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BIOINFOLET

PLATE - 1

Some traditional Genotypes of Sorghum

Ratki Jowar

Bhondi Jowar

Pivla Jowar

Dudri Jowar

PLATE - 2

Some traditional Genotypes of Sorghum

Mallu Jowar

Wanhadi Jowar

Pandharagavla Jowar

Pandharkavdi Jowar

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ALGAL FLORA OF DAIRY WASTE WATER

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ABSTRACT

Dairy waste water is one of the major source of water pollution, as it is rich in organic contents showing eutrophic condition. It contains lactose, casein (milk protein), phosphates and sulphates. Dairy waste water is used as source of nutrients by algae. During present research work algal flora of dairy waste water has been studied from June 2015 to May 2017. Algal samples were collected at monthly intervals from waste water of Deogiri Mahanand dairy, located near Aurangabad city of Maharashtra. Total of 72 species under 35 genera belonged to Chlorophyceae, Bacillariophyceae, Euglenophyceae and Cyanophyceae were recorded. Cyanophycean algal taxa were found to be dominant. Algal genera such as *Gloeocystis, Chlorococcum, Trebouxia, Chlorella, Scenedesmus Navicula, Nitzschia, Euglena, Oscillatoria, Phormidium, Chroococcus, Microcystis, Aphanothece, Gloeocapsa, Spirulina* and *Merismopedia* dominated algal flora. It was observed that winter and summer seasons were suitable for abundance of algae.

Key words: Algal flora, dairy waste water, physico-chemical analysis, seasonal variation.

Introduction

Dairy waste water is one of the source of water pollution. Very little work has been undertaken on algal flora of dairy waste polluted water. Few studies (Sukias et.al. 2001, Boominathan 2005, Divekar and Deshmukh 2006, Boominathan et. al. 2007, Kulandaivel 2007 and Bernal et. al. 2008) have been, however, reported. Attempts have been made during present study to explore algal flora of dairy waste water. In addition, physico-chemical analysis of dairy waste water was also performed to assess water quality.

Material and Methods

Algal samples were collected from waste water of Deogiri Mahanand Dairy, located near Aurangabad city of Maharashtra state. The collection was carried out during two consecutive years i.e. from June 2015 to May 2017. Algal samples were collected at monthly intervals.

The phytoplankton, floating and attached forms of algae were collected in acid washed collection bottles. Algal samples were preserved in 4% formalin for further taxonomic investigations. Fresh as well as preserved algal forms were observed under microscope and the algae were identified following standard literature (Smith 1950, Prescott 1951, Desikachary 1959, Krieger and Gerloff 1965, Philipose 1967 and Sarode and Kamat 1984).

In order to study quality of dairy waste water, physico-chemical analysis was performed at seasonal interval for the determination of colour, odour, water temperature, pH, calcium, magnesium,

chloride, nitrate, total phosphorus, potassium, silica, sulphate, total dissolved solids, total hardness, dissolved oxygen, free carbon dioxide and biological oxygen demand, following APHA(2005).

Results and Discussion

A total numberof 75 species under 35 genera were identified (Table 1). Of these 16 species under 10 genera were belonging to Chlorophyceae, 10 species under 4 genera to Bacillariophyceae, 6 species under 2 genera to Euglenophyceae and 40 species under 19 genera to Cyanophyceae. Cyanophycean or blue-green algae dominated algal flora of dairy waste water. Similar observations were made by Boominathan (2005), Diverkar and Deshmukh (2006) and Kulandaivel et. al. (2007).

Bernal et. al. (2008) studied microalgae from dairy sewage. Algal genera such as *Gloeocystis, Chlorococcum, Trebouxia, Chlorella, Scenedesmus, Navicula, Nitzschia, Euglena, Oscillatoria, Phormidium, Chroococcus, Microcystis, Aphanothece, Gloeocapsa, Spirulina* and *Merismopedia* were found to be dominant. Diverkar and Deshmukh (2006) reported dominance of *Scenedesmus, Navicula and Oscillatoria* in such water samples.

Algal taxa which were abundant in present study were *Gloeocystisgigas, Gloeocystis major, Chlorococcum humicola, Trebouxia humicola, Chlorella vulgaris, Scenedesmus quadricauda, Navicula cupsidata, Nitzschia palea, Nitzschia fonticola, Nitzschia irremissa, Euglena polymorpha, Euglena acus, Euglena elongata, Plectenema gracillimum, Oscillatoria acuta, Oscillatoria chlorina, Oscillatoria subbrevis, Chroococcus minutus, Chroococcus turgidus, Gloeocapsa rupestris, Aphanothece nidulans, Merismopedia punctata, Merismopedia tenuissima, Phormidium jenkelianum* and *Phormidium molle*. Physio-chemical analysis of polluted water samples revealed that colour of water was whitish, with unpleasant odour. Water temperature was 28°C and pH was slightly alkaline. Calcium contentof the water was 62.66 mg/l which might have contributed to the hardness. Calcium is one of the important elements influencing distribution of diatoms (Murlidhar et. al. 2002). The concentration of magnesium in the water was 41 mg/l. It was thus favourable for algal growth.

The amount of chloride present in the water samples was 45 mg/l, while nitrate content was 4.65 mg/l. Nitrates in water encourage algal growth, which takes place under eutrophic condition. Pearsall (1932) is also of the opinion that nitrates in water controls phytoplankton periodicity. Phosphorous in water favours the growth of algal species belonging to Chlorophyceae, Bacillariophyceae and Cyanophyceae. During present study, concentration of phosphorous was 78.50 mg/l. Zafar (1964) observed abundance of diatoms due to high concentration of phosphorous. Potassium content in water was found to be 29.26 mg/l. Potassium is an essential element for growth of algae, especially green algae, blue green algae and diatoms (Munawar, 1970). The concentration of silica was 2.86 mg/l, which enhance growth of diatoms. The concentration of sulphate was 69.50 mg/l.

There was no dissolved oxygen in the water, whereas concentration of free CO_2 was 263 mg/l. Biological oxygen demand was as high as 376 mg/l.

Seasonal variation of algal flora revealed that, members Chlorophyceae and diatoms were dominant algal groups in winter and summer seasons. Euglenoids and Cyanophyceae members were found maximum in summer season. Winter and summer seasons were found to be more suitable for growth of algae in dairy waste water. Hence, it is concluded that, dairy waste water is the habitat where algae can grow luxuriantly in diverse form.

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Table 1: Algal flora of dairy waste water.

CHLOROPHYCEAE
Gloeocystis gigas, Gloeocystis major, Tetraspora gelatinosa, Tetraspora lamellosa, Tetraspora lubrica, Chlorococcum humicola ,Trebouxia humicola , Trochiscia aspera, Tetradron hastatum, Chlorella elliposada, Chlorella vulgaris, Ankistrodesmus falcatus, Scenedesmus bijugatus , Scenedesmus quadricauda, Scenedesmus quadricauda var. longispina, Cosmarium sp.
BACILLARIOPHYCEAE
Navicula cupsidata, Navicula cupsidata var. ambigua, Navicula cupsidata var. danaice, Pinnularia sp., Cymbella aspera, Nitzschia fonticola, Nitzschia irremissa, Nitzschia palea, Nitzschia philippinarum, Nitzschia vanshi .
EUGLENOPHYCEAE
Euglena acus, Euglena convoluta, Euglena elongata, Euglena polymorpha, Euglena proxima, Phacus sp.
CYANOPHYCEAE
Microcystis aeruginosa, Microcystis robusta, Chroococcus minor, Chroococcus minutas, Chroococcus turgidus, Gloeocapsa rupestris, Gloeothece palea, Aphanothece nidulans, Aphanothece saxicola, Synechococcus aeruginous, Merismopedia punctata, Merismopedia tenuissima, Chlorogloea microcystoides, Myxosarcina burmensis, Arthrospira platensis, Spirulina gigantea, Spirulina labyrinthiformis, Spirulina laxissima, Spirulina major, Oscillatoria acuminata , Oscillatoria acuta, Oscillatoria an imalis, Oscillatoria chlorina, Oscillatoria minima, Oscillatoria obscura, Oscillatoria quadripunctulata, Oscillatoria subbrevis, Phormidium a bronema, Phormidium jadinianum, Phormidium molle, Lyngbya birgei, Lyngbya gracilis, Lyngbya hieronymusii, Microcoleus acutissmus, Nostoc linckia, Nostoc muscorum, Plectonema gracillimum, Plectonema puteale, Scytonema bohneri, Calothrix marchia.

Table 2: The average values of physicochemical parameters of dairy waste water.

Sr. No.	Parameter	Average Value	Unit
01	Colour	Whitish	--
02	Odour	Unpleasant	--
03	Water temperature	28	^{o}C
04	pH	7.23	--
05	Calcium	62.66	mg/l
06	Magnesium	41	mg/l
07	Chloride	45	mg/l
08	Nitrate	4.65	mg/l
09	Total Phosphorus	78.50	mg/l
10	Potassium	29.26	mg/l
11	Silica	2.86	mg/l
12	Sulphate	69.50	mg/l
13	Total Dissolved Solids	824	mg/l
14	Total Hardness	324	mg/l
15	Dissolved Oxygen	0	mg/l
16	Free CO_2	263	mg/l
17	Biological Oxygen Demand	376	mg/l