases, ultimately leading to cell death. Importantly, JNK activation was essential for the process of caspase activation and the subsequent induction of apoptosis by apigenin. Furthermore, the decrease in Mcl-1 levels due to apigenin exposure occurred through both transcriptional regulation and proteasome-mediated degradation. The over expression of Mcl-1 significantly reduced apigenin-induced apoptosis, the activation of caspases, and PARP cleavage in U937 cells. Additionally, apigenin showed potential to inhibit tumor formation in xenograft models of U937 human leukemia cells, as well as disrupt the PI3K/Akt and mTOR signaling pathways.(10)

3.2 Induction of Apoptosis:

Apoptosis is the body's natural, programmed cell death mechanism. This complex process involves a series of energy-dependent biochemical cascades and is accompanied by specific changes in cell structure. Currently, apoptosis is primarily activated through two main pathways: the extrinsic pathway, often called the death receptor pathway, and the intrinsic pathway, which is associated with mitochondrial activity. This vital process helps to eliminate unnecessary cells under normal physiological conditions.

A hallmark of cancer cells is their ability to evade apoptosis, setting them apart from healthy cells. Consequently, inducing apoptosis in cancer cells by targeting these pathways using chemotherapy drugs has become a prominent strategy in cancer treatment. Studies have shown that apigenin is a potent compound that can effectively induce apoptosis in human cancer cells, primarily by stimulating the intrinsic pathway(11) Figure [5]

Volume 4, Issue 3, 2026

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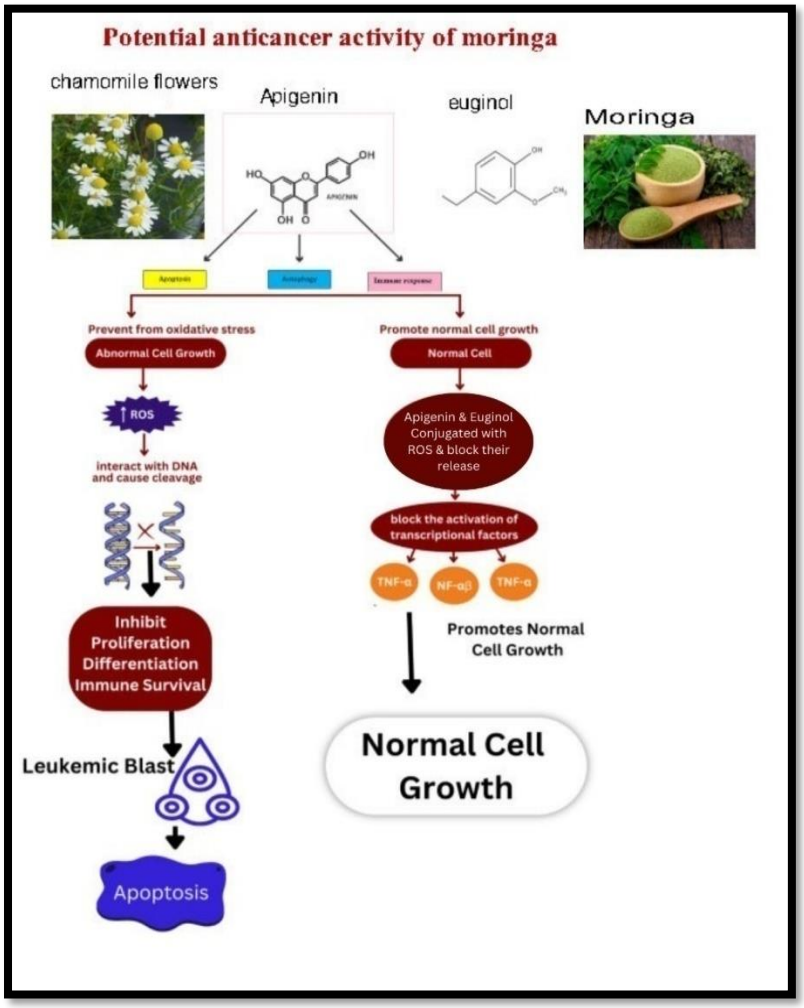


Figure 5:Illustrating about the potential of euginol from moringa and apigenin from chamomile flowers in combating cancer by inhibiting abnormal cell proliferation and apoptosis, in this way supporting healthy cell growth

3.4 Induction of Autophagy:
Autophagy, commonly known as type 2 non-apoptotic cell death, is a cellular process where cytoplasmic components are enveloped in vacuoles, enabling their thorough degradation by lysosomal enzymes. This dynamic mechanism allows cells to break down their own cytoplasmic material within lysosomes, effectively sequestering and degrading macromolecules. In certain situations, autophagy serves as a survival strategy, helping cells recycle metabolic resources and maintain energy levels during periods of starvation. However, in other contexts, it may lead to cell death, either alongside apoptosis or as an independent pathway. Recent research indicates that the relationship between autophagy and cancer is complexed. The capability of apigenin to induce autophagy was first observed in erythroleukemia TF1 cells, where it triggered autophagy without causing apoptosis. Since that initial finding, subsequent studies have demonstrated that apigenin can elicit autophagy, which may either inhibit tumor growth or provide protective effects depending on the circumstances. [12-13].

3.5. Promotes relaxation: Chamomile is often consumed for its calming properties and is commonly used as a natural remedy for treating

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stress, anxiety and depression and promotes relaxation. [14]

3.6. Aids in sleep: Chamomile infusion is believed to help improving sleep quality and treat insomnia symptoms and induce peaceful sleep [15]

3.7. Digestive support: It may help to soothe digestive discomfort, such as bloating, indigestion, and stomach cramps.[15-17]

3.8 Anti-inflammatory properties: Chamomile contains compounds that possess anti-inflammatory properties, which may help to reduce inflammation in the body [17-20]

3.9. Skin health: It is sometimes used topically to soothe skin irritations, such as eczema and minor wounds [20-21]

3.10 Energy and vitality: Moringa tea with chamomile infusion is often consumed for its potential energizing effects, providing a natural boost of vitality.

chamomile infusion and moringa tea have been associated with these benefits, it's important to note that individual experiences may vary. It's always recommended to consult with a healthcare professional for personalized advice and to ensure these herbal beverages are suitable for your specific health needs & requirements. [14-21]

Conclusion:

Moringa is undoubtedly a remarkable super food, providing a wide range of potential health benefits due to its rich nutrient contents and powerful antioxidants. Recent research strongly suggests that a diet abundant in chamomile plant flavones is linked to several health advantages, particularly a decreased risk of developing certain types of cancer. Incorporating dietary changes that emphasize chamomile flavones could serve as a holistic chemo preventive approach for individuals at heightened risk, potentially influencing the process of neoplastic transformation. However, as with any dietary supplement, moringa is crucial to consider the potential pros and cons before incorporating moringa into your daily routine, moringa has the potential to significantly contribute towards a healthy and balanced lifestyle. so, don't hesitate to include this nutrient-packed plant in to your regular meals for a healthy boost. In this review article we discussed in details about the potential health benefits and potential drawbacks of moringa alone or combining it with other dietary supplements, such as chamomile flowers infusion tea

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Competing interests / COI statement: The authors declared no conflict of interest

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Abbreviations List:

GABA : Gamma amino butyric acid
NPBMNCS: Normal Peripheral blood mononuclear cells
JNK: Jun-N-terminal kinase activation
PARP: Poly ADP-ribose polymerase
TFI: Television Francaise

Frontier in Medical & Health Research

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