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Original article

Medical applications of Couroupita guianensis Abul plant and Covid-19 best Safety measure by using Mathematical Nano topological spaces

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ABSTRACT

Lellis Thivagar and Richard introduced the idea of Nano topology as an extension of set theory for such study of intelligent systems with little or imperfect knowledge. The Nano open set consists of the components of a Nano topological space. It is derived from the Greek term 'Nanos,' which means 'dwarf,' in the current scientific meaning, a magnitude of one billionth. The topology is referred to as a Nano topology due to its small size, since it has no more than five components. Lellis Thivagar has carried out Nutrition Modeling Through Nanotopology directions, some of which were shown in his pioneering work. This article discusses the implementation of nanotopological structures to enable knowledge reduction in real-world scenarios. Couroupita guianensis's Ayurvedic usage of Immunobooster, antifungal, antibacterial, Skin infection, hypertension, tumor, snake bite, malaria. The chemical ingredient of C. guianensis, numerous studies have indicated that extracts derived from various sections of CG have a considerable antioxidant activity. Leaf, stem, as well as flower extracts demonstrated varied DPPH, hydrogen peroxide, nitric oxide, and hydroxyl radical scavenging properties. Almost every component of the tree has been Ayurvedic utilised to cure a variety of diseases. In mathematically using Nano topological spaces we can identify which parts the plant mostly cure antifungal, and antibacterial activities. After that one more applications of regarding Covid-19 virus. The WHO verified on 12 January 2020 that a new coronavirus was responsible for a cluster of respiratory illnesses in a cluster of persons in Wuhan, Hubei, China, which has been notified to the WHO on 31 December 2019. India announced its first incidence of COVID-19 at Thrissur, Kerala, on 30 January 2020, India is Cases: 43,018,032 and death cases 520,885 and Recovered: 42,480,436.After third wave of covid 19 now normal functioned happened. WHO and Indian government defined covid safety measures like Wear mask, Don't skip vaccinations, avoid touching his or her eyes, nose, and mouth, maintain a physical distance from the others, and vaccinations of all the people. Now using nano topological spaces which are main core component identified by nano topological spaces.

1. Introduction

Topology is the discipline of Mathematics whose objective is to clarify and investigate notions of continuity within in the environment of Mathematics. A topological space is a set equipped with a topological structure that enables the definition of continuous deformations of subspaces and, more broadly, all types of continuity. Euclidean and, more broadly, metric spaces are both instances of topological spaces, since every distance or metric determines a topology. Topology considers two types of deformations:

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homeomorphic and homotopies. A topological attribute is one that is invariant under such deformations. The size, which distinguishes a line from a surface compactness, which distinguishes a line from a circle and connectedness, which distinguishes a circle from two non-intersecting circles. The research in topology during the previous two centuries have reached a notable level in numerous directions. It serves as the basis for the majority of other fields of topology, such as differential, geometric and algebraic topology. General topology is often referred to as point-set topology. Molecular topology is indeed a branch of mathematics concerned with the algebraic representation of chemical molecules in order to facilitate their identification and characterization. Topology is indifferent to the features of a scalar field and is often deduced using simpler computations. This collection discusses a variety of topological topics that are directly applicable to chemists. Topological concepts are now widely used in a variety of branches of chemistry, such as molecular design and engineering, synthetic toxicology, the investigate of molecular shape, crystal as well as surface structures, chemisorption, macromolecular species including such polymers and DNA, and due to its biological. The method for the synthesis of novel medications and agrochemicals are of particular relevance at the moment. The book is primarily concerned with the use of topological indices in describing and characterizing molecular species. The Wiener indexes, as well as a number of other significant topological indices, are examined, with an emphasis on the very effective and widely used connection indices. The substantial advantages that topological indices provide in the research of chemical issues in sciences, medicine, and enterprise are discussed. In disciplines such as condensed matter physics in Green nanotechnology (Logambal et al., 2022; Renuka et al., 2020) quantum field theory, and physical topology is significant Mechanical engineering and physical science are both interested in the topological dependency of mechanical characteristics in solids. Electrical and mechanical characteristics of materials are determined by the organization and network structure of their molecules and constituent components. The compressive of crumpled topologies is investigated in order to better comprehend the remarkable strength-to-weight ratio of these mainly empty space formations (Kaviyarasu et al., 2012). Topology is also significant in contact mechanics, where the relationship between stiffness and friction is studied in relation to the dimension of surface structures, with implications in multi-body physics. A topological quantum field theory (TQFT) is a kind of quantum field theory that computes topological symmetries. Numerous biological systems, including molecules and nanostructures, have been studied using topology. To identify and compare the topology of folded proteins and nucleic acids, circuit topology and knot theory have been widely used. Circuit topology characterizes folded molecular chains according to how their intra-chain connections and chain crossings are arranged pairwise. In biology, knot theory, a subfield of topology, is used to investigate the effects of specific enzymes on DNA. Those enzymes cut, twist, and reattach the DNA, resulting in knotting and visible consequences such as decreased electrophoresis speed (Grzymala-Busse, 2004). In evolutionary biology, topology is often used to depict the link among phenotype and genotype. Phenotypic forms that seem to be highly dissimilar may be separated by a few mutations, depending on how genetic alterations translate to developmental phenotypic changes. Topological metrics such as the Euler characteristics and Betti numbers have been employed in neuroscience to quantify the complexity of activity patterns in neural networks (Fig. 1).

C. guianensis has antipyretic, antidepressant, analgesic, antiseptic, anti-inflammatory, antiprotozoal, anticancer, and antiulcer properties in Chinese medicine. They are frequently utilised in Ayurveda for their anti-inflammatory properties. C. guianensis flower has antibacterial and antifungal properties. Antibiotic, antifungal, antiseptic, and analgesic properties are found in the tree. C. guianensis was used extensively in the treatment of gastritis, scabies, bleeding piles, diarrhoea, and scorpion venom. The leaves, flowers, and bark of C. guianensis are used to treat hypertension, tumors, pain, and inflammatory responses. The leaves are used to generate a juice that is used to cure skin problems, and South

Fig. 2. Image of Guianensis couroupita Abul tree parts.

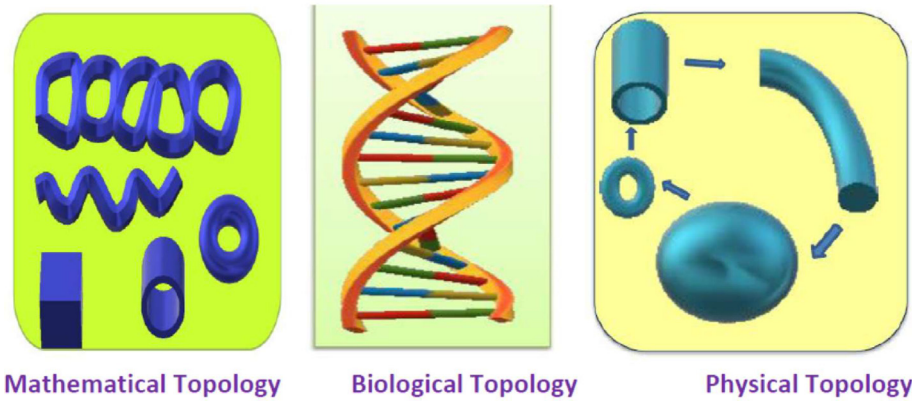

Fig. 1. Schematic diagram of Topology.

Americans treat malaria using all parts of the C. guianensis tree (Fig. 2).

L. Thivagar et al. (Grzymala-Busse, 2006; Lellis Thivagar, 2012; Lellis Thivagar and Sutha Devi, 2016) developed nano topological spaces in terms of approximations and the border area of a subset of a universe U through an equivalence relation, as well as nano closed sets, nano interior, and nano closure. A. Jayalakshmi and C. Janaki demonstrated the use of nano topological spaces in medical diagnosis (Lellis Thivagar and Priyalatha, 2017). Using the notion of Nano Topology, we can ascertain the risk factors for the emergence of Dengue (Jayalakshmi and Janaki, 2017). Some researchers developed some medical applications of Nano topological sapace. Aim of the present paper is which part of the C. guianensis plants's parts have maximum anti pactrial and antifungal activities contain we can analyze by using Mathematical nano topological spaces (Nasef et al., 2016; Jeevithaa et al., 2021). After than Covid-19 make impact globe level more than million people loosed his life. After longs days now college and schools are open. Covid-19 safety measure is very important one another one application of Nano topology what are the very important safety measure we can predicate using Nano topological spaces (Table 1).

2. Preliminaries

2.1. Definition

Let U be a non-empty finite set of objects called the universe and R be an equivalence relation on U named as the indiscernibility relation. Then U is divided into disjoint equivalence classes. Elements belonging to the same equivalence class are said to be indiscernible with one another. The pair (U, R) is said to be the approximation space Let $X \subseteq U$.

(i) The lower approximation of X with respect to R is the set of all objects, which can be for certain classified as X with respect to R and it is denoted by $L_R(X)$.

That is $L_R(X) = \bigcup_{x\in U}\{R(x) : R(x) \subseteq X\}$.

Where R(x) denotes the equivalence class determined by $\times \subseteq U$.

(ii) The upper approximation of X with respect to R is the set of all objects, which can be possibly classified as X with respect to R and it is denoted by $\bigcup_R(X) = \bigcup_{x\in U}\{R(x) : R(x) \cap X \neq \phi\}$

(iii) The boundary region of X with respect to R is the set of all objects, which can be classified neither as X nor as not-X with respect to R and it is denoted by $B_R(X)$. That is $B_R(X) = U^p{}_R(X) - L^o{}_R(X)$.

2.2. Property (Lellis Thivagar, 2012)

If (U, R) is an approximation space and X, Y $\subseteq$ U, then.

$$L^o{}_R(X) \subseteq X \subseteq U^p{}_R(X) \quad (1)$$

$$L^o{}_R(\phi) = U^p{}_R(\phi) = \phi \quad (2)$$

$$L^o{}_R(U) = U^p{}_R(U) = U \quad (3)$$

$$U^p{}_R(X \cup Y) = U^p{}_R(X) \cup U^p{}_R(Y) \quad (4)$$

$$U^p{}_R(X \cap Y) \subseteq U^p{}_R(X) \cup U^p{}_R(Y) \quad (5)$$

$$L^o{}_R(X \cup Y) \supseteq L^o{}_R(X) \cup L^o L_R(Y) \quad (6)$$

$$L^o{}_R(X \cap Y) = L^o{}_R(X) \cap L^o{}_R(Y) \quad (7)$$

i) $L^o{}_R(X) \subseteq L_R(Y)$ and $U^p{}_R(X) \subseteq U^p{}_R(Y)$ whenever $X \subseteq Y$.

ii) $U^p{}_R\left(X^C\right) = [L^o{}_R(X)]^C$ and $L^o{}_R\left(X^C\right) = [U^p{}_R(X)]^C$

2.3. Definition (Lellis Thivagar, 2012)

Let U be a non-empty, finite universe of objects and R be an equivalence relation on U. Let $X \subseteq U$.

Let $\tau_R(X) = N\tau = \{U, \phi, L^o{}_R(X), U^p{}_R(X), B_R(X)\}$.

Then $\tau_R(X)$ is a topology on U, called as the Nano topology with respect to X. Elements of the Nano topology are known as the Nano open sets in U and $(U, N\tau)$ is called the Nano topological space. Elements of $[N\tau]^C$ are called as Nano closed sets.

3. Results and discussion

3.1. Medical applications in Nano topological spaces

Algorithm

Step 1: Considering a deterministic universe U, a finite set $\mathscr{H}$ of attributes split into two classes, $\mathscr{H}_1$ for conditional attributes as well as $\mathscr{H}_2$ for decision attributes, an equivalence relation R on U correlating to $\mathscr{H}_1$, and a subset X of U, represent data as an information table with columns labelled with attributes, rows for objects, and entries for attribute values (Table 2).

Table 2
Couroupita Guianensis Abul's contain maximum Antibacterial, Antifungal component.

S. NO.	Parts of Plant	Basis	Conclusion
Case-I			
1	Bark	$\beta_R - (B)(X) = \{U, \{T, C, SI\}, \{W, P\}\}$	$= \beta_R(X)$
2	Fruit	$\beta_R - (Fru)(X) = \{U, \{C, SI\}, \{W, T, SB, P\}\}$	$\neq \beta_R(X)$.
3	Flower	$\beta_R - (Flo)(X) = \{U, \{T, C, SI\}, \{W, P\}\}$	$= \beta_R(X)$
4	Leaves	$\beta_R - (L)(X) = \{U, \{T\}, \{W, C, P, SA, SI\}\}$	$\neq \beta_R(X)$
5	Seed	$\beta_R - (S)(X) = \{U, \{T, C, SI\}, \{W, P\}\}$	$= \beta_R(X)$
Case-II			
6	Bark	$\beta_R - (B)(X) = \{U, \{SB, SA, H\}, \{W, P\}\}$	$= \beta_R(X)$
7	Fruit	$\beta_R - (W)(X) = \{U, \{SA, H\}, \{W, T, SB, P\}\}$	$\neq \beta_R(X)$.
8	Flower	$\beta_R - (Flo)(X) = \{U, \{SB, SA, H\}, \{W, P\}\}$	$= \beta_R(X)$
9	Leaves	$\beta_R - (L)(X) = \{U, \{SB, H\}, \{W, C, P, SA, SI\}\}$	$\neq \beta_R(X)$
10	Seed	$\beta_R - (S)(X) = \{U, \{SB, SA, H\}, \{W, P\}\}$	$= \beta_R(X)$

Table 1
The columns of a table reflect the Guianensis couroupita Abul plant's parts,

Couroupita Guianensis Aubl	Bark	Fruit	Flower	Leaves	Seeds	Antibacterial, Antifungal
Wound(W)	No(0)	Yes(1)	No(0)	High (0.3)	No(0)	Yes(1)
Tumor(T)	Yes(1)	Yes(1)	Yes(1)	High (0.3)	Yes(1)	Yes(1)
Cold(C)	No(0)	Yes(1)	No(0)	V.High(0.8)	Yes(1)	Yes(1)
Snake Bite (SB)	Yes(1)	No(0)	Yes(1)	High (0.3)	Yes(1)	No(0)
Pain(P)	No(0)	Yes(1)	No(0)	High (0.3)	No(0)	No(0)
Stomach Ache(SA)	No(0)	Yes(1)	No(0)	Moderate(0.6)	Yes(1)	No(0)
Skin Infection(SI)	No(0)	Yes(1)	No(0)	V.High(0.8)	Yes(1)	Yes(1)
Hypertension(H)	No(0)	No(0)	No(0)	V.High(0.8)	No(0)	No(0)

Table 3
College students and Covid-19 Safety measure.

College Student	Wearing Mask	Social Distancing	Wash Hands Often	Covering Cough/ Sneeze	Avoid Touching Surfaces	Covid-19 Vaccines	Hand sanitizer	Covid Safety
CS_1	✓	✓	X	X	✓	✓	X	YES
CS_2	✓	X	X	✓	X	✓	✓	YES
CS_3	✓	✓	X	X	✓	✓	X	NO
CS_4	✓	X	✓	X	X	✓	X	YES
CS_5	✓	X	✓	X	X	X	X	NO
CS_6	✓	✓	✓	✓	X	✓	✓	YES
CS_7	✓	✓	X	X	✓	✓	X	NO
CS_8	✓	X	✓	X	X	✓	X	NO
CS_9	✓	X	✓	X	X	X	X	NO
CS_{10}	✓	✓	✓	✓	X	✓	✓	YES
CS_{11}	X	✓	✓	X	✓	X	X	NO
CS_{12}	X	✓	X	X	✓	✓	X	NO
CS_{13}	✓	X	✓	X	X	X	X	NO
CS_{14}	X	✓	✓	X	✓	X	X	NO
CS_{15}	✓	X	X	✓	X	✓	✓	YES

Step 2: Determine the lower and upper approximations, as well as the boundary region of X in relation to R.

Step 3: Create the nanotopology $\tau_R(X)$ on U, as well as and its basis.$\beta_R(X)$

Step 4: Remove an attribute x from $\mathscr{H}_1$ and determine the lower and upper approximations and the boundary region of X with respect to the equivalence relation on $\mathscr{H}_1 - \{x\}$.

Step 5: Create a nanotopology $\tau_R - (x)(X)$ on U.

Step 6: Repeat steps 3 and 4 for all attributes in A_1.

Step 7: Those attributes in A_1 for which $\beta_R - (x)(X) \neq \beta_R(X)$ form the Core (R).

3.2. Medical applications of Guianensis couroupita Abul using Nano topological spa

Nanoparticles have become part of our life in cosmetics, drug delivery systems; Therapeutic, biosensor, and pharmaceutical materials applications can be harnessed to dramatically enhance important material properties (Chandrasekar et al., 2022; Perumal et al., 2022; Panimalar et al., 2022). Couroupita guianensis, often known as cannonball tree, is just a deciduous tree with in Lecythidaceae flowering plant family. It's indeed native to the tropical woods of South and Central America and is grown in a variety of other tropical places worldwide for its lovely, fragrant blossoms and huge, intriguing fruits. The fruits have a brownish grey colour numerous components of Couroupita guianensis may have therapeutic use. Couroupita guianensis is also a kind of medicinal plant which contains antibacterial, antimycobacterial, antimicrobial, antioxidant, anticancer, antiulcer, antinociceptive, anthelmintic, antifertility, and antifungal activities (Majumder et al., 2014). The chemical ingredient of C-guianensis such as indirubin acts as an antibacterial and antifungal agent since it notably heals fungal illnesses. It is active for the treatment of chronic myelocytic leukaemia. The extract of isatin from the flower of C-guianensis is also a chemical component that has been utilised as preventative agent, protects free radial-induced cancer,

The rows represent various human diseases are Wounds $\Rightarrow W$, Tumor $\Rightarrow T$, Cold $\Rightarrow C$, Snake Bite $\Rightarrow SB$, Stomach Ache $\Rightarrow$ SA Skin Infection $\Rightarrow SI$, and Hypertension.$\Rightarrow H$

The entries in the table are the attribute values

The given information system is incomplete and is given by (U, A)

where $U = \{W, T, C, SB, P, SA, SI, H\}$, and

H = {Bark (B), Fruit(Fr), Flower(Fl), Leaves(L), Seeds(S)}

First Case

Guianensis couroupita Abul's parts of plant contains Antibacterial, Antifungal component.

Initial step: 1.

Let $X = \{W, T, C, SI\}$ denote the set of human health issues associated with Guianensis couroupita Abul's parts of plant contain Antibacterial, Antifungal component, and R denote the equivalence relation between U and the set of all condition qualities (Kryszkiewicz, 1998; Molodtsov, 1999; Pawlak, 1982; Pawlak, 1991; Qian, 2010).

The set of equivalence classes for R is denoted by.

$$U/R = \{\{H\}, \{C, SI\}, \{W, P\}, \{T\}, \{SB\}, \{SA\}\},$$

$$L_R(\mathrm{X}) = \{T, C, SI\}$$

$$U_R^p(\mathrm{X}) = \{T, C, SI, W, P$$

$$B_R^d(\mathrm{X}) = \{W, P\}$$

Then nano topology $\tau_R(X) = \{U, \phi, \{T, C, SI\}, \{T, C, SI, W, P\}, \{W, P\}\}$.

The basis of nano topology is $\beta_R(X) = \{U, \{T, C, SI\}, \{W, P\}\}$.

Step: 1.

If **"Bark"** is removed from the set of condition attributes, then.

$$U/R - (B) = \{\{T\}, \{W, P\}, \{C, SI\}, \{SB\}, \{SA\}, \{H\}\}.$$

$$L_R^O - (B)(\mathrm{X}) = \{T, C, SI\}$$

$$U_R^p - (B)(\mathrm{X}) = \{T, C, SI, W, P$$

$$B_R^d - (B)(\mathrm{X}) = \{W, P\}$$

Hence , $\tau_R - (B)(X) = \{U, \phi, \{T, C, SI\}, \{T, C, SI, W, P\}, \{W, P\}\}$.

Step: 2.

If **"Fruit"** is removed from the set of condition attributes, then.

$$U/R - (Fru) = \{\{W, P\}, \{T, SB\}, \{C, SI\}, \{SA\}, \{H\}\}.$$

$$L_R^O - (Fru)(\mathrm{X}) = \{C, SI\}$$

$$U_R^p - (Fru)\,(\mathrm{X}) = \{W,\ T,\ C,\ SB,\ P,\ SI\}$$

$$B_R^d - (Fru)\,(\mathrm{X}) = \{W,\ T,\ SB,\ P\}$$

Hence,

$$\tau_R - (Fru)(X) = \{U, \phi, \{C, SI\}, \{W, T, C, SB, P, SI\}, \{W, T, SB, P\}\}.$$

Step: 3.

If "**Flower**" is removed from the set of condition attributes, then

$U/R - (Flo) = \{\{H\}, \{C, SI\}, \{W, P\}, \{T\}, \{SB\}, \{SA\}\}$, and

$L_R^O - (Flo)(\mathrm{X}) = \{T, C, SI\}$

$U_R^p - (Flo)(X) = \{T, C, SI, W, P\}$

$B_R^d - (Flo)(X) = \{W, T, SB, P\}$.

Hence $\tau_R - (Flo)(X) = \{U, \phi, \{T, C, SI\}, \{T, C, SI, W, P\}, \{W, P\}\}$.

Step: 4

If **"Leaves"** is removed from the set of condition attributes, then

$U/R - (L) = \{\{W, P\}, \{T\}, \{C, SA, SI\}, \{SB\}, \{H\}\}$.

$L_R^O - (L)(X) = \{T\}$ $U_R^p - (L)(X) = \{W, T, C, P, SA, SI\}$

$B_R^d - (L)(X) = \{W, C, P, SA, SI\}$

Hence, $\tau_R - (L)(X) = \{U, \phi, \{T\}, \{W, T, C, P, SA, SI\}, \{W, C, P, SA, SI\}\}$.

Step: 5

If **"Seed"** is removed from the set of condition attributes, then $U/R - (S) = \{\{H\}, \{C, SI\}, \{W, P\}, \{T\}, \{SB\}, \{SA\}\}$, and

$L_R^O - (S)(X) = \{T, C, SI\}$

$U_R^p - (S)(X) = \{\{T, C, SI, W, P\}$

$B_R^d - (S)(X) = \{W, P\}$

$\tau_R - (S)(X) = \{U, \phi, \{T, C, SI\}, \{T, C, SI, W, P\}, \{W, P\}\}$

Second Case II:

Guianensis couroupita Abul's parts of plant not contain Antibacterial, Antifungal component

Initial step: 2

Let $X = \{SB, P, SA, H\}$ denotes the set of human health issues associated with Guianensis couroupita Abul's parts of plant contain Antibacterial, Antifungal component.

Then $U/R = \{\{H\}, \{C, SI\}, \{W, P\}, \{T\}, \{SB\}, \{SA\}\}$,

$L_R(X) = \{SB, SA, H\}$

$U_R^p(X) = \{W, SB, P, SA, H$

$B_R^d(X) = \{W, P\}$

Then nano topology $\tau_H(X) = \{U, \phi, \{SB, SA, H\}, \{W, SB, P, SA, H\}, \{W, P\}\}$.

Step: 1

If the attribute **"Bark"** is removed, then

$U/R - (B) = \{\{T\}, \{W, P\}, \{C, SI\}, \{SB\}, \{SA\}, \{H\}\}$.

$L_R^O - (B)(X) = \{SB, SA, H\}$

$U_R^p - (B)(X) = \{W, SB, P, SA, H$

$B_R^d - (B)(X) = \{W, P\}$

Thus, $\tau_R - (B)(X) = \{U, \phi, \{SB, SA, H\}, \{W, SB, P, SA, H\}, \{W, P\}\}$

Step: 2

If the attribute "**Fruit**" is removed, then

$U/R - (Fru) = \{\{W, P\}, \{T, SB\}, \{C, SI\}, \{SA\}, \{H\}\}$. Thus

$L_R^O - (Fru)(X) = \{SA, H\}$

$U_R^p - (Fru)(X) = \{W, T, SB, P, SA, H\}$

$B_R^d - (Fru)(X) = \{W, T, SB, P\}$

$\tau_R - (W)(X) = \{U, \phi, \{SA, H\}, \{W, T, SB, P, SA, H\}, \{W, T, SB, P\}\}$

$\tau_R - (W)(X) = \{U, \phi, \{P, R\}, \{W, L, B, T, P, R\}, \{W, L, B, T\}\} \neq \tau_R(X)$

Step: 3

If "Flower" is removed from the set of condition attributes, the

$U/R - (Flo) = \{\{T\}, \{W, P\}, \{C, SI\}, \{SB\}, \{SA\}, \{H\}\}$.

$L_R^O - (Flo)(X) = \{SB, SA, H\}$,

$U_R^p - (Flo)(X) = \{W, SB, P, SA, H$

$B_R^d - (Flo)(X) = \{W, P\}$

Thus, $\tau_R - (Flo)(X) = \{U, \phi, \{SB, SA, H\}, \{W, SB, P, SA, H\}, \{W, P\}\}$

Step: 4

If the attribute **"Leaves"** is removed, then

$U/R - (L) = \{\{W, P\}, \{T\}, \{C, SA, SI\}, \{SB\}, \{H\}\}$.

$L_R^O - (L)(X) = \{SB, H\}$

$U_R^p - (L)(X) = \{W, C, SB, P, SA, SI, H\}$

$B_R^d - (L)(X) = \{W, C, P, SA, SI\}$

$\tau_R - (L)(X) = \{U, \phi, \{SB, H\}, \{W, C, SB, P, SA, SI, H\}, \{W, C, P, SA, SI\}$.

Step: 5

If the attribute **"Seeds"** is removed, then $U/R - (S) = U/R$ and

$L_R^O - (S)(X) = \{SB, H\}$

$U_R^p - (S)(X) = \{W, C, SB, P, SA, SI, H\}$

$B_R^d - (S)(X) = \{W, C, P, SA, SI\}$

Thus, $\tau_R - (S)(X) = \{U, \phi, \{SB, SA, H\}, \{W, SB, P, SA, H\}, \{W, P\}\}$

3.3. Results

From Case-I and II, We get $Core(R) = \{Fruit, Leaves\}$.

3.4. Observation

From the Core of R, we conclude that "Fruits" and "Leaves" of Guianensis Couroupita Abul's contain maximum Antibacterial, Antifungal component (Table 3).

3.5. Applications-II

Coronavirus disease 2019 (COVID-19) is first diagnosed in December 2019 in Wuhan, Hubei Province, China as an unidentified pneumonia. Later that year, the international committee on viral taxonomy (ICTV) identified COVID-19's causal agent as a new coronavirus called acute respiratory syndrome sars syndrome coronavirus 2 (SARS–CoV2). COVID-19 is quickly spreading not just in China, but also globally, and as a result, the World Health Organization (WHO) declared it a pandemic on March 12, 2020. As of August 25, 2020, individuals infected with COVID-19 have reported a broad variety of symptoms, ranging from moderate to severe sickness. Symptoms often manifest 2–14 days following viral contact. Anyone might have symptoms ranging from mild to severe.

Individuals WHO exhibit these symptoms may have COVID-19 Fibrosis or chills, Cough, Breathlessness or trouble breathing, Fatigue, Aches in the muscles or throughout the body, Headache. Experiencing a new loss of taste or scent. Throat irritation, Excessive congestion or a runny nose. Vomiting or nausea. Diarrhea the total number of reported cases and fatalities in 216 countries is 23,491,520 and 809,970, correspond-

ingly. Numerous government initiatives have been implemented to mitigate the danger of disease transmission. These tactics include travel restrictions, obligatory quarantines for travellers, social isolation, prohibitions on public gatherings, closure of schools and colleges, company closures, self-isolation, requiring individuals to work from home, curfews, and lockdowns. Authorities in a number of nations have imposed a lockdown or curfew in order to halt the rapid spread of viral infection. These policies have a detrimental influence on the global economy, education, health, and tourism. The epidemic of COVID-19 has impacted all levels of schooling (9). Worldwide (in 192 countries), educational institutions have either temporarily shuttered or enacted localised closures, impacting around 1.7 billion students. Numerous institutions worldwide either postponed or cancelled all campus events in order to reduce crowding and thereby viral spread. These measurements, however, have a greater economic, medical, and social impact on both undergraduate and graduate populations (Akerele, 1993; Xu et al., 2020; Acter et al., 2019; Kahler and Hain, 2020).

CASE I

COLLEGE STUDENTS ARE AWARE OF COVID-19 SAFTY MEASURE

Assume X = {CS_1, CS_2, CS_4, CS_6, CS_{10}, CS_{15}} be the set of **college students are aware of covid-19 safty measure** then

U/R(C) = {{CS_1, CS_3, CS_7}, {CS_2,CS_{15} CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}, {CS_{12}}} and

3.6. Nano topology

$\tau_R(C)(X)$ = *{U, ϕ, {CS_2, CS_6, CS_{10}, CS_{15}}, {CS_1, CS_2. CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{15}}, {CS_1, CS_3, CS_4, CS_7, CS_8}}*

Step 1. When the attribute " **Wearing Mask** " is removed from C then

U/R(C-WM) = {{CS_1, CS_3, CS_7, CS_{12}}, {CS_2, CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}}, here

L_R^O(C- WM) (X) = {CS_2, CS_6, CS_{10}, CS_{15}},

U_R^P(C- WM) (X) = {CS_1, CS_2. CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{12}, CS_{15}},

B_R^d(C- WM) (X) = {CS_1, CS_3, CS_4, CS_7, CS_8, CS_{12}}.

Therefore Nano Topology

$\tau_R(C-WM)(X)$ = *{U, ϕ, {CS_2, CS_6, CS_{10}, CS_{15}}, {CS_1, CS_2. CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{12}, CS_{15}}, {CS_1, H3, CS_4, CS_7, CS_8, CS_{12}}}.*

Step 2. When the attribute " **Social Distancing** " is removed from C then

U/R(C-SD) ={{CS_1, CS_3, CS_7}, {CS_2, CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}, {CS_{12}}}, here

L_R^O (C-SD) (X) = {CS_2, CS_6, CS_{10}, CS_{15}},

U_R^P(C-SD) (X) = {CS_1, CS_2, CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{15}},

B_R^d(C-SD) (X) = {CS_1, CS_3, CS_4, CS_7, CS_8}.

Therefore Nano Topology $\tau_R(C-SD)(X)$ =*{U, ϕ, {CS_2, CS_6, CS_{10}, CS_{15}}, {CS_1, CS_2, CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{15}}, {CS_1, CS_3, CS_4, CS_7, CS_8}}.*

Hence $\tau_R\ (C-SD)X = \tau_R(C)X$.

Step 3.

When the attribute " **Wash Hands Often** " is removed from C then U/R(C-V) ={{CS_1, CS_3, CS_7}, {CS_2, CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}, {CS_{12}}},

L_R^O(C-WHO) (X) = {CS_2, CS_6, CS_{10}, CS_{15}},

U_R^P(C- WHO) (X) = {CS_1, CS_2, CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{15}},

B_R^d(C- WHO) (X) = {CS_1, CS_3, CS_4, CS_7, CS_8}.

Therefore Nano Topology $\tau_R(C-WHO)(X)$ = *{U, ϕ, {CS_2, CS_6, CS_{10}, CS_{15}}, {CS_1, CS_2, CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{15}}, {CS_1, CS_3, CS_4, CS_7, CS_8}}.*

Hence $\tau_R(C-WHO)X = \tau_R(C)(X)$.

Step 4.

When the attribute " **Covering Cough/Sneeze** " is removed from C

then U/R(C- CCS) ={{CS_1, CS_3, CS_7}, {CS_2, CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}, {CS_{12}}}, here

L_R^O (C- CCS) (X) = {CS_2, CS_6, CS_{10}, CS_{15}},

U_R^P(C- CCS) (X) = {CS_1, CS_2, CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{15}},

B_R^d(C-CCS) (X) = {CS_1, CS_3, CS_4, CS_7, CS_8}.

Therefore Nano Topology $\tau_R(C-CCS)(X)$ = *{U, ϕ, {CS_2, CS_6, CS_{10}, CS_{15}},{CS_1, CS_2, CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{15}}, {CS_1, CS_3, CS_4, CS_7, CS_8}}. Hence* $\tau_R(C-CCS(X)$ =$\tau_R(C)(X)$.

Step 5.

When the attribute " **Avoid Touching Surfaces** " is removed from C then

U/R(C- ATS) ={{CS_1, CS_3, CS_7}, {CS_2, CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}, {CS_{12}}}, here

L_R^O(C- ATS) (X) = {CS_2, CS_6, CS_{10}, CS_{15}},

U_R^P(C- ATS) (X) = {CS_1, CS_2, CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{15}},

B_R^d(C- ATS) (X) = {CS_1, CS_3, CS_4, CS_7, CS_8}.

Therefore Nano Topology $\tau_R(C-ATS)(X)$ = *{U, ϕ, {CS_2, CS_6, CS_{10}, CS_{15}}, {CS_1, CS_2, CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{15}}, {CS_1, CS_3, CS_4, CS_7, CS_8}}. Hence* $\tau_R(C-ATS)(X)$ =$\tau_R(C)(X)$.

Step 6. When the attribute "Covid**-19 Vaccines** " is removed from C then

U/R(C- CV) ={{CS_1, CS_3, CS_7}, {CS_2, CS_{15}}, {CS_4, CS_8, CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}, {CS_{12}}}, here

L_R^O (C- CV) (X) = {CS_2, CS_6, CS_{10}, CS_{15}},

U_R^P (C- CV) (X) = {CS_1, CS_2, CS_3, CS_4, CS_5, CS_6, CS_7, CS_8, CS_9, CS_{10}, CS_{13}, CS_{15}},

B_R^d (C- CV) (X) = {CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{13}}.

Therefore Nano Topology $\tau_R(C-CV)(X)$ = *{U, ϕ, {CS_2, CS_6, CS_{10}, CS_{15}}, {CS_1, CS_2, CS_3, CS_4, CS_5, CS_6, CS_7, CS_8, CS_9, CS_{10}, CS_{13}, CS_{15}}, {CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{13}}}. Hence* $\tau_R(C-CV)(X) \neq \tau_R(C)(X)$.

Step 7. When the attribute "**Hand Sanitizer**" is removed from C then

U/R(C- B) ={{CS_1, CS_3, CS_7}, {CS_2, CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}, {CS_{12}}}, here

L_R^O(C- HS) (X) = {CS_2, CS_6, CS_{10}, CS_{15}},

U_R^P(C- HS) (X) = {CS_1, CS_2, CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{15}},

B_R^d(C- HS) (X) = {CS_1, CS_3, CS_4, CS_7, CS_8}.

Therefore Nano Topology

$\tau_R(C-HS)(X)$ = *{U, ϕ, {CS_2, CS_6, CS_{10}, CS_{15}}, {CS_1, CS_2, CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{15}}, {CS_1, CS_3, CS_4, CS_7, CS_8}}.*

Hence $\tau_R(C-HS)(X)$ =$\tau_R(C)(X)$. Therefore **CORE= {Wearing Mask, Covid-19 Vaccines}.**

CASE

II: COLLEGE STUDENTS ARE NOT AWARE OF COVID-19 SAFTY MEASURE

Let X = {CS_3, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}}

be the set of College Students are not Aware of Covid-19 Safty Measure then

U/R(C) = {{CS_1, CS_3, CS_7}, {CS_2, CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}, {CS_{12}}} and

Nano Topology $\tau_R(C)(X)$ = *{U, ϕ,{CS_5, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}}, {CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}}, {CS_1, CS_3, CS_4, CS_7, CS_8}}*

*Step 1. When the attribute " **Wearing Mask** " is removed from C then U/R(C-WM) = {{CS_1, CS_3, CS_7, CS_{12}}, {CS_2, CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}} ,*

L_R^O(C- WM) (X) = {CS_5, CS_9, CS_{11}, CS_{13}, CS_{14}},

U_R^P (C- WM) (X) = {CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}},

B_R^d(C- WM) (X) = {CS_1, CS_3, CS_4, CS_7, CS_8, CS_{12}}.

Therefore Nano Topology

$\tau_R(C-WM)(X) = \{U, \phi, \{CS_5, CS_9, CS_{11}, CS_{13}, CS_{14}\}, \{CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}\}, \{CS_1, CS_3, CS_4, CS_7, CS_8, CS_{12}\}\}$.

Hence $\tau_R(C-WM)(X) \neq \tau_R(C)(X)$.

Step 2. When the attribute " **Social Distancing** " is removed from C then

U/R(C-SD) ={{CS_1, CS_3, CS_7}, {CS_2, CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}, {CS_{12}}}, here

L_R^O(C-SD) (X) = {CS_5, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}},

U_R^P(C-SD) (X) ={CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}},

B_R^d(C-SD)(X) = {CS_1, CS_3, CS_4, CS_7, CS_8}.

Therefore Nano Topology

$\tau_R(C-SD)(X) = \{U, \phi, \{CS_5, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}\}, \{CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}\}, \{CS_1, CS_3, CS_4, CS_7, CS_8\}\}$.

Hence $\tau_R(C-SD)(X) = \tau_R(C)(X)$.

Step 3. When the attribute " **Wash Hands Often** " is removed from C then U/R(C-WHO) ={{CS_1, CS_3, CS_7}, {CS_2, CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}, {CS_{12}}},

here

L_R^O (C-WHO) (X) = {CS_5, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}},

U_R^P(C-WHO) (X) = {CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}},

B_R^d(C-WHO) (X) = {CS_1, CS_3, CS_4, CS_7, CS_8}.

Therefore the nano topology is given by

$\tau_R(C-WHO)(X) = \{U, \phi, \{CS_5, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}\}, \{CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}\}, \{CS_1, CS_3, CS_4, CS_7, CS_8\}\}$.

Hence $\tau_R(C-WHO)(X) = \tau_R(C)(X)$.

Step 4. When the attribute " **Covering Cough/Sneeze** " is removed from C then

U/R(C- CCS) ={{CS_1, CS_3, CS_7}, {CS_2, CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}, {CS_{12}}},

here

L_R^O (C- CCS) (X) = {CS_5, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}},

U_R^P(C- CCS) (X) = {CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}},

B_R^d(C- CCS) (X) = {CS_1, CS_3, CS_4, CS_7, CS_8}. Therefore Nano Topology

$\tau_R(C-CCS)(X) = \{U, \phi, \{CS_5, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}\}, \{CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}\}, \{CS_1, CS_3, CS_4, CS_7, CS_8\}\}$.

Hence. $\tau_R(C-CCS)(X) = \tau_R(C)(X)$

Step 5. When the attribute " **Avoid Touching Surfaces** " is removed from C then

U/R(C- ATS) ={{CS_1, CS_3, CS_7}, {CS_2, CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}, {CS_{12}}}, here

L_R^O (C- ATS) (X) = {CS_5, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}},

U_R^P(C- ATS) (X) = {CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}},

B_R^d(C- ATS) (X) = {CS_1, CS_3, CS_4, CS_7, CS_8}.

nano topology is $\tau_R(C-ATS)(X) = \{U, \phi, \{CS_5, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}\}, \{CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}\}, \{CS_1, CS_3, CS_4, CS_7, CS_8\}\}$. *Hence* $\tau_R(C-ATS)(X) = \tau_R(C)(X)$.

Step 6. When the attribute "**Covid-19 Vaccines**" is removed from C then

U/R(C- CV) ={{CS_1, CS_3, CS_7}, {CS_2, CS_{15}}, {CS_4, CS_8, CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}},{CS_{12}}},

here L_R^O (C- CV) (X) = {CS_{11}, CS_{12}, CS_{14}},

U_R^P(C- CV) (X) = {CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}},

B_R^d (C- CV) (X) = {CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{13}}.

Therefore Nano Topology $\tau_R(C-CV)(X) = \{U, \phi, \{CS_{11}, CS_{12}, CS_{14}\}, \{CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}\}, \{CS_1, CS_3, CS_4, CS_5, CS_7, CS_8, CS_9, CS_{13}\}\}$.

Hence $\tau_R(C-WM)(X) \neq \tau_R(C)(X)$.

Step 7. When the attribute "**Hand sanitizer** " is removed from C then

U/R(C- HS) ={{CS_1, CS_3, CS_7}, {CS_2, CS_{15}}, {CS_4, CS_8}, {CS_5, CS_9, CS_{13}}, {CS_6, CS_{10}}, {CS_{11}, CS_{14}}, {CS_{12}}}, here

L_R^O(C- HS) (X) = {CS_5, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}},

U_R^P(C- HS) (X) = {CS_1, CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{12}, CS_5},

B_R^d(C- HS) (X) = {CS_1, CS_3, CS_4, CS_7, CS_8}.

Therefore the nano topology is given by $\tau_R(C-HS)(X) = \{U, \phi, \{CS_5, CS_9, CS_{11}, CS_{12}, CS_{13}, CS_{14}\}, \{CS_1, CS_3, CS_4, CS_6, CS_7, CS_8, CS_{10}, CS_{12}, CS_5\}, \{CS_1, CS_3, CS_4, CS_7, CS_8\}\}$.

Hence $\tau_R(C-HS(X) = \tau_R(C)(X)$.

Therefore CORE = {Wearing Mask, Covid-19 Vaccines}.

Observation From the above two cases, it is observable that the primary outcome which is meant to be the CORE is Wearing Mask and Covid-19 Vaccines. We resolve that Wearing Mask and Covid-19 Vaccines are most safty contributes to the diminished safty from covid-19.

4. Conclusion

Mathematical concepts Plays very important role modern research. Es' specially Nano topological spaces many real life applications. Mathematical Biology have new platform for young researcher. In the same reason I choose plant named as Couroupita Guianensis Abul's parts of plant have wide range of medical applications. Each part of plant some separate like, Leaves, fruits, Seed, Bark and leaves. In our present work in the paper is which part of plant have maximum have Anti-fungal and Anti-Bacterial activities using mathematical Nano topological spaces based on the core result have been Levees and fruits have maximum have Anti-fungal and Anti-Bacterial activities. Covid-19 spreaded all over the world. World many people loosed her life, Business, Schools, and colleges are totally locked. Transports totally not functioning in across the world, Corona virus evolving and causing many evaluations, end of the Covid-19 third wave Colleges are open now. Indian Government and who frequently announced precaution measure to public. In my research which one of very important safety measure analyzed by Mathematical nano topological spaces, finally we identify the core value is Wearing Mask and Covid-19 Vaccines. Safe and efficient vaccinations are a game changer; yet, for the foreseeable future, we must continue wearing masks, wiping our hands, ensuring enough ventilation inside, physically removing ourselves from crowds, and so on. Being vaccinated does not imply we can disregard caution and endanger ourselves and others, especially given that research into the extent to which vaccinations protect not just against illness but also against infection and transmission is underway.

CRediT authorship contribution statement

C. Maheswari: Writing – original draft. **M. Sathyabama:** Writing – review & editing. **S. Chandrasekar:** Supervision, Writing – review & editing, Validation. **G. Gobi:** Data curation. **C. Inmozhi:** Data curation. **K. Parasuraman:** Visualization. **R. Uthrakumar:** Visualization, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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