Available online at www.elixirpublishers.com (Elixir International Journal)

Applied Mathematics

Elixir Appl. Math. 73 (2014) 26105-26107

ISSN: 2229-712X

Fuzzy CETD matrix to estimate the maximum age group victims of certain diseases due to the usage of pesticide Endosulfan in Kerala

K.Sivakamasundari* and Smitha.M.V

Avinashilingam University for Women, Coimbatore-641043.

ARTICLE INFO

Article history:

Received: 30 June 2014;

Received in revised form:

20 July 2014;

Accepted: 2 August 2014;

Keywords

Fuzzy cognitive Maps , ATD, RTD, Pesticide endosulfan, Agriculture, Human beings.

ABSTRACT

This article is a comprehensive study to find out the maximum age group victims of certain diseases due to the usage of pesticide Endosulfan people in South Indian State of Kerala (Palakkad and Kasargod) using CETD matrix. In the year 2003 W.B.Vasantha used to study migrant labours who were affected by HIV/AIDS. For this paper the data have been collected from Palakkad and Kasargod District of Kerala covering 101 victims.

Introduction

Due to modernization now a days the pesticides are sprayed in agriculture (Mango, cashewnut, vegetables etc) for getting better yield. Endosulfan is commonly used pesticide. This pesticide creates a range of chronic effects including cancer, cerebral meningities, skin diseases, vision loss and mental disorders and infertility of women. Our work is based on the field work conducted at 101 Endosulfan victims at Palakkad and Kasargode District in Kerala. The data collected from the victims of Endosulfan is studied using this fuzzy matrix model. Using this model we estimate the maximum age group victims of Endosulfan It is important to note while doing mathematical models the fuzzy matrix may take its entries [-1, 1] then also they are known as fuzzy matrix.

The method of calculation of fuzzy CETD matrix

The real data collected from the 101 victims of Endosulfan in Kerala is studied using fuzzy matrix model .The raw data is taken as it is and transformed into a raw time dependent data matrix by taking along the rows the age group and along the column the reasons for became Endosulfan Victims . Using the raw data matrix, convert it into the Average Time Dependent Data (ATD) Matrix (a_{ij}) bt dividing each entry of the raw data matrix by the number of years that is, the time period. This matrix represents a data, which is totally uniform. At the third stage we find the average and Standard Deviation (S.D) of every column in the ATD matrix. Using the average μ_j of each j^{th} column and σ_j the S.D. of each j^{th} column we chose a parameter α from the interval [0,1] and form the Refined Time Dependent Matrix (RTD matrix) , using the formula if $a_{ij} \leq (\mu_j - \alpha*\sigma_j)$ then e_{ij}= -1 else if $a_{ij} \epsilon (\mu_j - \alpha*\sigma_j, \mu_j + \alpha*\sigma_j)$ then e_{ij}=0 else $a_{ij} \geq (\mu_j + \alpha*\sigma_j)$ then e_{ij}=1.The ATD matrix is converted into Refined Time Dependent Dta Matrix . This matrix is also at times termed as the fuzzy matrix as the entries are 1, 0, -1. Now the row sum of this matrix gives the maximum age group victims of this social problem. We also combine these matrices by varying $\alpha \epsilon$ [0, 1] , so that we get the Combined Effective Time Dependent Data(CETD) matrix. The row sum is obtained for CETD matrix and conclusions are derived based on the row sums. All these are represented by graphs and graphs play a vital role in exhibiting the data.

Estimation of maximum age group victims of Endosulfan using 6x8 matrices

Using linguistic questionnaire from the101 victims of Endosulfan we have taken the following selected concepts.

X1 Skin diseases

X2 Deformation of heads, bones, tongue

X3 Eye sight disorder

X4 Defects in sex hormone

X5 Kidney, liver, heart diseases

X6 Neurobehaviour disorder

X7 Growth retardation

X8 Epilepsy, Crebral Pulsy, modules in whole body.

The above concepts are taken as the column of the initial raw data matrix. The age group in the years 0-10, 11-20, 21-30, 31-40, 41-50, and 51-60 are taken as the row of the matrix.

Table 1. Initial Raw Data Matrix

Age Group	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
0-10	2	11	2	0	3	21	1	2
11-20	4	5	3	0	0	15	1	5
21-30	0	0	0	0	0	3	2	2
31-40	2	1	1	2	0	1	1	0
41-50	3	0	0	1	0	0	0	1
51-60	1	0	0	0	0	0	0	3

Table 2. The ATD matrix

Age Group	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
0-10	0.2	1.1	0.2	0	0.3	2.1	0.1	0.2
11-20	0.4	0.5	0.3	0	0	1.5	0.1	0.5
21-30	0	0	0	0	0	0.3	0.2	0.2
31-40	0.2	0.1	0.1	0.2	0	0.1	0.1	0
41-50	0.3	0	0	0.1	0	0	0	0.1
51-60	0.1	0	0	0	0	0	0	0.3

RTD matrix for α= 0.15

$$\begin{pmatrix} 0 & -1 & 1 & -1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & -1 & -1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ -1 & 0 & 0 & 1 & -1 & 0 & 1 & -1 \\ 1 & -1 & -1 & 1 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \end{pmatrix}$$

The row sum matrix

$$\begin{pmatrix} 1 \\ 4 \\ -8 \\ -1 \\ -4 \\ -6 \end{pmatrix}$$

Tele:

E-mail addresses: sivanath2010@gmail.com

Table 3: The Average and Standard Deviation of the above ATD matrix

Mean	0.2	0.28	0.1	0.05	0.05	0.66	0.08	0.22
S.D	0.22	0.48	0.145	0.088	0.12	1.008	0.103	0.25

RTD matrix for α= 0.35

$$\begin{pmatrix} 0 & 1 & 1 & -1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 1 & 0 & 1 \\ -1 & -1 & -1 & -1 & -1 & 0 & 1 & 0 \\ 0 & -1 & 0 & 1 & -1 & -1 & -1 & -1 \\ 1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & 1 \end{pmatrix}$$

The row sum matrix

$$\begin{pmatrix} 3 \\ 5 \\ -4 \\ -4 \\ -6 \\ -6 \end{pmatrix}$$

RTD matrix for α= 0.45

$$\begin{pmatrix} 0 & 1 & 1 & -1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & -1 & 0 & 1 & 0 & 1 \\ -1 & -1 & -1 & -1 & -1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & -1 & -1 & -1 & -1 \\ 1 & -1 & -1 & 0 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \end{pmatrix}$$

The row sum matrix

$$\begin{pmatrix} 3 \\ 4 \\ -4 \\ -3 \\ -5 \\ -8 \end{pmatrix}$$

RTD matrix for α= 0.75

$$\begin{pmatrix} 0 & 1 & 0 & 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 & 0 & 1 \\ -1 & 0 & 0 & 0 & 0 & -1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 & 0 & -1 \\ 0 & 0 & 0 & 0 & 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 & -1 & 0 \end{pmatrix}$$

The row sum matrix

$$\begin{pmatrix} 3 \\ 4 \\ 1 \\ -2 \\ -1 \\ -2 \end{pmatrix}$$

Figure 1

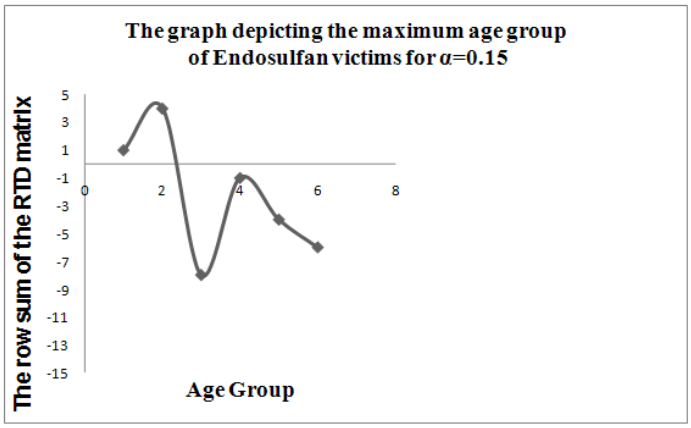


Figure 2

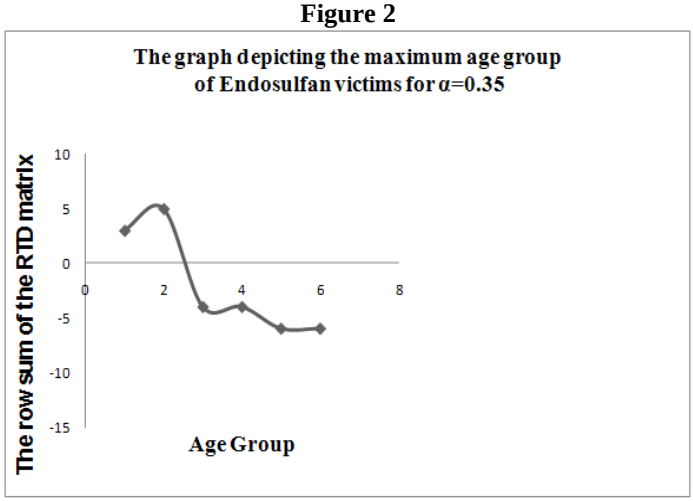


Figure 3

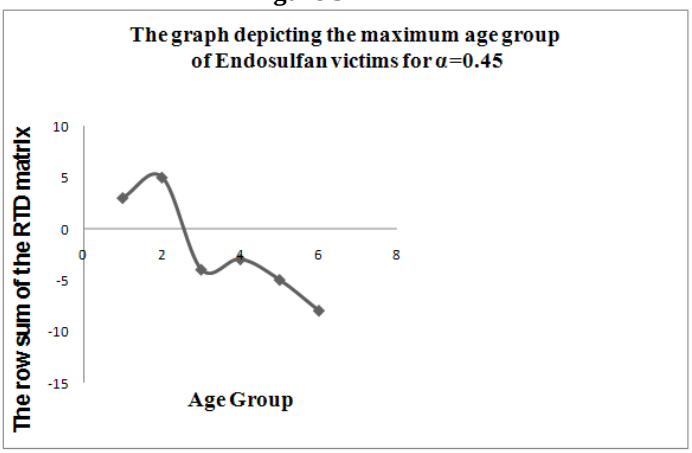
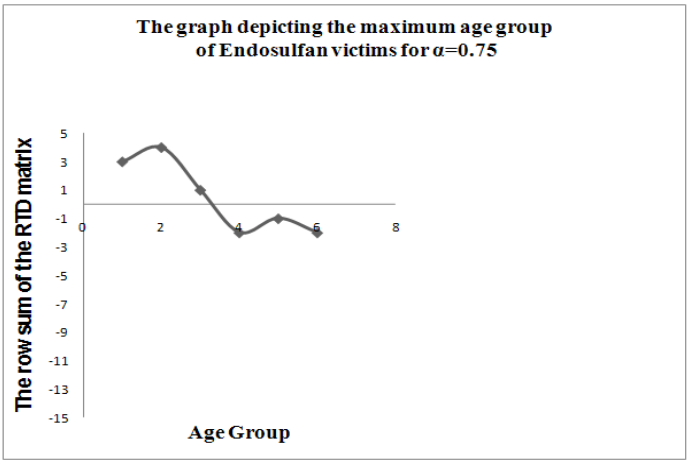


Figure 4



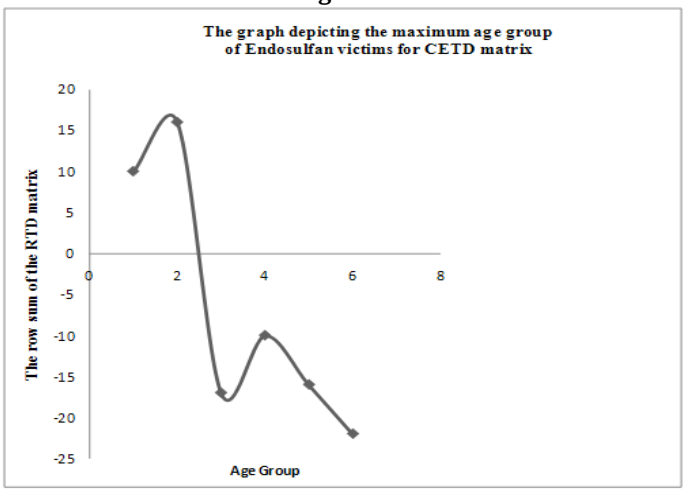
CETD matrix

$$\begin{pmatrix} 0 & 2 & 3 & -3 & 4 & 4 & 0 & 0 \\ 4 & 3 & 3 & -2 & -1 & 4 & 1 & 4 \\ -4 & -3 & -3 & -3 & -3 & -2 & 2 & -1 \\ -1 & -1 & 0 & 3 & -3 & -3 & -1 & -4 \\ 3 & -3 & -3 & 0 & -3 & -4 & -3 & -3 \\ -3 & -3 & -3 & -3 & -3 & -4 & -4 & 1 \end{pmatrix}$$

The row sum of CETD matrix

$$\begin{pmatrix} 10 \\ 16 \\ -17 \\ -10 \\ -16 \\ -22 \end{pmatrix}$$

Figure 5



Conclusions

From the above CETD matrix analysis the maximum Endosulfan victims are at the age group of 0-20. It is not changed with the change in values of the parameter from 0 to 1.But the age group 21-30, 31-40,41-50 and 51-60 are negative because only few people became victims of Endosulfan at this

age group. Also at the age group 0-20 are affected with types disases like epilepsy,skin dieases, cacer, neurobehaviour disorders etc. Also most of these people are illiterate. When Govt. , social organizations will give awareness about the side effects of Endosulfan and it will not affect to the next generation also.

In vegetable cultivation many fields trials have been carried out on alternative pest control methods focusing on herbal pesticides.In some studies, botanical pesticides were found more effective than endosulfan in controlling greenhouse pests. In Asion region farmers have developed their own combinations and methods of pest control using chillies, garlic, asafetida, cow urine and many other plant materials.Many cashew farmers have tried organic method and application of neem oil .Alternative pesticides and organic farming are encouraged in tea plantations and the use of endosulfan is being eliminated.

References

1. Anon (2003) "ENDOSULFAN" A Fact Sheet and Answers to Common Question. Pesticide News No.60 *The Journal of Pesticide Action Network UK. (Quarterly)* P 19.
2. *Dow to Earth Science and Evironmental Online*. (2011) "Endosulfan Victims through the years". Photo Gallery May 25.
3. "The Endo-Ban Tracker" (2011) Centre for science and Environment sep. 26, 2011.
4. EJF End of the road for Endosulfan. (2002) A call for action against a dangerous pesticide. *Environmental Justice Foundation, London, UK*. (2002)
5. ENDOSULFAN" (2011) The Kerala Story Department of Health and family welfare Govt. of kerala 20th April.
6. Savy Soum Misra (2010) "State of Endosulfan ". Published on *Down To Earth* December. (http:// www.downtoearth.org.in)
7. S. Narayanamoorthy. (2012) Applications of fuzzy CETD matrix technique to estimate the maximum age group of silk weavers as bounded laborers *Int. J. of Appl. Math and Mech.* 8 (2) pp. 89-98, 2012.
8. Vasantha Kandasamy. W.B., Antony Raj, S., and Victor Devadass, A. (2004). Some new fuzzy techniques, *Journal of Math and Comp.Sci. (Math.ser)* Vol 17, No.2, pp.157-160.
9. W.B. Vasantha Kandasamy and Smarandache Florentin, (2004) , "Analysis of social aspects of migrant labourers living with HIV/AIDS Using Fuzzy Theory and Neutrosophic Cognitive Maps", Xiquan, Phoenix.
10. W.B. Vasantha Kandasamy, Florentin Smaradanche and Ilanthenral (2007), "Elementary Fuzzy Matrix Theory and Fuzzy Models for Social Scientists".