

The Beef Cattle Fattening Business in Central Java: Partnership Pattern and Profitability Rates

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Abstract. Research has been conducted on the partnership pattern of beef cattle fattening businesses in Semarang District, Central Java Province from August 2021 to July 2022. It aimed to look at production costs, profits, profit sharing, satisfaction, convenience, and benefits for farmers. There were three rearing patterns. Pattern 1 (partnership pattern 1): Investors cover the production costs of cattle breeds and concentrates. Farmers provide grass, cowshed, and labor. Pattern 2 (partnership pattern 2): Investors cover the cost of producing cattle breeds. Farmers provide concentrates, grass, cowshed, and labor. Pattern 3: independent farmers. The research method was a survey through interviews with investors, farmers, and observations of fattened cattle. Twenty-seven Simental cattle breeds were used in this research that involved 18 farmers. The collected data included feeding, weight gain, production costs, profits, profit sharing, and participants' responses to partnership patterns. The obtained data were analysed descriptively. The research results showed the average weight gain/head/day for Patterns 1, 2, and 3 were 1.02, 1.01, and 0.97 kg, and benefit each IDR 1,119,390/month, IDR 1,120,000/month, and IDR 1,212,020/month was earned. Compared to the partnership pattern, the response of independent farmers was the highest since it was the most satisfying, the easiest, and provides the most benefits.

1 Introduction

Imports of meat are still increasing because of an imbalance between production and consumption of beef. Demand for beef in 2021 was 711,000 tons, compared to the production of 436,704 tons, necessitating imports of 274,296 tons [1]. Encouragement of the beef cattle fattening business, which is conducted using a partnership pattern, is one of the measures taken to meet the demand for beef. The primary goal of the cattle fattening business is to add weight to raised cattle [2]. The amount of consumed feed, the breed, sex, and age of the cattle at the time of fattening are some factors that affect rate of a cattle weight gains [3]. Although farmers must also produce feed in sufficient quantities to meet demand, many studies only

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address the issue of feed quality. Cattle can still function normally without feed thanks to the body's reserve nutrients produced during metabolism [4].

One of the indicators of the production is cattle growth. A certain amount of time is required for the production process in the cattle fattening business to transform input into output [5]. There are both fixed and variable costs involved in the production process. The business of cattle fattening anticipates a profit from the sale of cattle. It is feasible if the revenue from the sale of cattle exceeds the total production costs, which means that the profits can support his family and run a sustainable cattle-fattening business [6]. Successful cattle-fattening businesses contribute to increased meat production and prosperity.

A profit-sharing partnership, a business collaboration between entrepreneurs and farmers in which entrepreneurs act as investors and farmers act as cattle keepers, is one of the recent developments in the cattle fattening business. Investors typically provide various production facilities, such as cattle seeds and concentrate feed. Farmers provide land or cowshed, grass feed, and labor, and then production is divided according to the terms of the agreement. Cattle fattening partnerships offer numerous benefits, including (i) increased productivity, (ii) increased efficiency, (iii) assurance of quality, quantity, and continuity, (iv) risk sharing, (v) social impact, and (vi) enhanced national economic resilience [7].

For cattle-fattening businesses to have a competitive advantage, production factors, particularly feed, high-quality cattle seeds, labor, and management, must be utilized effectively and efficiently [8]. Based on this, research has been conducted on cattle-fattening businesses' partnership patterns and profit levels to analyze production costs, profits, profit sharing, satisfaction, convenience, and benefit of cattle-fattening business partnership patterns.

2 Research methods

The research was conducted from August 2021 to July 2022 in Pasekan Village, Semarang Regency, Central Java Province that involved 18 farmers. Twenty-seven heads of cattle were used in this research. The breeds of cattle were bulls of the Simental breeds. Three raising patterns were researched, namely partnership patterns 1 (Patterns 1) and 2 (Patterns 2), and independent farmers as a comparison (Pattern 3) (Table 1).

Data was collected on weight gain, profitability, and business feasibility, as well as responses to partnership patterns. Weight gain calculated using the formula [9]:

$$ADG = (W1-W2)/(T1-T2) \quad (1)$$

Details:

ADG : Average Daily Gain (kg/head/day)

W1 : the final body weight (kg)

W2 : initial body weight (kg)

T1 : time for initial weighing (day)

T2 : time for the final weighing (day)

Calculation of farmers' costs and profits in the cattle fattening business using formulations [10]:

$$\pi = P_y \cdot Y - (P_{x1} \cdot X1 + \dots + P_{xn} \cdot Xn) - (P_{xk1} \dots + P_{xkn} \cdot Xkn) \quad (2)$$

Details:

Π = Profit (IDR)

P_y = Production price (IDR)

Y = Production (kg)

$P_{x1} \dots n$ = Input price $x1 \dots n$; $X1 \dots n$ = Number of inputs $X1 \dots n$

$P_{xk1} \dots n$ = Input price $xk1 \dots n$; $Xk1 \dots n$ = Input price $Xk1 \dots n$

$P_{xk} \cdot Xk$ = Variable costs

$P_{xi} \cdot Xi$ = Fixed costs

Table 1. The Raising patterns among beef cattle fattening businesses at the research site

No.	Rearing Patterns	Partnership Performer	Distribution of Production Cost	Profit-sharing System
1.	Partnership Pattern 1 (Pattern 1)	Investor	<ul style="list-style-type: none"> ▪ Purchase of cattle breeds ▪ Concentrate feed 	<ul style="list-style-type: none"> ▪ Investors receive a refund of the cost of cattle breeds and concentrate ▪ After the selling price of the cattle breeding and concentrate is deducted, the remaining sales are split in half between the investor and partner farmers. ▪ Partner farmers have ownership of manure.
		Partner Farmer	<ul style="list-style-type: none"> ▪ Grass feed ▪ Cowshed ▪ Cowshed equipment ▪ Cattle keepers 	
2.	Partnership Pattern 2 (Pattern 2)	Investor	Purchase of cattle breeds	<ul style="list-style-type: none"> ▪ Investors receive refund on breeding cattle ▪ Partner farmers receive a refund of concentrate costs. ▪ After deducting the sale price and the capital of cattle breeds, the remaining sales are split equally between the investor and the partner farmer. ▪ Partner farmer have ownership of manure.
		Partner Farmers	<ul style="list-style-type: none"> ▪ Concentrate feed ▪ Grass feed ▪ Cowshed ▪ Cowshed equipment ▪ Cattle keepers 	
3.	Independent Farmer (Pattern 3)	Independent Farmer	<ul style="list-style-type: none"> ▪ Cattle Breeds Procurement ▪ Concentrate Feed ▪ Grass feed ▪ Cowshed ▪ Cowshed equipment ▪ Cattle keeper 	Independent farmers receive all proceeds from the sale of cattle

Reaction of investors and farmers to the partnership pattern is qualitative data which is converted into quantitative data using scoring techniques (11) The used criteria are trust, convenience, satisfaction, and benefits.

Table 2. Scoring scale

No.	Alternative answers	score
1	Very Positive	5
2	Positive	4
3	Moderate	3
4	Negative	2
5	Very negative	1

3 Results and discussions

3.1 Types, volume, and values of cattle feed

Fresh tofu dregs, concentrates, bran, coffee skins, grass, and rice straw are the types of feed given during fattening (Table 3). Fresh tofu pulp has a high nutrient content and total digestible nutrients (TDN), but farmers cannot store it for a long time due to its high-water content, which causes it to be easily damaged. Concentrate, bran, and coffee skin have a lower water content, allowing them to be stored longer and used as a feed mixture. Coffee

skin is industrial waste that much at the research site, but its nutrient content is low. It contains difficult materials for rumen microbes to digest; therefore, it must be fermented to improve its digestibility and quality. Rice straw can be stored for a long time, is cheap, and contains few nutrients. The protein content and digestibility of rice straw are of such low quality that it cannot satisfy the fundamental dietary requirements of cattle [12]. Both feed quality and feeding technique have an impact on meat quality. When cattle are raised in cowsheds with concentrated feed, the daily body weight gain is typically higher, the fat and marbling are higher, and the meat is brighter and more tender than when cattle are raised on grazing systems [13].

Pattern 1 had the most expensive feed value (IDR 26,892/head/day). Financially, the provision of concentrate is economical if the income increases or is equivalent to the additional expenses incurred. Pattern 1 has the smallest volume of feed but the highest costs. In contrast, pattern 3 has the highest volume of feed, but the smallest costs, amounting to IDR 21,919/head/day. Because the type and quality of the given feed ingredients vary, the volume of feed given is not a guideline for the suitability of the feed in terms of quality (Table 3).

Table 3. Types, average number, and value of feed for fattening cattle at the research sites (head per day)

No.	Feed Type	Pattern 1		Pattern 2		Pattern 3	
		Average of Feeding (kg)	Feed Value (IDR)	Average of Feeding (kg)	Feed Value (IDR)	Average of Feeding (kg)	Feed Value (IDR)
1.	Wet tofu dregs	15.43	12,344	20.25	16,200	22.02	17,616
2.	Concentrate	1.54	6,930	-	-	-	-
3.	Coffee skin	-	-	-	-	1.42	2,840
4.	Bran	1.85	6,475	2.53	8,855	-	-
5.	Elephant grass	15.43	772	15.82	791	19.88	50
6.	Field Grass	9.25	278	10.75	323	11.36	341
7.	Rice Straw	6.17	93	6.33	95	8.52	128
Total		49.67	26,892	55.68	26,264	63.20	21,919

The highest average dry matter consumption is among pattern 3, followed by Patterns 1 and 2, while consumption of crude protein is the highest in Pattern 2, followed by Patterns 1 and 3 (Table 4). That dry matter and crude protein consumption can lead to body weight gains of 1.02 kg/head/day (Pattern 1), 1.01 kg/head/day (Pattern 2), and 0.97 kg/head/day (Pattern 3). Consuming dry matter at 11.24 kg/head/day and crude protein at 1.27 kg/head/day can result in an average gain of 0.78 kg/head/day in body weight [18]. Fattened beef cattle with an initial body weight of 350 kg and a body weight gain target of 0.9–1.1 kg/head/day require at least 8 kg of dry matter/head/day and 0.80–0.83 kg of total protein/head/day.

Table 4. Average consumption of feed nutrients (head/day)

No.	Type of Business	Dry Materials (kg)	Crude Protein (kg)	Crude Fat (kg)	Crude Fiber (kg)	Ash (kg)
1.	Pattern 1	10.09	1.01	0.51	2.47	1.09
2.	Pattern 2	10.13	1.02	0.53	2.58	1.02
3.	Pattern 3	10.80	0.90	0.31	3.28	1.10

3.2 Cattle body weight gain

The daily body weight gain of Pattern 1 (1.02 kg/head) and Pattern 2 (1.01 kg/head) were higher than Pattern 3 (0.97 kg/head). The rate of cattle growth is determined by the quality and quantity of feed consumed, as well as by the management of maintenance [14]. Other factors influencing growth or body weight gain are cattle breed, maintenance, and environmental factors [15]. While the amount of slaughter weight and percentage of cattle carcasses can be affected by some factors, including the condition of the cattle, the slaughtering procedure, the slaughter weight of cattle, the nation, the age, and the sexes [16]

Pattern 1 has the least feeding but the fastest growth rate because concentrate is an easily digestible energy source feed with high nutrient content. Still, its business efficiency is lower than those not given concentrate in Patterns 2 and 3.

Table 5. Average body weight, body weight gain, and business efficiency during fattening

No.	Production parameters	Pattern 1	Pattern 2	Pattern 3
1.	Average body weight of beef cattle (kg/head)	214.3	206.2	194.3
2.	Average final body weight (kg/head)	379.5	365.8	365.1
3.	Fattening time (days)	162	158	176
4.	Total body weight gain during fattening (kg)	165.2	159.6	170.8
5.	Average daily gain (kg/head/day)	1.02	1.01	0.97
6.	Business efficiency	1.71	1.73	1.99

3.3 Analysis of cost and benefit

Land, cowshed, feed warehouse, and equipment are the most expensive investment costs for cattle fattening business. In financial analysis, investment costs are categorized as fixed costs, whereas costs incurred each time they consume variable costs [17]. Pattern 1's fixed expenses consist of land and building taxes, depreciation of cages and equipment, electricity, and interest on capital amounting to IDR 1,025,000 (Pattern 1), IDR 1,000,000 (Pattern 2), and IDR 975,000 (Pattern 3) (Table 6).

Variable costs for cattle include seed, feed, medicine, labor, and transportation. Revenue (inflow) from the cattle fattening business is obtained from selling cattle and manure. At the research site, cattle sold for between IDR 70,000 and IDR 74,000/kg in live weight. Pattern 1 profits IDR 1,119,390/month, Pattern 2 profits IDR 1,120,000/month, and Pattern 3 profits IDR 1,212,020/month. Pattern 1's total expenses amount to IDR 22,334,700 which includes the IDR 16,329,700 spent on cattle seed, IDR 2,000,000 tofu dregs, IDR 1,125,000 concentrate feed, and IDR 1,050,000 rice bran. The revenue from the sale of cattle totaled IDR 27,779,400, leaving a difference of IDR 11,449,700 between the selling and purchasing of cattle. The amount of profit shared is IDR 3,637,350.

In Pattern 2, the purchase price of the cattle breed was IDR 15,712,500, the tofu dregs were IDR 2,560,000, and the coffee skin was IDR 1,400,000, so the total expense of tofu dregs and coffee skin was IDR 3,960,000. The revenue from cattle sales was IDR 26,783,890, and the difference between cattle sales and cattle purchases was IDR 11,449,700. The amount of profit shared was IDR 3,637,350. Efforts to fatten cattle can achieve optimal results because they consider farmer resources, particularly labor, and management. According to financial calculations, the ratio between the production value of fattening cattle and costs (R/C) is 1.27 (Pattern 1 and Pattern 2), which means that for every IDR 1,000,000 invested in the beef cattle fattening business, there will be a return of IDR 1,270,000. However, for Pattern 3, the R/C was 1.35, meaning that for every IDR 1,000,000 spent, IDR 1,351,000 will

be returned. Since the R/C value is greater than 1, the cattle fattening business is considered feasible [18;19].

Table 6. The financial calculation for beef-cattle fattening in five months per head (IDR)

Description	Pattern 1	Pattern 2	Pattern 3
Variabel Cost:	21,309,700	20,583,500	19,332,500
- Cattle breed.	16,329,700	15,712,500	14,805,000
- Feed	4,360,000	4,151,000	3,857,500
- Medicine	20,000	20,000	20,000
- Labor	300,000	300,000	350,000
- Transportation cost	300,000	300,000	300,000
Fixed cost:	1,025,000	1,000,000	975,000
- Property Tax	150,000	150,000	150,000
- cowshed shrinkage	100,000	100,000	150,000
- equipment shrinkage	50,000	50,000	50,000
- electricity	25,000	25,000	25,000
- capital interest (3,0%)	650,000	625,000	600,000
Total cost	22,334,700	21,483,500	20,307,500
Production value	28,379,400	27,383,800	27,418,000
- sale of cattle	27,779,400	26,783,800	26,718,000
- compost	600,000	600,000	700,000
profit/period	6,044,700	5,900,300	7,110,500
profit/month	1,119,390	1,120,000	1,212,020
R/C on total cost	1.27	1.27	1.35

3.4 Investors' and partner farmers' response on partnership satisfaction and benefit

3.4.1 Response from investors to partnership satisfaction and benefit

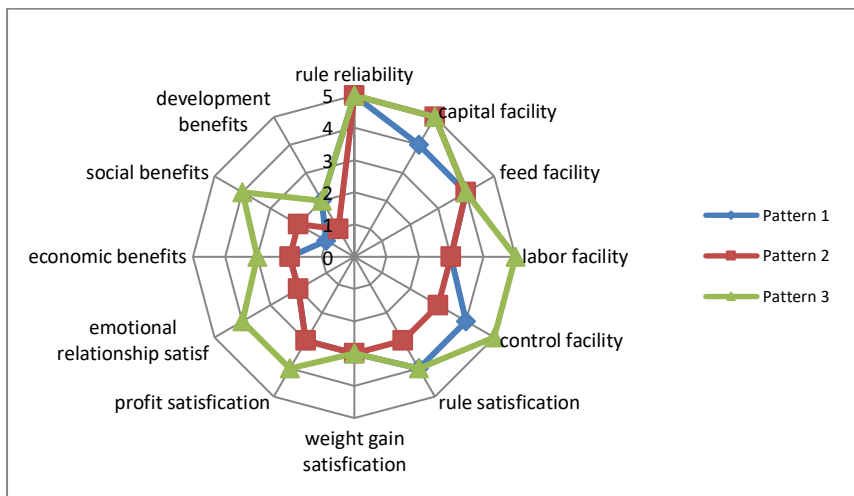


Fig. 1. Radar of the entrepreneur's response to the application of the beef cattle fattening business partnership model

Regarding Patterns 1 and 2, the investor response to the reliability of applying the rules is highly positive (score 5) for Patterns 1 and 2, easily understood since the weight of the cattle

purchased and sold is determined by weighing, so difficulty of yield and profit sharing was not occurred. In addition, according to investors, the ease of applying the rules in terms of capital, feed, labor, and supervision tends to be high (scores 4 to 5).

The level of satisfaction with conducting partnerships in the beef cattle fattening business is relatively lower than the level of trust and ease of application of the rules. Pattern 3 provides the greatest satisfaction level in terms of applying the rules and profits earned. Despite economic calculations, the profit margin for Pattern 3 is the lowest, which relates to farmers' freedom. Independent farmers (Pattern 3) obtain greater benefits than partnership patterns and social and developing capacity.

3.4.2 Sharing farmers' responses to partnership satisfaction and benefit

Farmers have a high level of trust in the Pattern 1 partnership pattern's rules, which are easy to understand because the farmer is the beef cattle fattening business manager, so he is well-versed in the rules' application. Independent farmers offer the highest levels of trust, convenience, satisfaction, and benefits. Regarding patterns 1 and 2, when purchasing cattle breeds, the farmer only receives information from the investor regarding the weight and price of the cattle. The farmer places full trust in the investor because the information is based on the farmer's experience, who can also estimate the market price of the cattle breed. This condition is reflected in the farmer's response to ease of control (score 5).

Pattern 2 has the lowest responses when viewed from the perspective of ease of capital availability. Except for cattle breeds, farmers must provide investment capital and working capital. This requirement is quite burdensome for partner farmers, whose capital capacity is typically limited. The funds provided during the period of maintenance can be used to purchase cattle breeds. Partner farmers are unable to develop capacity and continue pattern 2 at the next stage.

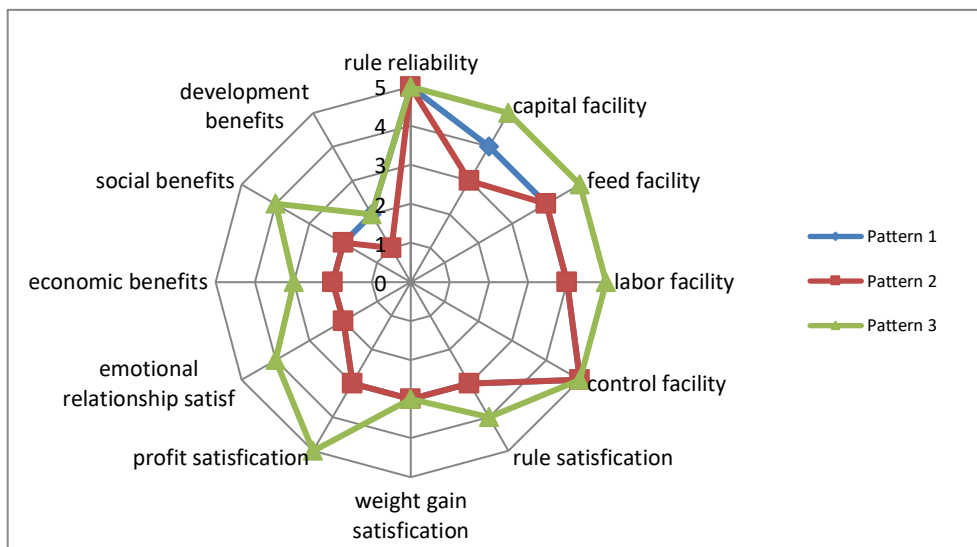


Fig. 2. Farmers' radar response to the implementation of the beef cattle fattening business partnership pattern

Pattern 2 shows a lower response when compared to other partnership patterns in terms of convenience, satisfaction, and the number of benefits. The satisfaction of the rules with profit sharing for farmers differs from capital and maintenance costs. A low level of emotional relationship satisfaction also contributes to this condition. The relationship

between entrepreneurs and farmers is limited to working or economic relations, so the emotional bond is weak, which triggers the lack of development of the partnership pattern [20; 21]. According to Pattern 2, farmers have less economic, social, and developmental capacity than in Pattern 1, consistent with the level of satisfaction and convenience for partner farmers in Pattern 2.

According to the farmer, the cattle fattening business using the independent farmer pattern is more satisfying, convenient, and profitable than the partnership pattern. Regarding the ease of capital provided, feed, labor, and farmer control obtained the highest response compared to the partnership pattern. Similarly, aspects of satisfaction with the rules, weight gain, profit, and emotional relationships obtained the highest response rates. Independent farmers also obtain greater benefits in terms of convenience and reliability.

4 Conclusions and recommendations

Pattern 1 has the highest average weight gain among Patterns 2 and 3, but has the highest feed costs. Pattern 1 makes a monthly profit of IDR 1,119,390; Pattern 2 IDR 1,120,000, and Pattern 3 IDR 1,212,020. Partner farmers and investors in Pattern 1 receive an average of IDR 3,637,350 in profit sharing, while in Pattern 2 IDR 3,555,695. Regarding the aspect of trust in the application of the rules, the responses to patterns 1 and 2 were very positive (score 5) from an investor's perspective. The farmer's response is highest in pattern 3 compared to patterns 1 and 2. The suggestions make the case that the pattern of government-assisted cattle fattening can also refer to the pattern of farmer-level business partnerships for cattle fattening.

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References

1. Pusat Data dan Sistem Informasi Pertanian, *Outlook Komoditas Peternakan: Daging Sapi* (Pusat Data dan Sistem Informasi Pertanian Sekretariat Jenderal - Kementerian Pertanian, Jakarta, 2022)
2. M. Kamal, M. Hashem, M. Al Mamun, M. Hossain, and M. Razzaque, *SAARC J. Agric.* **17**, 105 (2019)
3. S. Asem-Hiablie, C. A. Rotz, R. Stout, and K. Fisher, *Prof. Anim. Sci.* **33**, 461 (2017)
4. S. D. M. Jones, M. A. Price, and R. T. Berg, *Can. J. Anim. Sci.* **60**, 669 (1980)
5. O. D. Vergara, M. F. Ceron-Muñoz, E. M. Arboleda, Y. Orozco, and G. A. Ossa, *J. Anim. Sci.* **87**, 516 (2009)
6. S. S. Moore, F. D. Mujibi, and E. L. Sherman, *J. Anim. Sci.* **87**, E41 (2009)
7. D. Happyana, *J. Ilm. Peternak. Terpadu* **5**, 33 (2017)
8. H. Mayulu, D. Saputra, and M. Mursidah, *J. Ekon. Manaj. Dan Akunt.* **25**, (2023)
9. R. Kay, W. Edwards, and P. Duffy, *Farm Management* (McGraw-Hill Ed, USA, 2016)
10. S. Syapura, M. Bata, and W. S. Pratama, *J. Agripet* **13**, 59 (2013)
11. C. Chanifah, D. Sahara, and B. Hartoyo, *J. Ilmu Pertan. Indones.* **26**, 511 (2021)
12. Nurwantoro, V. P. Bintoro, A. M. Legowo, and A. Purnomoadi, *Apl. Teknol. Pangan* **1**, 54 (2012)
13. L. M. Melucci, A. N. Birchmeier, E. P. Cappa, and R. J. C. Cantet, *J. Anim. Sci.* **87**, 3089 (2009)

14. S. L. Mulijanti, S. Tedy, and - Nurnayetti, J. Peternak. *Indones. (Indonesian J. Anim. Sci.* **16**, 179 (2014)
15. E. L. Sherman, J. D. Nkrumah, C. Li, R. Bartusiak, B. Murdoch, and S. S. Moore, *J. Anim. Sci.* **87**, 37 (2009)
16. Socheh. M, S. W. Purbojo, and L. R. Hakim, *Teknol. Dan Agribisnis Peternak.* 297 (2018)
17. M. M. Hasan, S. M. E. Rahman, M. A. Hashem, M. A. K. Azad, M. R. Haque, and M. M. Rahman, *J. Agric. Food Environ.* **02**, 38 (2021)
18. P. Sarma, S. Raha, and H. Jørgensen, *J. Bangladesh Agric. Univ.* **12**, 127 (2014)
19. A. Maikasuwa, *Am. Int. J. Contemp. Res.* **2**, 230 (2012)
20. A. Suarda, T. G. Rasyid, and A. Mulia, *Vet. Pract.* **21**, 154 (2020)
21. S. Rohani, A. R. Siregar, T. G. Rasyid, and D. M. Darwis, *Int. J. Pharm. Res.* **12**, 1315 (2020)