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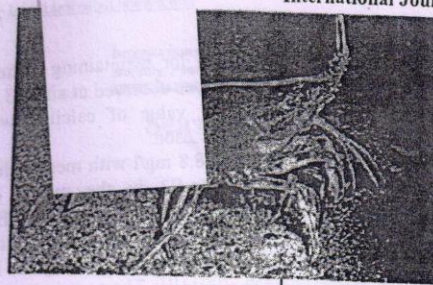

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Hydrobiological study of Bendsura River at district Beed (M.S.) India with reference to fisheries

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Abstract
Hydrobiological studies of Bendusara River were carried out for a period of one year from January 2019 to December 2019 from three different stations at Beed (MH). The parameters taken included the water temperature, pH, dissolved oxygen, calcium, carbon dioxide, BOD, alkalinity, chlorides, total hardness and total dissolved solids. These properties were analyzed and compared with standard values recommended by bureau of Indian standards and world health organization. Present investigation was undertaken to ascertain the water quality status of Bendusara River at Beed. The results revealed that there were significant seasonal variations in most of the parameters; water was found to be hard, polluted and not suitable for domestic, agricultural and fish growth.

Keywords: Hydrobiological status, Bendsura River, water, fish culture

Introduction
Rivers are vital and vulnerable freshwater systems that are critical for the sustenance of all lives. However, the declining quality of the water in these systems threatens their sustainability and is therefore a cause for concern. Rivers are waterways of strategic importance across the world, providing main water resources for domestic, industrial and agricultural purposes (Prakash *et al.*, 2020) [13]. The maintenance of healthy aquatic ecosystem is required for ecological balance and agriculture (Verma, 2018a, 2018b) [24, 25], which depends on good physico-chemical properties of water. India is gifted with a river system comprising more than 20 major rivers with several tributaries (Kumar *et al.*, 2005) [9], and more than 50% of water resources of India are located in various tributaries of these river systems (Lal, 2001).
Bendusara River is the major river in Beed district of Maharashtra. Beed city is situated on the banks of Bendsura River which is a tributary of Godavari often described as Ganges of Southern India. Bendusura River is polluted due to solid, liquid wastes and sewage disposal which is largely responsible for pollution. Although a large number of workers have studied the hydrobiological parameters and plankton as well as fish diversity of fresh water bodies including Rao (1977) [16], Prakash (2020) [13], Prakash *et al.*, (2002) [19], Singh and Verma (2016) [20], Sugumaran *et al.*, (2020) [21], Verma (2016, 2017, 2018c, 2019) [22, 23, 27, 26], Verma and Prakash (2018, 2020a) [28, 30], Bhagde *et al.*, (2020) [3] but till now there is no sufficient baseline data about physicochemical parameters of Bendsura river at Beed. Therefore, the present work was undertaken to study the hydrobiological characteristics of Bendsura River in relation to fisheries and pollution. Purpose of the study was not only to enhance the hydobiological condition of river but also to explore the possibilities for better management and development.

Materials and Methods
Bendusara river originates from the hills of Balaghat range rises near Waghera about two km. north -west of Limbaganesh and has a fairly long course (about 30 km) on the northern slopes of the Balaghat plateau, first flowing northwards and after Kadamwadi eastwards to Pali village, receiving a number of tributaries on both banks comprising a fairly large catchment area of 183 square km on the slopes of the plateau. About 8 kms below Pali, the river flows through Beed town and divides the city into smaller eastern and larger western parts then join to the river Sindphana which join the Godawari at Kshetra manirath. Three sampling sites were, selected along the course of the river at Beed city with the view of obtaining an accurate data.

The water samples were collected from three different sites in morning between 8.30 and 9.30 a.m. during the period of January 2019 to December 2019. Water was collected using sterile glass stopped bottles and 2L capacity plastic bottle. The estimation of various physico-chemical parameters was done following standard methods described by APHA (2005) [1], Trivedy and Goel (1986) [18] and Kodarkar (1998) [10].

Results and Discussion:

The water quality parameters and their range and mean values for selected sampling sites are presented in Table.1.

Table 1: Water quality of Bendsura River at Beed.

Parameters	Sampling Sites			Mean ±SD
	B1	B2	B3	
Water Temperature (°C)	21.0-32.0	21.3 -31.5	21.2-31.0	27.8±0.15
pH	7.0-8.2	7.3-8.5	7.4-8.4	7.6± 0.12
Dissolved Oxygen (mg/l)	2.3-3.4	2.0-3.0	2.4-3.6	2.8±0.14
Calcium (mg/l)	25-28	29-37	27-38	32.0±1.3
Free CO_2 (mg/l)	7.2-8.0	8.2-8.6	8.0-8.8	8.4±1.5
BOD (mg/l)	38-41	37-42	38-43	40.0±1.8
Alkalinity (mg/l)	170-178	167-179	171-177	172±2.5
Chloride (mg/l)	282-284	275-280	281-284	277±2.4
Total Hardness (mg/l)	108-120	121-130	112-125	114.5±1.9
TDS (mg/l)	825-827	820-824	795-800	815±2.8

Temperature measurement is an important aspect of water quality assessment as it not only determines the solubility of different gases in the water but also affects certain biochemical reactions taking place in the aquatic organisms (Singh and Singh, 2020) [17]. The temperature was ranged between 21.0 and 31.5 °C with mean temperature 27.8 °C. The maximum temperature was recorded as 31.5 °C at site-B2 in the month of June and minimum was recorded as 21.0 °C at site –B1 in the month of December. In summer months, water temperature was generally higher as compared to winter months (Prakash *et al.*, 2015) [15]. Fluctuation in air temperature had direct impact on water temperature (Welch, 1952) [32]. The range of water temperature was within the optimum range and suitable for the development and growth of fish (Jhingran, 1988) [6].

The pH value was varied between of 7.0 and 8.5. The minimum pH was recorded 7.0 at site-B1 while maximum 8.5 at site-B2. This value is within permissible limits as per prescribed by world health organization. Alkalinity range of river water is indicative of the fact that photosynthetic activity has dominance over the respiratory activity of the biota (Ansari and Prakash, 2020) [13]. The pH of water ranged between 7.0 and 8.5 which show the favorable conditions of productivity of fishes.

Dissolved oxygen level in the three sampling sites was ranged between 2.0 and 3.6 mg/l. It was maximum (3.6mg/l) at site-B3 in winter month and was minimum (2.0mg/l) at site- B2. The high range of dissolved oxygen was found during December i.e. winter season at site-B3. The dissolved oxygen value was slightly lower throughout the year from the permissible limit (BIS, 1983) [5]. The fish needs at least 5 mg/l dissolved oxygen therefore the water of river is not suitable for development and growth of fish (Verma, 2020b) [31].

Calcium is an important nutrient for aquatic organisms. The calcium level was ranged between 25-38 mg/l. It is found to be low in monsoon and high in winter season which could be due to its higher solubility at low temperature (Ansari and Prakash, 2000) [2]. The low calcium content present in the water resource may be responsible for maintaining normal hardness level. Maximum calcium was observed at site-B3 in the winter season. The minimum value of calcium was recorded at site-B1 in the monsoon season.

The free CO_2 level was ranged 7.2-8.8 mg/l with mean value 8.4mg/l. It was maximum at site-B3 in the month of December and minimum range of CO_2 was found at sitet-B1 in monsoon months. The free carbon dioxide present in the river is used by the phytoplankton and macrophytes in photosynthetic process (Prakash, 2001) [12]. The appearance of high concentration of free carbon dioxide could probably be associated with rapid decomposition of organic matter in the sediments.

BOD values ranged between 37-43 mg/l with mean value 40.0 mg/l. The maximum BOD was observed at site-B3 and minimum BOD at site-B2 in the months of July and August, respectively. Changes in BOD appear to be an amount of organic material in an aquatic solution which aids the microbial growth of water. It should be due to more sewage entering into the river. Rivers with low BOD have low nutrient levels; therefore, much of the oxygen remains in the water. Unpolluted, natural waters will have a BOD of 5mg/l or less. BOD directly affects the amount of dissolved oxygen in rivers and streams. The greater the BOD, the more rapidly oxygen is depleted in the stream. This means less oxygen is available to higher forms of aquatic life. The BOD level between 3.0 to 6.0 mg/l has been reported as optimal for normal activities for fishes (Bhatnagar and Devi, 2013) [4].

The alkalinity is the quantitative capacity of water sample to neutralize a strong acid to a designated pH which plays an important role in controlling enzyme activities (Prakash, 2001) [12]. In the present study total alkalinity also showed a seasonal fluctuation. The values were high during December at site-B3 and low during July at site- B2. The range (167-179 mg/l) of total alkalinity indicates that the water is hard type and is not suitable for fish growth (Verma and Prakash, 2020b) [31].

Generally unpolluted water contains low concentration of chlorides lower than 10mg/l. Permissible level of chloride is 250 mg/l (Joseph and Jacob, 2010). In the present study the chloride value was varied from 275-284mg/l with mean value 277mg/l. The chloride concentration indicates the river water was highly polluted.

The level of total hardness ranges from 108-114 mg/l with mean value 114.5 mg/l. The hardness of the river increases in the polluted waters by the deposition of calcium and magnesium salts. On the basis of hardness, Kiran (2010) [8] classified the water into soft (< 75 mg/l), moderate hard (75-150 mg/l), hard (150-300 mg/l) and above that very hard. Thus, the present finding suggests that the river water is moderately hard.

The total dissolved solids represent total mineral contents, which may or may not be toxic. It is an index of fertility of the aquatic ecosystem. In the present study, TDS of river water was ranged from 795-800 mg/l. The total hardness ranged between 795-800 mg/l indicates that water of the river was not suitable for fishes (Jhingran, 1988) [6].

Results of present investigation indicate the water is not suitable for drinking, domestic and agriculture purposes. In current status, this river was not found very much suitable for fish culture. The problem faced by Bindusara River was due to human activities and illegal in commercial developments in its basin. The river which is a natural drain is transformed in to a 'nallah' (channel) in which solid and liquid municipal

Seasonal Variation in Water Quality Parameters of Bendsura Reservoir Maharashtra

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Abstract: *The present study shows the seasonal changes of physicochemical parameters of Bendsura water reservoir namely Water temperature, PH, DO, Cl, CO2, BOD, Alkalinity, PO4, TS, TDS. All parameters were recorded in every months of July to December-2018.It was found that no more significant differences in the variability of physicochemical factors. The water of Bendsura reservoir is suitable for drinking purpose before proper treatment. Bendsura reservoir is also suited for agricultural and aquaculture potential. Hence, present work has to be undertaken.*
Key Words: *Physicochemical Factors, Bendsura reservoir, Water quality.*

Introduction:

The life was originated in water is the principle internal as well as external medium of the organisms. Several water bodies near the cities and villages are polluted due to the various pollutants such as garbage, waste water, swages, and industrial effluents etc. affecting physico-chemical characteristics of the water. Fluctuation in physico-chemical characteristics may affect the survival of aquatic animals. In present study an attempt will be made to highlight the effect of seasonal changes in physico-chemical parameters of Bendsura water reservoir. The Bendusara water reservoir is located on tributary of 18°-45-45" N altitude district Beed in Maharashtra. It is situated about 11 K.M. towards the south of Beed and reservoir is of the capacity of 180 square kilometers water spread area. Mainly this project is constructed for irrigation & drinking purpose. Many villages are benefited for the source of drinking water supply and other purposes. Bendsura reservoir for pisciculture and provides a good quality of food for human being. In recent years environmental monitoring through regular assessment of water quality was become an important factor in exploitation of aquatic resources.

Material and Method:

The present investigations were conducted for the period of July to December-2018 in BendsurareservoirBeed. Water samples were collected in sterilized glass bottle from three selected sites namely Shantivan-A, Gotakhori--B and Shadval peer-C. To achieve uniformly of observations sampling time was uniformly in morning between 9.00 to 10.00 a.m. on weekly basis for estimation of various seasonal changes of physico-chemical parameters according to the methods of Trivedy and Goel (1984), Kodarkar, et.al. (1998) and the results are compared with permissible limits laid down by BIS (IS; 2490, 1981, IS; 10500,199 & APHA (1992), as given in table.

Results and Discussion:

The monthly variations of physicochemical characteristics of water quality in Bendsura reservoir have summarized in the table 1, 2 & 3 respectively. The temperature of water was recorded with the help of thermometer. The temperature of water is the most significant ecological factor which strongly affects various properties of the water body. The temperature of reservoir water varied from 21.3°C to 26. 70C.It is raised to during the month of October and decreased three degree in December. The variation in the water temperature is due to different timing of collection and influence of season Jayaraman et.al (2003), Charl, (1980) observed that temperature is critical factors for the seasonal & periodicity of phytoplankton, In the present investigation The PH of water ranges from 8.1 to 8.3, 8.1 to 8.4 & 8.0 to 8.3 at spot A, B, & C respectively.PH values indicate the imbalance in carbonate and bicarbonate equilibrium (Karanth, 1987). The highest PH value recorded during the month of December and lowest in 8.0 in July by Sakhare& Joshi (2003).

Dissolved oxygen was determined by Winkler's method. Concentration of DO is one of the most important parameters to indicate water quality and its relation to the distribution and abundance of various algal species. The DO values ranges between 5.6 to 8.4 at spot A 5.3 to 7.4 at spot B &5.2 to 7.2 mg/lit at spot C. The seasonal values of DO were minimum in the month July and maximum in the month of November & December respectively. Similar observations were made by Roy et.al

(1987) & Kaur et.al (1997). The maximum amount of chlorideswere25.1 at spot B in the month of September and minimum in October at spot C. Munawar, (1970) suggested that higher concentration of chlorides in water is an index of pollution of animal origin and there is direct correlation between chloride concentration and pollution level. The maximum value of CO2 was1.5 mg/lit in the month of November & December at Spot-A & C while, minimum1.2mg/lit during the month July &October.BOD value found to be higher in the month of December i.e.,4.8 mg/lit at spot-A & in minimum value of 1.4 mg/lit the month of November at Spot-B.

During the present study higher range of the total alkalinity values in the month of November i.e., 104 mg/lit & lower in 88 in the month August at spot-B respectively. Throughout the study period it was observed that the phosphate concentration was recorded lower in the month of September at spot-B and higher in December respectively. The month wise analysis of total hardness showed that the quantity were more in month of December. I e. 101 mg/lit at spot-C& less in month of July i.e., 72 mg/lit.

The values of TDS were found higher during the month of September i.e.,197 mg/lit at spot-A & lower in month of November i.e., 142 mg/lit receptively. The fluctuations in the physicochemical parameters were observed from all three sampling stations. In general, all parameters are within the range of standard value prescribed by world health organization. Water quality parameters from Bendusara reservoir indicates that the suitable source for the supply of drinking, irrigation and aquaculture practices of Bendsura reservoir District Beed.

Table: 1(Shantivan-A)

Parameters	Months					
	July	Aug	Sept	Oct	Nov	Dec
Water Temperature (C)	25.2	24.5	24.2	25.5	22.13	21.3
PH	8.2	8.1	8.3	8.3	8.2	8.2
DO (mg/L)	5.6	7.2	6.1	8.3	8.4	8.4
Cl (mg/L)	23.2	24.1	25.1	18.2	18.3	21.2
CO2 (mg/L)	1.4	1.3	1.4	1.2	1.2	1.5
BOD (mg/L)	2.4	3.2	3.2	4.3	3.5	4.8
Alkalinity (mg/L)	102	103	102	100	90	95
PO4 (mg/L)	0.07	0.07	0.06	0.08	0.05	0.08
T H(mg/L)	72	80	82	99	100	99
TDS (mg/L)	188	187	197	148	142	148

Table: 2(Gotakhori-B)

Parameters	Months					
	July	Aug	Sept	Oct	Nov	Dec
Water Temperature (C)	25.2	24.3	24.6	26.5	25.3	22.0
PH	8.2	8.2	8.1	8.3	8.2	8.4
DO (mg/L)	5.3	6.2	6.3	7.3	7.4	6.1
Cl (mg/L)	22.2	24.2	25.1	19.1	19.2	20.2
CO2 (mg/L)	1.2	1.3	1.4	1.2	1.5	1.5
BOD (mg/L)	2.2	2.3	3.2	4.0	1.4	1.6
Alkalinity (mg/L)	103	88	103	102	103	100
PO4 (mg/L)	0.06	0.07	0.04	0.07	0.07	0.08
T H (mg/L)	75	83.2	85.2	89.2	90.4	100
TDS (mg/L)	189	185	170	190	156	148

Table: 3(Shadval Peer-C)

Parameters	Months					
	July	Aug	Sept	Oct	Nov	Dec
Water Temperature (C)	25.4	25.5	24.2	26.7	24.1	21.6
PH	8.0	8.1	8.0	8.2	8.1	8.3
DO (mg/L)	5.2	6.3	7.0	7.0	7.2	6.5
Cl (mg/L)	23.2	22.1	25.0	20.1	20.2	21.2
CO2 (mg/L)	1.3	1.4	1.3	1.3	1.4	1.5
BOD (mg/L)	2.1	2.4	3.4	4.1	1.6	1.7
Alkalinity (mg/L)	104	99	100	103	104	101

PO4 (mg/L)	0.07	0.06	0.05	0.08	0.07	0.08
TS (mg/L)	74	81.2	84.1	90.2	90.1	101
TDS (mg/L)	186	184	175	188	154	149

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Refrences:

1. APHA (1992): Standard methods for the examination of water & waste water. American public health association, New York. 18th edition.
2. Chari M.S. (1980): Environmental variation in the physicochemical characteristics of fresh water pond. M. Phil Thesis. Alligarh Muslim Univrsity, Alligarh.
3. Goel P. K. &Trivedy R. K. (1984): Impact of sewage on freshwater ecosystem and general future of fresh water bodies and sewage. J. Ecol. and Envoi. Sci. 6:83-6.
4. Indian standards: (IS: 2490) (1981) Domestic water specification, BIS, New Delhi.
5. Indian standerds: (IS: 10500) (1993) Drinking water specification, BIS, New Delhi.
6. Jayaraman P. R. (2003): Water quality studies on karmana river Thiruvananthapuram, District south KeralaIndia.Pollution Research Vol-22(I) 89-100.
7. Karanth K. R. (1987): Groundwater assessment development and management. New Delhi: Tata Mc Graw Hill Publishing Company Ltd. p. 725-6.
8. Kodarkar M. S. (1998): Methodology for Water analysis IAAB Publication, Hydrabad.
9. Konar S. K. (1999): Protection of wetland from sustainable development of rural economy in the next millennium souvenir of national conference cum workshop on wetland conservation: problem, prospectus & challenges in next millennium, October 23 to 25 1999, at R.A. arts, M. Commerce and S. R. Rathi science College, Wasim. Maharashtra. pp 19-25.
10. Munawar M. (1970): Limnololgical studies on freshwater ponds of Hydrabad, India-1. Byotype. *J Hydrobiologia*. 35: 127-162.
11. NERRI manual: (1998): Neeri Publication, Nagpur. Sakhare& Joshi (2003): Ecology of Palas and Nilegaon reservoir in Osmanabad District Maharashtra Journal of Aqua. Biol.18 (2) 17-22.

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16. Physico-Chemical Analysis of Khazana Bawali District Beed (M.S.) India

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Abstract

Khazana Bawali is one of the artificial water body of Beed is used for irrigation as well as by the villagers. Present paper deals with the physico-chemical analysis of Khazana well Beed Maharashtra for its water quality from July to December-2016. The Physico-chemical parameters studied included Atmospheric temperature, Water temperature, Transparency, PH, DO, Cl, BOD, Sulphates, TS, and TDS was determined. The water from Khazana well also suitable for agricultural potential and other purposes. Collected water samples should be analyzed & compared with standard values recommended by BIS. Monthly analysis over the period of one year suggests that the water from Khazana Bawali is not badly polluted.

Keywords: Physicochemical, Khazana well, Water quality.

Introduction

In present study an attempt will be made to highlight the effect of changes in physico-chemical parameters of Khazana Bawali. Several water bodies near the cities and villages are polluted due to the various pollutants such as garbage, waste water, swages, and industrial effluents etc. affecting physico-chemical characteristics of the water. Hence work has to be undertaken. Khazana Bawali or Treasure Well situated about four kilometers from Beed a district place in Maharashtra was constructed about four hundred and thirty years back during Nizamshahi rule in western India. Most of the cultivable land in this region there was arid and this was probably first public facility for irrigation. Barring negligible small portions irrigated by private wells, agriculture was then dependent on insufficient and uncertain monsoon. It is a large well of 20 meters radius in which rain water oozing from nearby hills is brought through underground tunnels and then used for irrigation by taking it through masonry channels under gravity. Ventilators provided at regular distance in this channel allow fresh air helping water purification and space also allows occasional manual cleaning. Underground construction below bed of the river crossing is one of the engineering feats. Project was once irrigating 1000 acres,

but it is gradually on the decrease. Record shows that about 500 acres were irrigated thirty-five years back and now it is further reduced to 165 acres. Khazana Bavli little over four kilometers on Beed-Solapur road west of Beed near the village Pali is a large well called the Khazana bavli which was constructed about 1582 A.D. by the then Jagirdar of Beed. There are three inlets which feed the well and only one outlet. The source of water supply has not yet, been traced. It has channels built for Irrigation purposes which irrigate over a thousand acres of land. Its water level remains the same at all times of the year.

Salient Features of Khazana Bawali

1	Year of Construction	1572 AD (991 Hizari)
2	Diameter of Well A) At Ground Level B) At 4.7 m depth	Outside Inside 20.0 M 19.10. M 12.6 M --
3	Total Depth of well (From GL	7.o m (4.7 + 2.3)
4	Inlet Tunnels	Two Nos of size 0.8 x 1.65 m
5	Outlet Tunnels	One no. of size 0.8 x 1.50 m
6	Length of outlet Tunnels Underground	2.5 km (8140 feet)
7	No of Ventilator valve / Repair Chambers On the underground Canals / Tunnels	52 nos.
8	No of ventilators on the inlet tunnels	91 (Now existing)
9	Length of open canal	3.91 kms
10	Water flow velocity	3.98 CuFt/sec
11	Total irrigable area	212 ha. (524 acres)

Material & Method

The present investigation was was conducted for the period of July to December-2016 in Khazana Bawali Beed Maharashtra for its water quality. To achieve uniformly of observations sampling time was in morning between 9.00 to 10.00 a.m. on weekly basis for estimation of various physico- chemical parameters following the procedures given in standard methods. APHA (1985), Trivedy and Goel (1986), Kodarkar. et.al. (1998).

Results & Discussion

The study of physical characteristics indicated that the magnitude of water parameters is partially or wholly associated with water level & seasons. The results of seasonal variations in water samples of Khazana Bawali have illustrated in the table 1.

The PH values were in the range 7.0 to 7.3, BOD, Cl, SO4, DO & within the permissible limits prescribed for drinking water BIS, (1983) and WHO, (1984). As regards total dissolved solids (TDS) the WHO and ISI is 500 mg/lit for drinking water .taking this value into consideration the TDS is as per limit. The observed slightly excess TDS value in sample is due to the waste disposed around Khazana Bawali.Chlorides, Sulphates & TS are present within safe limits. The results of present work revels that the water from khajana Bawali is not contaminated. Hence to summarize results of Khajana Bawali water on the basis of water quality it is concluded that the Khazana Bawali is a historical monument. It should be well protected from such a Contaminants by proper maintenance and sanitation. Ii is glory of Beed therefore it is very important to take of pollution and cleanliness. This precious treasure should be cherished by all in future.

Table: 1

Parameters	Months					
	July	Aug	Sept	Oct	Nov	Dec
Atmospheric Temperature (C)	26.3	26.4	24.5	27.2	23.2	21.4
Water Temperature (C)	23.4	24.3	24.5	25.1	21.2	20.4
Transparency	11.0	12.0	15.0	16.0	14.0	13.0
PH	7.1	7.0	7.3	7.0	7.2	7.1
DO (mg/L)	7.3	6.8	7.7	5.2	7.4	8.3
Chloride (mg/L)	11.2	19.12	11.7	16.1	20.1	22.1
BOD (mg/L)	2.4	4.0	4.2	5.1	5.5	4.8
Sulphates (mg/L)	4.5	7.4	5.2	3.2	2.1	3.4
Total Solids (mg/L)	140.23	130.31	144.20	150.20	150.44	147.10
Total dissolved solids (mg/L)	160.15	165.23	170.21	167.22	168.12	170.13

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References

- **APHA (1985):** Standard methods for examination of sewage and industrial wastes, 10th edition *American water works Association,* New York.
- **Indian standerds :** (IS:1500) (1983) Drinking water specification, BIS, New Delhi.

- **Jha A.N. & Varma P. K.(2000) :** Physico-chemical properties of drinking water in Towen area of Godda district under Sntal Pargana (Bihar), India Poll Res. 19 (2):245-247.
- **Kodarkar M.S. (1998):** Methodology for Water analysis IAAB Publication, Hydrabad.
- **NERRI manual: (1998)** Neeri Publication, Nagpur.
- **Munawar, M (1970):** Limnololgical studies on freshwater ponds of Hydrabad, India-1. Byotype. *I Hydrobiologia*, 35: 127-162.
- **Trivedy, R.K. and Goel, B.K. (1986):** Chemical & biological methods for water pollution studies, Environmental publication karad, Maharashtra (India).
- **Tekale N. S. and Kodarkar M.S. (1999)** Ideal immersion in Masunda Lake,Thane City(M.S)-A critical analysis and remedial measures J. aqua.Biol.14-I & II: 115 to 117.

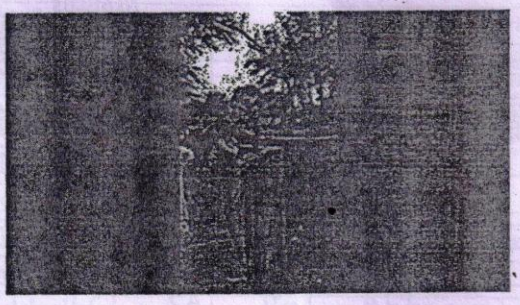

Fig:-1 Khazana Bawali Near Beed City

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28. Industrial Microbiology

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Abstract

Industrial microbiology is the use of microbes in industrial processes like industrial fermentation, waste-water treatment. It is linked to industry. It deals with screening, improvement, management and exploitation of microorganisms for production. It is useful for the production of end products on a large scale. Industrial microbiology includes the use of microorganisms to manufacture food or industrial products in large quantities. Numerous microorganisms are used within industrial microbiology; these include naturally occurring organisms, laboratory selected mutants, or even genetically modified organisms.

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Keywords: Microbiology, Industrial, laboratory, processes.

Applied Microbiology

Applied microbiology is a branch deals with application of microorganisms in the field of science for the production of human beneficial products such as medicines, antibiotics, vaccines, enzymes, biotechnological engineered products and also in food technology as fermentation products.

Medical Microbiology

Medical microbiology deals with response of immune system to the invading microorganism. It deals with conducting and interpreting tests for viral, fungal and parasitic infections. Medical microbiology also deals with bacterial pathogenesis of humans.

Environmental Microbiology

Environmental Microbiology deals with application of microorganisms in the field of environment. It deals with innovative research in the aspect of microbial interactions and microbial communities.

Soil Microbiology

Soil Microbiology deals with study of soil microorganisms and their functions involved in the changing properties of soil such as fertility and nutrient availability such as humus formation, N-fixation, soil stability and decomposition

Molecular Microbiology

Molecular microbiology deals with molecular mechanisms and physiological processes of microbes and their utilisation in production of biotechnology products and medicines such as vaccines, antibodies. It also involves advancement in pathogenicity of microbes.

Microbes

Microbes are single cell organisms which are naked to humans and are visible only under microscope. Generally viruses, bacteria and fungi come under microbes. Upto 6% of Earths living matter is made of microbes. They are beneficial as well as harmful to living organisms.

Industrial Microbiology

Use of microbes to obtain a product or service of economic value constitutes industrial microbiology. Any process mediated by or involving microorganisms in which a product of economic value is obtained is called fermentation (Casida, Jr.,1968). The terms industrial microbiology and fermentation are virtually synonymous in their scope, objectives and activities. The microbial product may be microbial cells (living or dead), microbial biomass, and components of microbial cells, intracellular or extracellular enzymes or chemicals produced by the microbes utilizing the medium constituents or the provided substrate. The services generated by microorganisms range from the degradation of organic wastes, detoxification of industrial wastes and toxic compounds, to the degradation of petroleum to manage oil spills, etc. Industrial microbiology also encompasses activities like production of biocontrol agents, inoculants used as biofertilizers, etc .Obviously, the scope and activities of industrial microbiology are too exten sive to be covered in any detail in a book like this scope; therefore, the coverage in this chapter remains generalized and rather elementary. The activities in industrial microbiology begin with the isolation of microorganisms from nature, their screening for product formation, improvement

of product yields, maintenance of cultures, mass culture using bioreactors, and usually end with the recovery of products and their purification.

Microbial Products of Potential Importance

Product / Activity Examples Products

1. Amino acidsL-glutarnic acid, L-lysine
2. AntibioticsStreptomycin, penicillin, tetracyc1ines, polymyxin
3. BeveragesWine, beer, distilled beverages
4. Biodegradable plastic β-polyhydroxybutyrate
5. EnzymesAmylase, proteases, pectinases, invertase, c e l l u l o s e
6. Flavouring agents Monosodium glutamate, nucleotides
7. FoodsCheese, pickles, yoghurt, bread, vinegar
8. GasesCO2,H2,CH4
9. Organic acidsLactic, citric, acetic, butyric, fumaric
10. Organic solventsAcetone, ethanol, butanol, amyl alcohol
11. OthersGlycerol, fats, steroids, gibberellins
12. VitaminsB riboflavin,
13. A12. Recombinant proteinsInsulin, interferon, subunit vaccines Substrates A wide range of compounds used for chemical syntheses of valuable products.Cells/Biomass
14. Biomass Food and feed yeast, other organisms used as single cell protein (SCP)
15. Cells Biofertilizers, biocontrol agents, bacterial insecticides, mycorrhyzae
16. Vaccines A variety of viral and bacterial vaccines

Activities

BiotransformationSteroids, antibiotics D-sorbitolDegradationDisposal of biological and industrial wastes, detoxification of toxic compounds, petroleum Solubilization/ accumulation Improved recovery of oil and metals, discovery of new oil reserves, removal of toxic metals .

Isolation and Screening of Microorganisms

The success of an industrial fermentation process chiefly depends on the microorganisms train used.

Isolation of Microorganisms

The first step in developing a producer strain is the isolation of concerned microorganisms from their natural habitats. Alternatively, microorganisms can be obtained as pure cultures from organisation, which maintain culture collections.

Microorganisms for New Products

The next step after isolation of microorganisms is their screening. A set of highly selective procedures, which allows the detection and isolation of microorganisms producing the desired metabolite, constitutes primary screening. Ideally, primary screening should be rapid, inexpensive, predictive, specific but effective for a broad range of compounds and applicable on a large scale. Primary screening is time consuming and labour intensive since a large number of isolates have to be screened to identify a few potential ones.

Inoculum Development- The preparation of a population of microorganisms from a dormant stock culture to an active state of growth that is suitable for inoculation in the final production stage is called inoculum development.

Culture Media- Inoculum preparation media are quite different from production media. These media are designed for rapid microbial growth, and little or no product accumulation will normally occur.

Contamination- The inoculum used for production tanks must be contamination free. But the risk of contamination is always present during inoculum development. Therefore, every effort must be made to detect as well as prevent contamination.

Sterilization - Sterilization is the process of inactivating or removing all living organisms from a substance or surface.

Common Contaminants- The most common contaminants of different industrial processes are considerably different. Some examples are given below.1. In canning industry, Clostridium butylicum is the chief concern. This obligate anaerobe can grow in sealed cans, and produce heat resistant spores and a deadly toxin. However, it is not a problem for catsup (too acidic), jam and jellies (too high sugar concentration) and milk (stored at low temperature).2. Organisms like lactobacillus are a problem in production of wine.3. In antibiotic industry, potential contaminants are many, e.g., molds, yeast, and many bacteria, including Bacillus.4.The most dreaded contaminants of fermentation industry are phages. The only effective protection against phages is to develop resistant strains.

Sterilization Procedures

Sterilization involves either inactivation or removal of living organisms. This may be achieved by(i) heating,(ii) irradiation.(iii) Chemicals or (iv) filtration.

Heating

It is the most commonly used and the least expensive sterilizing agent. Dry heat is used in ovens and is suitable for sterilization of solids, which can withstand the high temperatures needed for sterilization, e.g., laboratory glassware, talc, etc. Steam, i.e., moist or wet heat, is used for sterilization of media and fermenter vessels.

Radiation- High energy X-rays are used for sterilization of a variety of labware and of food.

Chemicals - The chemicals used for sterilization cause inactivation by oxidation or alkylation; these are formaldehyde, H2O2, ethylene oxide, propylene oxide etc. H2O2 (10-25% w/v) is being increasingly used in the sterilization of milk and of containers for food products.

Filtration - Aerobic fermentation requires a very high rate of air supply often equaling 1 vol of air (equal to medium volume) every minute.

Strain Improvement- After an organism producing a valuable product is identified, it becomes necessary to increase the product yield from fermentation to minimise production costs.

Mutant Selection - Large scale mutant selection programmes begin when favorable reports of clinical trials are obtained.

Selective Isolation of Mutants - A majority of desirable mutants, especially the 'minor gene' mutants, showing increased production are isolated by screening a large number of clones surviving the mutagen treatment; this is called secondary screening.

Bioreactors -A bioreactor is a device in which a substrate of low value is utilized by living cells or enzymes to generate a product of higher value. Bioreactors are extensively used for food processing, fermentation, waste treatment, etc.

Immobilized Cell Bioreactors- Bioreactors of this type are based on immobilized cells.

Bioreactor Media- The medium composition is as critical to product yields as high producing strains of microorganisms.

Downstream Processing

The various processes used for the actual recovery of useful products from a fermentation or any other industrial process is called downstream processing.

Separation of Particles

The first step in DSP is the separation of solids, usually cells, from the liquid medium. This is generally achieved as follows.

Filtration, Centrifugation, Flocculation and Floatation.

Antibiotic Preparation

Antibiotics are metabolites having preferential antimicrobial activity.

Inoculum

A high yielding strain is a prerequisite for antibiotic production.

Fermenter

Antibiotics are generally produced in stainless steel fermenters (30,000-200,000 l medium volume) used in the batch or fed batch mode.

Production Medium.-Antibiotic production employs a variety of media, a different one for each stage of operation.

Enzymes

Enzymes are proteins, which catalyse specific biochemical reactions in a very efficient manner. Enzymes have been used for thousands of years as crude animal and plant preparations or as whole microorganisms, which were allowed to grow on substrates.

Fermentation

Inoculum is developed in several stages as is the case with other fermentations. The organism may then be multiplied in one or more seed tank stages.

Isolation and Purification

Isolation and purification is done immediately after termination of fermentation in a manner that retains the enzyme activity.

Types of Fermentation Process - The fermentation unit in industrial microbiology is analogous to a chemical plant in the chemical industry. A fermentation process is a biological process and, therefore, has requirements of sterility and use of cellular enzymic reactions instead of chemical reactions aided by inanimate catalysts, sometimes operating at elevated temperature and pressure.

Batch Fermentation Process-A tank of fermenter is filled with the prepared mash of raw materials to be fermented. The temperature and pH for microbial fermentation is properly adjusted, and occasionally nutritive supplements are added to the prepared mash.

Continous Fermentation Process- Growth of microorganisms during batch fermentation confirms to the characteristic growth curve, with a lag phase followed by a logarithmic phase.

Solid State Fermentation–Semi Solid OR Solid State Methods - In this the culture medium is impregnated in a carrier such as bagasse, wheat bran, potato pulp, etc. and the organism is allowed to grow on this.

Anaerobic Fermentation–Basically a fermenter designed to operate under micro acrophilic or anaerobic conditions will be the same as that designed to operate under aerobic conditions, except that arrangements for intense agitation and aeration are unnecessary Many anaerobic fermentations do, however, require mild aeration for the initial growth phase, and sufficient agitation for mixing andmaintenance of temperature

Aerobic Fermentation–A number of industrial processes, although called 'fermentations', are carried on by microorganisms under aerobic conditions. In older aerobic processes it was necessary to furnish a large surface area by exposing fermentation media to air.

Surface Culture Method- In this method the organism is allowed to grow on the surface of a liquid medium without agitation. After an appropriate incubation period the culture filtrate is separated from the cell mass and is processed to recover the desirable product.

Submerged Culture Method- In this process, the organism is grown in a liquid medium which is vigorously aerated and agitated in large tanks called fermentors.

Important uses of industrial micro-organisms Product Micro-organism Use Vitamin B12,,Streptomyces,vitamin supplements, Lactic Acid, Lactobacillus delbrueckii, chemical reagents,Citric Acid, Aspergillus Niger ,food preservative, Ethanoic Acid, Acetobacter sp,. vinegar, solvent

Pectinases Micriorganism, Aspergillus sp., degrading pectin, Ethanol, Saccharomyces, chemical reagents, drinks, Penicillin, Penicillin chrysogenum, antibiotic

References

1. Industrial Microbiology by Gupta
2. Genetics Engineering by Shastri .
3. www.google.com