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Research Article

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Effect of textile dyes on *Spirulina platensis*

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ABSTRACT

Textile effluents are the basic problem to pull down the level of nutrient source of water and that source is spirulina , it is well known as it also create a film on water surface so that due to lack of sunlight aquatic life suffers. Here effect of many dyes have been observed by using proper methods, and it is concluded that on increasing the concentration of dyes in water then it resist the growth of spirulina platensis and decrease its nutrient level as well. In this paper three textile dyes have been taken congo red, metanil yellow and mordant green, results have been noticed as, on 14th day in control 0.435 absorbance has been found while at 100mg concentration, 0.397 absorbance has been found in congo red, 0.210 has been found in metanil yellow and 0.210 in mordant green. These results depict that the above statement is true. This paper also shows the effect of these dyes on chlorophyll content, carbohydrate content and protein content, in control on 14th day the chlorophyll content noticed as 0.369 on the other hand congo red at 100mg concentration read 0.242, metanil yellow as 0.136 and mordant green is taken as 0.216.

Keywords: *Spirulina platensis*, congo red, metanil yellow, mordant green, textile effluents

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INTRODUCTION

Now a days textile dyeing and finishing industry is facing major environmental problem and that is the industry produces large volumes of high strength aqueous waste continuously. The discharge of waste water containing recalcitrant residues into river and lakes lead to higher biological oxygen demand (BOD) causing serious threat to native aquatic life [17]. Textile effluents or dye containing wastewaters (i.e. 10000 different textile dyes with an estimated annual production of 7.10^5 metric tones are commercially available worldwide 30% of these dyes are used in excess of 1000 tonnes per annum or less) [1].10-25% of textile dyes are lost during the dyeing process, and 2-20% are directly discharged as aqueous effluents in different environmental components.

The discharge of dye containing effluent into the water environment is undesirable, not only because of their color but also because of many dyes released and their breakdown products are toxic, carcinogenic or mutagenic to life forms mainly because of carcinogens, such as benzidine, naphthalene and other aromatic compounds [21]. Without adequate treatment these dyes can remain in the environment for a very long period of time. For example , the half life of hydrolysed Reactive Blue 19 is about 46 years at pH 7 and at 25ºC [13].

As per the studies, wastewater from textile industry, dyeing industries, pulp and paper industries contain very toxic materials, which need to be treated. Effluent from textile industries that is highly colored synthetic dye have been released into receiving water that have polluted main water resources. Dyes may also significantly effect photosynthetic activity in aquatic life due to reduced light penetration and may also be toxic to aquatic life due to

presence of aromatics, metals and chlorides etc in them [18]. Therefore this wastewater from textile industries have negative impact on ecosystem [17]. When dyes are discharged into water bodies they show their toxic effect in water bodies [4]. Actually dyes in water not only reduce photosynthetic activity but also reduce dissolved oxygen concentration. There are many different physical and chemical methods for removal of dyes from wastewater. However these methods have some disadvantages also. Therefore new ecofriendly alternatives for this task are being developed [11].

Release of azo dyes into the environment from the effluent of the industries has become a major concern in waste water treatment because some azo dyes are toxic for the aquatic biota as they may be carcinogens [6,7]. The presence of very small amounts of dyes in water is highly visible and effects the aesthetic merit, water transparency and the gas solubility in bodies of water [2]. Color prevents penetration of sunlight into the water and reduces light transmission that could affect primary productivity color negatively affects photosynthetic activity and which is required for organisms to feed or reproduce [20].

EXPERIMENTAL SECTION

Experimental model

The Cyanobacterium, *S platensis* showed slightly spiral, lift direction of helix, 7-10 um width of cylindrical trichome, 33-48 um diameter of spiral and pH tolerance range was 9 -11.

Culture Medium

Zarrouk's medium

Spirulina was grown in the Zarrouk's medium (ZM) (Zarrouk, 1996). The Composition of growth medium (g/l) is given as:

Macronutrient	g/l
$NaHCO_3$	16.8g
K_2HPO_4	0.58g
$NaNo_3$	2.5g
K_2SO_4	1.0g
NaCL	1.0g
$CaCl_2 2H_2O$	0.04g
$MgSO_4 7H_2O$	0.2g
$FeSO_4 7H_2O$	0.04g
EDTA	0.08g
As (Micronutrient)	1.0g
pH	9.0

$NaHCO_3$ was added after autoclaving and pH was adjusted with IN NaOH. Composition of micronutrient solution was as follows:

Macronutrient	g/l
H_3BO_4	2.86g
$MnCl_2 4H_2O$	1.8g
$ZnSO_4 4H_2O$	0.222g
Na_2MoO_4	0.0177g
$CuSO_4 5H_2O$	0.079g

4.3 Sterilization

The growth media was used for the routine culturing of the test organism. Growth media was steam sterilized in an autoclave at 121^0C and at a pressure of 15 pounds per square inch 20 minutes. All glassware was sterilized in hot air oven at 160^0C for 2 hours. The chemicals, which are heat labile and may be affected by high temperature during autoclaving, were sterile by filtration through Millipore filter.

4.5 Incubation and maintenance of culture

The culture of *Spirulina platensis* was incubated and maintained in a culture room at temperature of 25^0C under cool white fluorescent tubes in 12/12 hour dark life cycle. The culture was shaken twice a day manually. All the sub-culturing and inoculation operation were carried out in the laminar airflow, all experiments were conducted in triplicate.

4.6. Growth measurement

Growth was monitored by measuring increase in chlorophyII-a carbohydrate content and protein content in the presence of different dyes (congo red, metanil yellow and mordant green) concentration and the absorbance was recorded at 540 nm and was expressed in terms of specific growth rate (μ/hr). At the specific growth rate constant (μ) correspond to $\ln 1/t_d$ where t_d is the doubling time. The specific growth rate (μh^{-1}) was computed to following the method of [22].

$$K = 2.303 \frac{(logN2 - logN1)}{T2 - T1}$$

Where,

N_1 = Initial optical density/protein concentration at time. T_1
N_2 = Final optical density/protein concentration at time . T_2

4.7 ChlorophyII- a estimation

ChlorophyII- a was estimated following the method of Mackinney[15].

Known volumes (3ml) of *Spirulina platensis* Cultures were harvested by Centrifugtion (5000rpm, 10 minutes) and the resulting pellet was resuspended in the equal volume amount (3ml) of methanol. After through mixing was kept at 4^0C. for 24 hours. Thereafter, it was centrifuged and the absorbance of the cell – free metabolic extract was recorded at 663 nm against methanol as a blank. Quantification of Chl-a($\mu g/ml$) was made by using the absorption coefficient of 12.63 of 12.63 was given by mackinney (1941).

4.8 Carbohydrate estimation

The total carbohydrate content of the Cyanobacterial cells was estimated by the method describe by [5]0.5 ml of an algal culture was taken into a thick wall test tube into which 1.5 ml of distilled water and a set of glucose standard was prepared simultaneously and 1ml of 5% phenol was added to each tube. After through mixing, 5 ml of sulfuric acid was added from a fast blowing auto pipette, directing the stream of acid to the agitated reaction mixture for fast mixing. Such tubes were incubated at room temperature for 10min. for complete reaction, and thereafter, shaken and placed in a water bath (30^oC, 20min). The intensity of the characteristic straw color thus developed was determined by reading absorbance at 492nm and the carbohydrate content (μg/ml carbohydrate) was calculated from the glucose standard.

4.9 Estimation of protein content

The growth of *Spirulina platensis* was also monitored by measuring an increase in total protein (μg/ml) by the method of [16] modified by [3].

0.5 ml of homogenized algal culture was taken in a test tube and 0.5 ml of 1N NaOH was added to it and placed in boiling water bath for 5 minutes. After cooling in cold water 2.5 ml of reagent "D" was added and allowed to react for 10 minutes. 0.5 ml of 1N Folin's reagent was then added and mixed thoroughly and allowed to stand for 30 minutes for development of blue color and then centrifuged at 5000 rpm for 30 minutes. The absorbance of the clean liquid was measured at 650 nm, and the amount of algal cell protein calculated as μg/ml culture with reference to a standard calibrated curve, obtained with BSA. The same procedure was adopted in preparing standard curve using graded concentration of BSA.

RESULTS

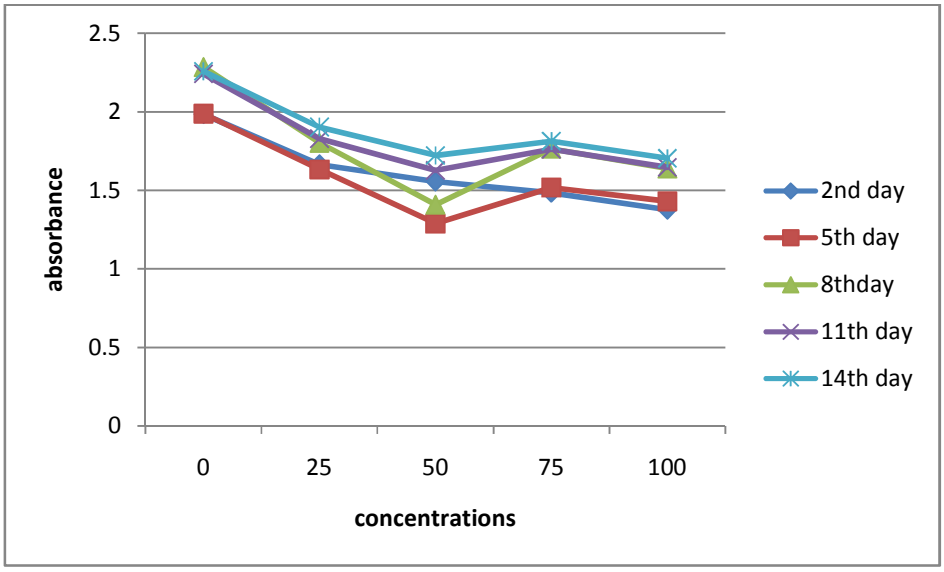
Congo red dye:-

Effect of Textile dye congo red on the overall growth of *Spirulina platensis*

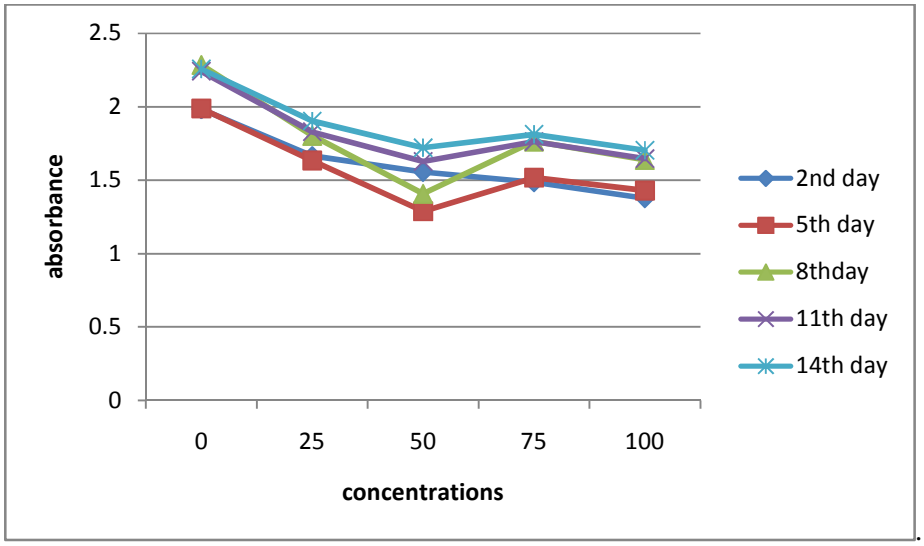
As depicted in Table 1.1 the effect of congo red dye concentration (25-100mg/I) on the specific growth rate of *S.plantensis*, in the presence of textile dye congo red had less specific growth rate at concentration beyond 75 mg congo red dye. The data demonstrates that the maximum growth rate is found in control. After control there is good growth at (25 mg/I) concentration of dye. Exposure of the *S.platensis* to higher concentrations (100mg) of congo red dye resulted in suppression of growth. As expected, genera of the Cyanobacteria responded differentially to congo red dye concentration.

Table 1.1: Effect of different concentration of textile dye congo red on the growth of *spirulina platensis* with time

Days/absorbance	control	25 mg/l	50 mg/l	75 mg/l	100 mg/l
2nd day	0.255	0.180	0.171	0.129	0.121
5th day	0.305	0.192	0.187	0.155	0.124
8th day	0.388	0.202	0.200	0.174	0.182
11th day	0.412	0.379	0.376	0.371	0.330
14th day	0.435	0.429	0.426	0.420	0.347



Growth pattern of *S. platensis* due to dye exposure



Pattern of chlorophyll content in *S.platensis* due to dye exposure

Effect of Textile dye congo red on the Chlorophyll l-a content of *Spirulina platensis*

As shown in Table various congo red dye concentration influence chl-a content in Spirulina plantensis is a time dependent manner. Chl-a content of *Spirulina plantensis* is maximum in control as compare with congo red dye treated cells. As concentration of dye increases in medium Chl-a content of cells decreases. As compare with control there is maximum Chl-a content at 25 mg concentration of dye and minimum at 100 mg concentration . Chl-a

content is lower in congo red treated cells as compare with control. It was determined that beyond (75mg) Chl-a content decrease significantly.

Table 1.2: Effect of different concentration of textile dye congo red on the chlorophyll content of *spirulina platensis* with time

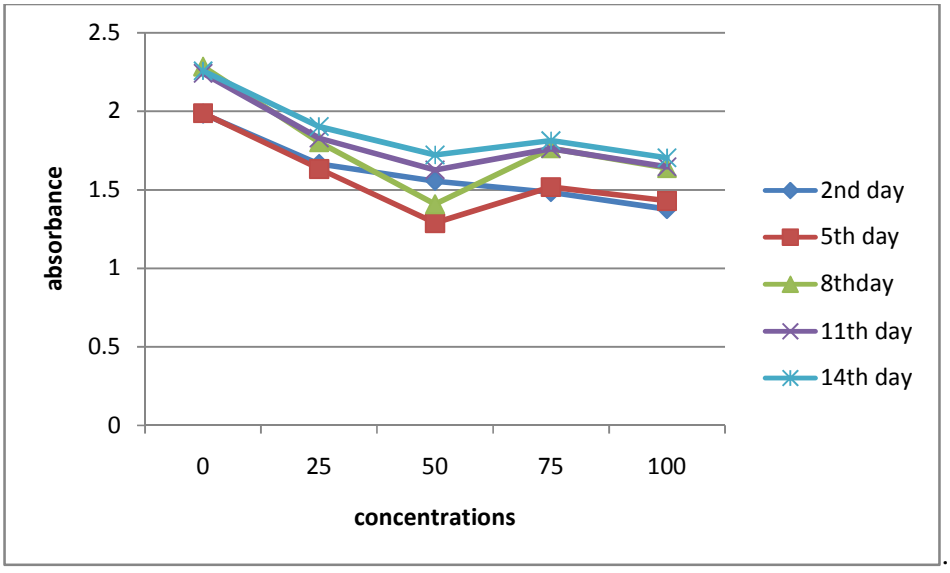
Days/absorbance	control	25 mg/l	50 mg/l	75 mg/l	100 mg/l
2nd day	0.17	0.155	0.146	0.139	0.134
5th day	0.193	0.18	0.176	0.145	0.138
8th day	0.213	0.209	0.201	0.196	0.158
11th day	0.257	0.254	0.248	0.242	0.174
14th day	0.369	0.343	0.338	0.291	0.242

Effect of congo red dye on the protein content of *Spirulina plantensis*

As shown in table 1.3 various concentration of congo red dye influence protein content in *Spirulina plantensis* in a time dependent manner. The concentration of protein increase with respect to incubation period. Initially the concentration of protein is low but later on it shows significant concentration of protein. The concentration of protein in control (83.76μg/ml) on the 14 day. At 25 mg congo red dye concentration protein content of *Spirulina plantensis* increased with time and attained maximum level (72.62μg/ml) on the 14th day but it is lower as compare to control. Further increase in the concentration of congo red dye in the growth medium resulted in suppression of protein content. It was determined that protein content at the highest concentration of dye that is 100mg/l is lowest 33.87.

Table 1.3: Effect of different concentration of textile dye congo red on the protein content of *spirulina platensis* with time

Days/absorbance	control	25 mg/l	50 mg/l	75 mg/l	100 mg/l
2nd day	27.5	8.57	6.8	6.68	6.34
5th day	38.26	8.91	8.51	6.8	6.57
8th day	38.41	36.20	34.78	33.83	9.02
11th day	54.09	46.52	45.83	40.31	19.88
14th day	83.76	72.62	66.66	53.11	33.87



Pattern of protein content in *S.platensis* due to dye exposure

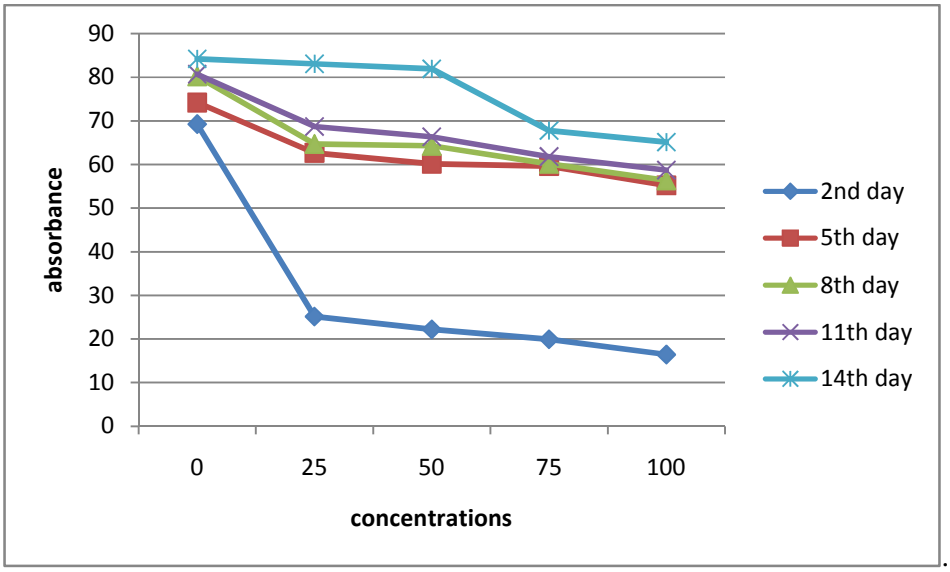
Effect of different concentration of congo red dye on the carbohydrate content of *Spirulina platensis*

As shown in table the data demonstrate that various concentration of congo red dye influence the carbohydrate content in Spirulina platensis in a time dependent manner. The carbohydrate content of Spirulina platensis at 25 mg concentration is increases with incubation period, it attained its maximum level of (83.03µg/ml) on the 14th day it is slightly lower as compare with control (84.16µg/ml). It was determined that carbohydrate content was found under

limit at 50mg of congo red dye concentration. However, beyond this concentration congo red dye caused reduction in carbohydrate content.

Table 1.4: Effect of different concentration of congo red dye on the carbohydrate content of *Spirulina platensis* with time.

Days/absorbance	control	25 mg/l	50 mg/l	75 mg/l	100 mg/l
2nd day	69.23	25.11	22.17	19.9	16.4
5th day	74.2	62.66	60.12	59.61	55.2
8th day	80.2	64.7	64.25	68.97	56.33
11th day	80.65	68.66	66.28	60.13	58.67
14th day	84.16	83.03	81.9	67.76	65.14



Pattern of carbohydrate content due to dye exposure

Metanil yellow dye:-

Effect of textile dye metanil yellow on the overall growth of *spirulina plantensis*

As depicted in Table 1.5 the effect of metanil yellow dye concentration (25-100mg/I) on the specific growth of *S.plantensis*, growth of *Spirulina plantensis* decreased with increased concentration of metainil yellow dye in the growth medium. Initially the growth was poor but later on it shows significant growth at 25 mg/l the growth was lower as compare to the respective control. But at 25 mg concentration there is higher growth (0.299) as compare to the other dye concentration of congo red dye. Exposure of metanil yellow dye at higher concentration (100mg) resulted in suppression of growth (0.210).

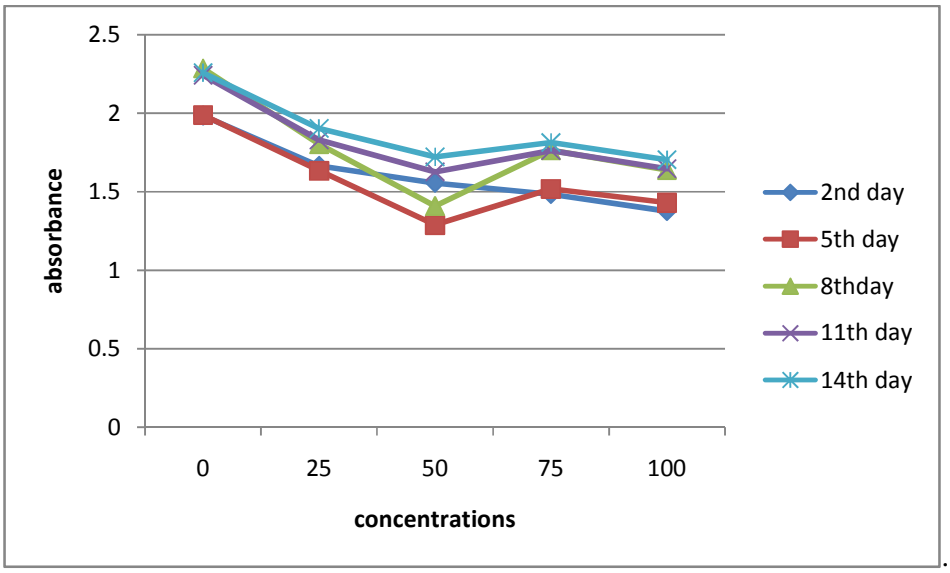
Table 1.5: Effect of different concentration of textile dye Metanil yellow dye on the growth of *Spirulina platensis* with time

Days/absorbance	control	25 mg/l	50 mg/l	75 mg/l	100 mg/l
2nd day	0.255	0.219	0.190	0.172	0.130
5th day	0.305	0.238	0.206	0.188	0.185
8th day	0.388	0.252	0.239	0.227	0.199
11th day	0.412	0.273	0.244	0.233	0.201
14th day	0.435	0.299	0.275	0.269	0.210

Effect of Textile dye Metanil yellow on the Chlorophyll-a content of *Spirulina platensis*

As shown in Table various metanil yellow dye concentrations influence Chl-a content in *Spirulina plantensis* in a time dependent manner. Chl-a content is lower in metanil yellow dye treated cells as compare with control . As concentration of dyes increases the Chl-a content decrease. An increased in the concentration of metanil yellow beyond 25 mg, caused reduction in the Chl-a content. As compare with other dye concentration of metanil yellow

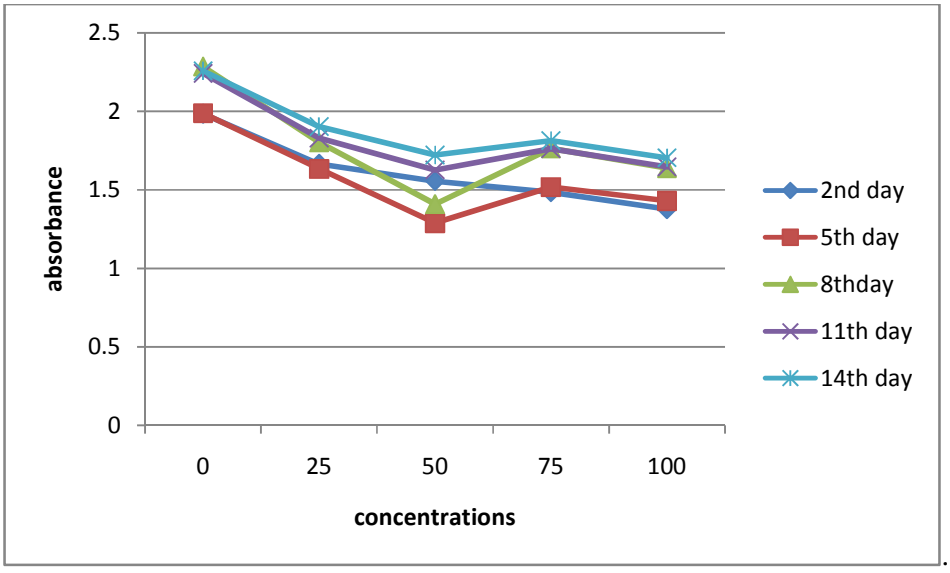
there is higher content of Chl-a at 20 mg concentration is (0.225) and concentration beyond this Chl-a decreased significantly.



Growth pattern of *S.platensis* due to dye exposure

Table 1.6: Effect of different concentration of textile dye Metanil yellow dye on the growth of *Spirulina platensis* with time

Days/absorbance	control	25 mg/l	50 mg/l	75 mg/l	100 mg/l
2nd day	0.17	0.13	0.125	0.107	0.103
5th day	0.193	0.175	0.125	0.11	0.106
8th day	0.213	0.19	0.136	0.131	0.129
11th day	0.257	0.202	0.146	0.133	0.129
14th day	0.369	0.225	0.169	0.145	0.136



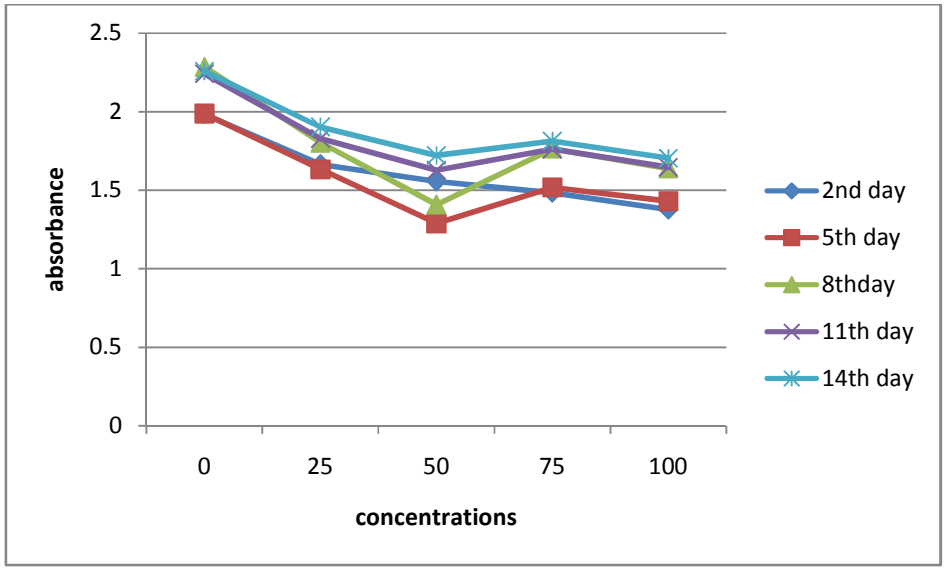
Pattern of chlorophyll content in *S.platensis* due to dye exposure

Effect of Metanil yellow dye on the protein content of *Spirulina platensis*

As shown in table 1.7 various concentration of Metanil yellow dye influence protein content in Spirulina platensis in a time dependent manner. As compare with control the concentration of protein was lower in the presence of metanil yellow dye in growth medium. The protein content at 25mg concentration was increased with time and attained maximum level (65.42µg/ml) on the 14th day but this concentration is low as compared to the control (83.76µg/ml). Further increase in the concentration of metanil yellow dye in growth medium resulted in suppression of protein. It was determined that beyond 50mg concentration caused reduction in protein content.

Table 1.7: Effect of different concentration of metanil yellow dye on the protein content of Spirulina platensis with time.

Days/absorbance	control	25 mg/l	50 mg/l	75 mg/l	100 mg/l
2nd day	27.5	8.34	8.05	6.74	6.28
5th day	38.26	21.00	9.14	8.17	6.68
8th day	38.41	32.45	28.8	20.00	10.11
11th day	54.09	52.08	51.5	40.63	32.08
14th day	83.76	65.42	60.77	51.09	42.09



Pattern of protein content in *S.platensis* due to dye exposure

Effect of different concentration of Metanil yellow dye on the Carbohydrate content of *Spirulina platensis.*

As shown in table the data demonstrate that various concentration of metanil yellow dye influence the carbohydrate content in Spirulina platensis in a time dependent manner. The carbohydrate content of Spirulina platensis at 25 mg concentration is increases with incubation period it attained its maximum level of (83.48µg/ml) on the 14th day it is slightly lower as compare with control (84.16µg/ml). The concentration was found under limit at 20mg of metanil yellow dye concentration. However, beyond this concentration metanil yellow dye caused reduction in carbohydrate content.

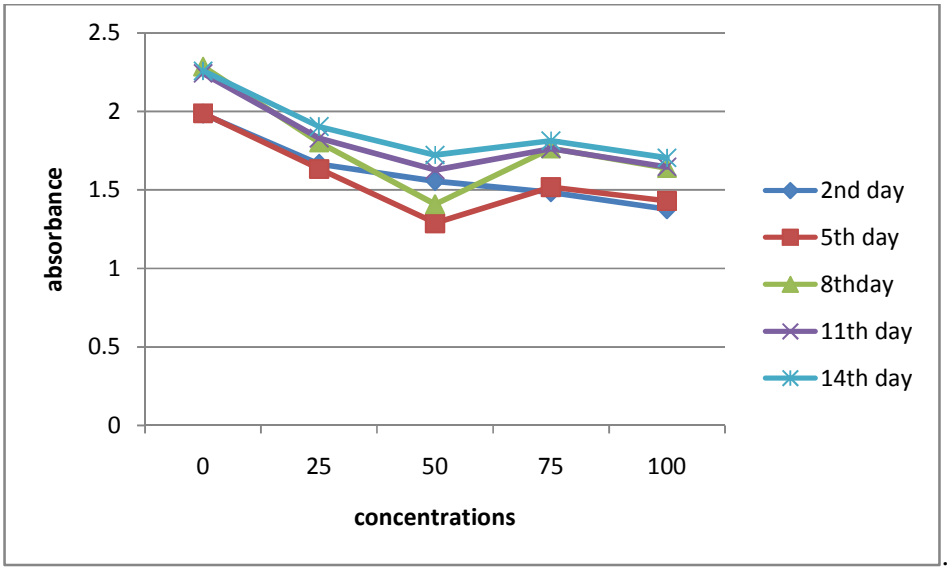
Table 1.8: Effect of different concentration of metanil yellow dye on the carbohydrate content of *Spirulina platensis* with time.

Days/absorbance	control	25 mg/l	50 mg/l	75 mg/l	100 mg/l
2nd day	69.23	22.51	28.24	18.55	17.42
5th day	74.20	60.40	59.38	54.75	44.57
8th day	80.20	67.08	66.40	59.84	59.61
11th day	80.65	69.34	68.21	66.06	60.52
14th day	84.16	83.48	69.11	66.40	64.02

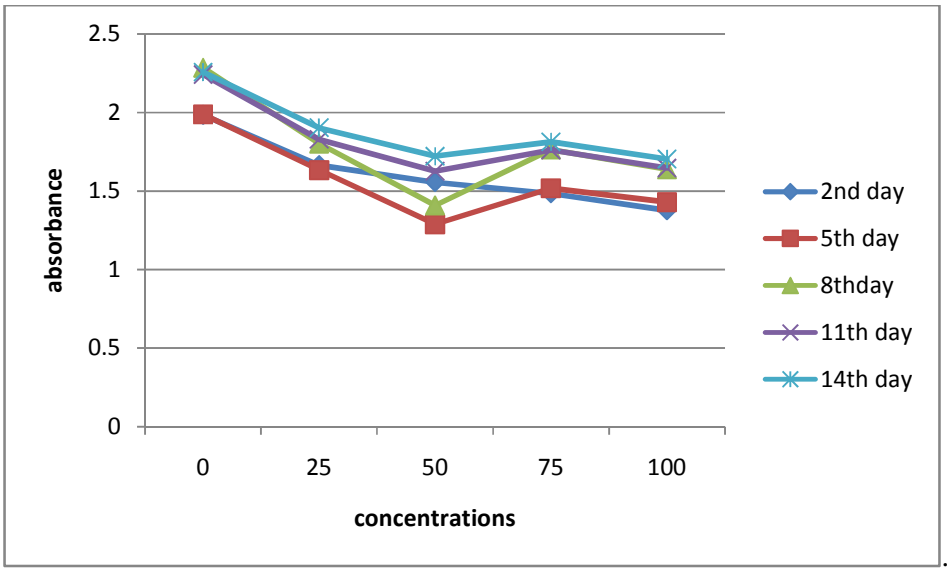
Mordant green:-

Effect of textile dye mordant green on the overall growth of *spirulina plantensis*

As depicted in Table 1.9 the effect of mordant green dye concentration (25-100mg/I) on the specific growth of *S.plantensis*, growth of *Spirulina plantensis* decreased with increased concentration of mordant green dye in the growth medium. Initially the growth was poor but later on it shows significant growth at 25 mg the growth was lower as compared to the respective control. But at 25 mg concentration there is higher growth (0.299) as compare to the other concentrations. Exposure of mordant green dye at higher concentration (100mg) resulted in suppression of growth (0.134).



Pattern of carbohydrate content in *S.platensis* due to dye exposure



Growth pattern of *S.platensis* due to dye exposure

Table 1.9: Effect of different concentration of textile dye Mordant green on the growth of *Spirulina platensis* with time

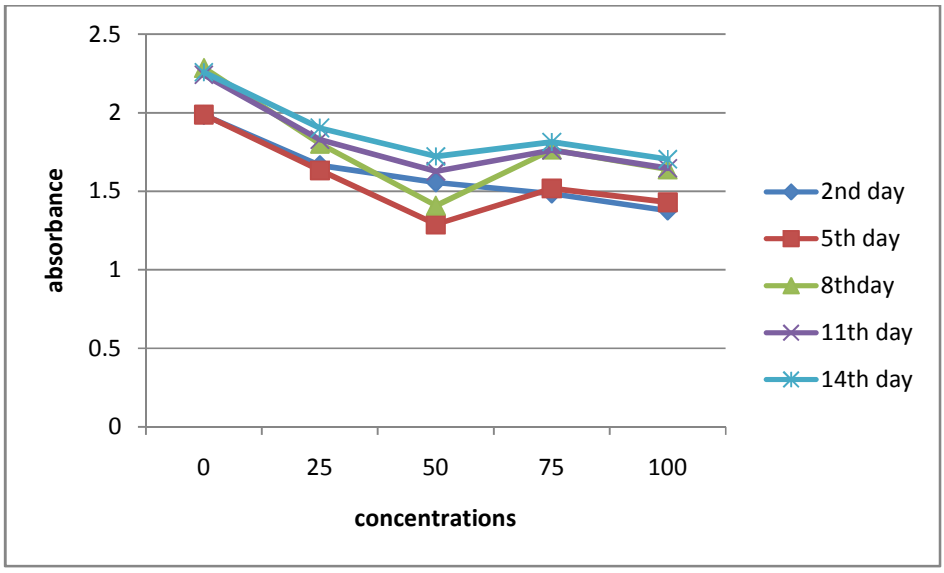
Days/absorbance	control	25 mg/l	50 mg/l	75 mg/l	100 mg/l
2nd day	0.255	0.219	0.190	0.172	0.130
5th day	0.305	0.238	0.206	0.188	0.185
8th day	0.388	0.252	0.239	0.227	0.199
11th day	0.412	0.273	0.244	0.233	0.201
14th day	0.435	0.299	0.275	0.269	0.210

Effect of Textile dye Mordant green on the Chlorophyll-a content of *Spirulina platensis*

As shown in Table various mordant green dye concentrations influence Chl-a content in *Spirulina plantensis* in a time dependent manner. Chl-a content is lower in mordant green dye treated cells as compare with control . As concentration of dyes increases the Chl-a content decrease. An increased in the concentration of mordant green beyond 25 mg, caused reduction in the Chl-a content. As compare with other concentration of mordant green there is higher content of Chl-a at 25 mg concentration is (0.221) and concentration beyond this Chl-a decreased significantly.

Table 1.10: Effect of different concentration of textile dye Mordant green on the chlorophyll content of *Spirulina platensis* with time

Days/absorbance	control	25 mg/l	50 mg/l	75 mg/l	100 mg/l
2nd day	0.17	0.150	0.155	0.139	0.134
5th day	0.193	0.180	0.179	0.145	0.138
8th day	0.214	0.197	0.195	0.165	0.158
11th day	0.250	0.209	0.208	0.198	0.175
14th day	0.279	0.221	0.225	0.210	0.216



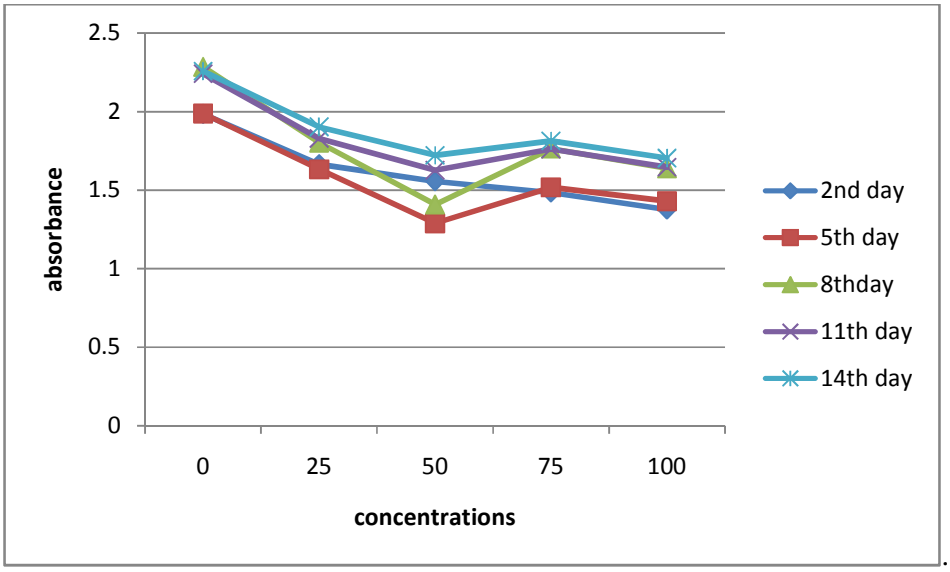
Pattern of chlorophyll content in *S.platensis* due to dye exposure

Effect of Mordant green dye on the protein content of *Spirulina platensis*

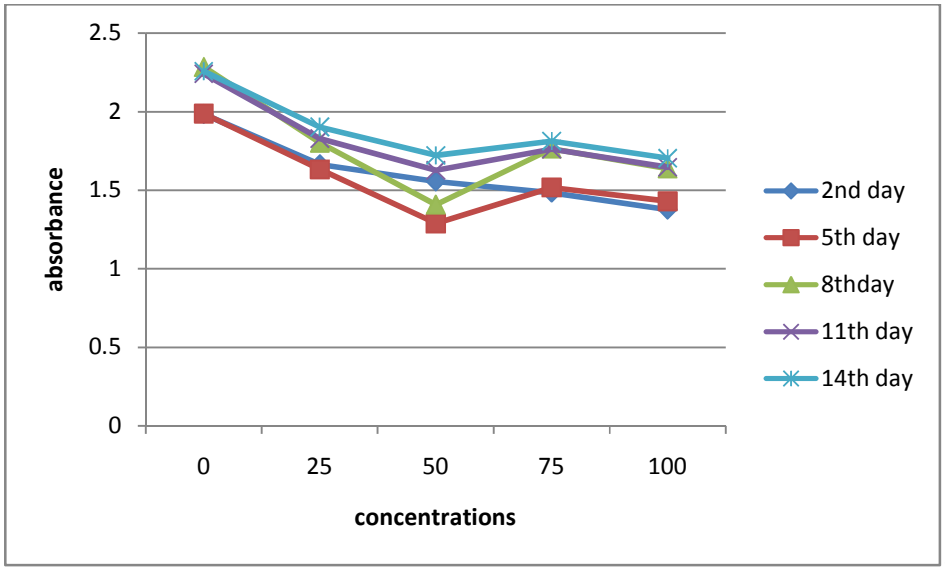
As shown in table various concentration of Mordant green dye influence protein content in *Spirulina platensis* in a time dependent manner. As compare with control the concentration of protein was lower in the presence of mordant green dye in growth medium.The protein content at 25mg concentration was increased with time and attained maximum level (0.409)on the 14th day but this concentration is low as compared to the control(0.679) . Further increase in the concentration of mordant green dye in growth medium resulted in suppression of protein. It was determined that beyond 50mg concentration caused reduction in protein content.

Table 1.11: Effect of different concentration of mordant green dye on the protein content of *Spirulina platensis* with time.

Days/absorbance	control	25 mg/l	50 mg/l	75 mg/l	100 mg/l
2nd day	0.413	0.258	0.213	0.205	0.198
5th day	0.433	0.279	0.210	0.200	0.185
8th day	0.468	0.313	0.201	0.195	0.155
11th day	0.523	0.357	0.198	0.187	0.137
14th day	0.679	0.409	0.179	0.163	0.119



Pattern of protein content in *S.platensis* due to dye exposure



Pattern of carbohydrate content in *S.platensis* due to dye exposure

Effect of different concentration of Mordant green dye on the Carbohydrate content of Spirulina platensis.

As shown in table the data demonstrate that various concentration of mordant green dye influence the carbohydrate content in *Spirulina platensis* in a time dependent manner. The carbohydrate content of *Spirulina platensis* at 25 mg concentration is increases with incubation period it attained its maximum level (1.903) on the 14th day it is slightly

lower as compare with control . The concentration was found under limit at 25 mg of mordant green dye concentration. However, beyond this concentration mordant green dye caused reduction in carbohydrate content.

Table 1.12: Effect of different concentration of mordant green dye on the carbohydrate content of Spirulina platensis with time.

Days/absorbance	control	25 mg/l	50 mg/l	75 mg/l	100 mg/l
2nd day	1.984	1.665	1.556	1.485	1.377
5th day	1.987	1.633	1.288	1.517	1.429
8th day	2.285	1.802	1.408	1.764	1.638
11th day	2.241	1.829	1.627	1.762	1.646
14th day	2.257	1.903	1.721	1.813	1.704

DISCUSSION

The use of large amounts of dye stuffs during the dyeing stages results in highly colored waste water. The thin layer of discharged dyes formed over the surface decreases the amount of dissolved oxygen. It also reduces photosynthetic activities due to reduced light penetration which badly affects the aquatic flora and fauna. In addition to aesthetic damages to sites, dyes are also toxic and carcinogenic. Conventional methods (activated sludge) and modern techniques (Advance Oxidation Processes) are highly intensive in terms of chemicals, energy and operations [10].

Here in experiments azo dyes were used because of their environmental stability, ease of preparation, their optical and electrical properties.

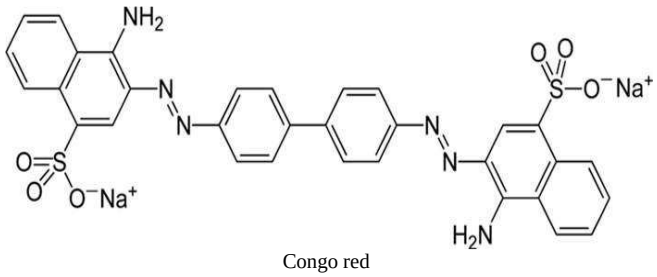
The cyanobacterium, S platensis showed slightly spiral, left direction of helix, 7-0 µm width of cylindrical trichome, 33-48 µm diameter of spiral and pH tolerance range was 9-1, also reported by Vonshak.

The effect of varying concentration of textile dyes (i.e. metanil yellow, mordant green and congo red dye) was studied on total protein content, carbohydrate content chlorophyll –a content in spirulina platensis. As evident from the data, protein concentration, carbohydrate concentration and chlorophyll – a content is present with textile dyes was lower as compared to the control corresponding[24]

It was observed that the increase rate of growth was specially achieved between 11th and 14th day at dye concentration range between 25mg – 75mg/l . However in the present study initial dye concentration higher than 75mg/l did not show remarkable increased rate of biomass or in growth. Increasing initial dye concentration decreased growth value during cultivation.

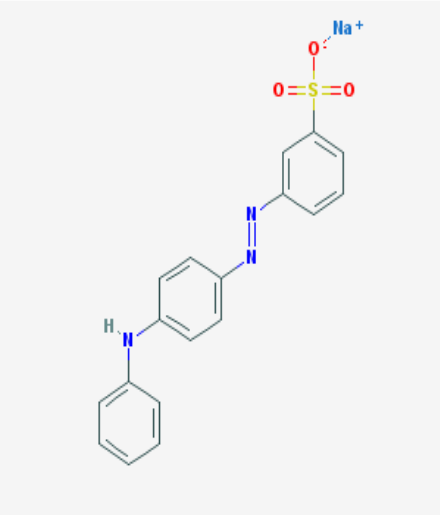
In this experiment the three dyes were taken are congo red, metanil yellow and mordant green. As three dyes are azo dyes so they show the properties of azo dyes.

Congo red dye was first synthesized in 1883 by Paul Bottiger who was working for the Friedrich bayer Company in Elberfeld. Germany Due to a color change from blue to red at pH 3.0-5.2. Congo red can be used as a pH indicator. It is the sodium salt of benzidinediazo-bis-I-napthylamine-4-sulfonic acid (formula:$C_{32}H_{22}N_6Na_6O_6S_2$: molecular weight:696.66 g/mol). It is a secondary diazo dye.



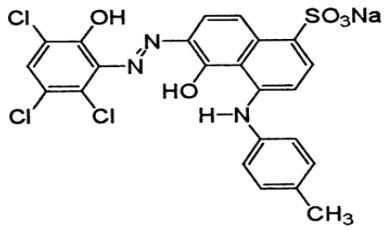
Congo red

Metanil yellow (monosodium salt of 4-m-sulphophenylazodiphenylamine) is an acidic azo dye it is a monoazo dye having CI name acid yellow 36 and comes under the trade name of external drug and cosmetic (D & C) yellow No. 1.



Metanil yellow

Metanil yellow has shown to promote tumor enhancing effects [14] causes testicular damage in gametogenic elements to arrest spermatogenesis in guinea pigs, rats, and mice [12] induced hematological changes [8], effect DNA synthesis [17] and a case of allergic dermatics due to metanil yellow was else reported by Hausen[19]. Metanil Yellow (Acid Yellow 36) is a highly water soluble dye is extensively used for the coloring of soap , spirit lacquer, shoe polish, bloom sheep dip, for the preparation of wood stains, dyeing of leather, manufacture if pigment lakes and for staining paper. Though Mentanil Yellow is a non permitted colorant, but still it is widely used as a colorant in sweet meat, ice creams, soft drinks and beverages. Due to its orange yellow color the dye is also extensively used for coating turmeric.



Mordant green

As it is mordant dye , so these type of dyes requires a mordant in their application and these dyes upon combination with the mordant deposit on the fiber in the form of insoluble colour. These are very economical and produce dark shades of color. Here we are using mordant chrome green 17 which has a molecular formula $C_{23}H_{15}Cl_3N_3NaO_5S$ and molecular weight 574.80 with registry number 6222613. Its manufacturing method includes 2-amino-3,6-trihydroxy-phenylethanone trichlorophenol diazotization, in alkali condition and N-p-tolyl 1 amino-8-napthol-4-sulphonic acid coupling.

Total carbohydrate content showed drastic reduction with increasing concentration of dyes. The reduced carbohydrate levels in the presence of congo red dye range from (84.16µg/ml to 69.76µg/ml & in the presence of metanil yellow ranged from (84.16µg/ml to 64.02µg/ml) when exposed to the 25,50,75,100 mg/l of the dye towards the end of 14th day of dye exposure, carbohydrate levels dropped down to 69.76µg/ml when treated with 100mg/l of the congo red dye & 64.2µg/ml when treated with metanil yellow dye. These results have been well collaborated with those of Kumar [9] the photosynthetic process [23] protein content also exhibited decreasing trend with increasing exposure of days and dyes concentration the protein content reduced as low as 33.87µg/ml by the end of 14th day when treated with 100mg/l of congo red dye & 42.09 µg/ml of metanil yellow dye.

The decreasing trend in the chlorophyll-a pigment content continued with the rising concentration of dye as 100 µg/l of dye sharply lowered chlorophyll-a contents by (0.369 to 0.136 µg/ml) respectively at congo red concentration such decrease in chlorophyll-a content may be ascribed to the inhibition on pigment synthesis.

The present experiment was design to observe the effect of graded concentration of textile dyes on protein content carbohydrate content and chlorophyll-content in *Spirulina platensis* and result were shown in tables.

As evident from the data protein concentration, carbohydrate concentration and chlorophyll-a at different concentration of textile dyes (i.e. metanil yellow, mordant green and congo red dye) was lower as compared to control added cells which are normally used for culturing of *spirulina platensis*.

The present study shows that spirulina platensis had a potential to removal of congo red dye and metanil yellow dye, mordant green from culture medium at different initial dye concentrations. Initial congo red concentration, metanil yellow dye and mordant green concentration and cultivation time significantly affected growth, carbohydrate concentration, protein concentration by *S.platensis*.

This species produced remarkable growth or biomass value, performed to treatment of unwanted pollutants (i.e. dyes, chemical effluents, pesticides) from artificially waste water. The equilibrium decolorization of dyes or dye uptake by the species increased with increasing in the initial dye value up to 100mg/l dye value. The Cyanobacteria is able to with stand high concentration of congo red, mordant green and metanil yellow, which is to be important for waste water treatment system.

CONCLUSION

The removal of colored or textile dyes organic pollutants from wastewater is considered as an important application of adsorption processes. The slow degradation of dyes, either chemically or biologically, by *S.platensis* proved to be efficient in degrading the dyes. Congo red, mordant green & metanil yellow show cytotoxicity at higher concentration hence at higher concentration biochemical activity is low (i.e. carbohydrate content, chlorophyll content, protein content). These findings are important regarding the practical use of such species in large-scale bio treatment of contaminate effluents. Therefore, the cyanobacteria species investigated in this study are highly recommended for beneficial bioremediation applications for in-situ and off-site removal of pollutants. The most promising species should help in the optimization of the self-purification and remediation of polluted and contaminated effluents before discharging into surface aquatic systems, providing a low-cost and naturally renewable technology. So the given studies in this project work is going to be highly useful in processes which carry the objective that is strictly will be in the favour of aquatic life.

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