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Importance of Supplement Moringa Herbs (*Moringa Oleifera*) in Broiler Diet under the Open System Farming: A Reviews

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Abstract: Importance of supplement Moringa herbs (*Moringa Oleifera*) in broiler diet under the open system farming. The objectives of this study were to the Moringa (*Moringa oleifera*) is a robust, fast-growing herb that can be grown in any soil in tropical areas. Moringaceae are native to Asia. It is a medium-sized perennial Thai people prefer to plant around their houses. Moringa leaves contain a variety of phytochemicals, such as high levels of pro-vitamin A carotenoids and beta-carotene, (Pathum, 2009), and more importantly, β-sitosterol. The levels of fibre, calcium, phosphorus and total energy were 6.38%, 12.92%, 2.35%, 0.28% and 3,911 Kcal/kg of DM, respectively. (Dongjan, 2011). Moringa leaves contain a variety of important phytochemicals and can be applied for use in broiler feed to improve production performance. It was found that dried moringa leaves should be supplemented at 4-15 percent of the feed. As a result, the weight of the broiler and the quality of the carcass increased, and the amount of cholesterol in the blood decreased, so it is suitable for supplementing the feed of broilers.

คำสำคัญ: Broiler, Growth Performance, Moringa Leaves (*Moringa Oleifera*)

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Introduction

Currently, in the poultry production industry, the demand for broilers has been increasing rapidly and this trend is likely to continue. Chicken is an essential food for human and animal consumption. It is a protein meal that is cheaper to produce than other meats (Office of Agricultural Economics, 2020). Due to the improvement in genetics and food quality to achieve faster growth and higher yields, there is very high production potential (Phaichok, 2015). In addition to wanting the chickens to grow quickly, it is desirable for them to require less food and have good food efficiency. Additionally, good carcass quality and colour, especially of the abdominal fat and all internal organs, is necessary. The cholesterol content of chickens is lower than in other animals (Thanad *et al*., 2004). related research studies have found that moringa leaves can be utilized as a feed ingredient. Moringa leaves contain a wide variety of phytochemicals, such as β-sitosterol, which helps reduce fat accumulation in the abdomen. They inhibit cholesterol absorption in the intestines, which decreases the cholesterol content in the blood (Matsuoka *et al.*, 2008) When used in poultry feed, they have been found to produce safe animal products. In addition, their use is beneficial to the sustainability of Thailand's animal husbandry industry (Puchong and Paichok, 2015).

Importance of Moringaceae leaves

Moringa is the scientific name of the *Moringa oleifera Lam*. family. Moringaceae are native to Asia. It is a medium-sized perennial Thai people prefer to plant around their houses. Its leaves are usually ground into a powder before use (Figure 1). Moringa used as medicine helps to control blood sugar levels as well as moisturizing the skin. Moringa leaves contain a variety of phytochemicals, such as high levels of pro-vitamin A carotenoids and beta-carotene, (Pathum, 2009), and more importantly, β-sitosterol, which helps reduce fat accumulation in the abdomen, and it inhibits cholesterol absorption in the intestines, which can cause a decrease in the amount of cholesterol in the blood (Matsuoka *et al.*, 2008). It helps relieve inflammation, improves the symptoms of rheumatism, relieve the symptoms of gout, helps maintain and cure liver and kidney diseases, and relieves swelling (Adulsak, 2020).

Moringa leaves have a high protein content compared with other plants. For example, it contains double the protein content of milk, with 23.2-29% dry matter protein. It has three times more vitamin A and seven times more vitamin C than carrots, three times more calcium than milk, and three times more potassium than bananas. The levels of fibre, calcium, phosphorus and total energy were 6.38%, 12.92%, 2.35%, 0.28% and 3,911 Kcal/kg of DM, respectively (Dongjan, 2011).

Fig 1. Show the characteristics of Moringa leaves (*Moringa oleifera Lam*.).

Dietary Supplementary Moringa Leaves for Broiler Growth Performance

Phaichok (2015) studied Moringa leaf supplementation in broiler feed at 0-6%. The weight gain of the supplemented group tended to be higher than that of the other groups, with a higher growth per day. Zanu et al. (2012) reported that supplementation of moringa leaves in broiler diets at 5% increased feed intake. The supplemented birds had a higher daily gain and an increased body weight, with higher growth than that in the Moringa leaf supplement group. The feed conversion ratio was found to be better in the group that was not supplemented with moringa leaves (0%). In contrast, the Abhishek et al. (2018) trial reported that moringa leaf supplementation in broiler diets at 15% had better performance. The body weight in the moringa leaf supplement group increased by 5%, resulting in a higher feed conversion ratio than in the other groups.

Regarding the rate of meal replacement, it was found that in the group supplemented with 5% moringa leaves, the trend of the feed conversion ratio was better than that of the other groups, as shown in Table 1. The moringa leaf supplementation results in increased feed consumption. Regarding the quality of the broiler carcasses, Phaichok (2015) found that moringa leaf supplementation in a broiler diet regimen (0-6%) at 4% moringa leaf supplementation resulted in a higher body weight. For carcass weight, it was found that 4% moringa leaf supplementation gave a carcass weight higher than that of the other groups. This is similar to the Zanu *et al*. (2012) trial, where supplementation of moringa leaves at 5% resulted in a higher carcass weight than the other groups. Zanu *et al*. (2012) reported that 5-15% moringa leaf supplementation had results that were consistent with that of Abhishek *et al.* (2018).The group that consumed 15% moringa leaves resulted in a better carcass percentage than the other groups. In addition, the Phaichok (2015) trial reported that the 4% moringa leaf supplementation group had an improved carcass percentage compared with the others. The group supplemented with 6% moringa leaves exhibited the greatest reduction in abdominal fat content as shown in Table 2.

The moringa leaf supplementation affected broiler blood cholesterol levels. In Phaichok (2015), 6% moringa leaf supplementation had the greatest effect on lowering cholesterol. Zanu *et al.* (2012) found that supplementation of 15% moringa leaves resulted in the greatest reduction in cholesterol. An effect of dietary moringa leaf supplementation on triglyceride levels was also

Table 1 Effect of Moringa leaf supplementation in diet on production performance.

Supplement (%)	feed intake (g/h)			body weight gain (g/h)			feed conversion ratio		
	Phaichok (2015)	Zanu *et al.* (2012)	Abhishek *et al.* (2018)	(Phaichok (2015)	Zanu *et al.* (2012)	Abhishek *et al.* (2018)	Phaichok (2015)	Zanu *et al.* (2012)	Abhishek *et al.* (2018)
0	120.08	125.43	142.65	57.10	36.33	39.69	2.14	3.59	3.18
2	126.27	-	-	61.75	-	-	2.02	-	-
4	129.53	-	-	63.32	-	-	2.00	-	-
5	-	137.53	150.40	-	39.33	40.83	-	3.49	3.12
6	118.99	-	-	59.21	-	-	2.14	-	-
10	-	124.50	152.13	-	39.66	39.82	-	3.13	3.28
15	-	125.70	159.85	-	29.27	40.54	-	4.29	3.49
20	-	-	158.51	-	-	38.49	-	-	3.79

found; 6 % moringa leaf supplementation resulted in lower triglycerides than the other groups (Phaichok, 2015), unlike the Zanu *et al.* (2012) trial, where no moringa leaf supplementation resulted in lower triglycerides than the other groups. Dietary moringa leaf supplementation also affected HDL levels, with 2 and 4% moringa leaf supplementation having higher HDL results than the other groups, (Phaichok, 2015), contradicting the Zanu *et al.* (2012) trial, where not supplementing with moringa leaves resulted in higher HDL levels than other groups. Moringa leaves at 4% resulted in lower LDL levels that the other groups, slightly different than the trial by Zanu *et al.* (2012) where 10% moringa leaf supplementation had a lower LDL content than the other groups. as shown in Table 3.

Moringa leaves can be used in broiler feed at 4-5% of the diet. Supplementation of moringa leaves at 4-15% in feed recipes resulted in the highest feed intake. Weight gains were higher per day and it tends to have the best feed conversion ratio and improves the quality of the broiler carcasses. It was found that adding moringa leaves in the recipes at 4-15% increased the carcass percentage higher than other groups. In addition to reducing the amount of fat in the abdomen, there is a lower blood cholesterol, an HDL content increase and the LDL content decreases. In a study conducted by Somphech *et al*. (2013), to 8% of horseradish leaves could be used in broiler diets without any effect on their growth rates, the feed conversion ratio, carcass quality and meat quality. Although the survival rate is lower, the feed cost per 1 kg weight gain was reduced and made the chicken skin more beautiful. It was preferred by consumers, in line with Isdakorn (2017), who recommended 4% supplementation in powder

Table 2 Effect of Moringa leaf supplementation in broiler diets on carcass quality

Supplement (%)	Live weight (g/h)			Carcass weight (g/h)			Carcass percentage (%)			Abdominal fat (% BW)		
	Phaichok, (2015)	Zanu *et al.*, (2012)	Abhishek *et al.*, (2018)	Phaichok, (2015)	Zanu *et al.*, (2012)	Abhishek *et al.*, (2018)	Phaichok, (2015)	Zanu *et al.*, (2012)	Abhishek *et al.*, (2018)	Phaichok, (2015)	Zanu *et al.*, (2012)	Abhishek *et al.*, (2018)
0	2,508.67	1,778.98	-	1,962.00	1,444.00	-	78.17	81.17	70.42	1.45	-	-
2	2,584.67	-	-	2,034.00	-	-	78.65	-	-	1.06	-	-
4	2,627.33	-	-	2,104.67	-	-	80.05	-	-	1.85	-	-
5	-	1,825.59	-	-	1,455.00	-	-	79.700	70.60	-	-	-
6	2,474.00	-	-	1,960.67	-	-	79.16	-	-	0.77	-	-
10	-	1,790.57	-	-	1,433.00	-	-	80.03	69.03	-	-	-
15	-	1,682.15	-	-	1,376.00	-	-	81.80	70.72	-	-	-
20	-	-	-	-	-	-	-	-	69.35	-	-	-

Table 3 Effect of Moringa leaf supplementation in broiler diets on blood cholesterol levels.

Supplement (%)	cholesterol (mg/dl)		Triglycerides (mg/dl)		HDL (mg/dl)		LDL (mg/dl)	
	Phaichok (2015)	Zanu *et al.* (2012)	Phaichok (2015)	Zanu *et al.* (2012)	Phaichok (2015)	Zanu *et al.* (2012)	Phaichok (2015)	Zanu *et al.* (2012)
0	102.67	108.41	45.00	31.40	47.33	34.04	17.67	13.13
2	101.33	-	46.00	-	52.67	-	19.33	-
4	104.67	-	42.00	-	52.67	-	17.00	-
5	-	105.32	-	30.50	-	30.44	-	14.43
6	104.00	-	39.00	-	49.67	-	15.67	-
10	-	102.25	-	32.04	-	39.25	-	13.03
15	-	100.94	-	31.75	-	38.32	-	13.13

form of moringa leaves. They have a greater total weight because chickens can benefit from the protein better. At 2 % of live weight of supplementation with moringa leaves, it was found that chickens will have better feeding efficiency. However, it did not affect their efficacy of protein utilization.

According to Kavoi (2016), supplementation resulted in weight gain and increased villus height. Supplementation of moringa leaves in broiler diets causes their cholesterol levels to drop, which is caused by a substance called β-sitosterol that blocks the absorption of cholesterol in the intestines (Anwar *et al*, 2007). In addition, supplementation of moringa leaf powder in food decreased the triglyceride and cholesterol content and increased HDL, which is good fat. However, moringa leaf supplementation did not affect blood HDL levels (Chivapat *et al*, 2011). Phaichok (2015); Abhishek *et al*, (2018); Zenu *et al*, (2012). It can be used as food ingredients for broilers without affecting the health and productivity of the broilers

Conclusion

Importance of supplement Moringa herbs (*Moringa Oleifera*) in broiler diet under the open system farming. Moringa (*Moringa oleifera*) is a medicinal plant found in Thailand. Moringa are fast-growing plants that can be grown on all types of soil in tropical countries. Moringa leaves can tolerate drought well and they can be utilized as a new feed ingredient for broilers. Moringa leaves contain an important phytochemical, β-sitosterol, which has properties to help reduce abdominal fat storage and inhibit cholesterol absorption in the intestines. (Lakshmipriya, *et al*., 2016; application of moringa leaf products in the feed on the performance of broilers showed that supplementing moringa leaf powder in the diet at 4-15% resulted in the highest feed intake. Weight gain was higher, and the feed conversion ratio was better. It was found that adding moringa leaves in the feed recipes at 4-15% increased the carcass percentage, reduced the amount of fat in the abdomen and lowered blood cholesterol levels. The HDL content increased and the LDL content decreased. (Pathum, 2009 ; Rattasak. 2009 ; Sahay *et al*., 2017)

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