WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Decision Making of Bacterial Leaf Blight Diseases of Rice by Using the Concepts of Nano Topology

R. Maheswari[1], Dr. K. Rekha[2], S. Priyanga[3]

[1]Assistant Professor, Department of Mathematics, Shrimati Indhira Gandhi College, Affiliated to Bharathidasan University, Trichy- 620002, Tamilnadu, India.

[2]Associate Professor, Department of Mathematics, Bishop Heber College, (Autonomous), Trichy-620002, Tamilnadu, India.

[3]PG Scholar, Department of Mathematics, Shrimati Indhira Gandhi College, Affiliated to Bharathidasan University, Trichy-620002, Tamilnadu, India.

Abstract:

In this article, a distinct approach in Nano topology is used as the perception to reduce conditional attributes". Also we identified the major symptoms to determine the Bacterial leaf blight of rice.

Keywords: Core**,** lower approximation, upper approximation**,** boundary region, attributes, Nano topology.

1. Introduction:

Bacterial leaf blight is a diseases or injury of plants marked by the formation of lesions, withering & death of parts (such as leaves & tubers). It is one of the most serious threats to the rice crop in irrigated and rainfed areas of the world. The symptoms of the diseases are Dry Rapidly, Wither, Bacterial ooze, Discoloured, Cracked, Swollen and Flattened .The theory of nano topology was introduced by Lellis Thivagar et al[5].They defined a nano topological spaces with respect to a subset X of a universe 'U' which is defined based on lower and upper approximations of X. In this paper, we determine the risk factor for the resolve of disease Bacterial leaf blight of rice via nano topology.

2. Preliminaries

Definition:2.1. [5]

Let U be a non-empty finite set of subject called the "universe" and R be an equivalence relation on U named as the indisceribility relation elements belonging to the same equivalence class are said to be indiscerrible with one another. The pair (U, R) is said to be approximate space. Let $X \subseteq$ U.

i. Lower approximation :

The lower approximation of X with respect to R is the set of all objects which can for certain classified as X with respect to R and it is denoted by $LO_R(X)$. (i.e.) $LO_R(X) = \bigcup_{x\in U} \{R(X) : R(X) \subseteq X\}$ where R(x) denotes the equivalence class determined by x.

ii. Upper approximation: -

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 $UP_R(x)$.(i.e.) $UP_R(X) = \bigcup_{x\in U}\{R(X) : R(X) \cap X \neq \varphi\}$

iii. Boundary region: -

The boundary region of X with respect to R is the set of all objects which can classified neither as x nor as not x with respect to R and it is denoted by $BD_R(X)$. (i.e.) $BD_R(X) = UP_R(X) - LO_R(X)$

iv. Nano topology:

Let U be a non-empty, finite universe of objects and R be an equivalence relation on U. Let $X \subseteq U$. Let $\tau_R(X) = \{U, \varphi, LO_R(X), UP_R(X), BD_R(X)\}$.

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 $(U, \tau_R(X))$ is called the Nano topological space.

Definition: 2.2.[5]

v. Basis:

Let U be a finite set and $X \subseteq U$. Then the basis of Nano topology $\tau(X)$ is given by $\beta_R(X) = \{U, LO_R(X), BD_R(X)\}$

3. Application of Nano Topology in reduction of attributes:

3.1 Algorithm:

Step: 1

Considering a deterministic universe U a finite set A of attributes split into two classes C for conditional attributes as well as D for decision attributes, on equivalence relation R on U correlating to C and a subset X of U.

Step: 2

Determine the lower and upper approximations as well as the boundary region of X in relation on R

Step: 3

Create the nano topology $\tau_R(X)$ on U, as well as and its basis $\beta_R(X)$

Step: 4

Remove an attribute x from C and determine the lower and upper approximations and the boundary region of X with respect to the equivalence relation on $C - \{X\}$.

Step: 5

Create a nano topology $\tau_R(X)$ on U

Step: 6

Repeat step 3 and 4 for all attributes on C

Step: 7

Those attribute in C for which $\tau_{C-x}(X) \neq \tau_R(X)$ form the core(R).

INFORMATION TABLE

RICE PLANT	DR	W	BO	DC	CR	SW	FL	RESULT
R_1	✓	✓	×	×	✓	✓	×	✓
R_2	✓	×	×	✓	×	✓	✓	✓
R_3	✓	✓	×	×	✓	✓	×	×
R_4	✓	×	✓	×	×	✓	×	✓
R_5	✓	×	✓	×	×	×	×	×
R_6	✓	✓	✓	✓	×	✓	✓	✓
R_7	✓	✓	×	×	✓	✓	×	×
R_8	✓	×	✓	×	×	✓	×	×
R_9	✓	×	✓	×	×	×	×	×
R_{10}	✓	✓	✓	✓	×	✓	✓	✓
R_{11}	×	✓	✓	×	✓	×	×	×
R_{12}	×	✓	×	×	✓	✓	×	×
R_{13}	✓	×	✓	×	×	×	×	×

R_{14}	×	✓	✓	×	✓	×	×	×
R_{15}	✓	×	×	✓	×	✓	✓	✓

Here U= $\bigcup_{i=1}^{15} \mathrm{R}\, i$ is the set of rice plant and the attributes A is equal to [DR = Dry Rapidly; W = Wither; BO = Bacterial Ooze; DC = Discoloured; CR = Cracked ;

SW = Swollen; FL = Flattened].

Here C is denoted as condition attributes = {DR, W, BO, DC, CR, SW, FL} and D is denoted as decision attributes = {Bacterial Blight}.

CASE:- 1 RICE PLANT WITH BACTERIAL BLIGHT :-

Assume $X = \{R_1\},\{R_2\},\{R_4\},\{R_6\},\{R_{10}\},\{R_{15}\}$ be the set of rice plant with Bacterial blight then,

$$U/_{R(C)} = \{\{R_1, R_3, R_7\},\{R_2, R_{15}\},\{R_4, R_8\},\{R_5, R_9, R_{13}\},\{R_6, R_{10}\},\{R_{11}, R_{14}\},\{R_{12}\}\}$$

Here,

$$LO_R(X) = \{R_2, R_{15}, R_6, R_{10}\},$$

$$UP_R(X) = \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{15}\}$$

$$BD_R(X) = \{R_1, R_3, R_4, R_7, R_8\}$$

and the Nano topology is given by,

$$\tau_{R(C)}(X) = \{U, \varphi, \{R_2, R_6, R_{10}, R_{15}\}, \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{15},\}, \{R_1, R_3, R_4, R_7, R_8,\}\}$$

STEP: - 1

When the attribute "DRY RAPIDLY" is removed from C. Then,

$$U/_{R(C-DR)} = \{\{R_1, R_3, R_7, R_{12}\},\{R_2, R_{15}\},\{R_4, R_8\},\{R_5, R_9, R_{13}\},\{R_6, R_{10}\},\{R_{11}, R_{14}\}\}$$

Here,

$$LO_{(C-DR)}(X) = \{R_2, R_{15}, R_6, R_{10}\},$$

$$UP_{(C-DR)}(X) = \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{12}, R_{15}\}$$

$$BD_{(C-DR)}(X) = \{R_1, R_3, R_4, R_7, R_8\ R_{12}\}$$

Then the Nano topology is given by,

$$\tau_{(C-DR)}(X) = \{U, \varphi, \{R_2, R_6, R_{10}, R_{15}\}, \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{12}, R_{15},\}, \{R_1, R_3, R_4, R_7, R_8, R_{12}\}\}$$

Hence, $\tau_{(C-DR)}(X) \neq \tau_{R(C)}(X)$

STEP: - 2

When the attribute "Wither" is removed from C. Then,

$$U/_{R(C-W)} = \{\{R_1, R_3, R_7\},\{R_2, R_{15}\},\{R_4, R_8\},\{R_5, R_9, R_{13}\},\{R_6, R_{10}\},\{R_{11}, R_{14}\},\{R_{12}\}\}.$$ Here,

$$LO_{(C-W)}(X) = \{R_2, R_{15}, R_6, R_{10}\},$$

$$UP_{(C-W)}(X) = \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{15}\}$$

$$BD_{(C-W)}(X) = \{R_1, R_3, R_4, R_7, R_8\}.$$

Then the Nano topology is given by,

$$\tau_{(C-W)}(X) = \{U, \varphi, \{R_2, R_6, R_{10}, R_{15}\}, \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{15},\}, \{R_1, R_3, R_4, R_7, R_8,\}\}.$$

Hence, $\tau_{(C-W)}(X) = \tau_{R(C)}(X)$

STEP:- 3

When the attribute "BACTERIAL OOZE" is removed from c. Then,

$$U/_{R(C-BO)}(X) = \{\{R_1, R_3, R_7\},\{R_2, R_{15}\},\{R_4, R_8\},\{R_5, R_9, R_{13}\},\{R_6, R_{10}\},\{R_{11}, R_{14}\},\{R_{12}\}\}$$

Here,

$LO_{(C-BO)}(X) = \{R_2, R_{15}, R_6, R_{10}\}$,

$UP_{(C-BO)}(X) = \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{15}\}$

$BD_{(C-BO)}(X) = \{R_1, R_3, R_4, R_7, R_8\}$.

Then the Nano topology is given by,

$\tau_{(C-BO)}(X) = \{U, \varphi, \{R_2, R_6, R_{10}, R_{15}\}, \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{15},\}, \{R_1, R_3, R_4, R_7, R_8,\}\}$

Hence, $\tau_{(C-BO)}(X) = \tau_{R(C)}(X)$.

STEP:- 4

When the attributes “DISCOLOURED” is removed from C. Then,

$U/_{R(C-DC)}(X) = \{\{R_1, R_3, R_7\}, \{R_2, R_{15}\}, \{R_4, R_8\}, \{R_5, R_9, R_{13}\}, \{R_6, R_{10}\}, \{R_{11}, R_{14}\}, \{R_{12}\}\}$.

Here,

$LO_{(C-DC)}(X) = \{R_2, R_{15}, R_6, R_{10}\}$,

$UP_{(C-DC)}(X) = \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{15}\}$

$BD_{(C-DC)}(X) = \{R_1, R_3, R_4, R_7, R_8\}$.

Then the Nano topology is given by,

$\tau_{(C-DC)}(X) = \{U, \varphi, \{R_2, R_6, R_{10}, R_{15}\}, \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{15},\}, \{R_1, R_3, R_4, R_7, R_8,\}\}$.

Hence, $\tau_{(C-DC)}(X) = \tau_{R(C)}(X)$

STEP:- 5

When the attributes “CRACKED” is removed from C. Then

$U/_{R(C-CR)}(X) = \{\{R_1, R_3, R_7\}, \{R_2, R_{15}\}, \{R_4, R_8\}, \{R_5, R_9, R_{13}\}, \{R_6, R_{10}\}, \{R_{11}, R_{14}\}, \{R_{12}\}\}$.

Here,

$LO_{(C-CR)}(X) = \{R_2, R_{15}, R_6, R_{10}\}$,

$UP_{(C-CR)}(X) = \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{15}\}$,

$BD_{(C-CR)}(X) = \{R_1, R_3, R_4, R_7, R_8\}$.

Then the Nano topology is given by,

$\tau_{(C-CR)}(X) = \{U, \varphi, \{R_2, R_6, R_{10}, R_{15}\}, \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{15},\}, \{R_1, R_3, R_4, R_7, R_8,\}\}$.

Hence, $\tau_{R(C-CR)}(X) = \tau_{R(C)}(X)$

STEP:- 6

When the attributes “SWOLLEN” is removed from C. Then,

$U/_{R(C-SW)}(X) = \{\{R_1, R_3, R_7\}, \{R_2, R_{15}\}, \{R_4, R_8, R_5, R_9, R_{13}\}, \{R_6, R_{10}\}, \{R_{11}, R_{14}\}, \{R_{12}\}\}$.

Here,

$LO_{(C-SW)}(X) = \{R_2, R_{15}, R_6, R_{10}\}$,

$UP_{(C-SW)}(X) = \{R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9, R_{13}, R_{10}, R_{15}\}$

$BD_{(C-SW)}(X) = \{R_1, R_3, \mathrm{R}_4, R_7, R_8, R_9, R_{13}\}$.

Then the Nano topology is given by,

$\tau_{R(C-SW)}(X) = \{U, \varphi, \{R_2, R_6, R_{10}, R_{15}\}, \{R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9, R_{10}, R_{13}, R_{15},\}, \{R_1, R_3, R_4, R_7, R_8, R_9, R_{13}\}\}$

Hence, $\tau_{R(C-SW)}(X) \neq \tau_{R(C)}(X)$

STEP:- 7

When the attributes “FLATTENED” is removed from C. Then,

$U/_{R(C-FL)}(X) = \{\{R_1, R_3, R_7\}, \{R_2, R_{15}\}, \{R_4, R_8\}, \{R_5, R_9, R_{13}\}, \{R_6, R_{10}\}, \{R_{11}, R_{14}\}, \{R_{12}\}\}$

Here,

$$LO_{(C-FL)}(X) = \{R_2, R_{15}, R_6, R_{10}\}$$

$$UP_{(C-FL)}(X) = \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{15}\}$$

$$BD_{(C-FL)}(X) = \{R_1, R_3, R_4, R_7, R_8\}$$

Then the Nano topology is given by,

$$\tau_{(C-FL)}(X) = \{U, \varphi, \{R_2, R_6, R_{10}, R_{15}\}, \{R_1, R_2, R_3, R_4, R_6, R_7, R_8, R_{10}, R_{15},\}, \{R_1, R_3, R_4, R_7, R_8,\}\}$$

Hence, $\tau_{(C-FL)}(X) = \tau_{R(C)}(X)$

Therefore, **CORE (R) = {DRYRAPIDLY, SWOLLEN}**

CASE:-II: RICE PLANT WITHOUT BACTERIAL BLIGHT

Assume $X = \{R_3, R_5, R_7, R_8, R_9, R_{11}, R_{12}, R_{13}, R_{14}\}$ be the set of rice plant without bacterial blight. By using the same procedure as in case –I, we get

CORE (R) = {DRYRAPIDLY, SWOLLEN}.

4. OBSERVATION:

From the above two cases, we observe that the core is {DRY RAPIDLY, SWOLLEN}

5. CONCLUSION:

We conclude that, DRY RAPIDLY, SWOLLEN are the most impact factors for "BACTERIAL LEAF BLIGHT OF RICE". Also this method can be applied in various fields namely, Medical field, Academic related field, Marketing fields, Business sectors and so on.

REFERENCES:

1. Akerele, O., 1993. Summary of WHO guidelines for the assessment of herbal medicines. Herbal Gram. 28, 13-19.
2. Grzymala-Busse, J.W., 2006. Rough set strategies to data with missing attributes values. In: Foundations and Data Approaches in Data Minig, pp.197-212.
3. A. Jayalakshmi and C.Janaki, Int. Journal of engineering Research, A new class of sets in nano topology spaces with an applications in Medical Diagnosis, Vol 12, Number 16(2017), pp 5894-5899.
4. Kahler, C.J., Hain, R., 2020. Fundamental protective Mechanics of face masks against droplet infections. J. Aerosol. Sci.148, 105617.
5. M. Lellis Thivagar, Carmel Richard, On nano forms of weakly open sets, International journal of mathematics and statistics invention, Volume 1, Issue 1, August 2013, pp 31-37.
6. M. Lellis Thivagar, Carmel Richard, Nutrition Modelling Through nano topology, Int. Journal of engineering Research and application, Vol 4, Issue 1(version 1), 2014, 327-334.
7. S. Logambal, C.Maheswari, S.Chandrasekar, T.Thilagavathi, C. Inmozhi, S.Panimalar, F.A. Bassyouni, R. Uthrakumar, Mohammed Ragab Abdel Gawwad, Reem M.Aljowaie, Dunia A. Al Farraj, K. Kanimozhi, Synthesis and characterizations of CuO nanoparticles using Couroupita guianensis extract for and antimicrobical applications, J. King Saud Uni. – Sci., 34, (3), (2022), 101910.
8. C.Maheswari [a],M.Sathyabama [b,*],S.Chandrasekar [C,*],G.Gobi [d],C.Inmozhi [e] K.Parasuraman, R.Uthrakumar [d]. "Medical Applications of Couroupita Guianensis Abul Plant and Covid-19 Best Safety Measure by Using Mathematical Nano Topological Spaces", Journal of King Saud University-Science 34 (2022) 1018-3647.
9. Yuhua Qianab,b, Chuangyin Dangb, jiye Lianga, and DaweiTangc, Set-valued ordered information systems Information sciences 179 (2009) 2809-2832.