

Investigation of Antimicrobial Activity of *Coriandrum Sativum* L.

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Abstract:- A total of 854 plants were found to have antibacterial capabilities after a review of the literature produced between 2015 and 2022, which accounts for 64% of the total amount of material on this topic published since 1995. Biological screening and botanical authenticity criteria were the focus of our review. In comparison to the estimated 474,000 plants and 25,187 medicinal species utilised by humans, these figures are rather insignificant. Medicinal herbs and their natural compounds are largely unknown as antibacterial agents.

Keywords:- *Anti-microbial, Herbal plant, Database, Biological identification.*

I. INTRODUCTION

AMR threatens world health. Antimicrobial over prescription and use in agriculture contribute to AMR, while technological and economic restrictions have slowed antimicrobial development. 750,000 people have died from AMR, and 10 million might die by 2050[1]. AMR refers to fungus, viruses, and protozoans in addition to bacteria. Plants might combat antibacterial shortages and antibiotic resistance. Secondary metabolite production helps plants withstand pests and illnesses before they cause substantial damage. Plants and animals have co-evolved to weaken one other's defences over 350 million years. Secondary metabolites help plants adapt and monitor their environment[2,3]. Non-essential metabolic processes provide plant smells, tastes, and colours. Secondary metabolites help plants deal with abiotic challenges (such UV radiation) and other species (including herbivores, diseases, surrounding plants, pollinators, and fruit dispersers) (e.g., herbivores, diseases, adjacent plants, pollinators, and fruit dispersers). Terpenoids, phenolics, and alkaloids are common. Among secondary metabolites, terpenoids have 50,000 identified molecules. Biodiverse plants. 374,000 plant species are estimated. 295,383 are angiosperms (monocots: 74,273, eudicots: 210,008), 1,079 are gymnosperms, 10,560 are ferns, 1,290 are lycophytes, and the rest are bryophytes and algae. 10 times as many species as land animals[4]. Hotspots include 44% of the world's plant species and encompass 1.4% of the planet's area. These regions are missing 290,000 plant species with secondary metabolites.

Since ancient times, mankind have utilised plants medicinally. Ancient medical literature from throughout the world mention plants as remedies. Mesopotamian cuneiform clay tablets mention the opium poppy and Cupressaceae plant *Cupressus sempervirens* L. around 2600 BCE (*Papaver somniferum* L., *Papaveraceae*). The 3,500-year-old Ebers Papyrus is the oldest known document (1553-1550 BCE). The Ebers papyrus describes Egyptian medicinal herbs. Many underdeveloped nations use traditional plant treatments in their modern healthcare systems. Plant-based medications are used in minority and underprivileged healthcare[5]. Natural antibiotics range widely (molds, bacteria, etc.). Humans evolved antibiotics to fight single-cell predators. Chemists alter molecules to make them less harmful and more efficient in killing germs.

From bacterial cell-wall receptor binding through immunoassay screening, these chemicals may be extracted and identified. New techniques are developed based on the chemicals of interest and their application needs. These substances have been developed from their natural sources through formulation, manufacture, distribution, and clearance in humans and other species (particularly farm animals) (cows, pigs, sheep, aquacultured fish, etc.). These approaches can also be used to monitor human and animal drug levels. These compounds are mostly used for food-animal tissue testing [6]. Several livestock antibiotics can cause severe effects in humans at modest dosages [7]. Antibiotics are commonly given to cattle to increase weight gain, feed efficiency, or cure or prevent illness. Animals with microbiological illnesses require higher and more frequent doses. Antibiotic-resistant bacteria in edible tissue may make humans untreatable. Most antibiotic investigations employ fluid and tissue samples. Review highlights this technique[8].

This article provides an overview of antibiotic prescriptions and antibiotic residue detection tools. This explains extraction and analysis chemistry. Recent reviews have focused on antibiotic regimens and the entire field. For more on sample preparation, extraction, and analysis, especially for bulk materials, feeds, or medicinal preparations, see additional reviews and publications. Omitting something isn't detrimental. Methodological applications and publications often change previously published techniques. 75% of the world's plant species are used medicinally, while only 4,478 are cited in regulatory papers. Amazing bioactive chemical combinations are found

in nature. Plant chemicals can multi-target, facilitate transport, inhibit degradation, and change resistance[9]. When plant extract effectiveness declines, synergistic interactions occur. Synergy and other interactions must be studied to maximise antibacterial plant chemicals. This is clearer. Recent research focuses on plant chemicals that synergize with conventional antibiotics to combat drug-resistant microorganisms[10].

II. MATERIAL & METHOD

We searched several electronic databases using the PRISMA model: Web of Science, PubMed, and SciFinder.

III. RESULT & DISCUSSION

A. Literature Statement

Figure 1 demonstrates how studies were found and vetted. Duplicates were deleted from 9,537 items. Only 453 of 4,024 papers (15%) passed. This highlights the need for rigorous research standards, from authenticating botanical starting materials to standardising lab processes in analysing plant extracts. Figure 2 demonstrates that antibacterial plant articles have increased in recent years. This study focuses on 4,026 articles published from January 1, 2015 to September 3, 2022, or 66% of all papers published under this search parameters since 2015.

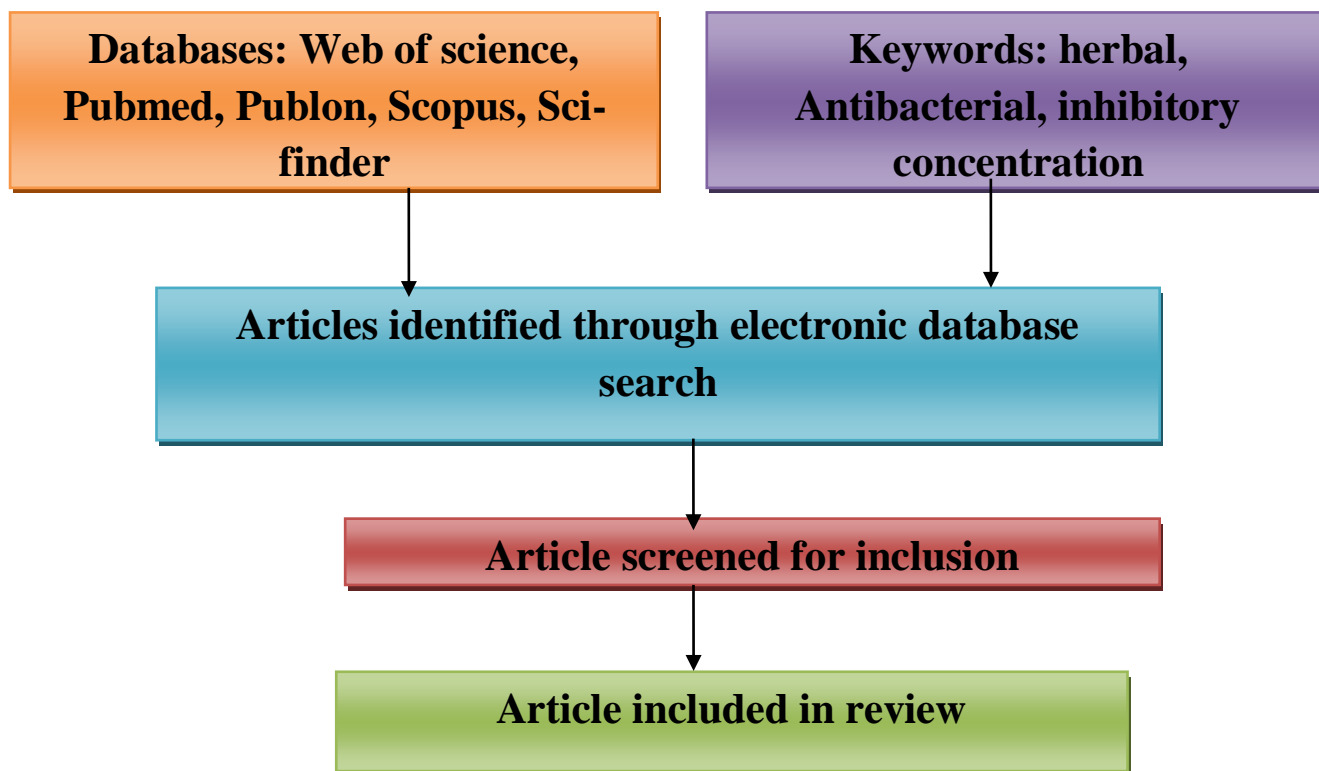


Fig. 1: Literature search for Construct data base

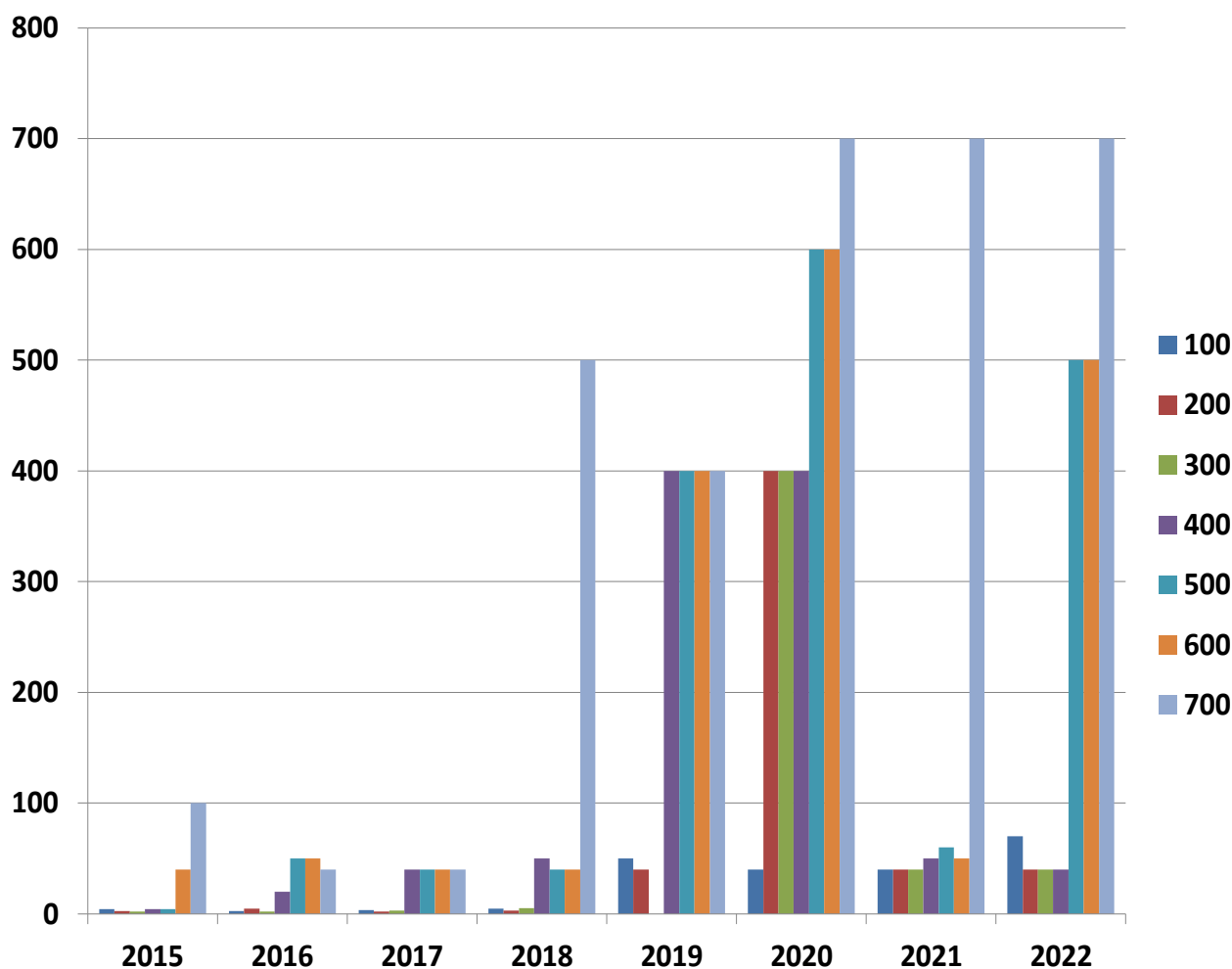


Fig. 2: 2015-2022 Publication Range Plant, inhibitory Concentration, antibacterial

2015: As a primary goal of our study, we sought to investigate the radical-fighting properties exhibited by Indian *Coriandrum sativum* L. leaves (Vulgare alef and *Microcarpum* DC types). Both *Vulgare alef* and *Microcarpum* DC have leaf that contains high levels of ascorbic acid (1.16 0.35 mg/g), total carotenoids (1.49 0.38 mg/g), and chlorophyll 'a' (8.232.4 mg/g) as well as high levels of chlorophyll 'b' (2.74 0.8 mg/g). Polyphenol values of 26.75 1.85 mg/g were found in both *Vulgare alef* and *Microcarpum* DC. Alcohol extracts of *Alef* and *Microcarpum* DC are more effective than 95 percent butylated hydroxyanisole in neutralising free radical damage. These extracts contain 200 ppm of the active ingredient. Using the PCA results, e-nose can discriminate between volatile substances[11]. *Microcarpum* DC was found to be superior to *Vulgare alef* in a quantitative sensory examination. 90% of the flavour components in both types were identified by GC-MS. These compounds were the most prevalent in both variants: decanal (7.645 and 7.74 percent), tridecen-1-al 2E > (667 and 1.21%), undecanal (1.20 and 1.75 percent), dodecanal (7.07 and 2.61 percent), and decanol n- > (25.12% and 39.35%, respectively). Tetradecanal (5.61% and 4.35%), 13-tetradecenal (9.53%), 1-octadecanol (1.25%), and octadecanol (1.25%) are the most common compounds.

2016: In this investigation, the impact of *C. sativum* on migraines was investigated. Coriander syrup together with sodium valproate was administered to the participants in the intervention group, whereas the control group received placebo syrup. Studies conducted on animals have shown that the fruits of *C. sativum* are both analgesic and anti-inflammatory. Pathan and colleagues demonstrated that the fruit of coriander has a central analgesic effect in rats[12]. According to the results of a test using mice and formalin, coriander extract has a dose-dependent analgesic effect and can postpone the onset of neurogenic and inflammatory pain. In a study conducted on mice, linalool was found to block inflammatory mediators, hence reducing levels of chronic discomfort. Research on coriander uncovered linalool at a level of 82 percent, geranial at a level of 6 percent, pinene at a level of 5 percent, pinene at a level of 3 percent, and thymol at a level of 3. (1.48 percent). Studies of a wide variety of Lamiaceae species have shown them to possess analgesic and anti-inflammatory effects. According to research done by Hajhashemi and colleagues, the polyphenolic fraction and essential oil contained in *Lavandula angustifolia* have both analgesic and anti-inflammatory effects on mice and rats. The impact of coriander on migraine may be due to linalool since linalool is the major component of coriander and neurogenic inflammation is a mechanism of migraine. Since the severity

of the attacks and the number of times they occurred were both reduced in the intervention group, coriander syrup could be an effective migraine preventative. We suggest using a variety of tests in order to evaluate this objective[13].

Although there were no negative outcomes from this trial, its limitations should nevertheless be taken into consideration. First, the patients only received the syrup for one month, thus we are unable to comment on its usefulness over the long term. Because the patients weren't followed up on after the research, we don't know the effects that will last in the long run. Long-term studies with large sample sizes are superior in terms of their generalizability and productivity[14]. The duration of pharmacological effects is measured during the course of the follow-up period. There is a need for more research to establish the mechanism behind the pain relief. This research concluded that consuming one month's worth of *C. sativum* fruit reduced the severity, frequency, and duration of migraine headaches. It is possible that it might be used as a treatment for migraines.

2017: In the United States, foodborne diseases are responsible for 3,000 annual deaths and affect 48 million people, making them a significant economic burden as well as a public health hazard. Food preservation methods that get rid of microbial contamination are one way to cut down on the number of people who get sick from eating contaminated food. Antibiotic resistance is on the rise among foodborne pathogens, and consumer demand for natural products is on the rise, both of which have put pressure on the food business in recent years[15]. Natural or bio-based food preservatives must be studied in order to find a solution to this problem. Known as *Coriandrum sativum* L., coriander seed is utilised in both cookery and traditional medicine. Yeasts, dermatophytes, filamentous fungi, and Gram-positive and Gram-negative bacteria are all susceptible to the antibacterial effects of coriander seed oil, thanks to its antibacterial qualities. In this study, coriander oil as a food preservative is examined and prospective pathways for its effective evolution as a food preservative are discussed[16]. Coriander oil's antibacterial properties and possible mechanisms of action in microorganisms are the focus of this investigation.

2018: In addition to its culinary and medicinal uses, the herb coriander is scientifically known as *Coriandrum sativum* (*C. sativum*). Cancer-fighting phytochemicals included in *C. sativum* also act as anticonvulsant, anxiolytic, analgesic, and analgesic for migraines, as well as antibacterial and anti-inflammatory[17]. Seeds contain a chemical known as linalool, which has been demonstrated to have a wide range of effects on numerous disease processes. *C. sativum*'s significant antioxidant activity is partly responsible for its preventive benefits on neurological disorders, cancer, and metabolic syndrome. *C. sativum*, a possible functional food for enhancing health in an era of ageing and lifestyle-related disorders, has been shown to have therapeutic effects in this study. Traditional Chinese medicine has used *C. sativum* for centuries, making it a natural choice for this investigation.

2019: Herbs belonging to the Umbelliferae family are well known for their beneficial effects on health and nutrition. The use of UHPLC-qToF/MS was employed in order to investigate the secondary metabolite diversity and compositional changes that occurred in cumin, fennel, anise, coriander, and caraway while roasting. Annotations were made on 186 different metabolites, the majority of which were flavonoids, fatty acids, and phenolic acids. In an untargeted manner, PCA, HCA, and OPLS-DA were utilised to investigate the heterogeneity of the fruits and establish the mechanistic changes that occur in the bioactive components after roasting[18]. These mechanistic changes include glycosidic breakage, lipid degradation, and the Maillard reaction. The process of roasting reduces the antioxidant activity of a food, as does the overall phenolic content. This is the first comprehensive map of the makeup of umbelliferous fruit metabolomes and the influence of roasting. There are culinary and medical applications for the *Coriandrum sativum* L. plant all over the world. The genotype, variety, planting season, ecotype, planting circumstance, growth stage, plant part, harvesting time, and extraction method all have an effect on the amount of bioactive compounds that can be produced by *C. sativum*, as well as their chemical compositions and yields[19]. Antioxidative and antibacterial effects are contributed to coriander and its extracts by a variety of different active components. This article provides an overview of the applications, chemical composition, bioactivities, and safety of coriander.

2020: Food, perfume, cosmetics, and medications all benefit from the usage of coriander seed oil. HD and microwave-assisted hydrodistillation were used to extract the essential oil from the coriander seed kernels (MAHD). Investigations on the chemical composition, total phenol concentration, antibacterial and antioxidant activities of essential oils were conducted utilising HD and MAHD methodologies. The bacteria's membrane and cell wall were inhibited by the essential oils, as shown by SEM. Heat and microwaves boosted the overall phenol concentration as well as the antioxidant activity[20]. Coriander seed oil wiped off the dangerous yeast *Candida albicans*. Gram-positive bacteria are more sensitive to the antibacterial effects of coriander seed oil than Gram-negative bacteria are. The antibacterial, phenolic, and antioxidant characteristics of essential oil obtained through the use of MAHD are among the best in the industry. In both essential oils, linalool was shown to be the most prevalent component, as determined by the GC-MS study. Essential oils and extracts of aromatic herbs and spices contain antibacterial, antifungal, and antioxidant components. The pharmaceutical and food processing industries use these components. A glabrous and fragrant annual herbaceous plant, coriander is formally known as *Coriandrum sativum* L. Essential oils and aroma compounds are made from it. *C. sativum* is used as both a flavouring ingredient and an adjuvant in the preparation of food. Antibacterial essential oil from this plant also prevents food-borne disease and food spoilage[21]. Found in coriander essential oil were linalool, Camphor, Geranium Acetate and Cymene as key volatile components, according to the research. Linalool, terpinene, pine, camphor, geraniol, camphene, limonene, geraniol and

d-limonene are the most common volatile chemicals discovered in seeds, according to Shahwar and colleagues. There was a significant concentration of these chemicals. Depending on the season, the development stage, and the climate, a plant's essential oil content and chemical composition can change[22]. We detected linalool, camphor, geranyl acetate, and cymene in the coriander essential oil that we employed in our investigation.

2021: Coriander, also known as *Coriandrum sativum* L., is a member of the Umbelliferae (Apiaceae) family of plants. This plant is herbaceous, glabrous, medicinal, and aromatic. It is most frequent in the Mediterranean and Middle Eastern regions, but India is the country that produces the most, makes the most use of it, and exports the most of it. This plant is employed as a treatment for anorexia, diarrhoea, spasms, stomach problems, bronchitis, and gout in regions surrounding the Mediterranean Sea. This spice is used not only as a seasoning and adjuvant in Tunisian cuisine, but also as a traditional remedy for insufficient milk, postpartum, and dermatitis[23]. Coriander has a number of medicinal properties, including those of an antioxidant, an antimutagenic, an antidiabetic, an antihelminthic, an anticonvulsant, a diuretic, an antifungal, an anxiolytic, an anticancer, and a hepatoprotective nature. Both the food and cosmetic industries make use of the essential oil of coriander due to the aroma it imparts as well as the antioxidant properties it possesses. Caraway, also known as *Carum carvi* L., is a fragrant biennial in the family Apiaceae. This plant has a long history of use in traditional medicine for the treatment of digestive conditions such as minor stomach and intestinal spasms, heartburn, bloating, gas, and lack of appetite. In addition to preventing phlegm and relieving constipation, caraway oil helps regulate urine flow. Breastfeeding mothers produce more milk when they consume caraway. Dyspepsia, flatulence, diarrhoea and hysteria are all treated with caraway seeds, which have anti-convulsant, antibacterial, analgesic, anti-inflammatory, anti-anxiety, anti-hyperglycemic and anti-spasmodic effects[24]. Analgesic effects are also found in caraway seeds. Thyroid hormones, indigestion, pneumonia, and as an appetiser and galactagogue are just a few of the conditions that caraway fruits are used to treat in traditional medicine. In both normal and streptozotocin-induced rats, it is used in the Unani system of traditional medicine to lower plasma triglyceride and cholesterol levels.

2022: Coriander, also known as *Coriandrum sativum* L., is a medicinal plant that belongs to the Umbelliferae (Apiaceae) family. It is herbaceous and glabrous, and it has a pungent aroma. It can be found in the areas surrounding the Mediterranean and the Middle East, but India is the country that produces, uses, and exports the most of it. Anorexia, diarrhoea, spasms, stomach symptoms, bronchitis, and gout are some of the conditions that can be treated with this plant, which is native to the Mediterranean region. This condiment is used as a flavouring and adjuvant agent in Tunisian cuisine, and it is also used as a treatment for inadequate milk, postpartum, and eczema. The spice coriander has medicinal properties including those of an antioxidant, an antimutagenic, an antidiabetic, an antihelminthic, an anticonvulsant, a diuretic, an antifungal, an

anxiolytic, an anticancer, and a hepatoprotective agent. Because of its distinct aroma and powerful antioxidant properties, the essential oil of coriander is utilised in the cosmetics and culinary industries[25]. Aromatic It belongs to the family Apiaceae and has umbelliferous flowers. *Carum carvi* L. This herb has been used for a very long time as a treatment for digestive issues such as gas, loss of appetite, bloating, heartburn, and moderate stomach and intestinal spasms. In traditional medicine, caraway oil was used to treat phlegm, ease constipation, and control urine production. Caraway is used by nursing mothers to increase the flow of milk. Anti-convulsant, anti-bacterial, analgesic, anti-inflammatory, anti-anxiety, anti-hyperglycemic, and anti-spasmodic are some of the medicinal properties that can be found in caraway seeds. Hysteria, flatulent indigestion, dyspepsia, and diarrhoea are some of the conditions that it has been used to treat. In conventional medicine, caraway fruits are employed as a carminative, an appetiser, and a galactagogue for the treatment of gastrointestinal conditions such as functional dyspepsia, pneumonia, indigestion, and thyroid hormones. It is also used in anti-obesity medications in traditional Unani medicine, and it has been shown to reduce plasma triglycerides and cholesterol in both normal rats and streptozotocin rats. These two spices are often used all over the world in traditional medicine to cure a broad variety of illnesses. The integration of their respective EOs results in a synergistic blend that possesses additional benefits.

IV. CONCLUSION

We looked at the research that was published between the years 2015 and 2022, which encompasses 64 percent of the research that has been done on this topic since 1995. In our review, we included data that adhered to botanical authenticity standards and was subjected to biological screening processes. These figures are quite low when compared to the projected total number of plants, which is 474,000, or the 25,187 medicinal species that people use. Medicinal plants and the natural compounds that they contain are sources of antibacterial agents that are underutilised. The fact that this review contains a number of bioactive extracts is encouraging. If the minimum inhibitory concentration (MIC) of an extract or fraction was less than 100 g/mL, Eloff described it as having substantial antibacterial activity, while Kute regarded it as significant antibacterial activity if it was less than 10 g/mL. 358 plant extracts meet Eloff's criteria for at least one type of bacterium. If the minimum inhibitory concentration (MIC) of an essential oil was less than 5 L/ml, Gibbons considered it to be active. We judged essential oils with MICs less than or equal to 5 grammes per millilitre (g/mL) to be noteworthy. For the most part, antibacterial qualities may be found in at least 60 essential oils. Antibacterial medicines derived from natural compounds found in plants have the potential to be a viable new source of treatment for bacterial infections.

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