Phytochemical, Antimicrobial And Antioxidants Availability In Plants

Ragavan.A[1],Yogeshwaran.G[2],Kanmani.S[3],Rajavel.K[4]
[1, 2, 3, 4] Dept of Chemical Engineering
[5]Assistance Professor, Dept of Chemical Engineering
[1, 2, 3, 4, 5] Adhiyamaan College of Engineering

Abstract- *Antibacterial activity of Carissa carandas roots was tested against clinical isolates of bacteria in this study. The extract of Carissa carandas was tested for its antimicrobial efficacy against Staphylococcus aureus, Pseudomonas aeruginosa, and Klebsiella pneumonia. The well diffusion method was used to assess antibacterial activity in MH agar medium. The extract had a substantial impact on the organisms that were examined. The Petroleum Ether extract had the highest level of inhibition against Pseudomonas aeruginosa (15.6 mm), but the lowest level of inhibition against Klebsiella pneumoniae (14.6 mm).The Hexane extracts hewed maximums one of inhibition against Pseudomonas aeruginosa (15.4 mm), whereas lowest against Klebsiella pneumoniae (12.6 mm).*

Keywords- Antimicrobial activity, Carissa carandas, Soxhlet extractor, Zone of Inhibition, Well diffusion method.

I. INTRODUCTION

Carissa carandas (F; Apocynaceae) is a genus with roughly 32 species found mostly in tropical areas. Three of the eight Indian species are economically significant. Throughout most of India, Sri Lanka, Java, Malaysia, Myanmar, and Pakistan, the plant is natural and widespread. (KarunakarHegde and colleagues, 2009). It has simple, opposite leaves that are oblong- ovate or oblong-lanceolate in shape, subacute at the base and obtuse at the apex, hairless, and thin. The blooms are bisexual and regular. (DMA et al., 1991; Jayaweera, DMA et al., 1991).Branchlets frequently alternating, with thin stout pointed horizontal glabrous spines 2.5-3.8 cm long at their base, and the bark is light grey and scaly. K. R. Kiritikar, 1980. When mature, the 3 to 10 fruit clusters are oblong, broad-ovoid, or spherical, with a thin but strong skin that is purplish-red becoming dark-purple or almost black and lustrous [4]. It can grow from sea level to 6000 feet and requires complete sun exposure. Karunda may blossom and produce fruit at any time of year. Unripe fruits are harvested from mid-May to mid-July for usage. August through September is the ripening season. The ability to synthesise more complex chemical compounds relies on an understanding of plant chemical constituents.

SOXHLETEXTRACTOR:

In 1879, Franz von Soxhlet developed the Soxhlet extractor, a piece of logical hardware. It was planned with the particular objective of eliminating lipids from solids.In contrast, a Soxhlet extractor isn't only for removing lipids. A Soxhlet extraction is much of the time required when the objective item has an unfortunate dissolvability in a dissolvable and the foreign substance is insoluble in that dissolvable.Using simple filtering, the target component may be isolated from the insoluble material if its solubility in the solvent is high enough.

ANTIMICROBIALACTIVITY:

An antibiotic is a chemical that kills or inhibits the development of bacteria, fungus, protozoans, and other microorganisms. Both microbicidal and microbistatic antimicrobials fall into two significant gatherings relying upon their instrument of activity,which is to kill microorganisms without leaving them with any chance of surviving and hence being known as growth inhibitors.

ANTIMICROBIALACTIVITY:

An antibiotic is a chemical that kills or inhibits the development of bacteria, fungus, protozoans, and other microorganisms. Both microbicidal and microbistatic antimicrobials fall into two primary gatherings relying upon their instrument of activity, which is to kill germs without leaving them with any chance of surviving and hence being known as microbe growth inhibitor.

II. MATERIALS AND METHODS

METHODS O FEXTRACTION:

SOLVENT-EXTRACTION:

Perforated plant material is placed in an extraction apparatus and repeatedly washed with the solvent to extract Essential Oils using the Solvent-Extraction method. For

extraction, a hydrocarbon solvent is utilised. In the solvent, all of the plant's extractable substance is dissolved. This comprises non-aroma waxes and pigments, as well as extremely volatile aroma molecules. The extract is distilled so that the solvent may be reused in the future. The remaining waxy mass is referred to as concrete. The waxy components that contaminate the pure essential oil are removed from the concentrated concretes. The absolute is made by heating waxy concrete and then mixing it with alcohol (ethanol). The concrete disintegrates into minute globules during the heating and stirring phase. Using alcohol as a solvent, the aroma molecules are successfully removed from the waxes.

Extraction methods that use solvents, which may leave a trace quantity of residue, are not suggested since they may irritate the immune system and cause allergies, among other things.

COLDPRESSING:

Citrus rinds, such as orange, lemon, grapefruit, and bergamot, are used to extract essential oils. A simple pressing operation at 1200C is all that's needed to get the oil out of the rind. Ground or hacked skins are taken out from the leafy foods squeezed. The outcome is a liquid combination of natural ointment and fluid that will isolate once a particular time allotment has elapsed. Only a little amount of the oil's original form has changed. A fully ripe fruit's exhilarating smell is preserved in these citrus oils.
A disadvantage of this technique is that the oils removed with it have a short timeframe of realistic usability

SUPER CRITICAL CO2 EXTRACTION:

Carbon dioxide is warmed to 870°C and pushed through the plant material at 8,000 strain in an interaction known as supercritical CO2 extraction (SCO2).Carbon dioxide is connected to a 'thick fog' or vapour under these settings. Regardless of how the pressure is released, the gaseous form of carbon dioxide exits and the Essential Oil is left behind. The most frequent extraction method is steam distillation.

TURBODISTILLATION:

Super refining is great for removing challenging to-separate or coarse plant materials including bark, roots, and seeds. The plants are absorbed water and steam is pushed through the plant and water blend in this interaction. A similar water is flowed through the plant material during the entire cycle.This approach permits essential oils to be extracted more quickly from difficult-to-extract plant sources.

STEAMDISTILLATION:

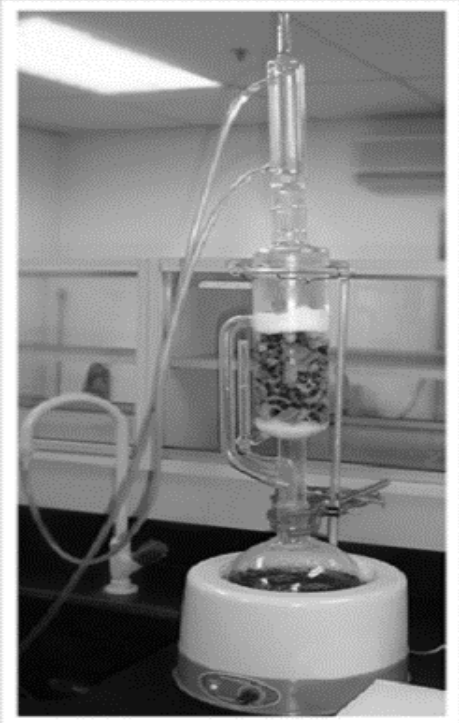
Using steam distillation as a method of distillation or separation is ideal for volatile, temperature-sensitive materials that cannot dissolve in water and may decompose at high temperatures. As a result of steam distillation, compounds or mixtures of compounds may be extracted at a lower temperature than the boiling points of their respective parts (s). Chemicals in essential oils can reach boiling points of up to 200°C. With steam or boiling water, these chemicals evaporate at a temperature of about 100°C and atmospheric pressure and are therefore vaporised. Essential Oil may be extracted from fresh or dried botanical material by putting it in a still's plant chamber and allowing steam to pass through it under pressure. There must be enough heat in the steam, but not so much that the plants or the Essential Oils are damaged or burnt. Essential Oils are evaporating in the still's condensation chamber as well as in the steam. Vapours of Essential Oil concentrate in this location due to the steam. It forms a film on the water's surface because of the essential oil's properties. The Essential Oil is then removed from the water by decanting or scraping the film off the top. The water left over from the distillation process is called floral water, although it may also go by the names distillate or hydrosol. Large numbers of the remedial properties of the plant are held, making it an astounding element for healthy skin items like toners and fogs.When treating a child or a sensitive adult, floral water may be preferred over pure essential oil. It may also be preferred when a more diluted treatment is desired. The mild antibacterial and calming properties of rose hydrosol, as well as the beautiful floral aroma, make it a popular beauty product.

SOHXLETEXTRACTION:

To use a Soxhlet extractor, a thick filter paper thimble is used to hold a solid substance containing a small amount of the desired component. The extraction solvent is poured in a flask with the Soxhlet extractor. The Soxhlet is then outfitted with a condenser. The dissolvable is warmed to reflux temperature. In the refining chamber, the dissolvable fume rises through an arm and fills the thimble. Thanks to the condenser, any solvent vapour cools and returns to the chamber containing the solid substance.

The holder containing the strong material slowly loads up with warm dissolvable. A portion of the ideal synthetic will be broken up in the hot dissolvable. Syphon side arms automatically empty the Soxhlet chamber when it's almost full, so that solvent may flow back down into an empty distillation flask. It is feasible to rehash this interaction for a really long time or even days. During each cycle, a modest

quantity of the non-unstable part is disintegrated in the dissolvable. There are several cycles in a distillation flask that bring the target component closer and closer to the desired concentration. The benefit of this approach is that it eliminates the need for



ZONEOFINHIBITION:

The concentrates were tried for their bactericidal properties utilizing the Agar cup-plate technique. In sterile petri-dishes, 25 mL of sterile nutritional agar media was poured and allowed to settle. Many measures of warmed dissolvable were gone through the example in the petri plates, yet just one clump of dissolvable was reused. After extraction, the dissolvable is ordinarily vanished utilizing a revolving evaporator, and the compound that was separated is recuperated. After 24 hours of incubation at 37°C to assure sterility, the non-soluble component of the recovered material is discarded. Using a pour plate approach, the organisms were seeded into the medium using sterile top agar (4 ml) and 1 millilitre of culture, respectively. A sterile borer was used to make holes in the medium. Dry extracts of Carissa carandas roots were soaked in Dimethyl sulfoxide (DMSO) and sterilised using Whatmann filter paper no. 0. As a standard reference, 1 mL of Tetracycline at a concentration of was used. Plates were brooded at 37°C short-term with proper positive and negative controls. To work with scattering, the petri dishes were kept in the fridge at 4°C for around 30 minutes. Petri plates were hatched at 37°C for 24 hours after dissemination to screen and evaluate the inhibitory zone. Dimethyl sulfoxide was used as a control material.

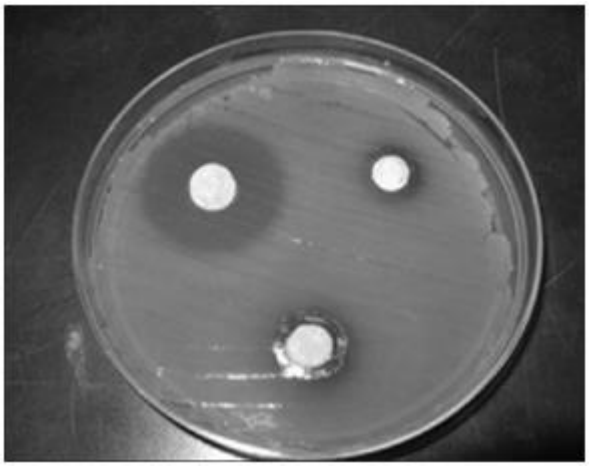


Figure-10: Scale to measure Inhibition Diameter

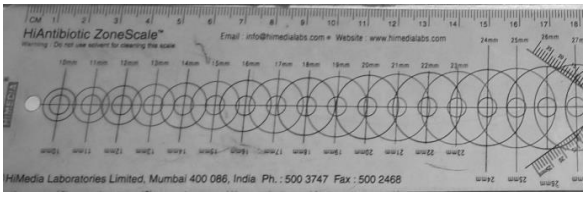
The scale used to measure the Zone of Inhibition diameter (ZOI) is displayed above.

ACTIVITY OF HEXANEEXTRACT:

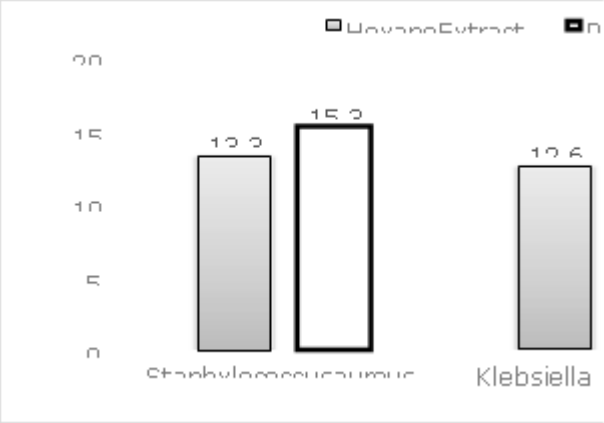
For *Staphylococcusaureus, Klebsiella pneumonia, Pseudomonasaeruginosa*ZoneofInhibitiondiameter for the root extract is foundto be 13.3 mm, 12.6 mm and 15.4mmrespectively.

4.2. ACTIVITYOF PETETHEREXTRACT:

For Staphylococcus aureus, Klebsiella pneumonia, Pseudomonas aeruginosa Zone of Inhibition diameter for the root extract is found to be 15.3 mm, 14.6 mm and 15.6 mm respectively.



Plant extracts have antimicrobial activity against infections.



Graph-1: Showing variation of Inhibition diameter

The Zone of Inhibition of Petroleum Ether extract against Pseudomonas aeruginosa was 15.6 mm, followed by 15.4 mm for Hexane extract extract against Pseudomonas aeruginosa. Hexane extracts also showed the zone of 13.3 mm, 12.6 mmrespectively, against Staphylococcus aureus and Klebsiella pneumonia respectively.

Researchers researched the biological features of Carissa carandas in depth, and their findings revealed that this plant has ethno-medical value. Because of the issue of medication resistance, several antibiotics have nearly become useless. Carissa carandas root extracts were shown to be active against infections, suggesting that this might be a future medicine with no adverse effects. Agar well dispersion was utilized to quantify the antibacterial movement.

On account of Petroleum Ether separates, Pseudomonas aeruginosa showed decreased aversion to Carissa carandas root extricates, with a greatest Zone of Inhibition of simply 15.6 mm. The existence of metabolic toxins or wide range antimicrobial substances that operate against both gramme positive and gramme negative bacteria might explain the antibacterial action of Carissa carandas roots. When tested against bacteria that cause gut infection, stomach discomfort, and diarrhoea, Petroleum Ether extracts had a greater level of antibacterial activity than Hexane extracts.

III. CONCLUSION

1. Soxhlet extraction method was found to be one of the promising techniques for the extraction of Biomolecules from the Carissa carandas roots, because of this, the plant's natural features will be preserved.
2. The efficiency of Soxhlet extractor is very high compared to other extraction process.
3. The bactericidal action of the root separates was tried utilizing the agar cup-plate strategy.
4. The solvents used for the extraction of Biomolecules from Carissa carandas roots are Hexane and Petroleum Ether.
5. The Inhibition diameter was measured by using a Zone of Inhibition diameter measuring scale.

REFERENCES

[1] Ahmed I, Beg AZ (2001). Antimicrobial and phytochemical studies on 45 Indian medicinal plants against multidrug resistant human pathogens. J. Ethnopharmacol., 74: 113-123.
[2] mbasta SP (2000). The useful plants of India. National Institute of Science Communication, New Delhi, India, p.303 Aruoma OI (1999).
[3] Free radicals, oxidative stress, and antioxidants in human health and disease. J. Agric. Food Chem., 47: 397-492.
[4] Bonjar GHS (2004). New approaches in screening for antibacterials in plants. Asian J. Plant Sci., 3: 55-60.
[5] Demir H, Acik L, Bali EB, Koc LY, Kaynak G (2009). Antioxidant and antimicrobial activities of Solidago virgaurea extracts. Afr. J. Biotech., 8(2): 274-279.
[6] Diamond RD (1993). The growing problem by mycoses in patients infested with human immunodeficiency virus. Rev. Infect. Dis., 13: 480-486.
[7] Duh PD (1998). Antioxidant activity of burdock (Arctium lappa Linne): its scavenging effect on free radical and active oxygen. J. Am. Chem. Soc., 75: 269-277.
[8] Espin JC, Soler-rivas C, Wichers HJ (2000). Characterization of the total free radical scavenging capacity of vegetable oils and oil fractions using 2,2-diphenyl-1-picrylhydrazyl radical. J. Agric. Food Chem., 48: 648-656.
[9] Fabri RL, Nogueira MS, Braga FG, Coimbra ES, Scio E (2009). Mitracarpus frigidus aerial parts exhibited potent antmicrobial, antileishmanial, and antioxidant effects. Biores. Technol., 100: 428- 433.
[10] Gajera HP, Patel SV, Golakiya BA (2005). Antioxidant properties of some therapeutically active medicinal plants – An overview. JMAPS, 27: 91-100.
[11] Gordon MH (1990). The mechanism of antioxidants action in vitro. In: Hudson BJF (ed) Food Antioxidants. London, New York, pp. 1-18.
[12] Greenwald P, Clifford CK, Miner JA (2001). Diet and cancer prevention. Eur.J. Cancer, 37: 948-965.
[13] Gulcin I, Alici HA, Cesur M (2005). Determination of in vitro antioxidant and radical scavenging activities of propofol. Chem. Pharm. Bull., 53: 281-285.
[14] Hall CA, Cuppett SL (1997). Structure-activities of natural antioxidants, In: Auroma OI, Cuppett SL (eds)

Antioxidant Methodology in vivo and in vitro concepts. AOCS Press, pp. 141- 170.

[15] Halliwell B, Gutteridge JMC (1989). Free radicals in biology and medicine (2nd ed). Japan Scientific Societies Press, Tokyo, Japan, p. 229-233.

[16] Honda K, Casadesus G, Paterson RB, Perry G, Smith MA (2004). Oxidative stress and redox iron in Alzheimer's disease. Ann. New York Acad. Sci., 1012: 179-182.

[17] Iwu MW, Duncan AR, Okunji CO (1999). New antimicrobials of plant origin. In: Janick J (ed) Perspectives on New Crops and New Uses. ASHS Press, pp. 457-462.

[18] Junaid SA, Abubakar A, Ofodile AC, Olabode AO, Echeonwu GON, Okwori AEJ, Adetunji JA (2008). Evaluation of Securidaca longipenduculata leaf and root extracts for antimicrobial activities. Afr. J. Microbiol. Res., 2: 322-325.

[19] Kaur GJ, Arora DS (2008). In vitro antibacterial activity of three plants belonging to the family Umbelliferae. Int. J. Antimicrob. Agents, 31: 393-395.

[20] Liu F, NG TB (2000). Antioxidative and free radical scavenging activities of selected medicinal herbs. Life Sci., 66: 725-735.

[21] Liu F, Ooi VEC, Chang ST (1997). Free radical scavenging activities of mushroom polysaccharide extracts. Life Sci., 60: 763-771.

[22] Miquel J, Romano-Bosca A (2004). Oxidative stress and antioxidant diet supplementation in ageing, arterosclerotic and immune dysfunction processes. ARS Pharm., 45(2): 91-109.

[23] Nieto S, Garrido A, Sanhuesa J, Loyola L, Morales G, Leighton F, Valenzuela A (1993). Flavonoids as stabilizers of fish oil: an alternative to synthetic antioxidants. J. Am. Oil Chem. Soc., 70: 773-778.

[24] Okeke IN, Laxmaninarayan R, Bhutta ZA, Pablos-Mendez A, Klugman KP (2005). Antimicrobial resistance in developing countries. Part 1: Recent trends and current status. Lancet Infect. Dis., 5: 481-593.

[25] Pawar VC, Bagatharia SB, Thaker VS (2005). Antibacterial activity of Aloe vera leaf gel extracts against Staphylococcus aureus. Indian J. Microbiol., 45 (3): 227-229.

[26] Perez C, Paul M, Bazerque P (1990). Antibiotic assay by agar well diffusion method. Acta Biol. Med. Exp., 15: 113-115.

[27] Polambo EA, Semple SJ (2001). Antibacterial activity of traditional Australian medicinal plants. J. Ethanopharmacol., 77: 151-157.

[28] Rangasamy O, Raoelison G, Rakotoniriana FE, Cheuk K, Urverg- Ratsimamanga S, Quetin-Leclercq J, Gurib-Fakim A, Subratty AH (2007). Screening for antiinfective properties of several medicinal plants of the Mauritians flora. J. Ethnopharmacol., 109: 331-337.

[29] Rios JL, Recio MC (2005). Medicinal plants and antimicrobial activity. J. Ethnopharmacol., 100: 80-84.

[30] Scalbert A, Williamson G (2000). Dietary intake and bioavailability of polyphenols. J. Nutr., 130: 2073-2085.

[31] Salar RK, Suchitra (2009). Evaluation of antimicrobial potential of different extracts of Solanum xanthocarpum Schrad. and Wendl. Afr. J. Microbiol. Res., 3(3): 97-100.