UGC Approved Journal

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

Vol. 4, Issue 9, September 2017

Optimisation Parameters for Dicofol Pesticide Removal by Electro-Coagulation

S. Shanmukha Rao[1], M. Srikanth[2], P. Neelima[3] and Dr. Meena Vangalapati[4]

M. Tech Student, Dept of Chemical Engg, AUCE (A), Andhra University, Visakhapatnam, AP, India[1,2,3]

Professor, Dept. of Chemical Engg, AUCE (A), Andhra University, Visakhapatnam, AP, India[4]

Abstract: Dicofol is an organochlorine miticide utilized for killing Red spite, vermin and so on generally utilised in cultivating and development fields like agriculture items. It is in an indistinguishable synthetic class from DDT and has a practically indistinguishable structure, varying by only one additional oxygen atom. Its harmfulness, solid impact, and malignancy causing nature influenced the condition and people, remembering the to control the antagonistic impacts of Dicofol on individuals, it is vital to focus on the evacuation of its deposits. We utilized expansive number of pesticides all through the world for the common place reaps and bugs, Here we are concentrating on Dicofol, was used generally in cultivating and development to control parasites like red demonstrates hatred for in apples, pears, sensitive characteristic item, cucumbers, tomatoes Etc. Vegetables. In the present study, Optimization of Dicofol by electro coagulation process is performed with various parameters and found to be Time(120 min),Voltage(15V), pH(5), RPM(700), and Electrode spacing(8cm). From these optimized conditions the maximum removal of Dicofol obtained was 95.52%.

Keywords: Dicofol, electro coagulation, optimization, organochlorine pesticide, DDT and aluminium electrodes.

1. INTRODUCTION

Organochlorine pesticides are the most ponder regular toxics display in the nature. The harmfulness, potential bioaccumulation and non-biodegradability of these blends address perils to the earth in respect of human wellbeing [1]. Dicofol is an organochlorine pesticide and it is the middle result of dichlorodiphenyltrichloroethane(DDT), containing one hydroxyl useful gathering in the structure[2]. Its destructiveness, solid impact, and disease causing nature influenced the condition and people, remembering the to control the pessimistic impacts of Dicofol on individuals, it is essential to focus on the expulsion of its residues [3]. We utilized substantial number of pesticides all through the world for the run of the mill gathers and bugs, Here we are concentrating on Dicofol[3,6], was used broadly in cultivating and development to control bugs like red shows disdain toward in apples[4,13], pears, fragile common item, cucumbers, tomatoes Etc. Vegetables.[4,9,10,11,12,14,15], Dicofol pesticide makes genuine impact sensory system in human beings [5]. Electrochemical process (electro coagulation) has been totally used to treat wastewaters. While the frame-works in the electro coagulation method fuse coagulation, adsorption, precipitation and lightness. it utilizes conciliatory anode to make squeeze hydroxide surges by reaction at the anode took after by electrolysis. The electro coagulation is essential and capable technique for the treatment of wastewater. This work intends to look at the probability of using iron cathode for ejection of pesticides from reproduced misuse water electro coagulation strategy [6], this procedure has the benefit evacuate the colloidal particles differentiated and standard flocculation coagulation, such charged particals have a more vital probability of being coagulated and destabilized by electric supply that helps to settle down [7].

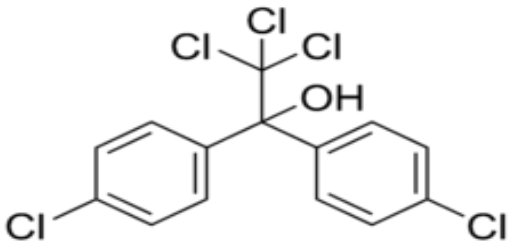

Figure 1: Structure of Dicofol

2. MATERIALS AND METHODS

Chemicals And Reagents: Dicofol pesticide, NaOH, HCL, Pyridine, 4-Aminoacetanilide, Glacial acetic acid, Amyl alcohol, sodium sulphate(anhydrous).
Equipments: DC Power supply unit, pH meter, magnetic stirrer, photo colorimeter.

UGC Approved Journal

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

Vol. 4, Issue 9, September 2017

Collection of the material: Vegetable waste was collected from nearby Market.
Processing of the material: Vegetable waste was spiked into small pieces and water is added to that waste and left for one to two days, stirred with mechanical stirrer for some time pesticide residues dissolved into water, that water is taken as a sample for process.
Electro coagulation using Aluminium Electrodes:
The reactions of aluminium electrodes can be summarized as follows:
at anode: $Al(s) \rightarrow 2Al^{3+}(aq.) + 6e^{-}\ 2Al^{3+}(aq.) + 6H_2O(l) \rightarrow 2Al(OH)_3(s) + 6H^{+}(aq.)$
at cathode: $6H^{+}(aq.) + 6e^{-} \rightarrow 3H_2(g)$
Overall: $2Al(s) + 6H_2O(l) \rightarrow 2Al(OH)_3(s) + 3H_2(g)$
Determination of Dicofol: Waste water is taken into beaker and aluminium electrodes were placed in the beaker and placed on the magnetic stirrer and connect the power supply and run for some time at several optimal conditions and collect the sample of 50 ml in conical flask and add (1ml of pyridine+2ml of 5M NaOH) heat in water bath for 3 minutes and cool in ice cold water and add 1ml of glacial acetic acid after that add (2ml of 4-aminoacetanilide+1ml of 10M HCL) shake thoroughly left for ten minutes and add (2*2.5ml of amyl alcohol) and the extract was observed at 525nm in spectrophotometer.

3. RESULTS AND DISCUSSIONS

OPTIMISATION OF PARAMETERS

Parameters like Voltage, Time, pH, RPM(mixing), Electrode spacing were studied for optimized removal of Dicofol from waste water using aluminium electrodes from vegetable waste.
Effect of Voltage: The effect of voltage was carried out by taking 500 ml of sample for process at each voltage, and the voltage was optimized in the range of (3-20) in the interval of 2 volts, and remaining parameters maintained at pH(6), time(60mins), RPM(500) spacing(8cm). The removal percentage of Dicofol was increased with increase in voltage and become stable at 15 volts and increase in voltage gives small changes in removal, and the optimum removal was obtained at 15 volts, This is due to at higher voltages the extent of anode electrode dissolution in electrolysis process this gives increase in formation of $Al(OH)_n$. Moreover the bubble generation increases and bubble size decreases with increase in voltage, this two are the benefits to remove of pesticide with H_2 flotation[8].

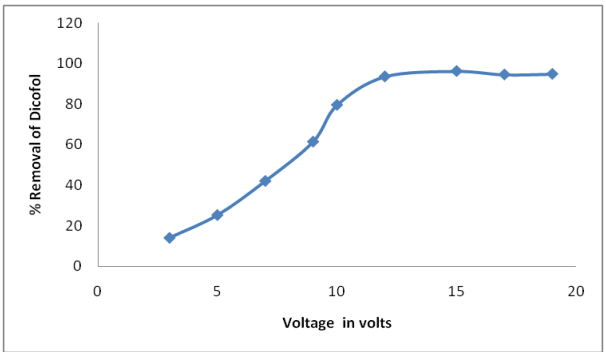

Fig 2: Effect of Voltage on Dicofol Removal

Effect of Time: Effect of Time was carried out by taking one liter sample solution in beaker and the remaining procedure is same as above, and the sample was collected for every 20 min's. that sample was analyzed periodically and get the absorbance using spectrophotometer. This parameter was observed in the range of (0-180 min's) and optimum removal of Dicofol was obtained at 120 min's and remaining parameters maintained at pH(6), voltage (15volts),

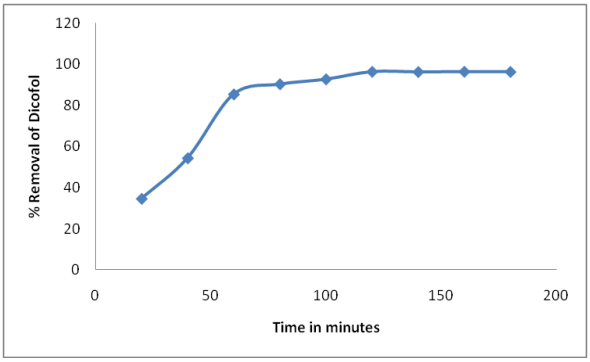

Fig 3: Effect of Time on Dicofol Removal

UGC Approved Journal

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

Vol. 4, Issue 9, September 2017

RPM(500),spacing(8cm).Electrolysis time determines the production of metal ions like Al^{+2} or Al^{+3}[5],with increase in ions removal will increases and in this study there is no further increase at 120 min's so that it is optimum time for Dicofol removal.

Effect of Mixing: Effect of mixing was observed by taking 500 ml of sample as like in voltage parameter and this was carried from the range of (300-900)RPM and remaining parameters maintained at pH(6), voltage(15volts), time(120min) spacing(8cm) and optimum removal was obtained at 700 RPM. If the mixing speed increases removal also increases why because the flow of ions between electrodes increases as a result high removal will occurs.

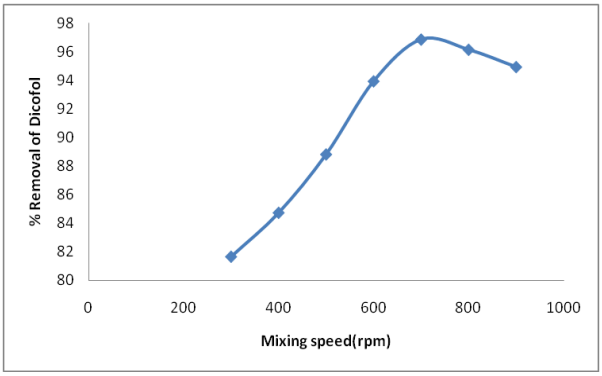

Fig 4: Effect of Mixing Speed on Dicofol Removal

Effect of pH: pH of the sample was adjusted by using 0.1N HCL, 0.1N NoaH solutions, this parameter was observed from pH-3 to pH-11 by taking 500 ml of sample in each step, and remaining parameters maintained at Time(120min), voltage(15volts), RPM(500) spacing(8cm). It seemed that optimal pH value was ranged from 3 to 6 and 8 to 11. in both acidic and basic mediums high removal of component was observed when compared to basic acidic conditions gives high removal due to increase in anodic dissolution and increase in $Al(OH)_n$ formation[5], optimum % removal was obtained at pH(5) among other pH conditions.

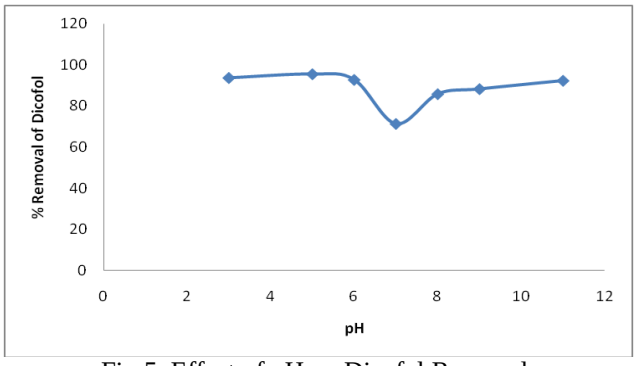

Fig 5: Effect of pH on Dicofol Removal

Effect of Electrode Spacing: Electrode Spacing was adjusted by using non conducting material like thermo coal sheet, and this set up was arranged in rectangular glass vessel. One liter sample solution was taken at every trail and experiment was held and sample was analyzed, finally optimum removal was obtained at 8cm and remaining

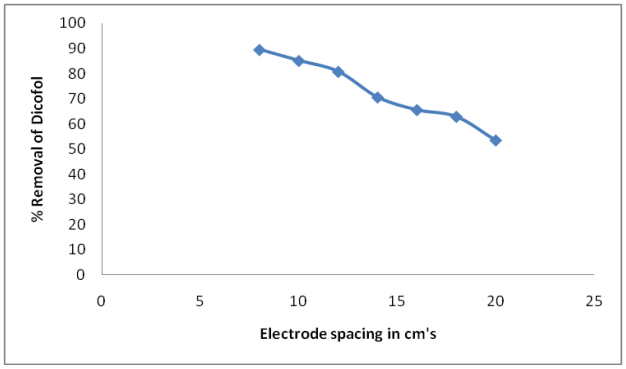

Fig 6: Effect of Electrode Spacing on Dicofol Removal

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

Vol. 4, Issue 9, September 2017

parameters maintained at Time(120min), voltage(15volts), RPM(500) pH(5). this parameter carried out in the range of (6-20 cm).By decreasing the space between electrodes reactions were improved due to increase in concentration ,as a result Removal efficiency increases[15].

4. CONCLUSION

In the Present study, The Removal of Dicofol residue from vegetable waste was has been investigated. and effect of parameters on Dicofol removal was optimized. Based on the results aluminium electrodes are efficient to removal of Dicofol residue.95.52% removal was obtained at Operating Conditions of Voltage(15 volts), Time(120minutes), RPM(700), pH(5), electrode spacing(8cm). Hence this Electro- coagulation process using aluminium electrodes was efficient to remove Dicofol residue from vegetable waste.

REFERENCES

[1]. Turnbull, Alan. "Chlorinated pesticides." Issues in Environmental Science and Technology 6 (1996): 113-136.
[2]. Rajan, Aswathy, Sanju Sreedharan, and V. Babu. "Solvent Extraction and Adsorption Technique for the Treatment of Pesticide Effluent." An International Journal (CiVEJ) Vol.3, No.2, June 2016.
[3]. Zhang, Jianbo, et al. "Removal of dicofol from water by immobilized cellulase and its reaction kinetics." Journal of environmental management 92.1 (2011): 53-58.
[4]. Mohammed, Sibhi, and P. A. Fasnabi. "Removal of Dicofol from Waste-Water Using Advanced Oxidation Process." *Procedia Technology* 24 (2016): 645-653.
[5]. Abdel-Gawad, Soha A., et al. "Removal of some pesticides from the simulated waste water by electrocoagulation method using iron electrodes." International Journal of Electrochemical Science 7 (2012): 6654-6665.
[6]. Qiu, Xinghua, et al. "Contribution of dicofol to the current DDT pollution in China." Environmental Science & Technology 39.12 (2005): 4385-4390.
[7]. Dohare, Er Devendra, and Tina Sisodia. "Applications of Electrocoagulation in treatment of Industrial Wastewater: A Review." (2014).
[8]. Daij, K. Benahmed, S. Bellebia, and Z. Bengharez. "Comparative experimental study on the COD removal in aqueous solutions of pesticides by the electrocoagulation process using monopolar iron electrodes." Chemistry International 3.4 (2017): 319-327.
[9]. Kumar, Vikesh, et al. "Estimation of persistent organochlorine pesticide residues in selected vegetables." Der Pharma Chemica 2.1 (2010): 70-75.
[10]. Yan, Hongyuan, et al. "Ionic liquid-mediated molecularly imprinted solid-phase extraction coupled with gas chromatography-electron capture detector for rapid screening of dicofol in vegetables." Journal of Chromatography A 1307 (2013): 21-26.
[11]. El Din, AM Shams, et al. "Persistence of acetamiprid and dinotefuran in cucumber and tomato fruits." Am.-Eurasian J. Toxicol. Sci. 4 (2012): 103-107.
[12]. Smith, Keith J., et al. "Removal of chlorinated pesticides from crude vegetable oils by simulated commercial processing procedures." Journal of the American Oil Chemists' Society 45.12 (1968): 866-869.
[13]. Archer, T. E. "Removal of dicofol (Kelthane) residues from apple pomace." Archives of environmental contamination and toxicology 1.3 (1973): 281-288.
[14]. Kumar, Vikesh, et al. "Estimation of persistent organochlorine pesticide residues in selected vegetables." Der Pharma Chemica 2.1 (2010): 70-75.
[15]. Ghalwa, A., M. Nasser, and N. B. Farhat. "Removal of abamectin pesticide by electrocoagulation process using stainless steel and iron electrodes." Journal of Environmental Analytical Chemistry 2 (2015): 1-7.

BIOGRAPHIES

Mr. Suri Shanmukha Rao M. Tech. Department of Chemical Engineering, Andhra University College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. He attended 03 National and International conferences.

Mr. Marrapu Srikanth M. Tech. Department of Chemical Engineering, Andhra University College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. He attended 03 National and International conferences.

Ms. neelima Reddi Parapathi M. Tech. Department of Chemical Engineering, Andhra University College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. She attended 02 workshops and Aero cart winner in frame of minds at the aadhrita 2012 at MVGR college of engineering.

Dr. Meena Vangalapati M. Tech., Ph.D, Professor, Department of Chemical Engineering, Andhra University College of Engineering (A), Andhra University, Visakhapatnam, Andhra Pradesh, India. She has 16 years of teaching experience and published 90 more Papers published in National and International Reputed Journals, published 13 monographs/Books, 3 patents filed and 10 awards