

## **To study the solvent effect and staining properties of *T. patula* dye extracted from wasted temple french marigold flower**

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### **ABSTRACT**

*The T.Patula dye is easily made from French marigold which is widely used in temple after use the flowers are thrown in river and cause river pollution so in this work we have used that, wasted French marigold flower and minimized the river pollution. The solvent effect study of T.Patula dye shows high absorbance in various solvents and interesting outcome of this work is that T.Patula dye shows staining properties in water conductive tissue i.e. xylem of plant so it is used as stain in botany laboratory.*

**Keywords:-** Solvent effect, Pollution and Staining properties.

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### **INTRODUCTION**

The study was aimed at investigating the effect of various solvents on the absorption spectra of patuletin dye belonging to Natural class of dyes. The solvents chosen for the study were water, ammonia, sodium hydroxide, hydrochloric acid, ethanol, acetonitrile, acetone, propan-1-ol, chloroform, nitrobenzene, ethylene glycol, acetic acid and DMSO [1-2].

It is very well known that chemical processes are influenced by the properties of solvents in which they are carried out. These include the dipole moment, dielectric constant, and refractive index values [3]. The most important property in this regard is the solvent polarity which can change the position of the absorption or emission band of molecules by solvating a solute molecule or any other molecular species introduced into the solvent matrix.

A number of literature citations are available for the studies of simple organic molecules with regard to their interactions in different solvents [4]. Dye molecules on the other hand are complex organic molecules which might carry charge centres (as an integral part of their structure or because they are derived salts) and are thus prone to absorption changes in various media. The structural complexity of dye molecules has drawn attention of many workers to understand their behaviour in various media. These changes are important to understand various physical-organic reactions of these macromolecules which have become important in different fields of pure and applied chemistry such as synthetic chemistry, extraction of dyes from solution, photodynamic therapy and chelating processes [5-6].

A stain is a discoloration that can be clearly distinguished from the surface, material, or medium it is found upon. Stains are caused by the chemical or physical interaction of two dissimilar materials. Stains are used intentionally in a variety of fields, including in research (biochemical staining), technology (metal staining), and art (wood staining, stained glass) [7-10].

Marigold (*Tagetes Erecta* L.) and French marigold (*Tagetes patula* L.) are used for preparation of dye. The textile industries use large volume of these dyes in their operations and therefore discharge large amount waste water into the environment, most of which is untreated. For the treatment of that water, we must know about the dye present in

and solvent effect on that dye. So in the present study deals with the solvent effect on the absorption spectra of T.Patula dye which belongs to natural class of dyes. Absorption spectrum of the dye solution was recorded in different solvents with the aim to probe the effects of various solvents and correlate absorption parameter to dye spectra in various solvents. For this purpose solvents of different types were selected, firstly the non hydrogen-bond donating solvents (also called as non-HBD type of solvents) such as NaOH and secondly the hydrogen-bond donating solvents (also called as HBD type solvents) such as acetic acid. From the solvent effect, study proper solvent system for using the staining properties of T.Patula dye.

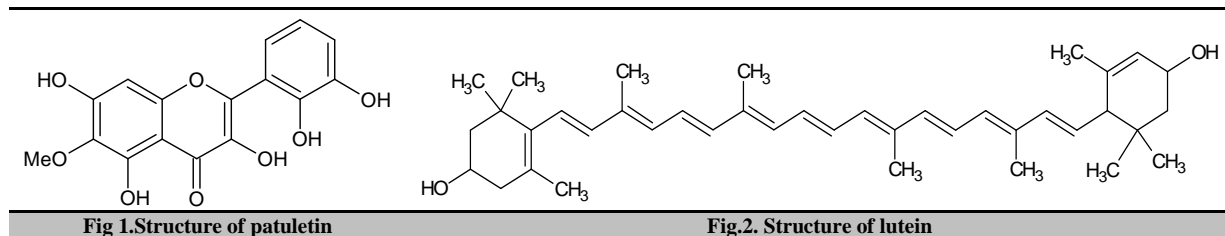
## MATERIALS AND METHODS

- The spectrophotometer was used for study the effect of solvent on a T. patula dye.

### 2.1. PREPARATION OF STAIN:

- 1) T. Patula + NaOH + Conductivity water  $\longrightarrow$  Green stain
  - 2) T. Patula + HCl + Conductivity water  $\longrightarrow$  Red stain
- The entire chemical prepared in as  $4 \times 10^{-3}$  M,
  - The T.Patula dye was prepared by Taking the patuletin and lutein in 1:1 proportion.

The following fig.1 and 2 are the structure of patuletin and lutein respectively.



### 2.2. STAINING PROCESS:

Take a thin section of stem of plant in Petridis containing distilled water then transfer this section to the 30% alcohol for 15 min after 15 min it transfer to the 50% alcohol for 15 min after that it transfer to the 70% alcohol for 15 min then transfer it to the Green stain after that it transfer to the Red stain for 10 min then it transfer to the 90% alcohol for 10 min after that it transfer to the absolute alcohol then it transfer to the xylene. Finally transfer to the slide and mount slide with DPX.

After mounting of slide, seen under Lambomed, ( vision 200, T250 L250) microscope and capture the image of section.

## RESULTS AND DISCUSSION

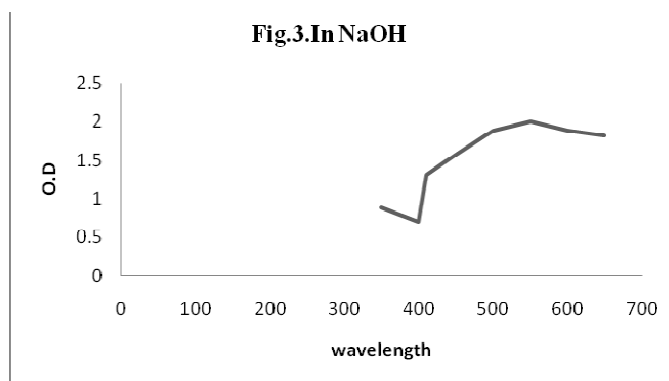
### 3.1. SOLVENT EFFECT:

#### 3.1.1. IN NaOH :

Solvent effect is summarised in the table 1. From that data  $\lambda$  max at 550 nm and absorbance was 1.999. The fig.3 show the graphical represent of wavelength Vs absorbance.

Table 1.- Solvent effect in sodium hydroxide

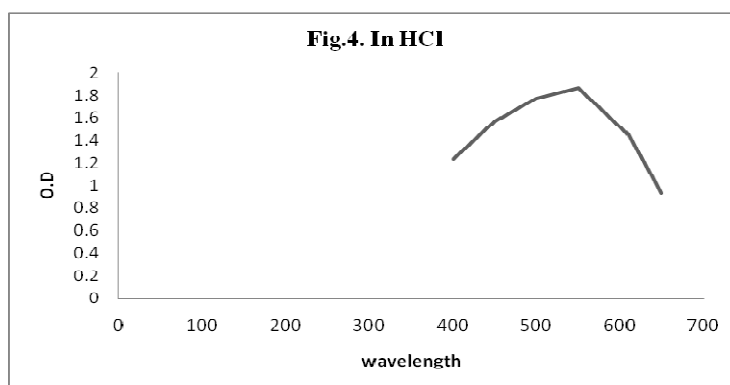
Sr.no.	Wavelength (nm)	O. D.
1.	350	0.879
2.	400	0.701
3.	410	1.308
4.	450	1.568
5.	500	1.886
6.	550	1.999
7.	600	1.879
8.	650	1.814

**3.1.2. IN HCl :**

Solvent effect is summarised in the table 2 from that data  $\lambda$  max at 550 nm and absorbance was 1.863. The fig.4 show the graphical represent of wavelength Vs absorbance

**Table 2:- Solvent effect in hydrochloric acid**

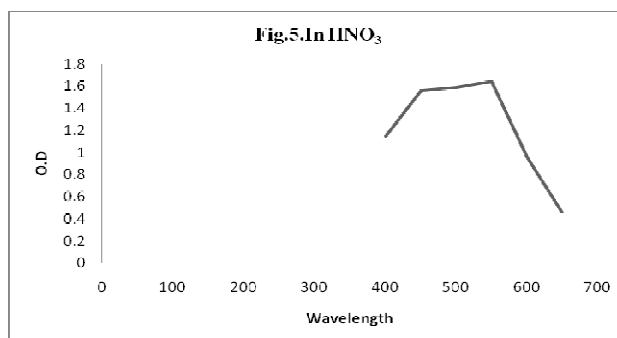
Sr.No.	Wavelength (nm)	O.D.
1	400	1.231
2	450	1.569
3	500	1.776
4	550	1.863
5	600	1.521
6	610	1.455
7	650	0.932

**3.1.3. IN HNO<sub>3</sub>:**

Solvent effect is summarised in the table 3 from that data  $\lambda$  max at 550 nm and absorbance was 1.642. The fig.5 show the graphical represent of wavelength Vs absorbance.

**Table 3:- Solvent effect in Nitric acid.**

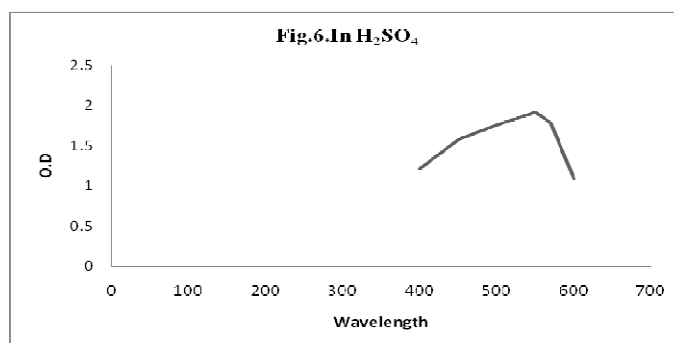
Sr.No.	Wavelength (nm)	O.D.
1	400	1.142
2	450	1.564
3	500	1.592
4	550	1.642
5	600	0.959
6	650	0.456

**3.1.4. IN H<sub>2</sub>SO<sub>4</sub> :**

Solvent effect is summarised in the table 4 from that data  $\lambda$  max at 550 nm and absorbance was 1.919. The fig.6 show the graphical represent of wavelength Vs absorbance.

**Table 4:- Solvent effect in sodium hydroxide**

Sr.No.	Wavelength (nm)	O.D.
1	400	1.217
2	450	1.158
3	500	1.759
4	550	1.919
5	570	1.786
6	600	1.088

**3.1.5. IN ACETIC ACID :**

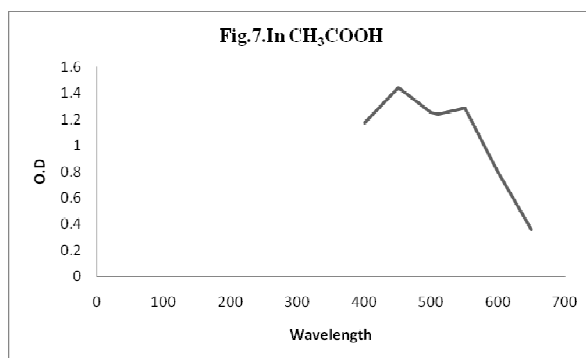
Solvent effect is summarised in the table5 from that data  $\lambda$  max at 550 nm and absorbance was 1.287. The fig.7 show the graphical represent of wavelength Vs absorbance.

**Table 5:- Solvent effect in acetic acid**

Sr. No.	Wavelength (nm)	O.D.
1	400	1.176
2	450	1.443
3	500	1.251
4	510	1.241
5	550	1.287
6	600	0.79
7	650	0.36

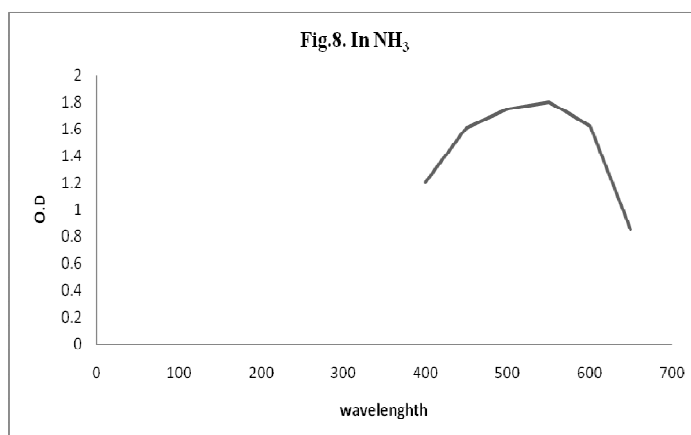
**3.1.6. IN NH<sub>3</sub> :**

Solvent effect is summarised in the table 6 from that data  $\lambda$  max at 550 nm and absorbance was 1.803. The fig.8 show the graphical represent of wavelength Vs absorbance.

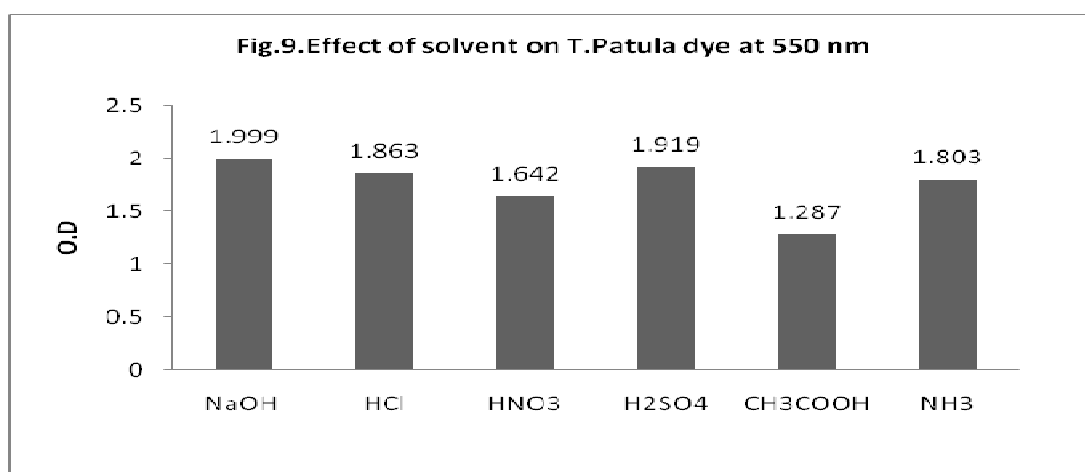


**Table 6.-: Solvent effect in ammonia.**

Sr.No.	Wavelength (nm)	O.D.
1	400	1.203
2	450	1.612
3	500	1.747
4	550	1.803
5	600	1.624
6	650	0.856



From the above study, we can say that,  $\lambda$  max of T. Patula dye in above solvent was remained same at various absorbance .The various absorbance of T. Patula dye in different solvent at same  $\lambda$  max shown in fig.9



**3.2. STAINIG PROPERTIES:**

Taking T.S. of caneria stem, we have taken an image of section without stain, this image shown in fig.10.in this image we can clearly seen the xylem and phloem but after some time water was removed and section was collapse. So for preserving the section, we must make the stain and permanent slide.

After the staining process, we have taken an image of section with reference stain (saffron and green fast stain) and T. Patula as shown in fig 11 and 12 respectively.

By comparing these two staining images, we can observed that, in T.Patula staining image is resemble with reference staining image. So we can also use the T.Patula dye as a stain.

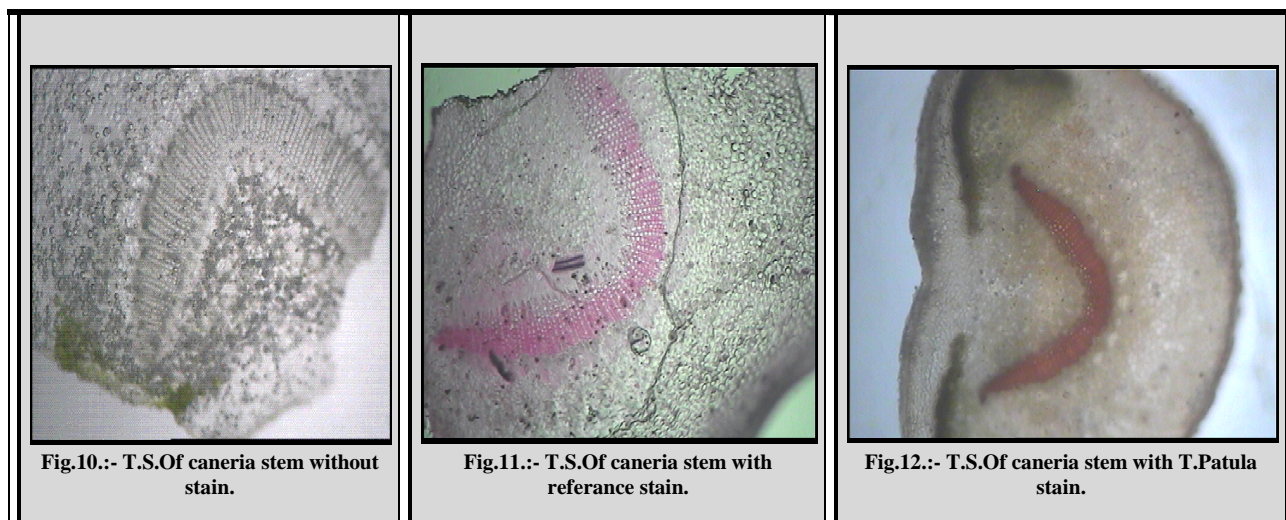


Fig.10.- T.S.Of caneria stem without stain.

Fig.11.- T.S.Of caneria stem with referance stain.

Fig.12.- T.S.Of caneria stem with T.Patula stain.

### CONCLUSION

The values of  $\lambda_{\max}$  of T.Patula Dye in these solvents are same. One can see from this data that, the absorption maximum of the dye is affected by solvent type and has a maximum of in the solvent sodium hydroxide and in hydrochloric acid so these solvent was best for T.Patula dye in staining. Thus this change in spectral position can be used as a probe for various types of interactions between the solute and the solvent.

From the staining properties, we can observe that, in T.Patula staining image is resemble with reference staining image so T.Patula dye also use as a stain for xylem in botany laboratory.

### Acknowledgement

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