Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

Asian Journal of Plant Science and Research, 2013, 3(2):127-132

ISSN : 2249-7412
CODEN (USA): AJPSKY

The extraction process and antioxidant properties of patuletin dye from wasted temple French marigold flower

Nilesh U. Jadhao* and Suresh P. Rathod

P.G. Department of Chemistry G.S. Gawande College, Umarkhed Dist-Yavatmal, Maharashtra (India)

ABSTRACT

The patuletin dye generally used in textile for colour to texture but it is not used as antioxidant agent in industries after that it thrown in river and causes the river pollution. So in this work we have use the wasted French marigold flower and minimise the river pollution. An interesting outcome of this work is that, the patuletin dye was show high antioxidant capacity than base and below the catechol. But due to easily available, low coast, no hazardous effect, easily degradable so the patuletin dye is more economically beneficial in antioxidant treatment.

Keywords: Antioxidant, *Tagetes patula L.* and River Pollutant.

INTRODUCTION

Corrosion is the gradual destruction of material, usually metal, by chemical reaction with its environment. In the most common use in the word, the electrochemical oxidation of metals in reaction with an oxidant such as oxygen**.** Rusting, the formation of iron oxides is a well-known example of electrochemical corrosion. This type of damage typically produces oxide or salt of the original metal [1]. Corrosion can also occur in materials other than metals, such as ceramics or polymers, although in this context, the term degradation is more common. Many structural alloys corrode merely from exposure to moisture in the air, but the process can be strongly affected by exposure to certain substances [2]. Corrosion can be concentrated locally to form a pit or crack, or it can extend across a wide area more or less uniformly corroding the surface. Because corrosion is a diffusion controlled process, it occurs on exposed surfaces [3-6]. As a result, methods to reduce the activity of the exposed surface, such as passivation and chromate-conversion, can increase a material's corrosion resistance. However, some corrosion mechanisms are less visible and less predictable.

The references indicate that, organic compounds containing $–NH_2$, -OH groups retard the corrosion action of metal. This may be due to the formation of surface layer, also may be due to retardation of oxidation.

The various organic compounds containing $–NH_2$, and -OH group are used to study the inhibition efficiency of organic compounds. The results are very interesting.

1.2. ORIGIN OF PROBLEM:

The marigold flower is two type species i.e. Marigold (*Tagetes Erecta L*) and French marigold (*Tagetes patula L*). The marigold flower is yellow in colour and French marigold flower is red yellow in colour as shown in fig. 1. a and b.


Fig1. a) Marigold (Tagetes Erecta L) b) French marigold (Tagetes patula L).

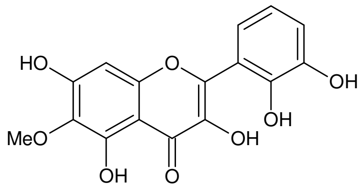
Marigold (*Tagetes Erecta L*) and French marigold *(Tagetes patula L)* are used for preparation of dye and they thrown into river and laterally causes the river pollution. So the photo catalytic degradation of patuletin dye over TiO_2 using solar radiation is found to be highly economical and successfully carried out in our published work [7]. These dye generally used in textile for colour to texture but, it is not used as antioxidant agent in paint industries. In the present work, we have study the extraction method and study of antioxidant properties of patuletin dye in different solvent extracted from French marigold and it gives interesting outcome.

MATERIALS AND METHODS

2.1 METHOD OF EXTRACTION OF PATULETIN DYE:

The dried flowers of French marigold (100g) were crushed and dissolved in distilled water (500ml) and allowed to boil in a beaker kept over water bath for extraction for 3 hour. All the colour was extracted from flowers of *tagetus* by the end of 3 hours. The solution was filtered, evaporated to half volume (250 ml). After extraction the extract was filtered through ordinary filter paper, the filtrate was collected, and the solvent was evaporated and recovered to dryness. 100 ml of distilled water was added to this extract. The absorbance was recorded for determination of concentration of the aqueous extract. UV- Visible spectrum of the extract showed higher colour content in this case. However we carried out column chromatography of crude extract on silica gel using the elution systems 20% EtOAc/hexane- 50% EtOAc/hexane and further on with 40% EtOAc from *Tagetus patula* extract to isolate one major red colour flavonoid- patuletin [8-10]. It was identified by UV- Visible spectrum at 550 nm shows higher absorbance peak. Yield of patuletin was 2.40 g.

The following is structure of patuletin.



Structure of Patuletin

2.2. METHOD OF ANTIOXIDANT PROPERTIES:

To study the inhibition efficiency of organic compounds. The simple experiments were carried out. In this experiments the beakers were labelled from 1-15 and in beakers having labelled 1,2,3,4,5, 25ml 0.5N HNO_3, and in beakers 6,7,8,9,10 0.5N HCl and in beaker number 11,12, 13,14,15 0.5N H_2SO_4 were added. In each beaker the different organic bases like p-nitroaniline, m-nitroaniline, p-toludien and phenol like Resersinol, β-Napthol, catechol and patuletin dye each were added.

The binding wire was cleaned first by paper and wash with water and its weight were determined on analytical balance. Inhibition efficiency was determined by following equation (I).The inhibition efficiency of organic compound in different oxidizing medium was used for comparisons.

$I.E. = \frac{Wu - Wi}{Wu} \times 100$ --------------- Equation (I)

Where,
IE= Inhibition efficiency,
Wi= Weight loss of metal in inhibitor solution
Wu= Weight loss of metal in unhibited solution (control) relation.

RESULTS AND DISCUSSION

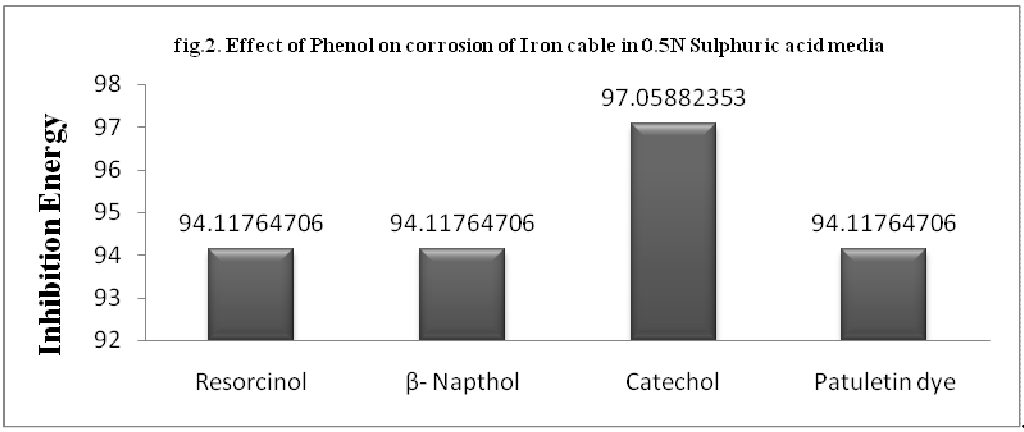
3.1. IN SULPHURIC ACID MEDIUM:
In sulphuric acid medium, we have study the effect of phenol, organic bases and comparison with patuletin dye.

3.1.1. EFFECT OF PHENOL ON CORROSION OF IRON CABLE:
Effect of phenol and patuletin dye on corrosion of iron cable in 0.5N H_2SO_4 acidic medium. It is summarise the data in table no. 1, from that data catechol shows the higher inhibition energy i.e. 97.0588 % and other phenol and patuletin shows same inhibition energy i.e. 94.1176%.

Table no.:1. Effect of phenol on corrosion of Iron cable in 0.5 N Sulphuric acid media.

Sr.no.	Organic Compound	Initial Weight (g)	Final Weight (g)	Loss in Weight (g)	% Loss in Weight	Inhibition Energy (%)
1.	Control	1.03	0.69	0.34	33.0097	....
2.	Resorcinol	1.03	1.01	0.02	1.9417	94.1176
3.	β- Napthol	1.03	1.01	0.02	1.9417	94.1176
4.	Catechol	1.03	1.02	0.01	0.9708	97.0588
5.	Patuletin dye	1.03	1.01	0.02	1.9417	94.1176

Graphical representation of comparison corrosion properties in phenol and patuletin dye in fig. 2



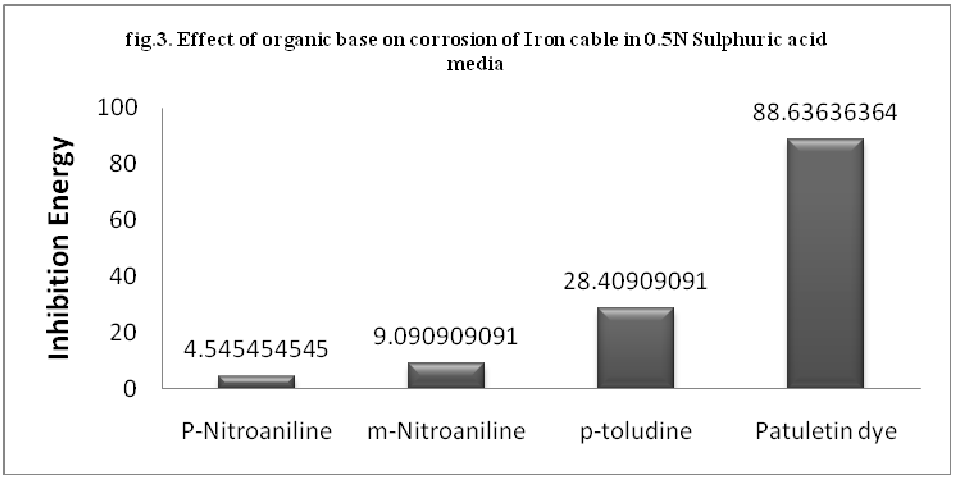
From these data, the patuletin dyes shows the good result of antioxidant properties or inhibition energy.

3.1.2. EFFECT OF ORGANIC BASES ON CORROSION OF IRON CABLE:
Effect of bases and patuletin dye on corrosion of iron cable in 0.5N H_2SO_4 acidic medium. It is summarise the data in table no. 2, from that data patuletin dye shows the higher inhibition energy i.e. 88.6363%

Table no.:2. Effect of organic bases on corrosion of Iron cable in 0.5 N Sulphuric acid media.

Sr.no.	Organic Compound	Initial Weight (g)	Final Weight (g)	Loss in Weight(g)	% Loss in Weight	Inhibition Energy (%)
1.	Control	1.03	0.854	0.176	17.0874	------------
2.	P-Nitroaniline	1.03	0.862	0.168	16.3107	4.54545455
3.	m-Nitroaniline	1.03	0.87	0.160	15.534	9.09090909
4.	p-toludine	1.03	0.904	0.126	12.233	28.4090909
5.	Patuletin dye	1.03	1.01	0.020	1.9417	88.63636364

Graphical representation of comparison corrosion properties in bases and patuletin dye in fig. 3.



From these data, the patuletin dyes shows the good result of antioxidant properties or inhibition energy.

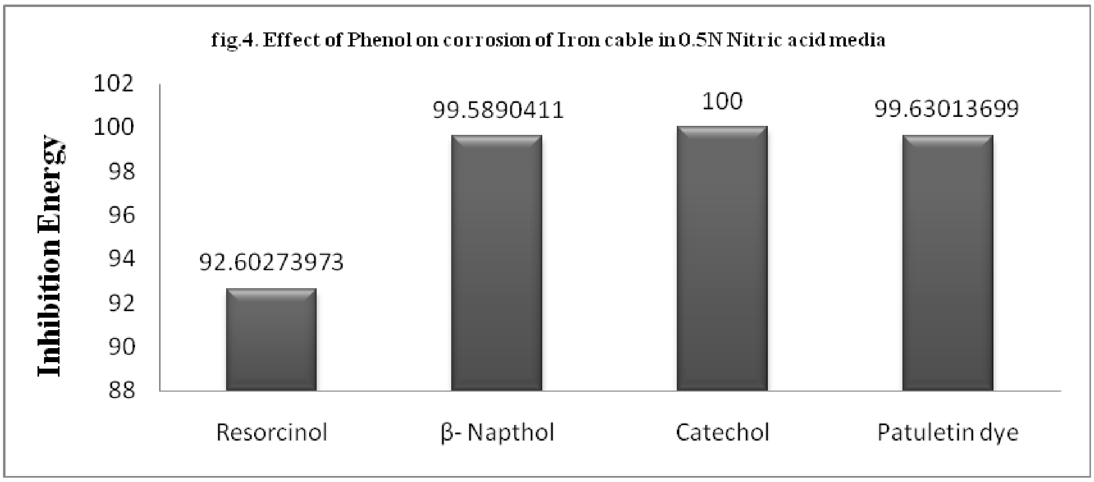
3.2 IN NITRIC ACID MEDIUM:
In nitric acid medium, we have study the effect of phenol, organic bases and comparison with patuletin dye.

3.2.1. EFFECT OF PHENOL ON CORROSION OF IRON CABLE:
Effect of phenol and patuletin dye on corrosion of iron cable in 0.5N HNO_3 acidic medium. It is summarise that, data in table no. 3, from that data catechol shows the higher inhibition energy i.e. 100 % and patuletin shows inhibition energy i.e. 99.6301 %

Table no.:3. Effect of phenol on corrosion of Iron cable in 0.5 N Nitric acid media.

Sr.no.	Organic Compound	Initial Weight (g)	Final Weight (g)	Loss in Weight (g)	% Loss in Weight	Inhibition Energy %
1.	Control	1.03	0.3	0.73	70.8737	....
2.	Resorcinol	1.03	0.976	0.054	5.2427	92.6027
3.	β- Napthol	1.03	1.027	0.003	0.2912	99.5890
4.	Catechol	1.03	1.03	0.00	0	100
5.	Patuletin dye	1.03	1.0273	0.0027	0.2621	99.6301

Graphical representation of comparison corrosion properties in phenol and patuletin dye in fig.4

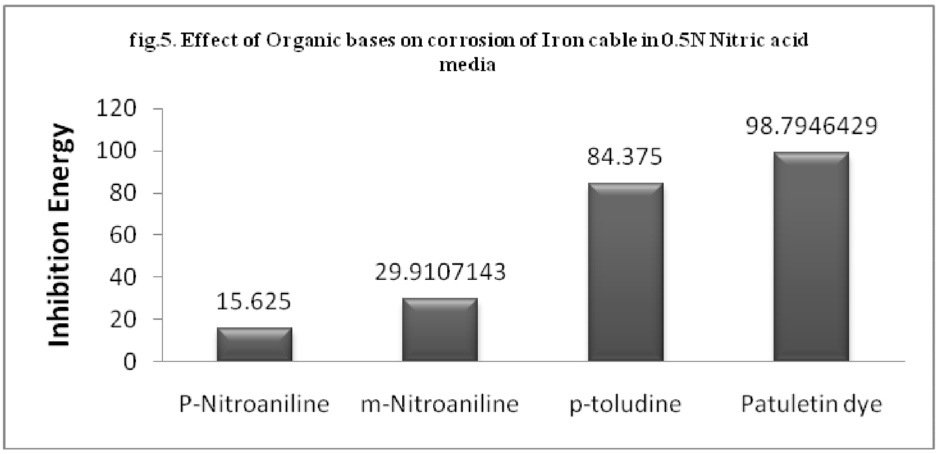


From these data, the patuletin dye shows the good result of antioxidant properties or inhibition energy.

3.2.2. EFFECT OF ORGANIC BASES ON CORROSION OF IRON CABLE:
Effect of bases and patuletin dye on corrosion of iron cable in 0.5N HNO_3 acidic medium. It is summarise the data in table no. 4, from that data patuletin dye shows the higher inhibition energy i.e. 98.7946%

Table no.:4. Effect of organic bases on corrosion of Iron cable in 0.5 N Nitric acid media.						
Sr.no.	**Organic Compound**	**Initial Weight (g)**	**Final Weight (g)**	**Loss in Weight (g)**	**% Loss in Weight**	**Inhibition Energy (%)**
1.	Control	1.03	0.806	0.224	21.7476	--------
2.	P-Nitroaniline	1.03	0.841	0.189	18.3495	15.625
3.	m-Nitroaniline	1.03	0.873	0.157	15.2427	29.9107143
4.	p-toludine	1.03	0.995	0.035	3.39806	84.375
5.	Patuletin dye	1.03	1.0273	0.0027	0.2621	98.794642

Graphical representation of comparison corrosion properties in bases and patuletin dye in fig.5.



From these data, the patuletin dye shows the good result of antioxidant properties or inhibition energy.

3.3 IN HYDROCHLORIC ACID MEDIUM:

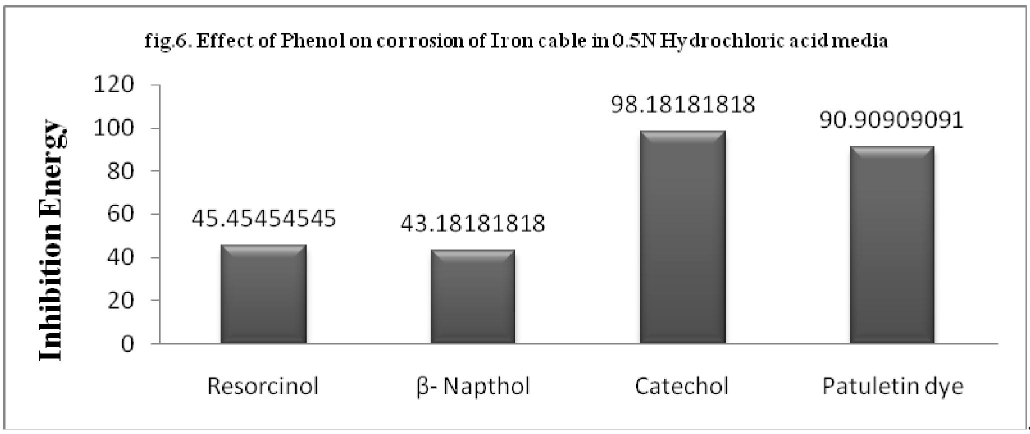
In hydrochloric acid medium, we have study the effect of phenol, organic bases and comparison with patuletin dye.

3.3.1. EFFECT OF PHENOL ON CORROSION OF IRON CABLE:

Effect of phenol and patuletin dye on corrosion of iron cable in 0.5N HCl acidic medium. It is summarise that, data in table no. 5, from that data catechol shows the higher inhibition energy i.e. 98.1818 %. & patuletin dye shows 90.90 % .

Table no.:5. Effect of phenol on corrosion of Iron cable in 0.5 N Hydrochloric acid media.						
Sr.no.	**Organic Compound**	**Initial Weight (g)**	**Final Weight (g)**	**Loss in Weight (g)**	**% Loss in Weight**	**Inhibition Energy (%)**
1.	Control	1.03	0.81	0.22	21.359223	--------------
2.	Resorcinol	1.03	0.91	0.12	11.650485	45.45454545
3.	β- Napthol	1.03	0.905	0.125	12.135922	43.18181818
4.	Catechol	1.03	1.026	0.004	0.3883495	98.18181818
5.	Patuletin dye	1.03	1.01	0.02	1.9417475	90.90909091

Graphical representation of comparison corrosion properties in phenol and patuletin dye in fig. 6.



From these data, the patuletin dye shows the good result of antioxidant properties of inhibition energy.

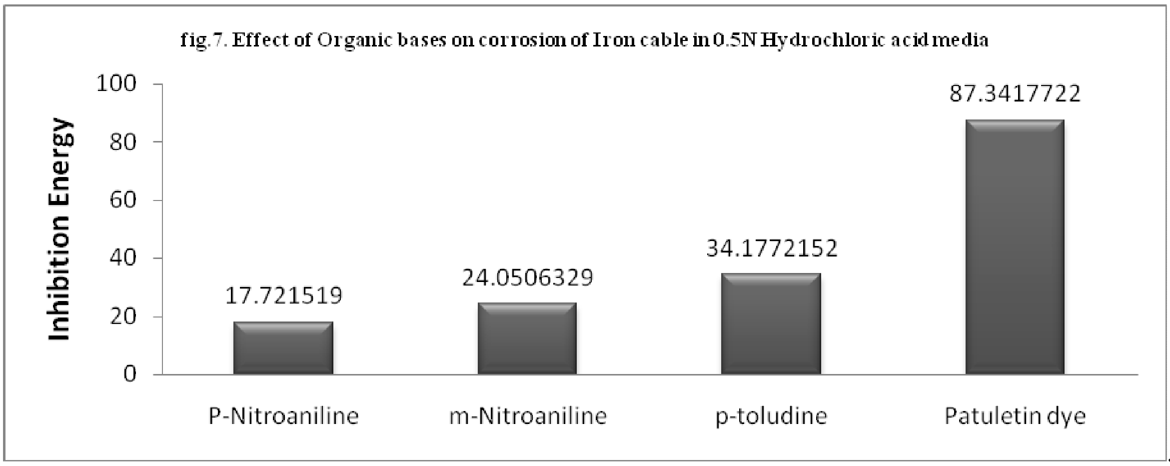
3.3.2. EFFECT OF ORGANIC BASES ON CORROSION OF IRON CABLE:

Effect of bases and patuletin dye on corrosion of iron cable in 0.5N HCl acidic medium. It is summarise the data in table no. 6, from that data patuletin dye shows the higher inhibition energy i.e. 87.3417%

Table no.:6. Effect of organic bases on corrosion of Iron cable in 0.5 N Hydrochloric acid media.

Sr.no.	Organic Compound	Initial Weight (g)	Final Weight (g)	Loss in Weight (g)	% Loss in Weight	Inhibition Energy(%)
1.	Control	1.03	0.872	0.158	15.3398058	-----------
2.	P-Nitroaniline	1.03	0.9	0.130	12.6213592	17.721519
3.	m-Nitroaniline	1.03	0.91	0.120	11.6504854	24.0506329
4.	p-toludine	1.03	0.926	0.104	10.0970874	34.1772152
5.	Patuletin dye	1.03	1.01	0.02	1.94174757	87.341772

Graphical representation of comparison corrosion properties in bases and patuletin dyes in fig. 7



From these data, the patuletin dye shows the good result of antioxidant properties or inhibition energy.

CONCLUSION

On the basis of above study, we can conclude that, the patuletin dye was easily available, has low coast as compared with other antioxidant phenol and bases. It also extracted with high yield.

As compared to catechol, the patuletin dye was no hazardous effect, it is easily degradable so it do not create the pollution and due its high availability. The patuletin dye is more economically beneficial in antioxidant treatment.

Acknowledgement

The authors are thankful to principal, G. S. G. College, Umarkhed, dist- Yavatmal, Maharashtra(India) for providing necessary facilities to carry out this work.

REFERENCES

[1] M.N.Desai and V.K. Shah, *Corros. Sci.* 12: 725 (**1972**).
[2] C.C. Nathan, *Corr. Inhibi.,* 161 (**1973**).
[3] F.H. Karma, E. Kalman, L. Varallyai and J.Konya, *Z. Naturforch,* 46: 398 (**1991**).
[4] E. Kalman, G. Palinkas, F.H. Karman, J. Telegdi, B. Varhegyi, J. Balla and T. Kiss. *Corr. Sci.* 35: 1477 (**1993**).
[5] R.J. Chin and K.Nobe, *Electrochem. Soc.* 119: 1457 (**1972**).
[6] D.M. Dradic, L. Vracar and V.Drazic, *Electrochem. Acta,* 39: 1165 (**1994**).
[7] N.U.Jadhao, *The ecosphere,* 2 (1&2) :167-169,(**2011**).
[8] R. Agarwal, N. Pruthi and S. Singh , *Natural Product Radiance*; 6: 306-09, **(2007).**
[9] E.J. Tiedemann and Y. Yang *Journal of the American Institute of Conservation*; 34: 195-206, (**1995).**
[10] A. Sarkar and C.M. *Clothing and Textiles Research Journal*; 21(4): 162-66,(**2003).**