

Physicochemical Water Pollution of River Ginzo's Seasonal Variations for Irrigation, Katsina Metropolis, Katsina State, Nigeria

AMINU IBRAHIM*

Department of Geography, Faculty of Earth and Environmental Sciences, Umaru Musa Yaradua University Katsina

*Corresponding Author

AMINU IBRAHIM, Department of Geography, Faculty of Earth and Environmental Sciences, Umaru Musa Yaradua University Katsina.

Submitted: 2025, May 27; Accepted: 2025, Jun 20; Published: 2025, Jun 30

Citation: IBRAHIM, A. (2025). Physicochemical Water Pollution Of River Ginzo's Seasonal Variations For Irrigation, Katsina Metropolis, Katsina State, Nigeria. *J Water Res*, 3(2), 01-04.

Abstract

A study on water quality in relation to irrigation was conducted at River Ginzo. The aim of the study physicochemical water pollution of River Ginzo's seasonal variations for irrigation, Katsina State. Improper monitoring the level of water quality in the river may lead to contamination of the water and low yield of irrigation. Water samples were collected at ten points in wet and dry seasons 2023/2024 each i.e. ten samples stations, thirteen parameters were analyzed using standard laboratory techniques. The parameters include Temperature (T), pH, Electric Conductivity (EC), Total Dissolve Solid (TDS), Turbidity (Tur), Total Hardness (TH), Chloride (Cl), Nitrate (NO₃), Dissolve Oxygen (DO), Biological Oxygen Demand (BOD).

Keywords: Irrigation, Parameter, Quality, River Ginzo, Standard, Variation, Water

1. Introduction

Rivers are vital freshwater resources supporting diverse ecosystems and irrigation activities. In Nigeria, many rivers face pollution challenges due to rapid urbanization, industrialization, and agricultural practices. River Ginzo in Katsina State is a crucial water body for local communities, providing water for irrigation and supporting aquatic life. However, increasing reports of pollution.

Ammonia (NH₃), Nickel (Ni), and Lead (Pb). Data was analyzed pair 't' test and related with FAO standards. Based on findings this research reveals 69.23% of parameters shows there is no significant relationship between the parameters and standards of water quality for irrigation due to variations exist between and within different parameters in the river

both temporally and spatially. Future research needs to concentrate on heavy metals to continue monitoring the quality of the river. Necessitate a thorough investigation into its current state and the implications for environmental and public health. stated Water Pollution refers to addition of material or energy to the water body which brings or introduce harmful substances to life, such as

toxic chemicals or excessive amounts of nutrients, into the water, resulting in negative impacts on the quality of life for both flora or fauna [1].

Despite River Ginzo's importance, there is limited comprehensive data on the extent of its pollution and the consequent effects on the ecosystem and human health. This study aims to bridge this knowledge gap by assessing the physicochemical water pollution of River Ginzo's seasonal variations for irrigation, particularly physicochemical, and their uptake in local vegetation, as well as examining the river's composition as an indicator of ecological health, is essential to determine the river's ability to sustain irrigation.

Additionally, evaluating the levels of pollutants and their sources is necessary to mitigate risks to irrigation and public health. This study will contribute to understanding the environmental challenges facing the river and provide data for the sustainable management of irrigation activities. The result were compared with safe limits and standards, which will produce the knowledge to stakeholders and inhabitants to take necessarily action on the outcome [2]. There is need for periodic monitoring of these physicochemical

parameter's presence in the river. Results obtained from this study will reveal if the irrigation consumed by the inhabitants of river Ginzo, Katsina state are contaminated or not.

2. Materials and Methods

2.1. Study Area: The research was conducted in 2023/2024 in Katsina metropolis, located within the North West Zone of Nigeria at latitude 12°15'N and longitude 70°30'E, covering an area of 24,192 km² (9,341 square meters). Katsina State experiences two distinct seasons, which are rainy and dry. The rainy season spans from April to October, while the dry season lasts from November to March [3]. This study took place during both the rainy and dry season. Katsina State has an average annual rainfall, temperature,

and relative humidity of 1,312 mm, 27.3°C, and 50.2%, respectively [4]. Notably, the research was conducted in Kofar Marusa within Katsina Metropolis.

2.2. Sampling Points: Water samples were taken in a period of two seasons; wet 2023 and dry 2024, using clean new rinsed dark plastic containers, two (2) litre capacity. The water samples were not being taken above the surface of the water body. Ten points were selected in the river, upstream, middle and downstream were consider in the selection of samples adopted from [5]. Water samples were collected from TEN (10) points along River Ginzo, specifically at Kofar Marusa, Kofar Durbi, and Kofar Sauri, to capture spatial variations in water quality.

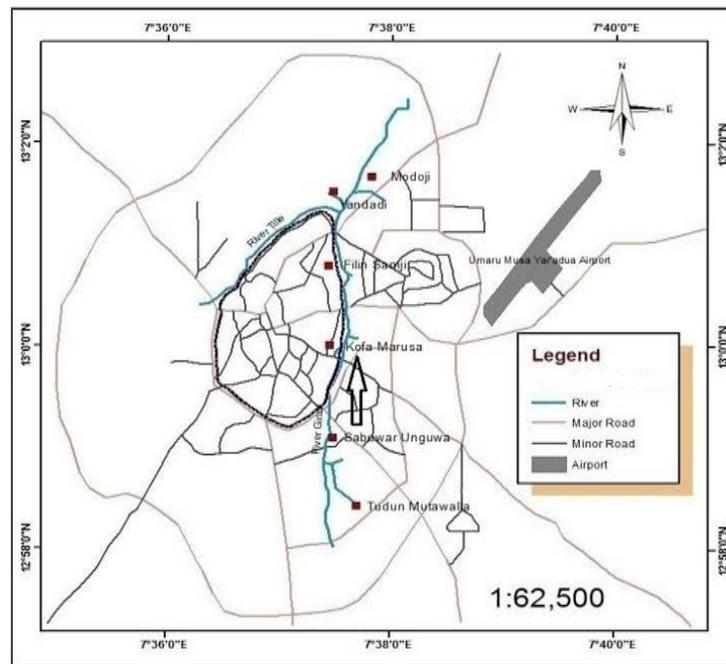


Figure 1: Map of Katsina Metropolis Showing River Ginzo Source Field work, 2023

2.3. Laboratory Analysis: The collected samples were analyzed for key physicochemical parameters, including Temperature, pH, Electric Conductivity, Total Dissolve Solid, Turbidity, Total Hardness, Chloride, Nitrate, Dissolve Oxygen, Biological Oxygen Demand, Ammonia, Nickel, and Lead using standard methods.

2.4. Data Comparison: The results were compared against FAO (2006) guidelines for irrigation quality to evaluate the suitability of River Ginzo's water for agricultural use.

3. Results and Discussion

3.1. Level of Physicochemical Parameters

The result of paired 't' test between parameters shows that there is no significant difference at 0.05 level between wet and dry season values among the ten (10) points in term of Temperature (P-value is 0.052), pH (P-value is 0.071) Electric Conductivity (P-value is 0.196), Total Dissolve Solid (P-value is 0.294), Nitrate (P-value

is 0.078), Dissolved Oxygen (P- value is 0.993), Biological oxygen demand (P-value is 0.405), Nickel (P- value is 0.200), and Lead (P-value is 0.639) which is 69.23% not significant (Table 1). The result indicated significant differences at $p < 0.05$ among the sampling points and seasons in term of Turbidity (P- value is 0.000), Total Hardness (P-value is 0.047), Chloride (P-value is 0.000), and Ammonia (P-value is 0.011). This indicated that there is pronounced variation in terms of these parameter among the sampling point in both wet and dry seasons. (Table 1). This finding is substantiated by the work of that no significant difference among the values of heavy metals [6,7].

This indicated that these parameters vary both temporally and spatially in the river because in dry season the variations of water quality are mainly influenced by domestic sewage, industrial effluents, and salt water intrusion. While in wet season, except

the aforementioned pollution sources, drainages from cultivated land and livestock farm are also the main factors influencing water pollution. (Table 1).

The result in Table 1 is substantiated by the work of that no significant difference among Sabke river Dannakola Daura, Katsina State, Nigeria [8,9]. There result reveals that there is no significant difference at 0.05 level between wet and dry season values among the three stations interm of temperature, (P-value is 0.13), pH (P-value is 0.66), BOD (P-value is 0.16), Chlorine (P-value is 0.15), Ammonia (P-value is 0.12), Lead (P-value is 0.5) and Nickel (P-value is 0.12). This indicates that there is no pronounced variation in terms of these parameters among the sampling station in both wet and dry seasons.

The result indicated significant differences at $p > 0.05$ among the sampling stations and seasons in term of Electrical Conductivity (EC) ((P-value is 0.01), Dissolved Oxygen (DO) (P-value is 0.05) and Total Dissolved Solid (TDS) (P-value is 0.03). Also, its indicated that these parameters vary both temporally and spatially in the river. Finding of this research reveals that 69.23% of parameters shows there is no significant relationship between the parameters and standards of water quality for irrigation due to variations exist between and within different parameters in the river. Hence, null hypothesis is hereby accepted because P-value is greater than 0.05.

S/N	PARAMETERS	Df	“t”	P	Remark
1	Temperature	9	-2.242	0.052	Not significant
2	pH	9	2.050	0.071	Not significant
3	Electrical conductivity (EC)	9	-1.397	0.196	Not significant
4	Total dissolved solid (TDS)	9	-1.114	0.294	Not significant
5	Turbidity (TUR.)	9	6.011	0.000	Significant
6	Total hardness (TH)	9	2.294	0.047	Significant
7	Chloride (CL)	9	7.829	0.000	Significant
8	Nitrate (NO ₃)	9	-1.987	0.078	Not significant
9	Dissolved oxygen (DO)	9	-0.009	0.993	Not significant
10	Biological Oxygen demand (BOD)	9	-0.874	0.405	Not significant
11	Ammonia (NH ₃)	9	-3.212	0.011	Significant
12	Nickel (Ni)	9	1.384	0.200	Not significant
13	Lead (Pb)	9	-0.485	0.639	Not significant
Source Field work, 2023/2024					

Table 1: Paired- Sample “t” Test

4. Conclusion

The study assesses the physicochemical water pollution of River Ginzo’s seasonal variations for irrigation, Seasonal variations in physicochemical parameters in the River using Paired “t” test indicated that parameters vary both temporally and spatially in the River. Finding reveals 69.23% of the parameters shows there is no significant relationship between parameters and standards of water quality for irrigation and thus, the null hypothesis is hereby accepted. The most physicochemical parameters are within acceptable limits, addressing these issues is crucial to ensure the safety and sustainability of River Ginzo as a water resource. Future research needs to concentrate on heavy metals to continue monitoring the quality of the river.

References

- IBRAHIM, A. (2024). DETERMINATION OF THE PHYSICO-CHEMICAL LEVEL OF WATER QUALITY FOR FISHING IN JIBIA DAM, KATSINA STATE, NIGERIA. *Journal of entomology and agronomy studies*.
- Fisheries, F. A. O. (2016). Aquaculture. *Fishery and*

Aquaculture Country Profiles—The Republic of Kenya. FAO, Rome.

- Kabir, H. G., Yar’adua, A. I., Matazu, K. I., Lawal, R. G., Kabir, Z. G., Bala, M. G., ... & Matazu, H. K. (2024). Heavy Metal Contamination Risks in Environmental and Vegetable Samples around a Metal Workshop in Kofar Marusa, Katsina Metropolis. *UMYU Journal of Microbiology Research*, 9(3), 440-451.
- Yaradua, I. A., Nasir, A., Usman, A., Bungudu, J. I., Alhassan, A. J., Shuaibu, L., & Yaradua, A. I. (2022). Health risk assessment of some selected heavy metals in agricultural soils from Katsina State, North-Western Nigeria. *Asian Journal of Applied Chemistry Research*, 11(4), 47-58.
- IBRAHIM, A. (2025). ASSESSMENT OF WATER QUALITY POLLUTION INDEX FOR FISHING IN JIBIA DAM, KATSINA, NIGERIA. *International Journal of Agricultural and Veterinary Science*.
- Olopade, O. (2013). Assessment of water quality characteristics for aquaculture uses in Abeokuta North Local Government Area, Ogun State, Nigeria. *Lakes reservoirs and*

-
- ponds*, 7(1), 9-19.
7. Ibrahim, A. (2022). Assessment of water quality for fishing in Jibia Dam, Katsina State. An M. Sc Dissertation submitted to the Department of Geography BUK.
 8. Safana, A. I., & Tasiu, Y. R. (2018). Comparative analysis of heavy metals in irrigation water and vegetables along ginzo waste channel, Katsina state. *Confluence Journal of Environmental Studies*, 1(2), 25-34.
 9. Tasiu R. Y. and Dabo Z. M., (2017). Water quality assessment for fishing in Sabke Dam Dannakola Daura, katsina. *Arid zone economy*. 12(4): 126-137.

Copyright: ©2025 AMINU IBRAHIM. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.