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Research Article

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Zoo-economic performance of rabbits (*Oryctolagus cuniculus*) supplemented with rations based on *Moringa oleifera* and *Carica papaya* leaf powder.

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Abstract

The objective of the study was to evaluate the zootechnical performance and economic profitability of rabbits (*Oryctolagus cuniculus*) fed diets supplemented with leaf powders of *Moringa oleifera* and *Carica papaya*. Twenty weaned rabbits, divided into five groups of four animals each, were assigned either a control diet or diets containing 10% and 15% of *Moringa* or papaya leaf powders for a period of 56 days.The zootechnical results showed a significant ($p < 0.05$) improvement in feed intake and average daily gain (ADG) in rabbits receiving 15% *Moringa* (80.14 g/day; ADG = 13.41 g/day). Feed conversion ratios were optimized with the 15% *Moringa* (5.06) and papaya (4.06) diets. From an economic perspective, the experimental diets s led to an increase in sale price and gross margins, particularly with the 15% *Moringa* diet (4,895 FCFA). The 15% papaya diet also generated an additional net margin of 2,569 FCFA compared to the control. In conclusion, the incorporation of up to 15% *Moringa oleifera* and *Carica papaya* leaf powders in rabbit diets enhances body weight gain, feed efficiency, and the profitability of rabbit production.

Keywords: *Carica papaya*, growth, *Moringa oleifera*, profitability, supplementation, rabbit,

Introduction

Rabbit farming is gaining importance in Burkina Faso due to its ability to quickly provide good quality protein and its compatibility with small, low-investment farms Ouédraogo et al.(2021). However, the sector remains limited by the cost and availability of commercial concentrates, which constrains the productivity and profitability of farms (Traoré et al., 2018; Ouédraogo et al., 2021). Feed accounts for about 70% of the cost of production in rabbit farming and has two essential roles that are difficult to separate.

Forage plants used in rabbit feed are an important element in the development of this industry. There are many forage plants in Burkina Faso that can be incorporated into animal feed. Moringa (*Moringa oleifera L.)* and papaya (*Carica papaya* L.) leaves are particularly important because of their impact on increasing rabbit productivity in Burkina Faso (Delma et al., 2025). *Moringa oleifera* and *Carica papaya* leaves are available in many tropical areas, rich in protein, minerals, vitamins, and bioactive compounds, and have been tested as food sources or supplements for various animal species (Sacramento et al., 2010). With this in mind, the judicious incorporation of these plants into rabbit feed could improve growth performance and the profitability of local rabbit farming.

In light of these factors, the zoo-economic evaluation of rabbits supplemented with rations incorporating *Moringa oleifera* and *Carica papaya* leaf powder will enable simultaneous measurement of productivity gains (growth, feed conversion ratio) and economic viability (feed cost, income per unit produced) in the Burkinabe context. This integrated approach is necessary in order to recommend appropriate, safe, and economically attractive feeding practices for local farmers.

This study focuses on evaluating the zootechnical performance and economic profitability of the tested rations incorporating *Moringa oleifera* and *Carica papaya* leaves in Burkina Faso.

Materials and Methods

Study environment

All the work for the study was carried out at the Saria research station, particularly at the Animal Production and Health Research Laboratory (LaRePSA). The site is located 23 km east of Koudougou, the capital of the Boulkiemdé province and the Centre-West region, and 80 km northwest of Ouagadougou (Figure 1). The geographical coordinates are 12°16' north latitude, 2°9' west longitude and 300 m altitude, covering an area of 400 hectares.

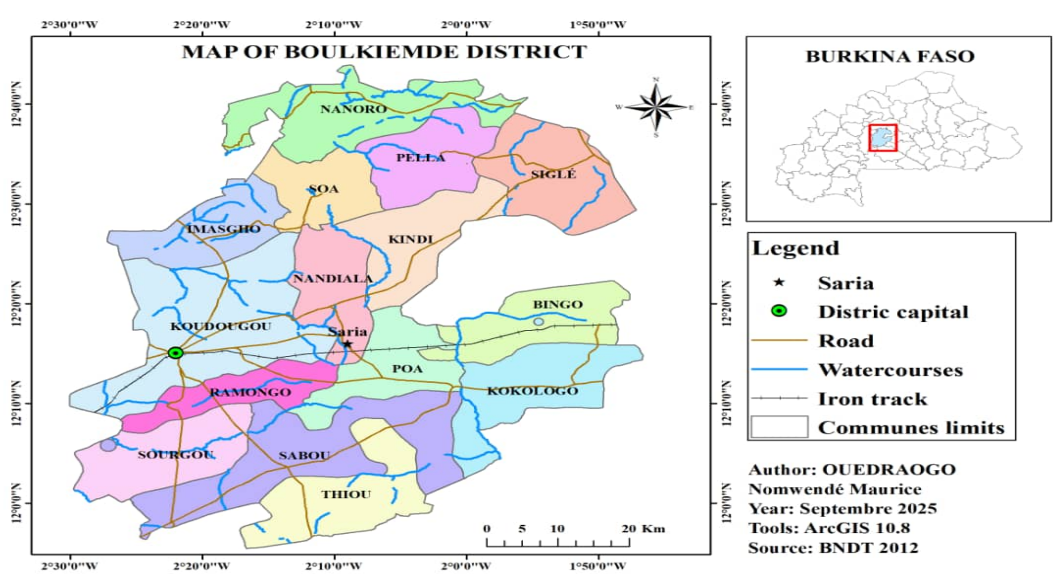

Figure 1: Study area

2 Animal and plant material

Plant material

The plant material, consisting of powdered *Moringa oleifera* and *Carica papaya* leaves, was harvested locally, dried in the shade to preserve the active ingredients, and ground into a fine powder. This powder was incorporated into the basic feed ration at three different concentrations: 10% and 15% of the total feed weight. A control group received the basic feed ration. The composition of the basic ration was formulated to meet the nutritional needs of growing rabbits.

Table 1: Composition of the basic ration

Ingredients	%
Corn bran	5
Corn kernels	5
Rice bran	20
Cotton seed meal	3
Parkia biglobosaflour	10
Peanut shells	10
Vitamin-enriched mineral concentrates	2
Composition	100

Animal material

A total of 20 rabbits (*Oryctolagus cuniculus* L.) aged between 45 and 60 days, with an average live weight of 612.4 g, were placed in rectangular cages measuring 115x65x35cm (length, width, and height). The cages were arranged randomly.

3 Experimental design

The Fisher block experimental design was set up at the INERA/Saria research station at the end of the winter season of2 024 , specifically between November 2024 and January2025 . The study was conducted in two distinct phases: a 10-day adaptation phase and a 56-day weekly data collection phase.

The young rabbits were divided into five (05) groups of four (04) subjects each. The following experimental rations were weighed before being distributed once a day at 8:00 a.m.:

Ration 1 = Basic ration;
Ration 2: Ration containing 10% *Moringa oleifera* leaf powder;
Ration 3: Ration containing 15% *Moringa oleifera* leaf powder;
Ration 4: Ration containing 10% *Carica papaya* leaf powder;
Ration 5: Ration containing 15% *Carica papaya* leaf powder.

Drinking water was provided *ad libitum*. The following day, the uneaten quantities were removed from the feeders and weighed for each compartment.

4 Determination of chemical composition

Moringa leaf samples were dried in an oven at 105°C for 24 hours to determine the DM content. The dried samples were ground and sieved for chemical analysis. Total ash (MM) was determined by calcination of the dry matter at 550°C. Organic matter (OM) was calculated as the difference between dry matter and ash. Total nitrogen (TN) was determined by the Kjeldahl method (N×6.25) (AOAC, 1990). Acid detergent fiber (ADF), neutral detergent fiber (NDF), and acid detergent lignin (ADL) contents were determined by analysis according to the protocol of Van Soest et al.(1991).

5 Determination of the nutritional effect of the plants used

Determination of feed intake

The amount of feed ingested was determined by calculating the difference between the amounts distributed daily and the amount refused. Data on voluntary feed intake was collected. The amounts of supplement

offered at each meal and the refusals were weighed using an electronic scale with a range of 5 kg ± 10 g. Voluntary intake was calculated using the following ***Equation (1)***

$$\text{IFI} = \frac{(QAD\,(g)\,/\text{period}) - (QAR(g)/\text{period})}{\text{Number of days} \times \text{Number of animals}} \quad (1)$$

where:
QAD = Quantity of feed distributed
QAR = Quantity of feed refused

Feed Conversion Ratio (FCR)

The FCI indicates the amount of feed required to produce 1 kg of meat in rabbits. It is the ratio of the amount of feed ingested (AIF) in g/day during a period to the weight gain during that same period. It is calculated according ***to Equation 2***.

$$\text{FCR} = \frac{\text{Feed Intake (g) during the period}}{\text{Weight gain (g) during the same period}} \quad (2)$$

Determination of live weights and average daily gains

The change in live weight of the rabbits is determined by weighing each animal twice, at the start of the trial and then every seven days. Weighing was carried out early in the morning using a 5 kg ± 1 g scale before feeding the animals. These data are used to calculate absolute weight gains and average daily gains (ADG) per seven-day period. Average daily gains (ADG calculated according ***to Equation 3***:

$$\text{ADG} = \frac{\text{Final Weight (FW)} - \text{Initial Weight (IW)}}{\text{Number of days}} \quad (3)$$

6 Methods for assessing the economic impact of rations

The cost of feed was estimated by evaluating the price per kilogram of each ingredient. The purchase cost of ingredients was determined based on the purchase price of ingredients on the local market and the labor costs involved. The purchase cost per kg of feed thus obtained is multiplied by the consumption index (CI) to determine the feed cost of producing one kilogram of live body weight (LBW) according to the treatment and per rabbit, using the formula below.

- Feed cost per rabbit = CI * BW of the rabbit * price per kg of feed.
- Selling price of rabbit = weight of rabbits * price per kg of rabbit.
- Gross margin per rabbit = selling price of rabbit - production cost of rabbit
- Additional net margin per rabbit (FCFA) = gross margin of the rabbit/batch - gross margin of the control batch.

7 Statistical analyses

The data collected was entered and classified in Excel 2013. The data was analyzed using R software (R-Development-core-team, 2013). Analysis of variance (ANOVA) was applied. The Student Newman and Keuls test at a 5% threshold was used to separate variances when the analysis revealed a difference between the means. Graphs and tables were plotted using Excel version.

Results

1. Chemical composition of feed

Bromatological analysis revealed that the chemical composition of the feed varied depending on the type. The dry matter (DM) content of the feed used in the trial ranged from 94.39 ± 0.021% to 94.785 ± 0.08% (Table 2).

Rations containing *Moringa oleifera* had a total nitrogen content ranging from 11.310 ± 1.32% to 12.965 ± 0.049%. However, the control ration had the highest total nitrogen content. The *Moringa oleifera*-based rations showed significantly ($p < 0.05$) lower total nitrogen levels than the *Carica papaya* leaf powder-based rations and the control ration.

Table 2: Chemical composition (% DM) and nutritional value of the feeds used

Feed	Ration 1	Ration 2	Ration 3	Ration 4	Ration 5	p-value
Dry matter (%)	94.7 ±0.11	94.53 ±0.06	94.39 ±0.02	94.69±0.01	94.79±0.08	0.0039
Total ash (g)	8.04 ±0.14	8.15± 0.52b	8.26 ±0.18	9.3±0.1	9.4±0.03	0.0009143
Crude cellulose (% of DM)	16.44 ±0.43	14.57 ±0.12c	16.83 ±0.5	16.09±0.15	15.82±0.41	0.002939
Total Nitrogenous Substances (g)	12.99 ±0.13	11.3 ±1.33	12.97 ±0.05	10.88±0.53	11.3±0.07	0.0127
ADF (% of DM)	20.3 ±0.46	18.8 ±0.66	20.88 ±0.95	20.3±0.21	19.9 ±0.11	0.06144
ADL (% of MS)	5.45 ±0.21	4.3 ±0.66	4.4 ±0.75	5.14±0.29	4.8 ±0.24	0.3408

2. Food intake

The effect of the experimental rations on food intake per subject is shown in Table 3.

Analysis of daily food consumption per animal revealed a significant difference ($p < 0.05$) between groups. Rabbits receiving 15% moringa leaf meal (Ration 3: 80.14 g/day) showed the highest consumption, followed by those receiving 10% papaya (Ration 4: 66.50 g/day) and 10% moringa (Ration 2: 61.36 g/day). Conversely, the lowest consumption was observed in the control group (Ration 1: 28.14 g/day) and in the Ration 5 group (31.21 g/day).

The feed conversion ratio showed significant variations ($p < 0.05$) between the different treatments. The best ratio (lowest IC) was observed in the group receiving 15% *Carica papaya* leaf powder (Ration 5: 4.06 ± 1.2 kg DM/kg BW), indicating better feed assimilation, followed by the group receiving 15% *Moringa oleifera* (Ration 3: 5.06 ± 1.12 kg DM/kg BW). In contrast, the group receiving 10% *Carica papaya* had the worst FCI (Ration 4: 7.40 ± 1.49), and the control group had a high feed conversion index (Ration 1: 7.28 ± 2.44), indicating less efficient assimilation.

Table 3: Food intake and food consumption index

Parameters	Ration 1	Ration 2	Ration 3	Ration 4	Ration 5	probability
Daily individual feed intake (g DM/day)	28.14^{d}	61.36^{c}	80.14^{a}	66.50^{b}	31.21^{e}	0.0001
Consumption index	7.28 ± 2.44	6.54 ± 2.22	5.06 ±1.12	7.40 ± 1.49	4.06 ±1.2	0.24

Values in the same row, indexed with the same letters (a, b, c, d, e), were not significantly different at the 5% threshold. Results are expressed as mean ± standard error of the mean (SEM).

3. Weight gain performance of rabbits

The effect of the experimental rations on weight gain is shown in Table 4. The results of this study reveal that the incorporation of moringa and papaya leaves into the feed ration had no negative effect on the weight gain of the young rabbits. The highest weight gain was observed in rabbits in group M15 (751.00 ± 206.93 g), which was a significant improvement (p = 0.01) compared to the other groups, particularly the control group (TT), which had the lowest growth (215.33 ± 86.95 g).

The overall results suggested that the incorporation of *Moringa oleifera* leaf meal, even at different rates (5%, 10%, 15%), as well as papaya leaves (5%, 10%, 15%), has a beneficial effect on the weight gain of rabbits.

Table 4: Parameters of weight gain in rabbits

Parameters	Ration 1	Ration 2	Ration 3	Ration 4	Ration 5	probability
Initial live weight, kg	571.00 ±141.82	615.50 ±206.83	619.75 ±278.37	638.00 ±189.07	659.25 ±238.32	0.96
Final live weight, kg	841.66 ±194.3	1067.50 ±296.00	1370.75 ±322.56	1037.5 ±241.11	1214.50 ±234.1	0.171
Absolute weight gain, kg	215.3333 ±86.95b	452.0000 ±153.48b	751.0000 ±206.93a	399.5000 ±79.73b	465.0000 ±137.18b	0.01
Average Daily Gain, g	3.85 ±3.85b	8.07 ±1.14b	13.41 ±3.7a	7.13 ±1.42b	8.30 ±2.45b	0.01

Values in the same row with the same letters (a,b) were not significantly different at the 5% level. Results are expressed as mean ± standard error of the mean (SEM).

The effect of the experimental rations on Average Daily Gain (ADG) is shown in Table 5. Regarding average daily gain, the analysis of variance revealed a significant difference ($p < 0.05$) between the group that received a ration containing 15% moringa meal and the other groups (m5, m10, p5, p10, p15, and tt) ($p < 0.05$).At the end of the experimen , the increase in average daily gain ranged from 13.41 ± 3.69 g/day for subjects receiving a ration based on *Moringa oleifera* powder at 15% incorporation (Ration 3) to 3.84 ± 3.85 g/day for those fed the control feed.

Overall, the group with 15% *Moringa oleifera* leaf powder (Ration 3) recorded the highest average daily gain (13.41 ± 3.7 g/day), while the control group had the lowest (3.85 ± 3.85 g/day). The other ration groups showed intermediate average daily gains with no significant difference ($p < 0.05$) from the control. The incorporation of powders up to 15% had no adverse effects and appeared to improve growth and consumption, particularly at the maximum dose tested.

In general, the incorporation of *Moringa oleifera* and *Carica papaya* leaf meal up to 15% in the rabbits' diet had no adverse effect on average daily gain, feed intake, or feed conversion ratio in the subjects of the different dietary treatments. However, average daily gain and feed conversion ratio increased, while the latter decreased with increasing levels of *Moringa oleifera* and *Carica papaya* leaf meal in the diet, particularly at 15% incorporation.

Table 5: Changes in average daily weight gain (g) of rabbits per 7-day period

Periods	Ration 1	Ration 2	Ration 3	Ration 4	Ration 5
Day 7	5.09	5.14	9.29	3.61	2.21
D14	3.73	6.29	10.70	4.29	3.76
D21	3.68	6.08	12.67	2.89	3.71
D28	4.08	7.21	13.10	4.81	9.27
D35	4.02	6.85	13.14	5.58	8.97
D42	3.10	7.17	12.60	5.71	7.61
D49	3.96	7.84	13.20	6.59	8.49
D56	3.85	8.07	13.41	7.13	8.30

4. Economic evaluation

The economic assessment of fattening took into account feed costs, veterinary expenses, labor costs, depreciation of livestock equipment, and the sale of animals.

Table 6 shows the feed production costs per rabbit (coupal), the sale price per rabbit (pvent), and the various gross and net margins for the different treatments.

The economic analysis revealed that the feed cost (coupal) per kilogram of weight gain varied significantly ($p < 0.05$) between groups. The control group (tt) had the lowest cost (175.18 FCFA/kg), whil the group incorporating 15% *Moringa oleifera* (m15) had the highest cost (587.50 FCFA/kg).However, the selling price per rabbit (pvent) and gross margin (mbrut) did not show significant differences ($p > 0.05$) between the batches. The M15 batch obtained the best results in terms of selling price (5,483 CFA francs) and gross margin (4,895 CFA francs), while the tt batch recorded the lowest values (3,366 CFA francs and 3,191 CFA francs, respectively).

With regard to the additional net margin (mnettesup), although the differences were not significant ($p > 0.05$), rabbits fed rations based on *Moringa oleifera* or *Carica papaya* generated a notable additional profit compared to the control. This profit increased with the incorporation rate, reaching more than 2,500 CFA francs of additional profit for the 15% rations.

Table 6: Economic evaluation of the different experimental rations

Ration	coupal (FCFA)	pvent (FCFA)	gross (FCFA)	mnettesup (FCFA)
RM10	468.23± 100.8^{ab}	4270.0 ±1184.00	3801.70 ±1185.4	1408.09 ±2407.3
RM15	587.5 ±139.51^{a}	5483.0 ±1290.24	4895.5 ±1226.29	2501.88 ±2685.52
RM5	321.066 ± 74.01^{bcd}	3561.3± 99.95	3240.27 ±63.12	960.2 ±2032.29
RP10	389.88± 56.51^{bc}	4150.0 ±964.44	3760.12 ±937.1	1366.5 ±1602.66
RP15	228.76± 108.49^{cd}	4858.0 ±936.21	4629.24 ±827.72	2569.9 ±2084.6
RT	175.18 ±28.68^{d}	3366.67± 777.14	3191.5± 802.97	0.0 ±00.0
p-value	0.004	0.17	0.24	0.7

Values marked with different letters a, b, c, d, e, f, g in the same column were significantly different at the 5% threshold (p).

RM10 = ration containing 10% moringa; RM15 = ration containing 15% moringa; RM5 = ration containing 5% moringa; RT = control ration; RP10 = ration containing 10% papaya; RP15 = ration containing 15% papaya; RP5 = ration containing 5% papaya; Coupal = feed cost; pvent = selling price; mbrut = gross margin; mnettesup = additional net margin

Discussion

1. Bromatological values of the experimental rations

Bromatological analysis of the different experimental rations reveals significant differences ($p < 0.05$) in terms of dry matter (% DM), mineral matter (% MM), crude cellulose (% CB), total nitrogen (% MAT), and acid detergent fiber (% ADF), depending on the levels of moringa or papaya leaves incorporated. The high crude protein content in moringa-based rations confirms the findings of Melesse et al. (2011), who highlighted the richness of *Moringa oleifera* in digestible proteins, essential amino acids, and minerals, making this plant particularly suitable for feeding monogastric animals.

The increased fiber levels (CB and ADF) observed in the M15 and P10 groups are consistent with the observations of Konmy (2020), who reported a high structural fiber content in *Moringa oleifera* and *Carica papaya* leaves, particularly in ADF, which is likely to maintain acceptable digestibility in rabbits.

2. Feed intake

The results for the rabbits' individual daily feed intake show a significant influence ($p = 0.0001$) of the different experimental rations. At 56 days, rabbits fed 15% *Moringa oleifera* leaf meal (80.14 g/day) had the highest consumption, followed by those fed 10% *Carica papaya* (66.50 g/day) and 10% *Moringa oleifera* (61.36 g/day). Conversely, the lowest consumption was observed in the basic ration (28.14 g/day) and in the 15% *Carica papaya* group (31.21 g/day). This variation in food consumption can be explained by the palatability and nutritional quality of the leaves used. These observations corroborate those of Konmy et al.(2020), who noted an increase in food consumption in rabbits fed *Moringa oleifera* leaf meal. The study by Oyegunwa et al.(2024) on rabbits confirmed that the gradual use of *Moringa oleifera* leaves (up to 15%) increased daily intake without any negative effect on digestibility.

With regard to *Carica papaya* leaves, Oloruntola et al. (2018) noted improved consumption and digestibility in rabbits fed diets containing *Carica papaya* leaves, suggesting a positive effect on appetite stimulation. However, the decrease observed with a 15% incorporation of *Carica papaya* may be attributed to saturation or an increase in secondary compounds, thereby reducing ingestibility.

The results of the study reveal a significant variation ($p < 0.05$) in consumption indices depending on the different diets administered to the rabbits. Although the difference between the groups is not statistically significant ($p = 0.24$), the observed trend suggests that adding 15% *Carica papaya* or *Moringa oleifera* leaves to the diet may improve feed conversion in growing rabbits. Our results are consistent with those reported by Konmy et al.(2020), who obtained an improvement in the feed conversion ratio (3.55) with the incorporation of *Moringa oleifera*. Mankga et al., (2022), in South Africa, tested incorporation rates of *Moringa oleifera* leaves of up to 15% without observing any negative effect on the growth or feed efficiency of rabbits. With regard to papaya, our results are similar to those of Jiwuba (2019), who recorded a feed conversion ratio of 7.42 with incorporation levels of 15%, 30%, and 45% *Carica papaya* leaf meal.

Thus, although the differences between the groups are not statistically significant ($p > 0.05$), the results show a clear practical and economic interest in incorporating 15% *Moringa oleifera* or papaya leaves into the feed rations of fattening rabbits.

3. Weight gain performance of rabbits

The results as a whole indicate that the incorporation of *Moringa oleifera* leaf meal, even at different rates (10% and 15%), as well as papaya leaves (10%, 15%), has a beneficial effect on the weight gain of rabbits.

This notable improvement in weight gain at a ration level of 15% *Moringa oleifera* seems to be directly linked to improved feed intake, confirming the conclusions of Ouédraogo et al.(2021), who established a positive correlation between feed intake and growth rate in rabbits.

Furthermore, Dougnon et al.(2012) demonstrated that incorporating 10% to 15% *Moringa oleifera* into rabbit feed does not negatively affect growth and may even improve weight gain.

With regard to *Carica papaya* leaves, our results are consistent with those of Coulibaly et al. (2024) in Burkina Faso, who noted a significant increase ($p < 0.05$) in rabbit weight with the addition of *Carica papaya* leaves to their diet, up to 15%. Furthermore, Oloruntola et al. (2018) also observed a notable improvement in weight in rabbits fed with feed containing 10% *Carica papaya* leaf meal. Our results concerning average daily gain (ADG) highlight a marked influence of feed on rabbit weight gain. The statistical significance of the results ($p = 0.01$) confirms a notable difference between the different treatments. These results are consistent with those of Jiwuba (2019), who also demonstrated a significant improvement in average daily gain in rabbits fed diets containing between 15% and 45% papaya. Similarly, Kuka et al. (2024) observed a significant improvement in average daily gain in rabbits fed diets containing up to 15% *Carica papaya* leaves.

Our results are also in line with those of Abubakar et al.(2021), Dougnon et al. (2012) and Mankga et al. (2022) , who noted a significant increase in average daily gain in rabbits fed diets containing up to 15% *Moringa oleifera* leaves.

However, the average daily gain obtained in our study (13.41 g/day for RM15) remains lower than that reported by Konmy (2020) in Benin (26.66 g/day with 10% moringa) and by[15] in Benin RM10 (37.98 g/day). It is also lower than the results of Ndofor-Foleng et al.(2019), who recorded average daily gains of 17.55 and 18.06 g/day with 10% and 20% moringa, respectively.

The improvement in average daily gain in our study can be explained by the richness of *Moringa oleifera* in digestible proteins, vitamins, and trace elements.(Konmy. 2020;O yegunwa et al.,2024) .

4. Economic evaluation

The economic analysis carried out as part of this study reveals a significant impact ($p = 0.004$) of the different diets on the cost of food production per rabbit (coupal), as well as on the gross and net margins generated. The ration containing 15% *Moringa oleifera*, although having the highest feed cost (587.50 ± 139.52 CFA francs), yielded the highest gross margin (4,895.50 ± 1,226.29 FCFA) and a significant additional net margin (2501.88 ± 2685.52 FCFA). These results can be explained by the remarkable weight gain observed in the rabbits in this group, indicating better feed utilization. This observation is consistent with the results of Owen et al.(2013) and those of , who emphasized that improved animal performancemore than compensates for the increased cost of moringa-enriched rations.

The ration containing 15% *Carica papaya*, although less expensive in terms of feed cost (228.76 ± 108.49 FCFA), also showed a high net margin (2569.91 ± 2084.60 FCFA), suggesting that papaya leaves are an economically viable alternative. Indeed, the ration containing 15% *Carica papaya* allowed for satisfactory growth at a moderate cost, thus maximizing the return on investment (Owen et al., 2013). This strategy of optimizing the cost-performance ratio is consistent with the findings of Coulibaly et al. (2024), who highlighted the profitability of rations incorporating 10 to 15% papaya leaf meal. Rations containing 10% *Carica papaya* or *Moringa oleifera* showed attractive gross margins of 3801.70 and 3760.12 CFA francs, respectively, but a lower net margin due to moderately high feed costs and intermediate zootechnical performance. This highlights the importance of achieving an optimal incorporation threshold, beyond which performance justifies the additional expenditure.

Conclusion

The study evaluates the impact of incorporating *Moringa oleifera* and *Carica papaya* leaves into the diet on growth performance in rabbits (*Oryctolagus cuniculus*). The results reveal that adding up to 15% powder from these leaves to the feed ration has no adverse effects on weight gain, feed intake, average daily gain, and feed conversion ratio in rabbits, compared to the basic ration. Therefore, these unconventional feeds promote a significant increase in weight gain in fattening rabbits. It appears that these unconventional feeds promote a significant increase in weight gain in fattening rabbits, thereby improving the profit margin of production.

These results suggest that the use of *Moringa oleifera* and *Carica papaya* is a promising natural alternative for improving rabbit productivity.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Declaration of authors' contributions

AGSA and BJD participated in the design and planning of the study, BJD and JS collected the data, AGSA, BJD, and JS analyzed the data, AGSA, BJD, and JS wrote the first draft of the manuscript, and AGSA and BJD revised the manuscript during the review process under the supervision of VMCBY.

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