UGC JOURNAL NUMBER 44557

International Journal of Allied Practice, Research and Review

Website: www.ijaprr.com (ISSN 2350-1294)

Impact of Dairy Waste Water on *Coccinia grandis* and *Solanum melongena*

Gandhi Krishna, Dhorawala Disha and Parikh Punita
Department of Botany, The M.S. University, Vadodara, Gujarat, India

Abstract - The current study reported impact of Amul dairy waste water on biochemical properties of *Coccinia grandis* and *Solanum melongena* (treated plants) grown in the fields at Hadgud village of Anand district in the year 2017-18. Physicochemical properties of waste water included pH, Acidity, Alkalinity, Biological Oxygen Demand(BOD), Chemical Oxygen Demand(COD),Total solids, Total suspended solids, Total dissolved solids, sodium, sulphide, Total hardness, Calcuim hardness, and magnesium hardness. Biochemical Parameters like pigments (chl – a , chl – b , total chl) , protein and carbohydrate were analysed in the plants from control area as well as those irrigated with waste water. The results showed that pigments (chl – a, chl – b , total chl) , as well as protein and carbohydrate content of the treated plants were found to be more in treated plants as compared to control plants.

Keywords - *Dairy waste waters , Physicochemical parameters , Biochemical properties.*

I. Introduction

Amul is the largest food brand of India majoring in production of milk and milk products. It is run by collection of milk from 700 villagers. This dairy processes 1800ml of raw milk per day for which it requires an average of 1600ml of water per day. Dairy industries are involved in the manufacturing of various types of milk products such as fluid milk, butter, cheese, milk powder, condensed milk, flavoured milk, ice cream etc. typical by products obtained include butter milk, whey and their derivatives. The entire process generates around 15 lac. litres of wastewater after it is being recycled. To control and mitigate all types of pollution dairy has very well designed and well maintained environmental management system.

The dairy waste contains organic and inorganic micronutrients and was found to discharge through an underground channel into the farms of Hadgud village situated at approximate 3.5 kilometers away from the Dairy. Since past many years, the farmers use this wastewater for irrigation purpose. Crops like *Coccinia grandis, Solanum melongena, Zea mays, Pennisetum glaucum* are grown here.

Thus the current study aimed to investigate the effect of dairy waste water on certain biochemical properties (Chlorophyll, Carbohydrate and Protein) of crops; viz., *Coccinia grandis* and *Solanum melongena* grown in the fields where treated wastewater was used to irrigate the plants.

II. Materials and methods

The present study was conducted in the summer season of the year 2017-18. The water samples were collected from the outlet channel of Amul dairy wastewater plant (Pure wastewater), from the channel at Village Hadgud which was being released after treatment (Treated wastewater, Anand (Gujarat) and also from the Borewell (control) found in the same area.. The collection, preservation and analysis of these water samples followed the method described in APHA(2005)

To estimate chlorophyll content in the leaves, the samples of *Coccinia grandis, Solanum melongena* were collected at the flowering stage. Small, Medium and Large sized leaves were selected with the replicate of five for each size. Chlrorophyll a, b and Total Chlorophyll were estimated(Arnon's method 1949) The Carbohydrate (Anthrone, 1962) and protein(Lowry , 1951) were estimated in three different sizes of fruits of the test plants with replica of three for each size. Similar work was carried out in the test plants grown in the nearby farms from villages of Anand (Control plants).

III. Results and discussion

a) Physicochemical properties of untreated and treated water samples.

The physicochemical properties of dairy wastewater were given in Table1. The dairy wastewater is white in colour, turbid and unpleasant. In the present investigation the pH value of treated wastewater was 7. According to BIS standard, the prescribed limit varies between the range 5-9 for irrigation purpose. Total Alkalinity of dairy wastewater was 1650mg/l. The alkaline nature might be due to carbonate, bicarbonate of calcium and magnesium dissolved in dairy wastewater. BOD of treated water sample was 18mg/l. which was higher than the permissible value. Waste water of dairy industry contain large quantities of milk constituents such as casein, lactose, fat, inorganic salts, all the components contribute largely towards their high biochemical oxygen demand. The value of COD of treated water was 71mg/l, which indicated its suitability for irrigation purpose. COD is the amount of oxygen required for a sample to oxidize all its organic and inorganic matter. (Ogunfowokanetal.,2005;otokunefor and obiukwu2005.) Total dissolved solids; in treated water was 2300mg/l which was found within permissible range. This is because normally the treated wastewater of Amul dairy had lower value of sediments which were further reduced by treatment. Total suspended solids play an important role in water and wastewater treatment. Total suspended solids of treated water sample were 1800mg/l.Their presence in water sample cause depletion of oxygen level. Chloride content of the treated wastewater was 497mg/l which is found to be higher than the standard value This might be contributed to dissolution of salt deposits discharged in

treated wastewater from dairy industries. Sulphide of treated wastewater was 26mg/l. The anaerobic and facultative bacteria reduce the sulphur and its compounds into sulphides, with methane nd carbon dioxide thus causing very obnoxious ours. Thus, the aesthetic objective for sulphide is <0.05 mg/l .The quality of sulphide at this concentration is well below the amount that the body can detoxify. Total hardness are sum of the value of the calcium hardness and magnesium hardness. In the present study, total hardness was higher in the treated wastewater (450 mg/l) compared to borewell water (Control) (286 mg/l) . Calcuim hardness in treated water (18.03 mg/l) was lower than the borwell water (83.36 mg/l) and magnesium hardness was higher in treated water (431.97 mg/l) as compared to borewell water (202.64mg/l).Hardness mainly due to chloride , sulphate and heavy metals.

Table 1: Physicochemical properties of untreated and treated water samples.

Sr No.	Parameter	Pure Waste-water	Treated waste water/Dairy waste water	Borewell water/Control water	Standards
1.	pH	14	7	7	5-9
2.	Colour	Milky	Slightly milky	--	
3.	Odour	Unpleasant	--	--	--
4.	BOD (mg/l)	25	18	2.16	12
5.	COD(mg/l)	89.2	71	5.70	100
6.	Acidity(mg/l)	12.5	50	95	
7.	Alkalinity(mg/l)	6500	1650	1050	<100
8.	Total solids(mg/l)	6950	2300	2500	
9.	Total dissolved solids (mg/l)	6750	1800	1500	4000
10.	Total suspended solids(mg/l)	200	500	1000	400
11.	Chloride(mg/l)	8449	497	812.24	<350
12.	Sodium(mg/l)	73	65	35	
13.	sulphide(mg/l)	30	26		0.05
14.	Total hardness(mg/l)	130	450	286	
15.	Calcuim hardness(mg/l)	14.02	18.03	83.36	<400

16.	Magnesium hardness(mg/l)	115.98	431.97	202.64	<60

b) Biochemical properties:

1) Chlorophyll content in the leaves

As shown in Fig 1and 2, as compared to control samples, treated samples showed increase in the level of chlorophyll a, chlorophyll b and total chlorophyll in both the *Coccinia grandis* and *Solanum melongena*. Also as the size of the leaves increased the content also was found to get increased. Enhancement of chlorophyll could be due to high nutrient uptake, higher synthesis and translocation probably facilitated by optimum availability of iron and magnesium and also due to reduction in phenol content in the primary treated dairy waste water (Nagda et al., 2006).

2) Carbohydrate content in the fruits

Both the test plants showed enhancement in the carbohydrate content as compared to fruits of control plants. The carbohydrate content of *Solanum melongena* in the control plants were found to be have more content of Carbohydrate than the treated plants (Fig 3 and 4). This might be attributed to addition of fertilize in the control fields which inturn might have enhanced the carbohydrate content in the fruits.

3.) Protein content in the fruits

Protein content found to be more in the fruits of the treated plants as compared to control in both the test plants (Fig 3 and 4). The enhancement of protein content of crop plants might be due to increased rate of amino acid synthesis probably attributed to the higher rates of both RNA-ase and transaminase activity (Singh et al., 1991) . There was no significant difference in the protein and carbohydrate between the fruits of *Solanum melongena* in control and treated plants.

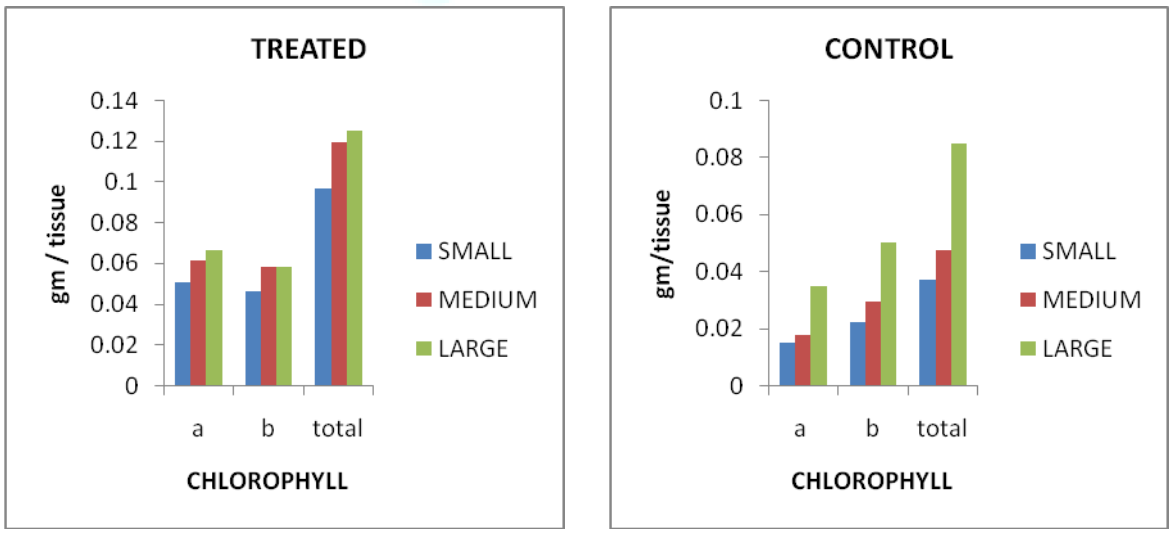

Fig 1: Pigment contents of treated and control leaves of *Coccinia grandis*

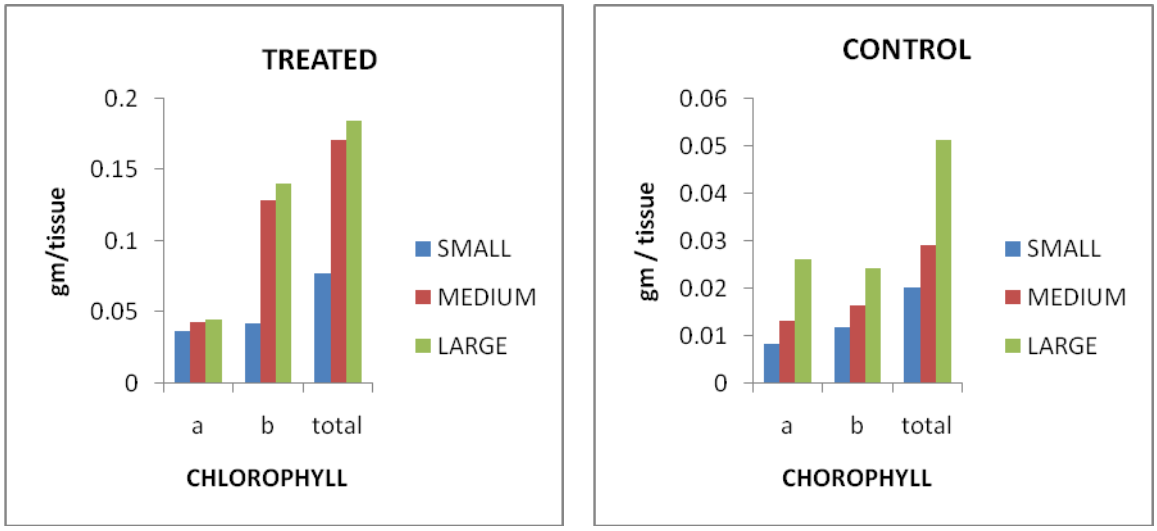

Fig 2 : Pigment contents of treated and control leaves of *Solanum melongena*

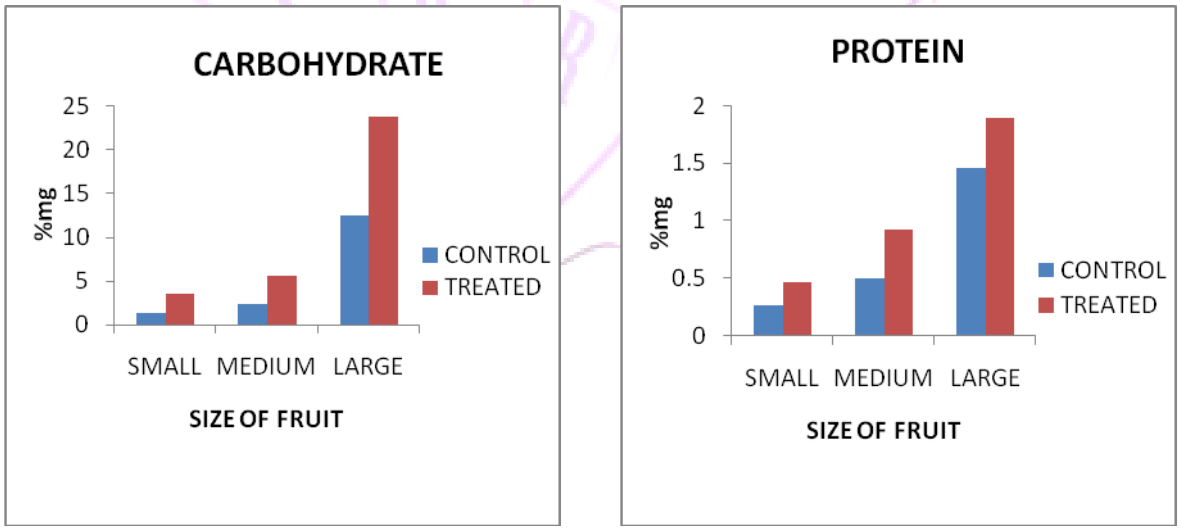

Fig 3 : Carbohydrate and protein contents of control and treated fruits of *Coccinia grandis*

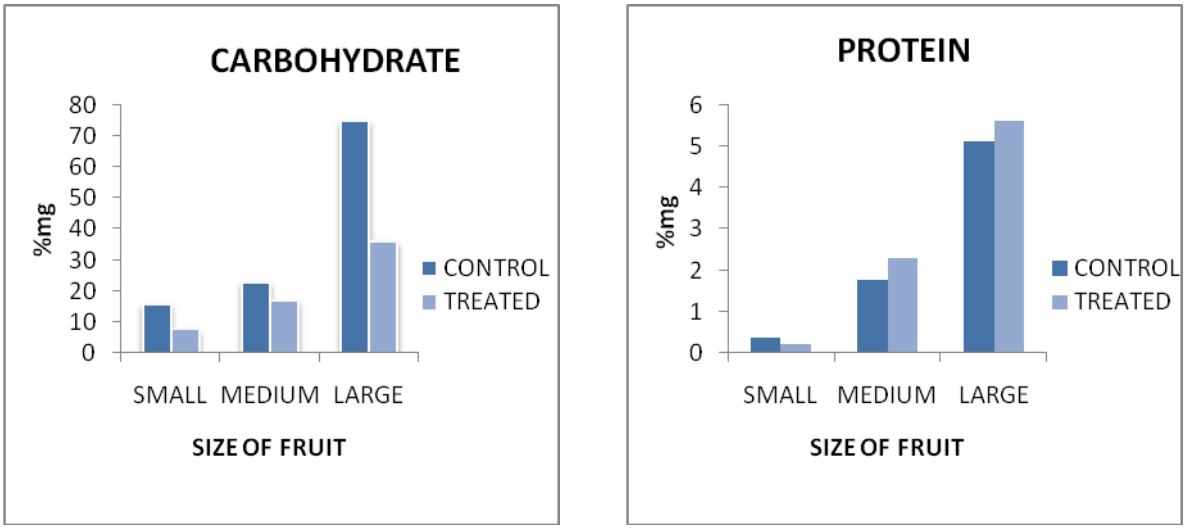

Fig 4 : Carbohydrate and protein contents of control and treated fruits *of Solanum melongena*

IV. Conclusion

The above results confirmed that the dairy waste water can be used for agricultural purpose, because it increased the nutrients availability to the plants. Since the higher concentrations of the treated dairy waste water inhabit the plant growth if applicable for longer duration, it is recommended that it should be used only after suitable dilution.

V. References

1. **AL – Dulami Ri , Ismail N , Ibrahim MH, 2014 Resposes of growth of lady's fingers (Abelmoschus esculentus L.) to different treatment methods of dairy waste water , Ann Agric Environ Med 21[1] : 42-8**

2. **APHA 2005 standard methods for the examination of water and wastewater , 21 st edn. American Public Health Association , Washington , DC.**

3. **Banupriya G and S.Uma Growie 2012 A study on microbial diversity of dairy waste water and its impact on growth of different plant species , INTJ CURR SCI : 71-77**

4. **Challam,Beula S and Chaturvedi , S.S. 2013 Effect of treated dairy waste water on height and yield of *Zea mays L.* ,RASAYAN J. Chem. 6[2] : 153-157**

5. **Chaudhary meetu and Verma Susheel k . 2011 Analysis of physicochemical properties of the processed fruits and vegetable products , International Journal of pharma and Bio sciences 2 : B – 661 – B -666**

6. **Shah, G. L. 1978 In: Flora of Gujarat State Part I and II, Sardar Patel University, Vallabh Vidyanagar.**

7. **Patel Aditya , Sharma Siddharth , Mitra sukhen and Shah Monika ,2016, Performance and evalution study of dairy waste,Internationl Journal of Advanced technology in engineering and science , 4 [4] 172-176**

8. **Saini Madhvi , Sharma kailash Chandra and Sharma Manju 2015 Study of Biochemical characteristrial waste water of Bhiwadia , Rajasthan, India Bulletin of environment , Pharmacology and life sciences 4 [3]: 110-117**

9. **Sharma,N.K, Goswami Bhakiti , Gajjar Bijal , Jain Chirag ,Soni Deepak and Patel Krishna 2011 Utilization of Amul Dairy waste water for agriculture practices , International Journal of environmental Sciences 2 [1]: 22-32**

10. **Venkatesan.S , Rajesh.S and Seeganpaul .Y . 2016 potential use of waste waters from the dairy Industry for irrigation : A pilot study using (vignaradiate) , SIRJ – BE6 3 [9] : 8-22**