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EVALUATION OF *Wedelia trilobata* (L.) Hitchc. AS A FORAGE FOR REPRODUCTIVE RABBITS DOES IN A TROPICAL ENVIRONMENT

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ABSTRACT: In this study, *Wedelia trilobata* (L.) Hitchc. was evaluated as forage for reproductive rabbit does in a tropical environment. Eighteen crossbred does (New Zealand White × Local) were fed six dietary treatments in a Completely Randomized Design (CRD) with three replications. Six diets were designated as W0, W25, W40, W50, W60, and Wa, corresponding to *W. trilobata* levels of 0, 25, 40, 50, and 60% of concentrate intake (dry matter, DM, basis), *ad libitum*. The trial lasted nine months, covering three reproductive cycles. Feed and nutrient intake, reproductive performance, and milk yield were measured. *W. trilobata* contained 9.25% crude protein (CP), similar to *Brachiaria mutica*, but had higher metabolizable energy (ME: 10.3 MJ/kg DM) and lower fiber (CF: 18.9%, NDF: 40.4%, and ADF: 27.9%). Nutrient intake peaked at moderate inclusion (W40-W60), with DM intake of 124-132 g/day compared with 113 g in the W0 and 103 g in the Wa ($P < 0.05$). The W50 group had the highest CP intake (23.7 g/day), while the greatest ME intake was 1.52 MJ/day. Rabbit does in the moderate groups were heavier before kindling (2957-2958 g) than the control (2736 g) and produced more milk (86.9-88.2 g/day) than the W25 group (74.7 g/day) ($P < 0.05$). Litter size and weights did not differ significantly ($P > 0.05$) among treatments. In conclusion, including *W. trilobata* at 40-60% of concentrate intake improved doe condition and milk yield without affecting litter size or weight. Its abundance makes it practical forage for smallholder rabbit production in tropical climates.

Keywords: Alternative forage, Rabbit does, Reproductive performance, Sustainable livestock breeding, Tropical climate, *Wedelia trilobata*.

INTRODUCTION

The rising demand for affordable animal protein continues to challenge sustainable livestock production, especially in tropical and subtropical regions. Rabbits are well suited to this context because they reproduce quickly, grow fast, and can use diets rich in roughage and low in grains (Lan et al., 2022; Christopher et al., 2023). This makes rabbit farming attractive for smallholder farmers, who often depend on locally available feeds rather than costly commercial concentrates. However, high temperatures and humidity can reduce feed intake, weaken immunity, and lower reproductive efficiency (Liang et al., 2022; Liu et al., 2022; Abdelsalam and Fathi, 2023; Trung et al., 2024).

The Mekong Delta, a low-lying alluvial plain with high temperatures, humidity, long sunshine hours, and heavy rainfall, has much land that is more competitive for rice and tropical fruits than for permanent pastures (Mo, 2024). These agro-ecological features constrain conventional forage availability for on-farm use and reinforce the need for locally abundant cut-and-carry feeds. In 2023, Vietnam's rabbit population reached ~1.172 million head with ~5.58 thousand tons of carcass output; distribution is concentrated in the Red River Delta (~39%), followed by the Northern midlands and mountains (~31%), while the Mekong Delta accounts for ~105 thousand head (~9%) and ~1.13 thousand tons (National Statistics Office, 2024). In practice, rabbit production remains largely smallholder-based with modest inputs, conditions under which low-cost forages are essential (Lan et al., 2022).

With restrictions on antibiotic use in animal production, natural and readily available feed alternatives are increasingly needed to support both productivity and animal health (Abdelsalam and Fathi, 2023). One promising option is *Wedelia trilobata* (L.) Hitchc. (Figure 1), commonly called creeping oxeye or Singapore daisy. Native to Central and South America, it now grows widely in wet tropical regions without the need for cultivation (Balekar et al., 2014; Khan et al., 2023; Mo, 2024).

Figure 1 - Image of *Wedelia trilobata* (L.) Hitchc.

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Although sometimes viewed as invasive, the plant adapts well to poor soils, drought, and changing light conditions (Zhang et al., 2020; Mo, 2024; Dai et al., 2024). This resilience makes it a readily available forage source where grasses are scarce. *Wedelia trilobata* is a prostrate, creeping perennial in Asteraceae that forms a dense ground cover typically 15–30 cm tall, occasionally approaching ~70 cm. Stolon-like stems may reach ~2 m and root at the nodes, supporting rapid clonal spread and quick regrowth after cutting (Balekar et al., 2014). Leaves are opposite, glossy, slightly succulent, 2–9 × 2–5 cm, usually trilobed with serrate margins, and are sessile or borne on very short petioles (Balekar et al., 2014). Inflorescences are terminal/axillary capitula with 8–13 yellow ray florets (6–15 mm) surrounding numerous tubular disc florets; flowering occurs year-round, supporting a steady supply of leafy biomass for cut-and-carry feeding (Balekar et al., 2014).

Nutritionally, *W. trilobata* contains about 10-18% crude protein (CP) in dry matter (DM), similar to or higher than many tropical grasses, and provides more metabolizable energy (ME) (Ibok et al., 2023; Mo, 2024). It also supplies non-fiber carbohydrate (NFC), ether extract (EE), and essential minerals, while its lower fiber content may improve energy availability (Mo, 2024). In addition, *W. trilobata* contains tannins, saponins, flavonoids, and phenolic compounds linked to improved health and fertility in traditional medicine (Balekar et al., 2014; Zhao et al., 2019). Traditionally, it has been used to support reproductive health, suggesting benefits for breeding animals (Balekar et al., 2014; Christopher et al., 2023). Earlier studies on growing rabbits and goats reported good results for feed intake, nutrient digestibility, and growth when *W. trilobata* was included in the diet (Truong and Trung, 2023; Mo, 2024). Although secondary compounds might affect digestibility, rabbits consume it readily without apparent negative effects on palatability or nutrient use (María et al., 2021; Mo, 2024). Forages with such properties can also help reduce heat stress and support reproduction in tropical conditions (Miah et al., 2020; Abdelsalam and Fathi, 2023; Trung et al., 2024; El-Ratel et al., 2025). Based on available reports, the evidence on its effects on the reproductive performance of rabbit does, remains limited, especially under tropical smallholder systems (El-Gindy et al., 2022; Christopher et al. 2023). This study, therefore, examined the feeding value of *Wedelia trilobata*, focusing on nutrient intake and reproductive performance of rabbit does under tropical conditions in the Mekong Delta.

MATERIALS AND METHODS

Study area and time

The study was conducted at the private farm (10°01'56.4"N; 105°45'57.5"E), located in the Mekong Delta at a mean altitude of 0.8 meters, which experiences a tropical climate characterized by high temperatures, high humidity, abundant sunshine, and heavy rainfall. The experimental period spanned from spring to winter, lasting approximately 9 months, covering three consecutive reproductive cycles (litters 1 to 3). This study complied with the provisions of Article 72 of the Vietnamese Law on Animal Husbandry (National Assembly of Vietnam, 2018), which regulates the humane treatment of livestock in scientific research and related activities. Kien Giang College, as the institutional authority, reviewed and approved issues concerning rabbit ethics and welfare in this study.

Animals

A total of 18 reproductive female crossbred rabbits (New Zealand White x Local) were utilized in this study. These rabbits, approximately 5 months of age, newly mature and ready for being mated, with an average initial body weight of approximately 2486±50.2 g, were sourced from local farms in the Mekong Delta. Moreover, six male rabbits (New Zealand White x Local) of approximately 12 months of age were randomly used to mate with all female rabbits in the experiment. Before the commencement of the experiment, all experimental rabbits were vaccinated against coccidiosis, pasteurellosis, and internal parasites. An adaptation period of several days was provided to allow the animals to acclimate to the experimental conditions. Rabbits were housed in individual cages of 0.5 x 0.5 m in size. Each cage was equipped with feeders and water troughs.

Experimental design

The experiment was structured as a Completely Randomized Design, encompassing six dietary treatments, each with three replicates, where each experimental unit consisted of one reproductive female crossbred rabbit (New Zealand White x Local). These rabbits were carefully monitored through three consecutive reproductive cycles (litter 1 to 3), spanning an approximate duration of 9 months. The six dietary treatments were designated as W0, W25, W40, W50, W60, and Wa. For W0, W25, W40, W50, and W60, *Wedelia trilobata* was offered at levels corresponding to 0, 25, 40, 50, and 60% of the concentrate intake (DM basis), respectively, while the Wa treatment provided *Wedelia* with *ad libitum*. In all treatments, the concentrate was supplied consistently at an average of 75 g/rabbit/day, which constituted 55% of the total diet. Para grass (*Brachiaria mutica*) was offered *ad libitum* to all treatments except Wa throughout the experimental period. Rabbit does were fed diets as per the experimental design, while the rabbit bucks used for mating received a diet consistent with the W0 treatment. The W0 was also given to experimental female rabbits during the gilt stage.

Feeds and feeding

Two primary natural forages were provided daily were *Brachiaria mutica* and *Wedelia trilobata*. Both forages were harvested daily from natural sources around the farms. The forages were cut in the afternoon, thoroughly washed, drained, and then offered to the rabbits the following morning. Commercial concentrate feed was purchased from a livestock feed store. Rabbits were fed three times daily (at 8:00 AM, 11:00 AM, and 5:00 PM). The quantities of feed offered to each rabbit were weighed daily. Any leftover feed was collected and weighed the following morning to accurately determine the daily feed intake. Fresh, clean water was provided *ad libitum* daily.

Measurements and data collection

Daily feed intake was determined by recording the amount of feed offered and the amount of feed refused each morning. Samples of both offered feed and refusals were collected once a week in the morning. These samples were then chopped, dried at 60°C for 12 hours, and ground through a 1 mm sieve. Subsequently, the chemical composition of the feed and refusals was analyzed to determine the daily intake of various nutrients. The following nutrient intake parameters were calculated per rabbit per day: DM, organic matter (OM), CP, EE, NFE, NFC, crude fiber (CF), neutral detergent fiber (NDF), acid detergent fiber (ADF), and ME. The reproductive performance of the female rabbits was monitored across three consecutive reproductive cycles (litter 1 to 3), as outlined in the experimental design. Key indicators included litter size recorded as the number of kits per litter at birth, alive, and the number of kits at weaning; litter weight measured as the total weight of the litter after birth, alive, and at weaning; and milk yield was determined daily for each doe by a weigh-suckle-weigh method. Kits were weighed immediately before and after suckling to ascertain the amount of milk consumed. This process commenced at birth, where kits were weighed immediately after being dried and before their first suckling, and continued with daily weighing once in the morning until weaned.

Chemical analysis

All feed samples (offered and refused), as well as any other samples collected for nutrient analysis, were processed as follows: samples were chopped, dried in an oven at 60°C for 12 hours, and then finely ground using a 1 mm sieve. The analysis of nutrient composition, including DM (method 930.15), OM (method 942.05), CP (calculated as N × 6.25, method 990.03), EE (method 920.39), and CF (method 962.09) content, was conducted according to standard procedures, such as those outlined by AOAC (1990). Concentrations of NDF and ADF were determined following the methods described by van Soest et al. (1991). NFE (= OM – CP – EE – CF) and NFC (= OM – CP – EE – NDF) were calculated by difference. ME was estimated based on the determined nutrient composition as suggested by Maertens et al. (2002), as ME (MJ/kg DM) = DE (MJ/kg DM) × ME/DE, where DE (MJ/kg DM) = 13.932 – 0.196 CF (%DM), ME/DE = 0.995 – 0.0048 × DP (g/kg DM)/DE (MJ/kg DM), DP (g/kg DM) = CP (g/kg DM) × CPD/100, and CPD = 78.7 – 0.69 × CF (% DM).

Statistical analysis

All quantitative data collected were subjected to analysis of variance following the model: $Y_{ij} = \mu + C_i + T_j + e_{ij}$, where Y_{ij} is the dependent variable, μ is the overall mean, C_i is the effect of reproductive cycles, T_j is the effect of treatments, and e_{ij} is the random residual error. Statistical analyses were performed using a recognized statistical software package (e.g., Minitab 21.4, 2023). When the F-test indicated significant differences among treatment means ($P<0.05$), post-hoc comparisons were conducted using Tukey's HSD test to identify specific differences between pairs of means.

RESULTS AND DISCUSSIONS

Feed nutrients

The chemical composition analysis of the feed ingredients utilized in the feeding experiment, which included *Wedelia trilobata*, grass, and concentrate, is presented in Table 1. Grass exhibited a DM content of 16.1%, which was higher than that of *W. trilobata* at 12.3%. Regarding CP content, *Brachiaria mutica* had 11.8%, higher than *Wedelia* at 9.25%. EE content was found to be higher on *W. trilobata* at 6.34% compared to *Brachiaria mutica* at 5.53%. A difference was observed in NDF content, with *W. trilobata* determining 40.4%, lower than *Brachiaria mutica* at 69.1%. Similarly, the ADF content of *W. trilobata* was 27.9%, lower than grass at 37.7%. As anticipated, the concentrate served as a rich source of protein and fat. The concentrate contained 22.8% CP and 7.45% EE. Regarding carbohydrate content, the concentrate had the highest NFE at 53.7% and NFC at 39.3%. *W. trilobata* contained 47.4% NFE and 25.9% NFC, while *Brachiaria mutica* had the lowest values with 36.9% NFE and a very low 1.46% NFC. In terms of ME, the concentrate was the most energy-dense with 14.3 MJ/kgDM. *W. trilobata*provided 10.3 MJ/kgDM which was higher than grass at 6.85 MJ/kgDM.

The analysis of feed composition showed that *W. trilobata* had lower DM and CP than para grass but offered higher energy and less fiber. This may explain why rabbits readily consumed it when included in their diets. Grass generally had higher fiber fractions, while *W. trilobata* provided more EE and a better energy concentration. Such differences are important, as rabbits need both adequate fiber for gut health and enough energy to support reproduction. Earlier studies also reported that *W. trilobata* contains less NDF and ADF than common grasses, while still offering moderate protein and higher energy (Mo, 2024). This means it can act as a useful energy source among tropical forages. However, rabbits usually perform best with diets containing around 18% CP (Christopher et al., 2023; Trung et al., 2024), so *W. trilobata*alone may not fully meet protein requirements unless balanced with concentrate.

Table 1 - Nutrient composition (%DM, excluding DM, ME) of feeds

Feeds	DM	OM	CP	EE	NFE	NFC	CF	NDF	ADF	ME
Wedelia trilobata	12.3	81.8	9.25	6.34	47.4	25.9	18.9	40.4	27.9	10.3
Brachiaria mutica	16.1	87.9	11.8	5.53	36.9	1.46	33.7	69.1	37.7	6.85
Concentrate	89.3	90.4	22.8	7.45	53.7	39.3	6.45	20.8	12.6	14.3

DM (%): dry matter, OM: organic matter, CP: crude protein, EE: ether extract, CF: crude fiber, NDF: neutral detergent fiber, ADF: acid detergent fiber, NFE: nitrogen-free extract, NFC: non-fiber carbohydrate, ME (MJ/kg DM): metabolizable energy.

Feeds and nutrients intake

The present study evaluated the feed, nutrient, and energy intake of reproductive rabbit does under varying proportions of *Wedelia trilobata* in their diets (Table 2). The experimental treatments, denoted as W0, W25, W40, W50, W60, and Wa, represent *Wedelia trilobata* proportions at 0, 25, 40, 50, 60% of concentrate, and *ad libitum*, respectively.

Brachiaria mutica offer significantly diminished as the *W. trilobata* inclusion level increased, starting at 96.9 g for W0 and falling to 48.3 g for W60, with statistical significance (P=0.001). In stark contrast, the offer of *W. trilobata* saw a marked rise, from 16.0 g (W25) to 76.0 g (Wa), also highly significant (P=0.001). *Brachiaria mutica* refusal mirrored the trend of grass offer, being highest in W0 at 50.3 g and lowest in W60 at 25.5 g, indicating significant differences across treatments (P=0.001). *Wedelia trilobata* refusal was absent in treatments W25, W40, and W50. However, it became noticeable at W60 (12.2 g) and was highest in the *ad libitum* group, Wa (38.6 g), demonstrating significant variability (P=0.001). Concentrate intake exhibited remarkable consistency across all treatments, ranging narrowly from 65.4 g to 68.8 g, with no significant statistical difference (P=0.473). *Brachiaria mutica* intake was most prominent in the W0 group at 46.6 g and declined to 22.7 g in the W60 group, a statistically significant trend (P=0.001). Conversely, *Wedelia trilobata* intake showed a significant upward trajectory, from 16.0 g (W25) to 37.1 g (W60) and peaking at 37.4 g (Wa), with high statistical significance (P=0.001).

Table 2 - Feed, nutrients, and energy intake of does.

Variables	W0	W25	W40	W50	W60	Wa	SEM	P-value
Brachiaria mutica offer, g DM/doe/day	96.9^{a}	80.6^{b}	64.6^{c}	64.6^{c}	48.3^{d}	-	0.020	0.001
Wedelia offer, g DM/doe/day	-	16.0^{e}	24.7^{d}	37.0^{c}	49.3^{b}	76.0^{a}	0.229	0.001
Brachiaria mutica refuse, g DM/doe/day	50.3^{a}	41.4^{ab}	30.9^{abc}	35.0^{bc}	25.5^{c}	-	3.25	0.001
Wedelia trilobata refuse, g DM/doe/day	-	-	-	2.89^{b}	12.2^{b}	38.6^{a}	2.31	0.001
Wedelia trilobata intake, g DM/doe/day	-	16.0^{c}	24.6^{bc}	34.1^{ab}	37.1^{a}	37.4^{a}	2.36	0.001
Brachiaria mutica intake, g DM/doe/day	46.6^{a}	39.2^{ab}	33.7^{abc}	29.6^{bc}	22.7^{c}	-	3.25	0.001
Concentrate intake, g DM/doe/day	66.9	66.9	65.5	68.8	65.4	65.6	1.33	0.473
DM, g/doe/day	113^{ab}	122^{ab}	124^{a}	132^{a}	125^{a}	103^{b}	4.26	0.001
OM, g/doe/day	101^{ab}	108^{a}	109^{a}	116^{a}	110^{a}	90.7^{b}	3.60	0.001
CP, g/doe/day	22.1^{ab}	22.5^{ab}	22.6^{ab}	23.7^{a}	21.6^{b}	17.7^{c}	0.419	0.001
EE, g/doe/day	8.84^{a}	9.47^{a}	9.12^{a}	9.81^{a}	9.08^{a}	7.43^{b}	0.214	0.001
NFE, g/doe/day	50.5	55.8	56.6	59.8	58.9	52.6	2.07	0.054
NFC, g/doe/day	27.4^{c}	31.2^{b}	31.7^{b}	36.0^{a}	35.5^{a}	36.5^{a}	0.570	0.001
CF, g/doe/day	20.1^{s}	20.5^{s}	20.7^{s}	22.6^{s}	20.1^{s}	13.0^{b}	1.31	0.004
NDF, g/doe/day	43.2^{ab}	45.1^{a}	45.5^{a}	46.4^{a}	43.5^{a}	29.1^{b}	2.97	0.012
ADF, g/doe/day	26.5^{a}	27.9^{a}	26.7^{a}	27.7^{a}	26.9^{a}	18.6^{b}	1.62	0.013
ME, MJ/doe/day	1.30^{b}	1.42^{ab}	1.43^{ab}	1.52^{a}	1.46^{ab}	1.28^{b}	0.038	0.001

W0, W25, W40, W50, and Wa: proportions of *W. trilobata* at 0, 25, 40, 50, and 60% of concentrate, and *ad libitum*, respectively; DM: dry matter, OM: organic matter, CP: crude protein, EE: ether extract, CF: crude fiber, NDF: neutral detergent fiber, ADF: acid detergent fiber, NFE: nitrogen-free extract, NFC: non-fiber carbohydrate, ME: metabolizable energy; SEM: standard error of means; P: = significant level; $^{a-e}$: means within a row with different superscripts differ significantly (P<0.05).

DM intake differed significantly (P=0.001), with the highest values observed in treatments W40, W50, and W60, ranging from 124 g to 132 g. Notably, W0 (113 g) and Wa (103 g) exhibited lower DM intakes. OM intake followed a similar pattern to DM intake, with W40, W50, and W60 showing higher intakes (ranging from 109 g to 116 g) compared to W0 (101 g) and Wa (90.7 g) (P=0.001). CP intake was significantly highest in W50 (23.7 g), whereas W60 (21.6 g) and Wa (17.7 g) demonstrated significantly lower CP intakes compared to W50 (P=0.001). EE intake remained high across treatments W0 to W60 (ranging from 8.84 g to 9.81 g), but was significantly lower in Wa (7.43 g) (P=0.001). NFE intake did not display statistically significant differences among the treatments (P=0.054). NFC intake was significantly elevated in treatments W50, W60, and Wa (ranging from 35.5 g to 36.5 g) when contrasted with W0 (27.4 g) (P=0.001). CF intake did not show significant differences among W0 through W60, but was significantly lower in Wa (13.0 g) (P=0.004). NDF intake was highest in treatments W25, W40, W50, and W60 (ranging from 43.2 g to 46.4 g), and significantly lower in Wa (29.1 g) (P=0.012). ADF intake followed a similar trend to NDF, being highest in W0 through W60 (ranging from 26.5 g to 27.9 g), and significantly lower in Wa (18.6 g) (P=0.013). ME intake was significantly higher in W50 (1.52 MJ), and in other *Wedelia*-supplemented groups (W25, W40, W60), compared to W0 (1.30 MJ) and Wa (1.28 MJ) (P=0.001).

As *W. trilobata* levels increased, rabbits ate less grass but more *W. trilobata*, showing a clear substitution effect. Concentrate intake stayed almost the same across treatments, since the amount offered was fixed. This indicates that rabbits first consumed their concentrate and then adjusted their forage intake, a pattern also reported by Sánchez-Laiño et al. (2018) and Christopher et al. (2023). An important observation was that no *W. trilobata* was left uneaten in groups up to W40 or W50 group, while refusals appeared only at the W60 and Wa. These results showed that *W. trilobata* was well accepted at moderate proportions but became less palatable when it dominated the diet. Similar patterns of forage refusal at high inclusion levels have been noted in rabbit feeding trials with unconventional forages (Safwat et al., 2014; Okpakpor et al., 2022; Yaa et al., 2023).

DM and ME intake were highest when *W. trilobata* made up 40-60% of the concentrate intake equivalent. At these levels, rabbits also reached the best CP intake. Similar findings were observed by Mo (2024), who reported improved feed intake and energy supply with moderate *W. trilobata* inclusion. In contrast, the *ad libitum Wedelia* group ate less overall DM and CP, suggesting that too much *W. trilobata* alone reduced diet balance or palatability. Fiber intake was lowest when *W. trilobata* was fed *ad libitum*, which could be a concern. Rabbits need enough fiber to keep their digestion healthy and prevent disorders (Rommers et al., 1999; Maertens et al., 2002). Although *W. trilobata* has lower fiber than grass, combining it with some grass and concentrate gave a better balance. These results confirm that moderate *W. trilobata* inclusion supports both higher intake and better nutrient use, especially under tropical conditions where heat stress often reduces appetite (Abdelsalam and Fathi, 2023; Trung et al., 2024). In practice, this could help farmers who depend mainly on forages gathered locally, as *W. trilobata* grows abundantly without requiring cultivation or extra inputs.

Reproductive performance

The reproductive performance of the female rabbit does, including doe weight changes, milk yield, and litter characteristics, was monitored across six dietary treatments over three consecutive reproductive cycles (Table 3). The treatments, W0, W25, W40, W50, W60, and Wa, correspond to *W. trilobata* inclusions at 0, 25, 40, 50, and 60% of concentrate DM, and *ad libitum*, respectively.

Table 3 - Doe weight change and milk, and the number and weight of kits

Traits	W0	W25	W40	W50	W60	Wa	SEM	P-value
Doe W before mating, g/doe	2460	2534	2594	2544	2599	2583	62.9	0.502
Doe W before kindling, g/doe	2736^{b}	2836^{ab}	2957^{a}	2948^{ab}	2958^{ab}	2904^{ab}	56.4	0.045
Doe W change, g/doe/cycle	276	303	363	404	359	321	36.4	0.261
Milk yield, g/doe	84.1^{ab}	74.7^{b}	88.2^{a}	86.9^{ab}	87.8^{ab}	78.1^{ab}	3.46	0.034
No. kits born	6.89	6.44	7.00	6.44	7.00	6.78	0.504	0.932
No. kits alive at birth	6.67	6.00	7.00	6.44	7.00	6.11	0.477	0.547
No. weaned kits	6.44	5.67	6.11	5.89	6.78	5.78	0.507	0.618
Litter W at birth, g/litter	340	278	343	329	308	310	18.9	0.156
Litter W at 21 days old, g/litter	1519	1336	1335	1402	1519	1217	86.2	0.118
Litter W at weaning, g/litter	2188	1980	2143	2185	2389	2028	144	0.431

W0, W25, W40, W50, and Wa: proportions of *W. trilobata* at 0, 25, 40, 50, and 60% of concentrate, and *ad libitum*, respectively; W: live weight; SEM: standard error of means; P: = significant level; $^{a-e}$: means within a row with different superscripts differ significantly (P<0.05).

Doe weight before mating did not show statistically significant differences among the treatment groups (P>0.05), with weights ranging from 2460 g (W0) to 2599 g (W60). However, doe weight before kindling was significantly influenced by the dietary treatments (P=0.045). The highest weights before kindling were observed in W40 and W60 groups (2957 g and 2958 g, respectively), and these were significantly higher than W0 (2736 g). Other groups (W25, W50, Wa) showed intermediate, non-significantly (P>0.05) different values. The change in doe weight during pregnancy (Doe W change) did not exhibit significant differences across treatments (P>0.05), ranging from 276 g (W0) to 404 g (W50). Milk yield was significantly affected by the dietary treatments (P=0.034). The highest milk yield was recorded in W40 (88.2 g/day), closely followed by W60 (87.8 g/day) and W50 (86.9 g/day), which were significantly (P=0.034) higher than W25 (74.7 g/day). W0 and Wa groups showed intermediate milk yields (84.1 g/day and 78.1 g/day, respectively). Number of kits born, number of kits alive at birth, and number of weaned kits did not show statistically significant differences among any of the treatments (P>0.05). The number of kits born ranged from 6.44 (W25, W50) to 7.00 (W40, W60). Similarly, litter weight at birth, litter weight at 21 days old, and litter weight at weaning showed no significant differences across the experimental groups (P>0.05).

Doe weight before mating did not differ among treatments, but weights before kindling were higher in groups with 40-60% *W. trilobata* compared to the control. This indicates that moderate *W. trilobata* inclusion helps build up better body reserves for pregnancy, a factor closely linked with their ability to sustain lactation (Quevedo et al., 2006; Pascual et al., 2013). Although overall weight gain during pregnancy was not different, the higher weights at kindling reflect improved nutritional status (Prieto-Huecas et al., 2023). Milk yield was higher in does fed *W. trilobata* at 40-60% than in those given 25%. This is important, since milk output is one of the strongest determinants of kit survival and growth in the early weeks (El-Gindy et al., 2022; Miah et al., 2020). Similar improvements in milk yield with dietary supplements have been reported in rabbits under tropical conditions (El-Speiy et al., 2024; Habeeb et al., 2025; Zhao et al., 2025). On the other hand, litter size and weights at birth or weaning did not differ significantly. This suggests that the basal diet, even in the control group, provided enough nutrients for basic reproductive outcomes. Genetic potential and environmental stressors, especially heat stress, may also have limited further improvements in litter traits (Lan et al., 2022; Abdelsalam and Fathi, 2023). Still, the higher doe weights and milk yields with moderate *W. trilobata* inclusion point to better maternal condition, which indirectly benefits kit survival and health. In tropical regions such as the Mekong Delta, heat stress often reduces feed intake and reproductive performance (Abdelsalam and Fathi, 2023; Trung et al., 2024). The ability of *W. trilobata* to support higher intake and sustain milk production shows its value as a resilient forage resource. It is easy, therefore, to provide a simple feeding option for household rabbit production in hot-humid regions.

CONCLUSIONS

The results show that *Wedelia trilobata* can be valuable forage for reproductive rabbit does in tropical conditions. Feeding *W. trilobata* at moderate levels of 40–60% of concentrate intake improved doe body weight before kindling and increased milk yield while maintaining good feed intake. Litter size and weights did not differ significantly among treatments, suggesting that the basal diet already supported essential reproductive outcomes. However, the lower fiber intake observed when *W. trilobata* was given *ad libitum* indicates that excessive use should be avoided. Because it grows easily without intensive cultivation, *W. trilobata* can help smallholder farmers reduce reliance on conventional forages and maintain productivity in hot, humid climates. Further studies should examine its long-term effects on health and reproductive success across multiple cycles, its potential use for growing rabbits, and its economic feasibility in smallholder systems.

DECLARATIONS

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Ethics committee approval

All procedures involving animals complied with Article 72 of the Vietnamese Law on Animal Husbandry (No. 32/2018/QH14) and institutional guidelines. The research protocol was reviewed and approved by the institutional authority at Kien Giang College, An Giang, Viet Nam.

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Authors' contributions

NTV Chau conceived, designed, and collected the data for the experiment. D Mo analyzed and interpreted the data and drafted the manuscript. All authors reviewed and approved the final version of the manuscript.

Data availability
The authors will provide the analysed datasets on reasonable request to the corresponding author.

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Competing interests
The authors declare that there is no conflict of interest.

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