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CORIANDER SATIVUM SEEDS: A POSSIBLE REMEDY IN THE TREATMENT OF THYROID DISEASE

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ABSTRACT: Thyroid disease is a significant component of the widespread endocrine diseases that are prevalent in India. Thyroid disorder is becoming more common among Indians at an alarming pace. The majority of thyroid problems in India are either hypothyroidism or hyperthyroidism. A growing number of people are turning to alternative medical treatments because they are effective and have little adverse effects. The coriander is an herb that is freely available in India. It is used with vegetables as a spice and in medicine as anxiolytic, carminative, antithyroid drug, *etc*. The coriander seeds are rich in both the essential oils and the volatile oils with a high degree of medicinal values. In addition to essential oil, it also has tannins, terpenoids, reducing sugars, alkaloids, phenolics, flavonoids, fatty acids, sterols, and glycosides. Additionally, it has significant nutritional benefits, including a variety of minerals, vitamins, proteins, lipids, carbs, and fibers. Coriander is also referred to as Chinese parsley and is grown for both its leaves and seeds (fruits). Coriander is used medicinally because of some of its properties, such as being an antioxidant, an antifungal, an antibiotic, and a digestive agent in the process of digestion. The coriander plant has been shown to contain several polyphenols and antioxidant substances that have a substantial preventive effect against the onset of certain illnesses. TSH is frequently regarded as a key hormonal regulator of the testis' physiology throughout its developmental stage.

INTRODUCTION: The thyroid is an endocrine gland that sits in the neck controls thyroid hormone production. When irregularities develop in the thyroid gland, it can cause a hormone imbalance that may impact the body. The whole process of fetal hormonal maturation is governed by thyroid receptors, including TR and TR subtypes, which play a critical role in the formation of the fetus's brain.

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The fetus depends on the mother's thyroid hormones for the full twelve weeks of gestation. Then the thyroid receptors start to appear in the cerebral cortex, the foetal thyroid is able to concentrate iodine for the synthesis of thyroxine [1, 2]. They are expressed on the cell nucleus and regulate thyroid hormone production through gene expression.

The human hormonal system, which controls cellular metabolism, growth and development, oxygen utilization, and basal metabolic rate, includes the thyroid as a key component [3]. Thyroxine (T4) and triiodothyronine (T3) are secreted by the thyroid gland and are essential for healthy growth and development as well as serving

as the main regulators of basal metabolic rate. The basal metabolic rate (BMR) is increased as a result of thyroid hormones' stimulation of protein synthesis and the development of the nervous system *via* the activation of genes [4]. One to two percent of the adult population is thought to have thyroid abnormalities, according to a recent forecast based on several research, making thyroid illness one of the most prevalent endocrine disorders globally [5].

Pathophysiology: Thyroid dysfunction can be broadly categorized into two main conditions: hypothyroidism and hyperthyroidism. Hypothyroidism refers to a condition when the thyroid gland acts below its ideal level, resulting in an insufficient supply of critical thyroid hormones, particularly thyroxine (T4) and triiodothyronine [6].

Underlying Causes: Hypothyroidism comes from numerous circumstances, each distinguished by unique underlying pathophysiologic processes.

Primary Hypothyroidism: The prevalent cause is Hashimoto's thyroiditis, an autoimmune illness. This illness develops when the immune system incorrectly starts an attack on the thyroid gland, generating chronic inflammation. Over time, this inflammatory process destroys thyroid tissue and impairs the regular synthesis of hormones. Immune cells enter the thyroid, resulting to a decrease in the production of T4 and T3 [7].

Secondary/ Tertiary Hypothyroidism: These variations are brought on by pituitary and hypothalamic dysfunction. The pituitary is stimulated by the hormone that stimulates the thyroid (TSH), which is subsequently generated by the thyroid, to release the hormone that releases thyrotropin (TRH), which is released by the hypothalamus.TSH serves a critical function in encouraging the thyroid gland to create thyroid hormones. Disruptions in either the hypothalamus or pituitary gland may block this communication system, resulting in diminished TSH production and consequently decreased synthesis of thyroid hormones [8].

Importance of Thyroid Hormones in Body Functions: Thyroid hormones play a key role in several body processes. Typically, Thyroxine is (T4), which is created by the thyroid gland, is then converted into triiodothyronine, or T3, in other organs by the action of the enzyme known as iodothyronine deiodinase, which depends on selenium [6]. T3 interacts to thyroid hormone receptors inside the nucleus of cells, stimulating the activation of certain genes and the creation of particular proteins [9]. Additionally, it binds to integrin αvβ3 on the cell membranes, resulting to the activation of processes including the creation of blood vessels and cell growth [9]. Nearly all thyroid hormones in the circulation (99.97%) connect to plasma proteins, whereas the physiologically active form is the free, unbound hormone [7].

Thyroid Hormone Production Process: Tyrosine and iodine are essential nutrients for the thyroid gland, which produces all thyroid hormones. Iodine contained in the circulation is absorbed into thyroglobulin molecules inside the thyroid gland, under the regulatory effect of thyroid-stimulating hormone (TSH) generated by the pituitary gland. Insufficient amounts of iodine or TSH might result in a reduced synthesis of thyroid hormones [10].

The Role of the Hypothalamic Pituitary Thyroid Axis: The careful equilibrium of thyroid hormone levels is regulated by the hypothalamic–pituitary–thyroid axis. The anterior pituitary gland produces TSH in response to thyrotropin-releasing hormone (TRH) from the hypothalamus. Thyroxine exerts a negative feedback mechanism, resulting to a decrease in the generation of TSH and TRH. Inadequate amounts of TRH, albeit rare, may lead to inadequate TSH production and subsequently impede the synthesis of thyroid hormones [8].

Thyroid Hormone Changes during Pregnancy: Significant alterations in thyroid hormone physiology are brought about by pregnancy. The thyroid gland develops a 10% expansion, thyroxine output rises by 50%, and iodine needs climb. A lot of women have healthy thyroid function but show symptoms of thyroid autoimmunity or iodine insufficiency, which may develop to hypothyroidism either before or after childbirth [11].

Hyperthyroidism: The specific subtype of hyperthyroidism under study has a significant impact on the pathophysiology of the condition.

Graves Disease: Graves Disease is characterized by an autoimmune process where antibodies target

the thyroid-stimulating hormone (TSH) receptor. This immune response is affected by a mix of genetic predisposition and environmental variables. The resultant antibodies activate the TSH receptor, leading to an enhanced synthesis and release of thyroid hormones. Additionally, these antibodies have a trophic impact on the thyroid gland, promoting its expansion, known as goiter growth [12].

Toxic Multinodular Goiter: Toxic Multinodular Goiter (TMNG) follows a specific pattern of pathophysiology. Initially, there is a period of nodular growth that runs over many years. During this period, the nodules progressively develop autonomy for manufacturing thyroid hormones. Somatic mutations affecting the TSH receptor result in the constitutive activation of the cAMP signaling cascade, eventually leading to thyroid autonomy. Larger nodule size, generally reaching 3 cm, is related with a higher frequency of overt hyperthyroidism [13].

Toxic Adenoma: Toxic Adenomas are solitary nodules defined by autonomous thyroid hormone synthesis owing to particular somatic mutations within the TSH receptor.

Hyperthyroidism Caused by Iodine (Jod-Basedow Phenomenon): Iodine-Induced Hyperthyroidism often originates owing to high iodine consumption, either via diet or use of drugs containing iodine, such as contrast media or amiodarone. Those prone to this occurrence include persons dwelling in locations with iodine deficit, those with underlying thyroid nodular disease, occult Graves's disease, or a history of treated Graves disease. The development of hyperthyroidism starts approximately 2 to 12 weeks following exposure to excessive iodine. In this case, the regular self-regulatory process of iodide organification is bypassed, resulting to an excess synthesis of thyroid hormones [14, 15].

Amiodarone Induced Thyrotoxicosis: Amiodarone-Induced Thyrotoxicosis (AIT) may be categorised into two subtypes: Type 1 and Type 2. Type 1 AIT develops from increased iodine exposure owing to amiodarone, particularly in patients with pre-existing thyroid problems, mirroring the Jod-Basedow phenomenon. Typically, latent Graves disease or a multinodular goiter are signs of a pre-existing thyroid condition. Type 2 AIT, on the other hand, generates damaging thyroiditis as a direct toxic action of amiodarone on thyroid follicular cells [16, 17].

Thyroiditis: Thyroiditis entails transitory rise of circulating thyroid hormone levels owing to inflammation or death of thyroid follicular cells. While thyroiditis has a similar pathophysiology of cellular inflammation or death, varied etiologies contribute to variances in clinical appearance. Infections can cause painful subacute thyroiditis, which is suppurative thyroiditis, and drug-induced thyroid disease. Autoimmune responses can also cause Hashimoto's thyroiditis, which is agreeable sporadic thyroiditis, and painless postpartum thyroid inflammation [18].

Potential Mechanisms of Action:

***Coriander sativum* Seeds and Thyroid Function:** *Coriander Sativum* seeds, referred popularly as cilantro seeds, have experienced lasting relevance due to their dual functions in culinary and medical worlds. Ongoing scientific inquiries have began uncovering fascinating features, indicating at the possible ability of these seeds to have an influence upon thyroid function.

Notably, the seeds hold a consortium of active ingredients, so promoting investigation into the possible repercussions these chemicals could carry concerning thyroid health. upon the following discourse, we begin onto an examination of probable molecular paths by which these chemicals may interact with thyroid function, anchored upon important findings.

Flavonoids: Within the seeds of Coriander Sativum, a family of polyphenolic chemicals termed flavonoids appears, boasting considerable antioxidant and anti-inflammatory effects. Emerging research attempts offer a probable relationship between these flavonoids and thyroid function, coming from their capacity to reduce oxidative stress and decrease inflammation inside the boundaries of the thyroid gland. The complicated participation of oxidative stress and inflammatory processes in a variety of thyroid illnesses gives value to the research of flavonoids as possible facilitators of better thyroid well-being.

It is remarkable that flavonoids expand beyond their presence just inside *Coriander sativum*. These phytochemical elements are widespread in a varied variety of botanical sources, including plants, fruits, vegetables, and leaves. Their position within medicinal chemistry is well-recognized for its many dimensions, embracing properties such as anti-cancer, antioxidant, anti-inflammatory, and antiviral actions. Additionally, their range of impact extends into both brain and cardiovascular worlds. The efficiency of these varied biological activities is closely tied to the particular category of flavonoid, its individual method of action, and its degree of bioavailability.

Operating as cost-effective medicinal agents, flavonoids reveal their significant efficacy across a range of health issues. Contemporary scientific research explore into the isolation of flavonoid analogs, as well as their repercussions for human health. These studies, typically accompanied by a range of methodologies and animal models, aim to unravel the various consequences of flavonoids. Consequently, this continuous search has resulted in the discovery of an increasing cohort of flavonoids, consequently underlining the necessity for a complete compilation of these recognised beneficial substances. Such an ensemble is poised to increase our grasp of the possible consequences for human health coming from flavonoid involvement [19].

Phytochemicals: Phytochemical elements contained in the seeds of *Coriander sativum* comprise a varied variety of chemicals, including phenolic acids and lignans. Notably, these compounds have received interest owing to their suggested capability for anti-thyroid peroxidase (anti-TPO) action.

Thyroid peroxidase, a crucial enzyme integrally involved with the manufacture of thyroid hormones, gains relevance in the setting of autoimmune thyroid diseases, notably Hashimoto's thyroiditis, where autoantibodies targeting this enzyme play a fundamental pathogenic role. Emerging research reveals a possible interaction between certain phytochemicals and the regulation of anti-TPO antibodies, thus possibly giving a therapeutic option for ameliorating autoimmune thyroid diseases [20-23].

Essential Oils: Within the seeds of Coriander Sativum, one finds crucial essential oils defined by their quantity of elements such as linalool and geraniol. These essential oils have attracted attention for their shown anti-inflammatory and immunomodulatory effects. Ongoing research suggests a probable link between these bioactive chemicals and their possible effect on immune responses germane to thyroid dysfunction. Through the control of immunological responses, these essential oils reveal the promise of abating the inflammation integrally associated to numerous thyroid problems [24].

Iodine Content: Iodine serves as a vital ingredient in the creation of thyroid hormones. Notably, Coriander Sativum seeds do carry iodine content, although at rather small amounts. Nonetheless, academic research postulate the possibility of an interaction between the iodine content, along with other elements contained within the seeds, that might possibly provide a synergistic influence on thyroid function. It is interesting that iodine supplementation remains a well-recognized technique in the therapy of thyroid diseases. In this regard, the observable presence of iodine inside *Coriander sativum* seeds bears the possibility of adding to their possible medicinal benefits [25].

Anti-Inflammatory Effects: Persistent inflammation is a prevalent trait across numerous thyroid illnesses. The existence of particular bioactive chemicals inside *Coriander sativum* seeds, especially quercetin and apigenin, has been submitted to scientific research, indicating established anti-inflammatory characteristics across numerous investigative settings. These bioactive elements possess the ability to exert effect on the generation of cytokines and coordinate immunological responses that drive thyroid-associated inflammation. This discovered mechanism gives an appealing opportunity for therapeutically treating the range of thyroid disorders 26.

Regulation of Thyroid Hormones: Several academic research have provided the supposition that *Coriander sativum* seeds might possibly generate detectable consequences, either directly or indirectly, on the complicated systems controlling thyroid hormone generation and conversion.

The compounds enclosed inside these seeds, represented by saponins and alkaloids, have surfaced as compelling topics of research owing to their presumed potential to finely modify the dynamic interaction within the hypothalamus-pituitary-thyroid axis. This modification has the ability to reverberate across hormone secretion and metabolic pathways. It is vital, however, to highlight that this subject forms a developing field demanding greater empirical study. The elucidation of precise mechanistic frameworks remains a vital quest in order to thoroughly define the foundations of these possible consequences [27].

Thyroid Dysfunction: Thyroid disorders can cause abnormality in temperature regulation, fertility, blood pressure, mental health and metabolism. There is increased evidence that there are some environmental exposures including certain insecticides, fungicides and herbicides are found to be potential risk factors for thyroid disease in the major part of the population. T Their effects include thyroid disruptors that interfere with the activity of the thyroid hormone receptor, bind to transport proteins, inhibit thyroidal Iodine that uptake, increase thyroid hormone clearance, disrupt cellular absorption of thyroid hormones, interfere with iodothyronine deiodinases, and interfere with the expression of thyroid hormone genes [28]. An essential factor in the diagnosis of asymptomatic thyroid dysfunctions is the measurement of TSH, T3 and T4 levels in the serum [7].

The reduced levels of thyroid hormones can cause hypothyroidism presenting with indications such as reduced sweating, myxedema, skin that is dry, swollen face with edematous the eyelids, pallor, retarded nail growth, air-dry brittle hair, non pitted pretibial edema and problems with stool, obesity, decreased sexual desire and irregular menstrual cycles menorrhagia in common, oligomenorrhoea or amenorrhoea in long standing scenarios. Excessive thyroid activity causes hyperthyroidism. The condition known as thyrotoxicosis, which is an excess of thyroid hormone, is sometimes confused with hyperthyroidism [8]. Thyrotoxicosis typically develops as a result of toxic multinodular goitre, toxic adenomas, and graves' disease. Exophthalmos, an elevated BMR, hyperactivity, dysphoria, irritability, anxiety, palpitations, exhaustion, weight loss with an increased hunger, diarrhea, polyuria, warm, moist skin, and tremor are all symptoms of hyperthyroidism (29).

Different forms of Thyrotoxicosis with Hyperthyroidism:

- Toxic adenoma
- Grave's disease
- Iodine-induced thyrotoxicosis
- Multinodular goiter
- Hasitoxicosis
- TSH secreting pituitary adenoma

Different forms of Thyrotoxicosis without Hyperthyroidism:

- Thyroiditis with De Quervain
- Iodine-induced thyroiditis
- after-delivery thyroiditis

Adverse Effects of the Antithyroid Drugs: Thyroxine is widely used at replacement doses for the treatment of hypothyroidism and as a suppressive dose to terminate thyrotropine hormone secretion in the thyroid cancer patients with complete thyroidectomy or with nodular nontoxic goiter. To suppress thyrotropin secretion, the patient should administer doses of thyroxine. Reduced bone mass, decreased bone density, and other cardiovascular alterations such as hypertrophy of the left ventricle, an increase in atrial premature beats, and a shortening of systolic time intervals are some of the side effects of this medication. Ther is a need to minimize the included risk by monitoring serum free thyroxine and triiodothyronine levels [30].

Coriander Seeds: The family Apiaceae includes the herbal plant *Coriandrum sativum*. The Middle East and the Mediterranean are its natural home [31]. It is commonly grown in several Asian nations as well as central and eastern European nations. Both the leaves and the seeds have several culinary and therapeutic uses. Antibacterial, anti-inflammatory in nature digestive, diuretic, carminative, anaphrodisiac, hypoglycemic, hypotensive, and myorelaxant qualities are only a few of the health advantages. Ayurveda makes reference to several of these therapeutic characteristics, including antibilious, tonic, diuretic, carminative, and stimulant [32]. Due to its diaphoretic, diuretic,

carminative, and stimulating properties, coriander is utilized in traditional Indian medicine to treat a variety of digestive, respiratory, and urinary system issues. Coriander has long been utilized in the Ayurvedic medical system to treat a variety of health issues, including dyspepsia, loss of appetite, thyroid issues, convulsions, and sleeplessness [33-34]. While the fat oil percentage of dry coriander fruits varies between 9.9 and 27.7%, the essential oil content ranges from 0.03 to 2.6%. Volatile substances found in the coriander fruit include anethol, borneol, bornyl acetate camphor, camphene, carvone, cineole, cymene, coriandrin, and dihydrocoriandrin. phydroxybenzoic acid, limonene, linoleic acid, myrcene, coriandrone A, coriandrone B, coriandrones C–E, and coriandrones [35].

Synonyms: *Biforaloureiroi* Kostel, *Coriandrum globosum* Salisb, *Coriandrum majus* Gouan, *Selinumcoriandrum* Krause, *etc*.

Taxonomical Classification:

Kingdom: Plantae

Subkingdom: Tracheobionta

Superdivison: Spermatophyta

Divison: Mangoliophyta

Class: Mangoliopsida

Subclass: Rosidae

Order: Apiales

Family: Apiaceae

Genus: Coriandrum Linn

Species: *Coriandrum Sativum* Linn

Distribution of Coriander: Since the dawn of civilization, *Coriandrum sativum* has been grown. As a spice plant, it is believed to have migrated from the Eastern Mediterranean region to India, China, Russia, Central Europe, and Morocco (16).Now it has distributed in Europe, Northern Africa, and Asia continentals [17, 18].

Parts used: Dry fruit and fresh green leaves [36, 37].

Physicochemical Properties:

Total Ash: should not exceed 6%, acid-insoluble ash: shouldn't exceed 1.5%, water-soluble extractives: shouldn't exceed 19%, alcohol-soluble extractives: shouldn't exceed 10%, and volatile oil: shouldn't be less than 0.3% v/w [38].

CONCLUSION: To prevent the many adverse effects brought on by hormone therapy, the herbal approach to thyroid illness is generally necessary. The use of herbal remedies is becoming more and more popular worldwide, and they have been highlighted as the key component of recent scientific studies that evaluate herbal remedies used in traditional medicine. Within *Coriander sativum* seeds resides a variety of bioactive components that display the ability to possibly exert effect over thyroid function *via* multiple molecular paths. However, it is vital to realise that the existing corpus of research, although promising, largely comprises of basic investigations or studies done inside animal or cellular frameworks. To corroborate these propounded pathways and detect the real implications of *Coriander sativum* seeds on human thyroid health, a broad array of well-designed clinical studies becomes needed.

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REFERENCES:

1. Babiker A, Alawi A and Al Atawi M: The role of micronutrients in thyroid dysfunction. Sudan J Paediatr 2020; 20(1): 13–19.
2. Bernal J: Thyroid hormones in brain development and function. Endotext. 2000. Available from: https://www.ncbi.nlm.nih.gov/books/ NBK285549/
3. Tortora GJ and Derrickson B: Principles of Anatomy and Physiology. John Wiley and Sons Inc 2012; 13th ed; pp: 697.
4. Fox SI: Human Physiology. Mc Graw Hill 2010; 12th ed; pp: 338.
5. Lakshmi CM: Scientific Basis for Ayurvedic Therapies. CRC Press LLC, New York Wasinghton DC 2004; 133-48.
6. Maia AL, Goemann IM, Meyer EL and Wajner SM: "Deiodinases: the balance of thyroid hormone: type 1 iodothyronine deiodinase in human physiology and disease". The Journal of Endocrinology 2011; 209(3): 283–97. doi:10.1530/JOE-10-0481. PMID 21415143
7. Garber JR, Cobin RH, Gharib H, Hennessey JV, Klein I, Mechanick JI, Pessah-Pollack R, Singer PA and Woeber KA: "Clinical practice guidelines for hypothyroidism in adults: cosponsored by the American Association of Clinical Endocrinologists and the American Thyroid Association". Thyroid 2012; 22(12): 1200–35. doi:10.1089/thy.2012.0205. PMID 22954017
8. Persani L: "Clinical review: Central hypothyroidism: pathogenic, diagnostic, and therapeutic challenges". The Journal of Clinical Endocrinology and Metabolism (Review) 2012; 97 (9): 3068–78. doi:10.1210/jc.2012-1616. PMID 22851492

9. Cheng SY, Leonard JL and Davis PJ: "Molecular aspects of thyroid hormone actions". Endocrine Reviews 2010; 31(2): 139–70. doi:10.1210/er.2009-0007. PMC 2852208. PMID 20051527
10. Gaitonde DY, Rowley KD and Sweeney LB: "Hypothyroidism: an update". American Family Physician 2012; 86 (3): 244–51. PMID 22962987.
11. Stagnaro-Green A, Abalovich M, Alexander E, Azizi F, Mestman J, Negro R, Nixon A, Pearce EN, Soldin OP, Sullivan S and Wiersinga W: "Guidelines of the American Thyroid Association for the diagnosis and management of thyroid disease during pregnancy and postpartum". Thyroid 2011; 21(10): 1081–125.
12. Smith TJ and Hegedüs L: Graves' Disease. N Engl J Med 2016; 375(16): 1552-1565. [PubMed]
13. Hamburger JI: Evolution of toxicity in solitary nontoxic autonomously functioning thyroid nodules. J Clin Endocrinol Metab 1980; 50(6): 1089-93. [PubMed]
14. Stanbury JB, Ermans AE, Bourdoux P, Todd C, Oken E, Tonglet R, Vidor G, Braverman LE and Medeiros-Neto G: Iodine-induced hyperthyroidism: occurrence and epidemiology. Thyroid 1998; 8(1):83-100. [PubMed]
15. Bervini S, Trelle S, Kopp P, Stettler C and Trepp R: Prevalence of iodine-induced hyperthyroidism after administration of iodinated contrast during radiographic procedures: a systematic review and meta-analysis of the literature. Thyroid 2021; 31(7): 1020-1029. [PubMed]
16. Fradkin JE and Wolff J: Iodide-induced thyrotoxicosis. Medicine (Baltimore) 1983; 62(1): 1-20. [PubMed]
17. Bogazzi F, Bartalena L and Martino E: Approach to the patient with amiodarone-induced thyrotoxicosis. J Clin Endocrinol Metab 2010; 95(6): 2529-35. [PubMed]
18. Pearce EN, Farwell AP and Braverman LE: Thyroiditis. N Engl J Med 2003; 348(26): 2646-55. [PubMed]
19. Iqbal MJ, Butt MS and Suleria HAR: Coriander (*Coriandrum sativum* L.): Bioactive Molecules and Health Effects. In: Mérillon, JM., Ramawat, K. (eds) Bioactive Molecules in Food. Reference Series in Phytochemistry. Springer, Cham. 2018https://doi.org/10.1007/978-3-319-54528-8_44-1.
20. Sangeetha Thangavelu, Balamuralikrishnan Balasubramanian, Sampathkumar Palanisamy, Velayuthaprabhu Shanmugam, Senthilkumar Natchiappan, Syed Ibrahim Kalibulla, Baskaran Rathinasamy and Vijaya Anand Arumugam Journal: South African Journal of Botany 2022; 146: 776. DOI: 10.1016/j.sajb.2021.12.024
21. Adlercreutz H: Lignans, human health. Crit Rev Clin Lab Sci 2007; 44: 483–525. doi: 10.1080/10408360701612942. [PubMed] [CrossRef] [Google Scholar] [Ref list]
22. Ionkova I: Anticancer lignans from discovery to biotechnology. Mini Rev Med Chem 2011; 10: 843–856. doi: 10.2174/138955711796575425.
23. Tang EL, Rajarajeswaran J, Fung SY: Antioxidant activity of *Coriandrum sativum* and protection against DNA damage and cancer cell migration. BMC Complement Altern Med 2013; 13: 347.
24. Mandal S & Mandal M: Coriander (*Coriandrum sativum* L.) essential oil: Chemistry and biological activity. Asian Pacific Journal of Tropical Biomedicine 2015; 5(6): 421-428. https://doi.org/10.1016/j.apjtb.2015.04.001
25. Nagarathna PKM and Deepa KJ: Study on Antithyroid property of some herbal plants review article. International Journal of Pharmaceutical Sciences Review and Research 2013; 23(2); 203-11.
26. Tianyi Y, Farooq A, Mohiuddin M, Farooq A, Gonzalez Norela CT, Abbasi A, Hina A & Irshad M: Role of different organic and inorganic amendments in the biofortification of iodine in *Coriandrum sativum* crop. Frontiers in Ecology and Evolution 2023; 11. https://doi.org/10.3389/fevo.2023.1145979
27. Jabeen and Qaiser: "Coriander fruit exhibits gut modulatory, blood pressure lowering and diuretic activities." Journal of ethnopharmacology 2009; 122: 123-30. doi:10.1016/j.jep.2008.12.016
28. Anderson S, Bruun NH, Pedersen KM and Laurberg P: Biologic variation is important for interpretation of Thyroid function tests. Thyroid 2003; 13(11): 1069-78.
29. Harrison TR, Harrisons principles of Internal medicine, Edited by Kasper Dennis L, Fauci Anthony S and Longo Dan L: Published by McGraw Hill, Medical Publishing Division 16th ed 2005.
30. Bartalena L, Bogazzi F and Martino E: Adverse effect of thyroid Hormone Preparation and antithyroid Drugs istituto di endocrinologia, University of psia, Itly 1996; 15(1): 53-63.
31. Burdock GA and Carabin IG:"Safety assessment of coriander (*Coriandrum sativum* L.) essential oil as a food ingredient Food Chem Toxicol 2009; 47(1): 22–34.
32. Momin AH, Acharya SS & Gajjar AV: *Coriandrum sativum*-review of advances in phytopharmacology. International Journal of Pharmaceutical Science and Research 2012; 3: 1233.
33. Mir H: *Coriandrum sativum*. In: Application of Plants in Prevention and Treatment of Illnesses. Persian 1992; 1: 257–262.
34. Zargari A: *Coriandrum sativum* L. Herbal Medicine Persian 1991; 1: 586–590.
35. Bervini S, Trelle S, Kopp P, Stettler C and Trepp R: Prevalence of Iodine-Induced Hyperthyroidism After Administration of Iodinated Contrast During Radiographic Procedures: A Systematic Review and Meta-Analysis of the Literature. Thyroid 2021; 31(7): 1020-1029. [PubMed]
36. Small E. Culinary herbs. NRC Research Press, Ottawa 1997:219-225
37. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network- (GRIN). National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.arsgrin.gov.4/cgi-bin/npgs/html/taxon.pl? 11523 (22 July 2015).
38. The University of Queensland. Special edition of environmental weeds of Australia for biosecurity Queensland, http://keyserver.lucidcentral.org/weeds/data/080c0106-040c-4508-8300-0b0a06060e01/media/Html/Conium_maculatum.htm (2011).

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