Bioresources Development Conference (BDC26)
NABDA
Journal of Biotechnology Research
ISSN: 1119-0531
Special Issue Vol. 5(5): (2026)

Influence of dietary mandrake (*Mandragora officinarum*) root powder on water quality in the culture of *Clarias gariepinus* hatchlings

[1]Jibrin, B., [1]Shua'ibu, N., [1]Abdulrasheed, H., [2]Azimat, A., [3]Ahmed, F. and [4]Maisheru, J. A.

[1]Department of Fisheries Technology, Federal Polytechnic, Bali, Taraba State, Nigeria.
[2]National Biotechnology Research and Development Agency, Jega, Kebbi State, Nigeria.
[3]No. 9 Lamido Kebbi Street, Wuro Hausa, Yola Town, Adamawa State, Nigeria.
[4]National Biotechnology Research and Development Agency, Billiri, Gombe State, Nigeria

Corresponding Author: shugaalbfpb@gmail.com

Article ID: NJBR-BDC26-D007 | Received:12 February, 2026 | Accepted: 20 February, 2026

ABSTRACT

The Influence of dietary mandrake (Mandragora officinarum) root powder on water quality in the culture of Clarias gariepinus hatchlings was evaluated over a 28-day period. Mandrake root powder, used as a phytogenic additive, was incorporated into Coppens fish feed (0.2–0.5 mm; 49% crude protein) at inclusion levels of 0.0 g/100 g (MR_1) (control), 0.25 g/100 g (MR_2), 0.5 g/100 g (MR_3), 0.75 g/100 g (MR_4), and 1.0 g/100 g (MR_5), each in triplicate. A total of 1,500 hatchlings (mean weight: 0.25 ± 0.0 g) were randomly distributed into 15 plastic tanks (100 fish per tank). Water temperature, pH, dissolved oxygen, and ammonia were measured at the start of the experiment and monitored weekly. Data obtained were analyzed using one-way analysis of variance (ANOVA) at a significance level of $P < 0.05$. Results indicated that temperature ranged from 27.71 to 27.81 °C, pH from 7.55 to 7.70, dissolved oxygen from 5.50 to 5.66 mg/L, and ammonia from 0.03 to 0.04 mg/L across treatments. No significant differences ($P > 0.05$) were observed in all measured parameters among treatment groups. The findings suggest that dietary inclusion of mandrake root powder at the tested levels does not adversely affect water quality and is safe for use in the culture of C. gariepinus hatchlings.

Key words: Aquaculture, *Clarias gariepinus*, Phytogenic Additive, Water Quality, *Mandragora officinarum*, Hatchlings.

INTRODUCTION

In aquaculture, feeding experiments are always conducted under controlled conditions in order to prevent any form of environmental interference, which might involve natural food organisms, temperature, and other water quality parameters, with the variable being studied (Ali, 2022). Feeding experiments are mostly conducted in tanks placed indoors or outdoors for easy and reliable data collection (Salisu *et al.,* 2024). The critical water quality parameters which affects hatchlings stage of fish are: temperature, pH, dissolved oxygen, and ammonia (Babale, 2016). Temperature is a basic parameter in all aquatic environments. It is the main regulator of nearly all physicochemical cycles, and consequently of metabolism and fish pond productivity; tropical fish require water with a temperature range of 25 – 32°C to grow and reproduce (Ali *et al.,* 2025). pH is a measure of the acidity or alkalinity of water; water with a pH less than 7 is acidic, above 7 is alkaline, while 7 is neutral; water with a pH value of about 6.5 – 9 is the best for fish culture (Elezuo, 2016). The dissolved oxygen content of the pond water is one of the most critical factors in fish culture (Babale, 2016). Fish require adequate dissolved oxygen in the water. 5 – 6ppm (mg/L) of oxygen is considered to be an absolute minimum requirement for fish (Elezuo,

2016). Ammonia is a nitrogenous waste produced by either the pond organisms (including fish) or decomposition of organic matter (Babale, 2016). For catfish culture at the hatchling stage, unionized ammonia level in ponds should be maintained at less than 0.05 ppm (Elezuo, 2016). Both water quality and quantity have the potential to significantly affect the hatchling stage of fish metabolism, survival, and growth (Jamabo and Dienye, 2016; Babale, 2016). It is therefore pertinent to ensure good water quality for optimum fish growth, survival and yield. It is always needful to change 40 – 50% of the water in the culture receptacle bi - weekly; this is because fresh water replenishes trace minerals that are used up in the tanks by fish, flora, and fauna (Ali *et al.,* 2025). This study evaluates the influence of dietary mandrake (*Mandragora officinarum*) root powder on water quality in the culture of *Clarias gariepinus* hatchlings.

MATERIALS AND METHODS

Study Area

The study was carried out at the Lay-Joy fish farm, Billiri. Billiri Local Government Area (LGA), Gombe State. Billiri LGA lies within latitudes 9°50' and 11°09''N and longitudes 9.833 ° and 11.150°E. It covers an area of 737 km² and is 50 km away from Gombe, the capital city. The hatchlings for the experiment were bred in the hatchery room of the farm. The hatchlings were 4 days old at the commencement of the feeding trial.

Experimental Feed

Coppens fish feed (0.2-0.5 mm) was used as the basal feed for this study and was obtained from feed suppliers at Gombe, while the dietary mandrake root powder was purchased from Bon - Amour Pharmacy Limited, Lagos, Nigeria, imported from Piping Rock Health Products, Ronkonkoma, New York, USA. Experimental feed was prepared by incorporating dietary mandrake root powder at four graded levels; 0.25g, 0.5g, 0.75g and 1.0g/100gfeed into Coppens fish feed (0.2 – 0.5mm), while feed without dietary mandrake root powder, i.e. 0.0g/100g feed, served as the control feed and was coded as MR_1 (control), MR_2, MR_3, MR_4, and MR_5, respectively. The dietary mandrake root powder was included at the measured quantity for each feed and was diluted into 5 ml of warm water (35^0C) to form a solution. The solution was sprayed onto the Coppens fish feed (0.2 – 0.5mm), fish oil was added to the experimental feed with mandrake root powder to reserve the mandrake root powder. The Coppens fish feed (0.2 – 0.5mm) with dietary mandrake root powder was prepared in 100g each time. The proximate composition of the Coppens fish feeds (0.2-0.5 mm) fed to the *C. gariepinus* hatchlings is presented in Table 1. The feed contained 49% crude protein, 12% crude lipid, 6.0% crude fibre, 8.0% ash, 1.5% calcium, 8.0% moisture and 1.5% phosphorus.

Table 1: Proximate Composition of Coppens C. gariepinus Hatchlings Feed (0.2 – 0.5 mm) used for the Study

Nutrients	Percentage (%)
Crude protein	49
Crude lipid	12
Crude fibre	6.0
Ash	8.0
Calcium	1.5
Moisture	8.0
Phosphorus	1.5

Source: Field Survey (2023)

Experimental Design

Each of the treatment feeds was fed to *C. Gariepinus* hatchlings (n = 1,500; 0.26±0.0g) in

triplicate, making a total of 15 plastic hatchery tanks (semi-flow-through system), i.e. (n = 100 per tank). Hatchlings were fed 6 times daily between the hours of 07:00 and 23:00 at regular intervals for a period of 28 days at a fixed feeding rate of 10% body weight as recommended by Ukwe *et al.* (2018). Water temperature, pH, dissolved oxygen, and ammonia were measured at the beginning of the experiment, after which they were measured weekly throughout the period of the experiment. Water temperature, dissolved oxygen, and pH were measured using a Horiba U-22 XD multi-parameter water quality checker, while ammonia was measured using a freshwater aquaculture test kit (Model AQ-2, Code 3633-03, Lamotte U. S. A.

Statistical Analysis
Data obtained were statistically analysed using one-way analysis of variance (ANOVA) at P = 0.05; where significant differences were detected, mean values were separated using least significant difference (LSD).

Results
The results of the influence of dietary mandrake (*M. officinarum*) root powder on water quality in the culture of *C. gariepinus* hatchlings is shown in Table 2. There were no significant differences (p>0.05) in the mean water temperature, pH, dissolved oxygen, and ammonia values of the experimental tanks during the study period.

Table 2: Influence of Dietary Mandrake (M. officinarum) Root Powder on Water Quality in the Culture of C. gariepinus Hatchlings

Parameters	Initial	MR_1	MR_2	MR_3	MR_4	MR_5
Temperature (°C)	27.71	27.74	27.76	27.77	27.81	27.79
pH	7.55	7.70	7.60	7.62	7.64	7.66
Dissolved oxygen (mg/L)	5.66	5.50	5.53	5.58	5.52	5.57
Ammonia (mg/L)	0.02	0.03	0.03	0.04	0.03	0.04

All mean values are not significantly different (p>0.05).
Mean values in each row with similar superscripts are not significantly different (p>0.05).
Key: MR_1 – mandrake root powder (0.0g/100g), MR_2 – mandrake root powder (0.25g/100g), MR_3 – mandrake root powder (0.5g/100g), MR_4 – mandrake root powder (0.75g/100g), and MR_5 – mandrake root powder (1.0g/100g).

DISCUSSION
The water temperature values, 27.71 – 27.81 °C recorded from this study were comparable with the values, 27.76 – 27.85 °C reported by Ali *et al.* (2025) for *C. gariepinus* fingerlings reared in plastic tanks. All the water temperature values recorded from this study were within the acceptable recommended range. The water pH values, 7.55 – 7.70 recorded from this study were comparable with the values, 7.22-7.80, reported by Salisu *et al*. (2024) for *C. Gariepinus* reared in rectangular plastic tanks. All the water pH values recorded from this study were within the acceptable recommended range. The dissolved oxygen (DO) values, 5.50 – 5.66 mg/L recorded from this study are comparable with the values, 5.40 – 5.71 mg/L, reported by Ali *et al.* (2025) for *C. gariepinus*. All the DO values recorded from this study were within the acceptable recommended range. The ammonia (NH_3) values, 0.03 – 0.04 mg/L, recorded from this study were similar to the values, 0.03 – 0.04 mg/L, reported by Mamudu *et al*. (2026) for tilapia fingerlings reared in plastic tanks. All the NH_3 values recorded from this study were within the acceptable recommended range. The favourable water quality parameters observed in this study corroborates the findings of Jamabo and Dienye (2016) reported that the success of aquaculture depends on quality feed and water

for better growth.

CONCLUSION

The varying levels of dietary mandrake root powder incorporated into the feed of C. *gariepinus* hatchlings used in this study did not any significant effects on the water quality parameters of the culture tanks.

REFERENCES

1. Ali, M. E. (2022). Performance and cost-benefit of African mud catfish *Clarias gariepinus* (Burchell, 1822) fed different levels of dietary betaine, β - glucan and co - mixed additives diets. Ph.D. Thesis, Department of Fisheries, Modibbo Adama University, Yola, Nigeria. Pp. 183.
2. Ali, M. E., Dauda, I., Abubakar, A. M., Adamu, T. A., Ibeagi, M. C. and Nandom, N. (2025). Effects of graded levels of co – mixed of betaine/β – glucan on the water quality parameters of Clarias *gariepinus* fingerlings reared in plastic tanks. *Sub-Saharan Journal of Multidisciplinary Research and Innovation (SAMRI).*2(2): 1 – 7.
3. Babale, M. Y. (2016). Growth performance at various growth stages of *Clarias gariepinus* (Burchell, 1822) fed various inclusion levels of processed watermelon (*Citrullus lanatus,* Mansf.) seed cake diets. Ph.D. Thesis, Department of Biological Sciences, Ahmadu Bello University, Zaria, Nigeria. Pp. 164.
4. Elezuo, K. O. (2016). Growth performance of *Clarias gariepinus* juveniles fed processed almond (*Terminalia catappa L.*) kernel meal. Ph.D. Thesis, Department of Aquaculture and Fisheries Management, University of Ibadan, Ibadan, Nigeria. Pp. 197.
5. Jamabo, N. A. and Dienye, H. E. (2016). Effects of different commercial feed on water quality and survival of *Clarias gariepinus* (Burchell, 1822) fingerlings. *International Journal of Innovative Studies in Aquatic Biology and Fisheries (IJISABF),* 2(4): 8 – 11.
6. Mamudu, S. B., Lumi, G. D., Azimat, A.,Aqiba, R. U. and Nandom, N. and Ibeagi, M. C. (2026). Effects of some herbal bioresources on the water quality of tilapia fingerlings. *Sub – Saharan Journal of Multidisciplinary Research and Innovation (SAMRI),* 3(1): 37 – 43.
7. Salisu, A. S., Mohammed, M. T., Ibrahim, B. J. and Auwal, A. B. (2024). Water quality parameters of *Clarias gariepinus* (Burchell, 1822) fingerlings fed graded levels of bambara groundnut (*Vigna subterranea* L.) meal as replacement for fishmeal. *Proceedings of the7th International Annual Conference of the Society of Agriculture, Environmental Resources and Management (SAEREM).* Pp. 230 – 232.

How to Cite This Article

Jibrin, B., Shua'ibu, N., Abdulrasheed, H., Azimat, A., Ahmed, F. and Maisheru, J. A. (2026). Influence of dietary mandrake (*Mandragora officinarum*) root powder on water quality in the culture of *Clarias gariepinus* hatchlings. *NABDA Journal of Biotechnology Research*, 5(5), 62-65.