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ORIGINAL ARTICLE

Studies on Sewage Water Quality Criteria Leads to Eutrophication in Guntur District, Andhra Pradesh, India

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ABSTRACT
Nutrients are necessary for plants to live, and they are the limiting factor with regard to plant growth in many freshwater ecosystems. Water quality in rivers as well as water reservoirs is affected by human activity in its environment. The aim of the study is to evaluate various water quality parameters of sewage water from Agro-Industries of Guntur district, Andhra Pradesh. The water samples were collected from the 10 different sites of Guntur district, Andhra Pradesh. The collected sewage water samples were evaluated for the various physio-chemical parameters such as the pH, conductivity, total soluble solids (TSS), BOD, chemical oxygen demand (COD) and dissolved oxygen concentration (DO) are generally higher than the normal water. The nitrate and phosphate analysis were high this due to maximum dilution. The focus in this was to determine of nitrate and phosphate. A high eutrophication was observed, the major reason involving eutrophication were leaked sewer lines and direct discharge involving sewage into rivers.
Keywords: *Wastewater, Eutrophication, Biological oxygen demand, Chemical oxygen demand, Nutrients*

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INTRODUCTION

Water quality in rivers as well as water reservoirs is affected by human activity in its environment. Besides the direct negative action with toxic materials, humans burdens the water environment through large amounts of nutrients. The too much nutrients amount produced by the human being and discharged into drinking water influences the rapid improve of trophy. Among the primary sources of eutrophic nutrients fit in the intensive agricultural creation, some kinds of industrial waste lakes and rivers, using of polyphosphates within detergents and increasing creation of municipal waste lakes and rivers and wastes [1]. Anthropogenic activity is often a cause of annual modifications in our chemical composition of flow waters. Man affects water quality by changing the total amount and quality of home sewage discharged to the water. A reduction of sewage as well as an improvement of its high quality have an effect on the water chemical compounds as well as instantly lead to a loss of ammonia ions concentration as well as, to a lower extent, to diminish of orthophosphates [2].

In case of eutrophication when a body of water gets overly enriched with nutrients and nutrients which stimulate excessive growth of plants as well as algae [3]. This method may result in oxygen destruction of the water body[4]. One example is a great increase associated with phytoplankton in a water entire body as a response to increased amounts of nutrients. Eutrophication is almost usually induced by the discharge associated with nitrate or phosphate-containing liquids, fertilizers, or sewage into an aquatic system. Eutrophication arises from the oversupply of nutrients leading to the overgrowth of plants. After such organisms pass away, the bacterial degradation of the biomass consumes the O_2 in the water, thereby causing the state of hypoxia.

Based on Ullmann's Encyclopedia, "the main limiting factor for eutrophication is phosphate." The of phosphorus generally encourages excessive plant growth as well as decay, favouring simple dirt and plankton over some other more complicated plants, and causes the severe reduction in water high quality. Phosphorus is a necessary nutritional for plants to live, and it is the limiting factor with regard to plant growth in many freshwater ecosystems. Phosphate adheres firmly to the soil, so it is primarily transported by erosion. As soon as, it translocated to lakes, the actual extraction of phosphate from water

is slow, therefore the difficulty of reversing the consequences of eutrophication[5].Numerous reports were available for the nitrogen as a primary restricting nutrient for the accumulation associated with algal biomass.The primary causes in eutrophication appear to be extra nitrogen and phosphorus-from resources including fertilizer runoff as well as septic system effluent in order to atmospheric fallout from burning up fossil fuels-which enter water bodies and fuel the overgrowth of algae, which, consequently, reduces water quality as well as degrades estuarine and seaside ecosystems. With this background, we aim to evaluate various water quality parameters of sewage water from Agro-Industries of Guntur district, Andhra Pradesh.

MATERIAL AND METHODS

Study Region

Guntur district is located in the north coastal region of Andhra Pradesh. The district is located within the geographical co-ordinates connected with 15° - 18 in addition to 16° - 50 connected with northern latitude and 70° - 10 and 80° - 55 of eastern side longitude. The district seemed to be bounded on the east by the Bay of Bengal, with south by Prakasam center, on north by Krishna district and on the gulf by Mahaboobnagar and Kumool districts. The river Krishna traverses about 250 mi.

Sewage water samples were collected at 10 sampling sites mentions in the Table 1 along with their longitudes and latitudes.

Table 1. Area Location and Latitudes

Sr. No	Location	longitudes	latitudes
1	Guntur	16.3067° N	80.4365° E
2	Mangalagiri	16.4346° N	80.5662° E
3	Tadikonda	16.4200° N	80.4521° E
4	Pedda Vadlapudi	16.4115° N	80.6110° E
5	Bandarupalle	16.3735° N	80.3589° E
6	Chebrolu	16.2007° N	80.5286° E
7	Mutluru	16.1580° N	80.4841° E
8	Macherla	16.4760° N	79.4394° E
9	Rompicherla	16.2097° N	79.9087° E
10	Acharya Nagarjuna University	16.3763° N	80.5277° E

Estimation of physical, chemical and biological and located in the Guntur region during the summer and winter seasons. The pH, temperature, conductivity, TDS of the sample were performed on the field with the handheld instrument by *HANNA*. The instrument is calibrated before analyzing the sample in the field.

Statistical analysis

The obtained data were analyzed on the GraphPad statistical software. The results were depicted as mean of three replicates.

RESULTS

In the present study, the pH of the water inlet and outlet was found to vary from 7.0 to 8.0. The particular pH of all samples was in the BIS (Bureau of Indian Standards) limit, i.e. 6.5 to 8.5 (Figure 1). So, each sample was slightly alkaline in nature.

The average electrical conductivity is seen higher in winter than in summer except location 6, 7 and 8. At sampling location no 2,the conductivity variation between the inlet and outlet water were significantly different in the summer. The lowest EC value was showing 0.21mS and the highest value was 0.94mS (Figure 2).

The concentrations of TDS are varying from 0.2ppt to the maximum of 0.48ppt. There are non-significant variation in the inlet and outlet; the outlet concentration may be similar to inlet because of the addition of chlorine in water (Figure 3).

Figure 1.pH variations among ten sampling locations

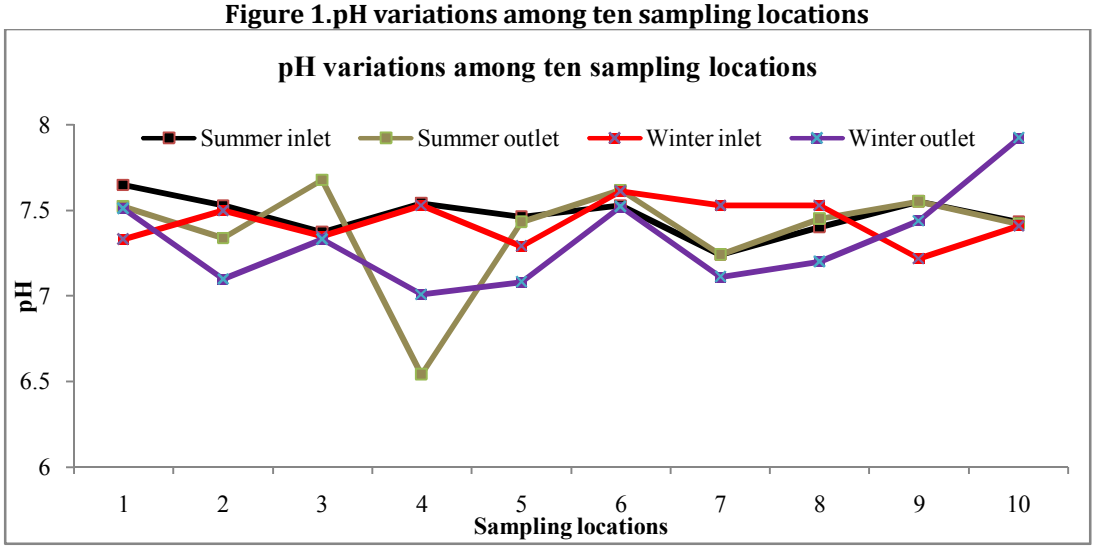


Figure 2. Electrical conductivity (EC) variations among ten sampling locations

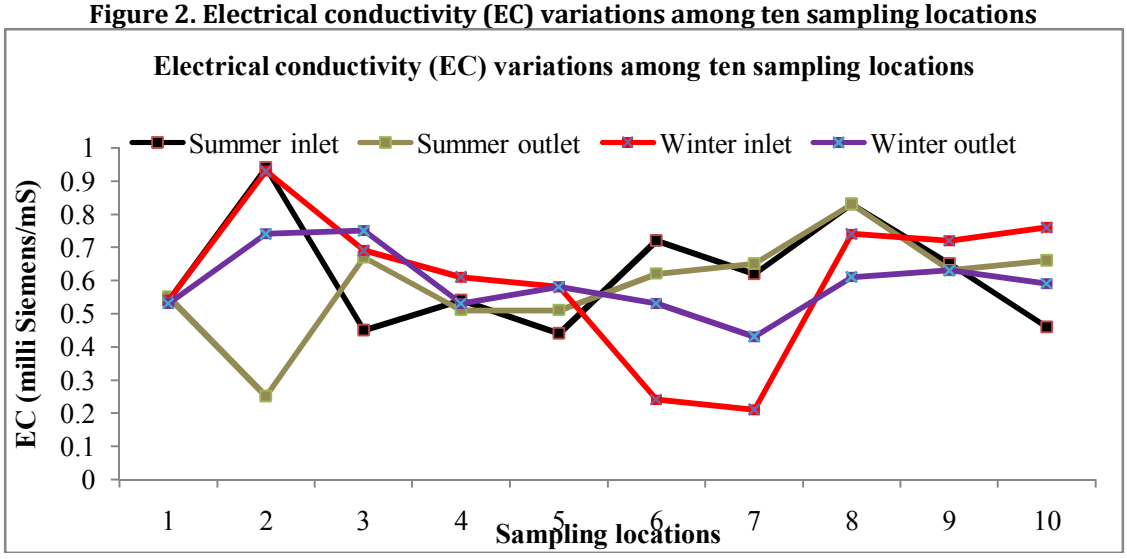
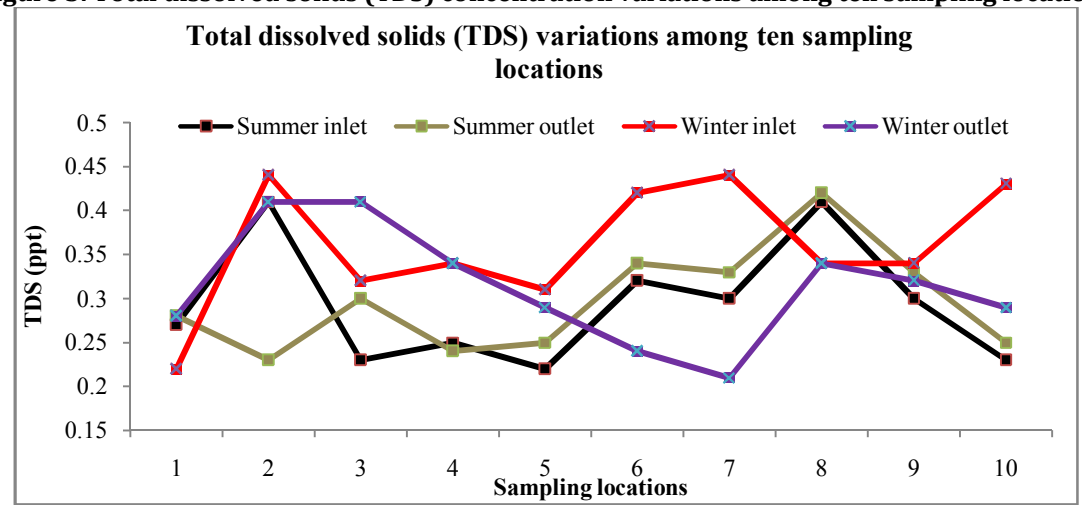
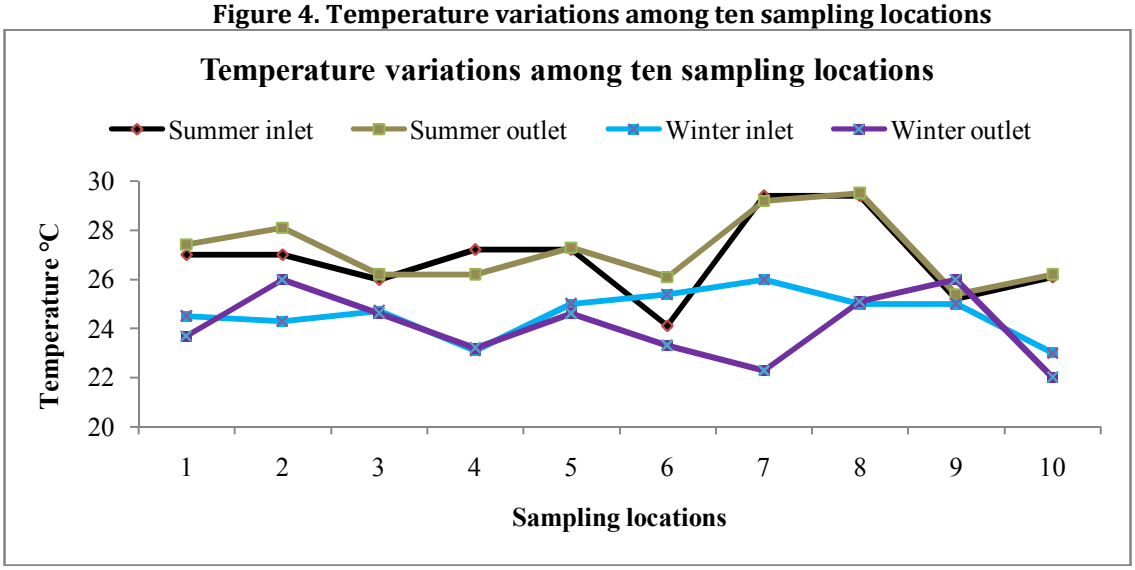


Figure 3. Total dissolved solids (TDS) concentration variations among ten sampling locations



The temperature of the water was found to be varies between 22°C to 29°C. In the summer, location 7 and 8 showed highest inlet and outlet temperature as compared to the other locations (Figure 4).

Figure 4. Temperature variations among ten sampling locations



In the present study, the BOD value was within the best practice rules. In the summer season, BOD values were higher than winter weather. In the summer, oxygen concentration reduces due to temperature factor. Therefore, it showed maximum BOD values in summer than the winter (Table 2).

The COD values for all locations were significantly differs in the summer and winter due to substantial treatability of sewage in a water treatment plant. The organic and inorganic substances were present in the water according to the BIS limit. The amount of nitrate and phosphate were varies from 1 to 1.9 and 1 to 2.2, respectively.

Table 2: Results table of chemical parameters

	DO		BOD		COD		NITRATE		PHOSPHATE	
S. no	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
1	4.5	4.3	9.1	8.7	22	26	1.14	1.10	2.21	1.97
2	5.1	4.9	9.3	7.4	25	28	1.54	1.32	2.19	2.10
3	3.9	4.0	8.7	8.4	28	22	1.40	1.51	1.95	1.83
4	3.8	4.2	7.5	7.6	17	25	1.80	1.45	1.65	1.83
5	5.1	4.8	9.1	9.5	23	28	1.51	1.65	2.10	1.99
6	6.1	5.6	8.1	8.2	22	18	1.25	1.68	1.85	2.10
7	3.4	4.1	7.9	7.5	19	23	1.32	1.27	1.64	1.68
8	6	5.8	9.7	8.5	25	28	1.65	1.32	1.38	1.74
9	5.1	4.9	8.2	7.5	28	22	1.81	1.89	2.14	1.98
10	5.1	4.3	7.9	8.2	17	25	1.41	1.87	2.15	1.10

S. no: Sample number; DO: Dissolved oxygen; BOD: Biological oxygen demand; COD: Chemical oxygen demand

DISCUSSION

The Guntur district is gifted with the vast floor and ground water information. About 3.56 lakh hector area is irrigated by canals and it has a new ground water recourse of 3.63 lakh ha[6]. However, failure of rainfall through successive years since 2001 has resulted in depletion with ground water resources and canal water supply for irrigation. This has greatly affected often the agricultural production. The supply connected with spurious seeds, insecticides in addition to fertilizers have further supplied to the failure of the facilities.

Madhavi and Prasad Rao [7] assessed the quality of ground waters in four major manufacturing areas of Hyderabad and claimed that the pH of sewage discharges from Patancheru, Kattedan, Nacharam and Jeedimetla were 6.9, 6.1, 6.9 and 7. 0, respectively. Yadav et al. [8] claimed a pH of 7. 1- 8. 3. A similar locating was recorded by Dheri et al. [9], the place that the mean value of EC connected with sewage-contaminated water was a lot more than tube well water. Saha et al.[10] claimed that the pH of manure water from 7. 3-7. 4 which is a critical pedoman affecting the quality of sewage effluents and its recycling. Bharose et al. [11] claimed that the sewage water seemed to be slightly alkaline in dynamics compared to tube well water.

Hallale and Allapure [12] reported that the maximum sodium content of 9.5ml/L was registered in sewage water while in summer season. While maximum of 5.6ml/L with rainy season in Udgir, and the potassium ranged from 0.3 or more to 0.8ml/L. The sewage waters have a high nutrient load, stopped solids and dissolved nitrates. It adds available Some remarkable, P, K to garden soil, indicating their significant supplement through sewage suggesting make use of sewage water as a minimal grade cheap fertilizer with agriculture, which can markedly can help cost due to substitution connected with chemical fertilizers [13]. Similarly, Reddy et al. [14] in addition reported that the sewage waters have a high nutrient basket full which increases available some remarkable, P and K to help soil and the sewage waters can be used as a fertilizer swap to reduce cost.

Lokhande *et al*. [15] reported that your minimum BOD value of 246.3mg/L along with the maximum value of 569.5mg/L in manure water. BOD increases on account of biodegradation of organic resources that exerts oxygen antagonism in a water body. Shekhawat and Singh[16] claimed that the BOD levels of manure water ranged from 15 to 253mg/L which will exceed the desirable restricts (100mg/L) which intended that primary treatment of waters required before being used in grinding. Abida and Harikrishna [17] reported that the sewage waters contain the minimum COD associated with 506. 9mg/L and the maximum value of 602. 9mg/L. Saha et al. [18] claimed that available soil Some remarkable, P and K information in wheat crop harvested in vertisols, soils irrigated with sewage water in addition to soils irrigated with yard water was 11.4%, 44% and 17%, respectively.

Ladwani et al. [19] reported that the facilities irrigated with sewage waters were recorded significantly bigger N, P and E (299, 26, 34 kilos ha) as compared to the facilities irrigated with ground waters (266, 18.13, 323kg ha). This indicates this domestic waste water irrigation provides essential nutrients to the facilities. Mohammad and Mazahreh[20] reported that the irrigation having sewage water showed an enormous increase of N, K and K in the foliage of the grass. The amount of entire N, P and P was 4.90%, 0.30 and 3.47%, respectively compared to canal normal water irrigation. Similar results were likewise published by Rusan *et al*. [21] on crops.

CONCLUSIONS

Examination of sewage water demonstrates at inlet the guidelines such as pH, Conductivity, TSS, BOD, COD, DO are generally higher than of normal exterior water characteristic. The nitrate and phosphate analysis with inlet are high this is due to maximum dilution but not much growth of microorganisms at the beginning, even at the outlet it's negligible it has no more relevance in eutrophication. Our principal focus of this study ended up being determination of Nitrate along with Phosphate. From observed the effects it can be cleared that the waste treatment plant has satisfactory capacity to treat the water.

Typically, the concentration of N along with P is increase caused by stagnation period and microbial activity, even the impact involving temperature and other parameters are responsible for increasing its attentiveness in natural water systems. The observed plant expansion was due to direct produce of sewage in these estuaries and rivers. This is due to direct discharge involving sewage into these normal water bodies. A high eutrophication is usually observed, it can be seen that it area is having lot of lawn activities and it leads to improvement of nutrients directly into your river. Major reason involving eutrophication are leaked sewer lines, direct discharge involving sewage into rivers, formation runoff etc. Hence there may be need of more waste treatment plants which can handle the excess load of waste from the residential areas.

REFERENCES

1. Smith VH, Tilman GD, Nekola JC,(1999). Eutrophication: impacts of excess nutrient inputs on freshwater, marine, and terrestrial ecosystems. Environ. Pollut., 100(1-3): 179–196.
2. Lehmann A, Rode M,(2001). Long-term behaviour and cross-correlation water quality analysis of the River Elbe, Germany. Wat. Res., 35(9): 2153–2160.
3. Chislock MF, Doster E, Zitomer RA, Wilson AE, (2013). Eutrophication: causes, consequences, and controls in aquatic ecosystems. Nature Education Knowledge, 4(4): 10.
4. David S, John RV, (2004). Over fertilization of the World's Freshwaters and Estuaries, University of Alberta Press, p. 1
5. Khan MN., Mohammad F, (2014). Eutrophication of Lakes. in A. A. Ansari, S. S. Gill (eds.), Eutrophication: Challenges and Solutions; Volume II of Eutrophication: Causes, Consequences and Control, Springer Science
6. Rao CS, (2011) Determination of water quality of some rural areas of Guntur district, Andhra Pradesh, India, Department of Environmental Sciences, Acharya Nagarjuna University, Andhra Pradesh, India, 2-3
7. Madhavi A, Rao AP,(2003). Effect of Industrial effluent on properties of ground water. J. Environ. Biol. 24(2):187-192.
8. Yadav RK, Chaturvedi RK, Dubey SK, Joshi PK, Minhas PS,(2003).Potential and hazards associated with sewage irrigation in Haryana. Indian J. Agric. Sci. 73(5): 249-255.

9. Dheri GS, Brar MS, Malhi SS(2007). Heavy-metal concentration of sewage contaminated water and its impact on underground water, soil and crop plants in alluvial soils of northwestern India. Commun Soil Sci Plan. 38:1353–1370.
10. Saha JK, Panwar N, Srivastava A, Biswas AK, Kundu S, Rao AS. (2010) Chemical, biochemical, and biological impact of untreated domestic sewage water use on Vertisol and its consequences on wheat (*Triticumaestivum*) productivity. Environ Monit Assess 161:403–412
11. Bharose R, Lal SB, Thomas T, Davi AA, Masih H, Peter JK, Masih J. (2014). Effect of different levels of sewage water on accumulation of heavy metals in soil, plants and bulbs of onion cropm(*Allium cepa* L.). Int. J. Res.5(1): 219-222.
12. Hallale SN, Allapure RB. (2012). Seasonal variation in physic-chemical parameters of domestic sewage at Udgir, Maharashtra, India. Pollut. Res. 31(3): 401-402.
13. Ali AA(2010). Reuse of wastewater for irrigation in Saudi Arabia and its effect on soil and plant. Paper presented in 2010 19th World Congress of Soil Science, Soil Solutions for a Changing World 1 – 6 August 2010, Brisbane, Australia. 2250-2253.
14. Reddy PK, Reddy SK, Reddy KG, PrasadRM. (2013). Sewage irrigation can sustain the soil health: A review.Int. J. Agric. Sci. 3 (4): 470-472.
15. Lokhande RS, Singare PU, Pimple DS. (2011). Study on physico-chemical parameters of waste water effluents from Taloja industrial area of Mumbai,India. Int. J. Ecosyst. 1(1): 1-9.
16. Shekhawat VS, Singh C.P. (2011). Seasonal appraisal of physic chemical parameters of waste water discharged in Amanisha-Nalla of Jaipur city, Rajasthan. Pol. Res. 30(4): 587-591.
17. Abida and Harikrishna (2008). Study on the quality of water in some streams of Cauvery river. J. Chem. 5(2): 377-384.
18. Shah MC, Shilpkar PG, Acharya PB(2008). Ground water quality of Gandhinagar Taluka, Gujarat, India. Eur. J. Chem. 5(3): 435-446.
19. Ladwani KD, Ladwani KD, Manik VS, Ramteke DS. (2012). Impact of domestic wastewater irrigation on soil properties and crop yield. Int. J. Sci. Res. 2 (10):1-7
20. Mohammad M, Mazahreh N. (2003). Changes in soil fertility parameters in response to irrigation of Forage Crops with secondary treated wastewater.Commun Soil Sci Plan. 34(9-10): 1281–1294.
21. Rusan MJM, Hinnawi S, Rousan L. (2007). Long term effect of waste water irrigation of forage crops on soil and plant quality parameters. Desalinization.215: 143-152.

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