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The Role of the Amino Acid (Methionine) Protected on the Productivity Performance of the Dairy Cow

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ABSTRACT

One of the most important aspects of livestock is the supply of essential quantities of balanced nutrients manufacture. In several physiological functions of nutrients, concerning organisms, protein has an important role. Ruminants are not wholly protected of amino acids by microflora degradation of animal feed sources and by maintaining proteins from the breakdown in the rumen where both high and medium yielding ruminant amino acids are required, they must be met; therefore, rumen-protected protein (RPP) dietary supplementation, including primarily rumen-protected protein (RPP), methionine (RPMeth), protected from rumen flora, it was necessary. Numerous scientists are attracted in the study of the character of (RPMeth) in a dairy cow about it's an impact on milk produce, growth rate, N- efficiency, coefficient digestibility, intake of DM. Unluckily, the findings obtained from many RPMeth investigations showed excessive fluctuation results in ruminant nutrition between its helpful and useless influence, specifically during early and late lactation periods. Thus, for ruminants, when they use this review post, farm owners may be careful when they are plan to apply RPMeth to the diet of animals. In summary, supplementation RPMeth also has a positive balanced effect, even with no detrimental effect on the yield of milk, animal productivity and hemato-biochemical parameters, especially during the early lactation when used with a ruminant diet low in crude protein.

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INTRODUCTION

The important nutrient monitoring agent is the protein; particularly low-quality forage was fed into ruminants. Nutrient ingredients requirements are varied, like protein (CP), according to the physiological status of the animal such as gestation, produce milk and growth. The optimal growth and extreme production of milk is necessary for protein (Ayyat *et al.*, 2019). There are two types protein is needed by mammalian. Primary, a CP is broken down in stomach of a ruminant, called (rumen degradable protein, RDP), which is used by microbial flora for generation. Another, CP without fermented by flora rumen is (rumen-protected protein, RPP), which is break down and absorbed in the ruminant small intestine (Ayyat *et al.*, 2019) (see fig.1).

Many amino acids by-pass over to intestinal tracts when feed proteins protecting against microflora organisms in the animal rumen, and consequently in case amino acids deliveries more absorption for each part energy (Kamalak *et al.*, 2005). The addition of rumen-protected amino acids to the ruminant diet can be improved the animal performance in particular methionine (Meth) and lysine.

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The most amino acids can be converted to ammonia (NH₃), forming acids, organic acids and carbon dioxide by microbes in the animal rumen, primary nitrogenous NH₃ made, for bacterial development, nutrients are important. Accordingly, in order to meet the requirements of the animal AAs, the stability between RDP and RPP is high significant (Ayyat *et al.*, 2019). Methionine is in the form of a vital AA, which might perhaps be a preventive amino acid factors for milk production and reproduction in dairy cattle. The initiation of protein synthesis shows an important role by introducing a codon of methionine and hence it for mammalian cellular functions (Brosnan *et al.*, 2007 and Métayer *et al.*, 2008). The proportion of dietary amino acids (AAs) absorbed from intestinal tract by increases in rumen-protected methionine supplementation (RPMeth, In specific Meth, reached, which answers a grave question check increases the general usage of nitrogen (N) in the rations (Ali *et al.*, 2009), the unfavorable climate is minimized and effects via urea kinetics modulation. Many published studies have shown that the Meth is the greatest restrictive amino acid for milk production in lactating cattle rations having green roughage including; legume, maize and soybean silage, with meal and crushed corn grain (NRC, 2001).

Many studies, like Zanton *et al.* (2014) assessed the results that supplementation (RPMeth) in lactating cow's, they concluded a milk protein increase percent and yield of milk protein. Furthermore, study shown that rising milk production (Sipőcz *et al.*, 1999) and levels of milk protein (Berthiaume *et al.*, 2006) by supplementation with RPMeth in the rations.

Supplementing RPMeth with poorer crude protein diets, thus, it can permit animal growers to ration this diet to their ruminant lacking dropping milk production and protein in the milk; urea concentration in the blood and milk, their urea yields; there is a strong connection between excretion through the urinary system and the dietary CP quantity (Nousiainen *et al.*, 2004), as well as the low CP quantity dietary CP can increase milk and milk yields composition (Colmenero and Broderick, 2006). The latest review post, as such, intended to shed bright the effects RPMeth addition to the nutrition of ruminants with respect to their nutrition influences, besides its effect on nitrogen efficiency (NE) to dairy cattle productivity performance and hematological parameters about criteria.

Historical Progress of Rumen Protect Methionine (RPMeth)

Since 1960, when it became apparent that the profile of absorbed Meth from abomasal, intestinal and intravenous infusion studies was not always suitable for ruminants, the principle of protecting free Meth from ruminal degradation has been in force (Schwab, 1995), these experiments found that amino acid (AA) was the primary restricting AA for the growth of wool and the rise in body weight gain for sheep, but also that Meth for both lactating and growing dairy cattle was a limiting nutrient (AA). Many labs. have also worked to establish measures to protect Meth from ruminal damage (Chalupa, 1975). Once its function was discovered as the second most necessary restricting (AA) for growth sheep, or else the initial or the second most significant controlling (AA) for both growth and lactating cows, resulting importance in maintaining Lys established. In order to attempt to protect Meth and Lys from ruminal oxidation, several experiments have been carried out. Preparatory attempts have oriented on protecting meth with lipids, typically as weakening substances, fasteners and thickeners, in mixtures with inorganic compounds and carbohydrate.

Delmar Chemicals of Canada, for instance, generated a 20 percent meth formula in the 1960s in which a DL-Meth, necessary qualities and nanoparticles glycerin substrate was covered in a tristearin product. Also many meth components that are lipid-protected have also been studied. Finding a combination of technologies and techniques that provide a strong ruminal passage and gastrointestinal escape of meth is the biggest challenge for lipids which is used as a key defining component. Meth substrate covering with enzyme-resistant, salinity polymeric materials which are insoluble with in neutral pH atmosphere of the rumen, but are strongly dissolved with in acidic abomasum, has been the most ideal technique. The acidity variations between the ruminant stomach and the abomasum for ruminal protection and gastrointestinal escape relies on this process. Compared with other substances, covered methionine has better ruminal stability and gastrointestinal escape correlations (Ayyat *et al.*, 2019).

The organization of growth and economic in (Antony France) reportedly holds the copyrights for the use of salinity nanoparticles which maintain foods against gastric deterioration. Another tool that has been used to expand the availability of meth. to ruminants is the legalization of aptamers and variants of Meth. Ruminal oxidation is much more prevented through Hydroxy Methylthio Butanoic Acid (HMB) than free Meth. The HMB is change to meth. by enzymes that convert into are inherited from ruminants (Ayyat *et al.*, 2019).

Consequently, this could be absorbed from the complex stomach (rumen) and fourth part of ruminant stomach (omasum) through simple diffusion. Fortunately, it may be that HMB also has poor potential to substitute ingested meth in dairy cattle due to its limited effects on blood meth levels and milk protein quantities when offered to dairy cattle supplied with Meth-lack foods (Ayyat *et al.*, 2019). It has also been stated that various (HMB) esters enhance their ruminal by-pass, perhaps partially due to their apparent avoidance, capability to really be drained across the wall of rumen. The iso-propyl -ester phenotype HMB has an outstanding potential to replace Meth-absorbed in the intestine (Robert *et al.*, 2001 and Schwab *et al.*, 2001).

Rumen-protected methionine (RPM) as general Overview

Many best proteins have degradable in the ruminal digestive system in ruminant the outcome in apart losses of nitrogen source as urea via urine by kidney (Ayyat *et al.*, 2019). The dairy cattle in medium or high stage producing milk, and they do not enough requirement of AA when created by rumen bacteria, thus the cows in the two stages can requirement by protected AA to prevent degradation in ruminant stomach (Kamalak *et al.* 2005). Many techniques are used or recognized to protect the protein in the diet in order to prevent hydrolysis in the rumen by microorganisms inducing; activation inhibitor proteolytic, modify the chemical substrate, heat treatment (Ferguson, 1975).

Totally amino acid appears as a form D or L, both of them are identification in the chemical form. When growing bulls fed on RPMeth as the isomer D while it absorption by intestinal tract and entering to the plasma, which is changing to the L- form inside any organ or tissues before it combined to animal production (Campbell *et al.*, 1996).

Tow amino acids which containing sulfur group are methionine and cysteine. Meth could role as originator of cysteine, it is containing in much component protein, for example in the skin, feather, hair and nail, the keratin is grater component for each part pervious body described. The Meth exciting in albumin, especially in the egg the biggest ratio is 5 percent, it is un-soluble in water. Therefore, Meth is the highest goal necessary to the hens (Willke, 2014).

Meth be able to create from sulfur or both inorganic and organic nitrogen sources and carbohydrates by plant, bacteria and fungi (Ayyat *et al.*, 2019). An acute rise in circulating methionine and a mild improve in milk protein percentage could be provided by everyday highest level of RPMeth (Toledo *et al.*, 2017).

Additionally, the study reported to pulse fetus growth, and drop gestation loss when feeding was RPMeth. But, the reproductive ones, the influences of late gestation cows are scarcely apparent.

Hence, later dairy cow fed on the RPMeth lead to high level of Meth in the plasma, suitable to encourage a little raise of protein percentage in the milk and to develop mass of fetus and upkeep of gestation of the crossbred dairy cattle (Ayyat *et al.*, 2019).

Gomes and Kumar (2005) reported that many diseases have been occurred which are related to lack of meth in the feed, several diseases such as liver corrosion, paralysis of muscle, hair damage, etc. These underlines the prominence of Meth in dairy cow. While, Meth amount extremely increased in the food, the Meth metabolism is regulated (Dever and Elfarra, 2010).

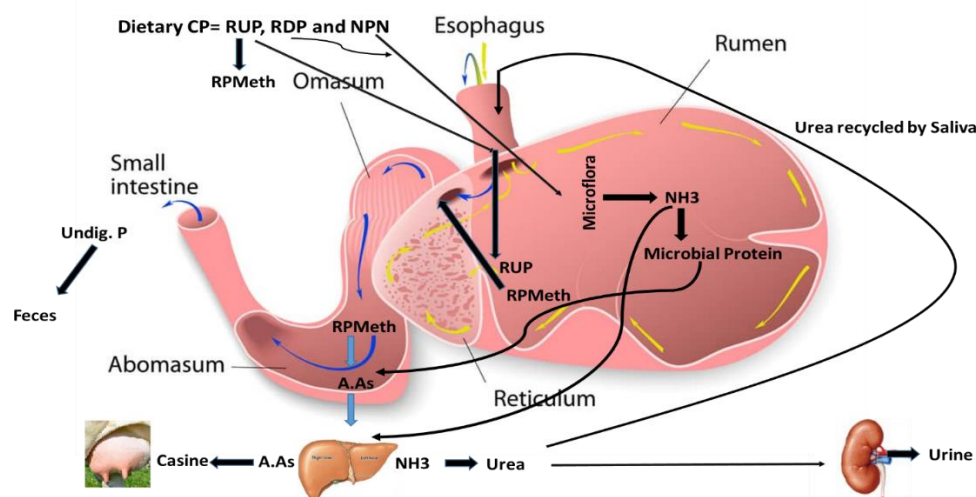


Fig (1): Escape of rumen protect methionine (RPMeth) from the rumen during degradation protein (Ayyat et al., 2021).

Impacts of Using RPMeth in Dairy Cattle Nutrition

1. The absorption of microbial protein and productivity dairy cattle

It is beneficial to feed cattle through tiny concentrations of RPMeth for cows of amino acid limits. The researchers noted that decrease in nitrogen output after decreased crude protein diet supplementation with RPMeth (Greenwood and Titgemeyer, 2000).

Additionally, the results for generation of rumen bacteria like *R. albus*, digestibility, fermentation rate and microbial protein yield when cows fed low-protein ration with high Meth level was similar to high protein in the feeding of dairy cattle (Ayyat et al., 2019). But, the animal fed on the high protein ration cause to produce the total gases in the rumen such as NH_3 and CH_4 as compared to low protein with high or low Meth in the ration (Abbasi et al., 2019). Furthermore, pervious study showed that additive lysine as metabolizable form can be better animal performance in calf (Klemesrud et al., 2000).

Feeds are containing inadequate level of metabolizable amino acids may decrease CP addition during gestation. Waterman et al. (2007) detected that combination of urea and RPMeth as the amount five g/day can improve CP addition and efficient rate of nitrogen through late gestation.

Recent study in beef cattle that reduce daily nitrogen excreted by urine when supplemented RPMeth with roughage fed hay increasing together nitrogen digestible and retention. Recent study in beef cattle that reduce daily nitrogen excreted by urine when supplemented RPMeth with roughage fed hay increasing together nitrogen digestible and retained. The addition RPMeth would supply the daily requirements of protein by increasing the rate of use of nitrogen by bulls (Archibeque et al., 2002).

In over-all, rumen protected protein (RPP) addition to the ruminant rations able role a portion of better utilization and absorption microbial protein and growth rate in ruminant (Ayyat et al., 2019).

The dairy cattle in the initial stage lactation when the addition of RPMeth and rumen protected lysine (RPLys) with combination or only use RPMeth, it is no impact on milk protein and fat component (Socha et al., 2005). In contrast, in dairy cattle in the both stage lactation medium and initial stages the addition RPMeth and RPLyse lead to high amount of protein in the milk, while it is a tiny influence of milk produce (Dinn et al., 1995).

While, the report of (Kudrna et al., 2009) showed that the addition amount 18.2g/animal/day it is no influence of increasing and components of milk, but it lead to positive health dairy cattle.

The addition of both RPMeth and RPLys to dairy cattle ration lead to increase CP percent in milk and milk yield when the feed have to fourteen and eighteen percent (Piepenbrink et al., 1996). In addition, in dairy cattle in high yield of milk with feed alone RPMeth received sixteen gram per day per cow increased milk yield (Lara et al., 2006).

The rate of 1.03 of methionine and 0.52 percent of lysine as combination in the basal diet concentrate and forages like alfalfa hay in ruminant diet, Meth delivered best amount of Lysine and Meth to rumen microflora, increase fermentation rate, and absorbed protect amino acids in the intestinal tract (Ayyat et al., 2019).

The observations of the *in vivo* study, which shows that herbivores react strongly to dietary supplementation with RPMeth and Lysine, represent the findings achieved again from *in vitro* study. Information attained from dairy cattle study showed supply of essential amino acids protection from rumen and fermentation throughout at the end stage of lactation.

These influences might be the relationship of energy portion in the animal soft tissues extra than increasing affected on milk yield or its components.

Data observation in the results of researcher showed that the utilization of mixed of lysine and RPMeth is decreased when it low dose used as compared to high level for a limited study periods in the dairy cattle at final stage of lactation (Chung, 2003). In further research of Berthiaume et al. (2006) showed that the increased urea and glucose levels in plasma of dairy cattle but did not affected on milk production and milk components, when the cows addition of RPMeth in the basal diet. Conversely, establish that the addition of RPMeth for cattle contributed to an increase in the components of milk include protein and fat (Misciattelli et al. 2003 and Rulquin et al. 2006).

The researchers reported that the supplementation of RPMeth and RPLys in the diet of dairy cattle that lead to increased protein in milk as compared with the other studies, but it was not affecting on other parameters. When adding high amount of RPMeth in the diet that lead to use nitrogen in the milk yield in lactating cattle. Therefore, increase both of milk yield and protein component in the milk related to adding RPMeth in the diet, so it is resulting extreme efficiency of nitrogen.

These show the digestibility of RPMeth in the omasum or intestinal tract had extra effect than whole RPMeth supplemented and the association effects did not on milk components and milk yield production of dairy cattle had observed between CP levels and RPMeth. Rulquin et al. (2006) reported that the levels of nitrogen in the urine, feces and milk were not affected by supplemented RPMeth in dairy cattle diet. The supplementation Meth-OH groups with fatty acid and slat of calcium, which that increase milk production, lactose yield and effect on cholesterol levels in the blood (Fahey et al., 2002). The addition of RPMeth in Holstein dairy cattle at the rate zero, thirteen and sixteen gram per day lead to increase the level of plasma Meth was reported by (Bach and Stern, 2000).

The study showed that beneficial influences of cobalamin (Vit. B12) doses in dairy cattle feeding nutrients enriched with RPMeth and folic acid (Girard et al., 2005). Also, showed that increase in milk sugar (lactose), energy-corrected- milk yield, fat, milk solids. On the comparison, couple of experiments indicated that the components of milk and milk production did not actually impacted through the addition of RPMeth and RPLys for the dairy cattle (Liu et al., 2000 and Berthiaume et al., 2001). Berthiaume et al. (2006) reported that RPMeth supplemented in the diet has no improved of the intake of Meth to the net udder or mammary gland. Chamberlain et al. (1986) reported that dairy cow fed on silage lead to lower Meth and lysine absorbed in the intestinal tracts since greatest microbial protein yield in the belly ruminant can be used up through milk synthesis.

The amount of milk production and milk protein content had no changed between dairy cattle fed on low or regular crude protein in the diet by adding RPLys and RPMeth (Dinn et al., 1998).

Conversely, the milk yield, digestibility of protein, BUN (blood urea nitrogen) and nitrogen excreted in the kidney lowered when the protein declined in the ruminant diets. Besides, the report was done by (Sevi et al., 1998) indicated that the low protein percentage in the dairy cattle rations which affected significantly on the percentage of milk fat.

Iwańska et al (1999) showed that a significant influence of forage silage and cereal grain mixed rations with RPMeth supplementation, noticeable on the composition milk such as fat, casein

(milk protein), and milk production. Moreover, the study was done by these authors Pruekvimolphan and Grummer (2001) declared that protection of RPMeth lead to enhanced fat and milk protein substances when the cow fed on the feather meal and meat or bone meal. Watanabe et al. (2006) investigated that the similar effects of tow form D and L-Meth for succession in milk production, somatic cells, and live body condition and milk fat per cent in dairy cattle. Lara et al. (2006) reported that the animals at the first lactation stage and fed low-level protein in the rations with dietary supplementation by RPMeth, their greatest outcomes were achieved. When adding the diets of dairy cattle, which did not produce milk or non-lactating animal with Meth and Lysine, no improvement in overall gastrointestinal tract nitrogen absorption was observed. In addition, did not any variations were identified in the fermentation rate and yield of microbial proteins in the rumen. Chung et al. (2006) showed that the values of milk yield had no affected by adding Meth and Lysine in the final stage of lactation of dairy cattle.

Pruekvimolphan and Grummer (2001) indicated that increased these parameters (the milk production, daily dry matter intake, the percent of protein in milk) when dairy cow fed RPMeth with adding bone and meat meal with mixed rations composed fifty percent yellow corn - concentrate with supplemented RPMeth and fifty percent -silage as roughage feed. The supplementation of RPMeth in the dairy cattle in the first stage of lactation leads to increment of milk components such as fat and protein but declined the level of blood sugar (Socha et al., 2005).

These strong receptions of animals at the first stage of lactation depending upon on gastrointestinal digestion of RPLys and RPMeth, the quantity of dietary protein percentage and the availability of MCP (metabolizable- protein). Impact of synchronization of mixed RPMeth and vitamin B9 (folic acids) as meters of folacin metabolism and dairy lactating performances (Girard et al., 2005).

The addition of RPMeth plus fat which divided in to three groups in dairy cattle diet include the first treatment only fat, second only RPMeth and the third treatment is RPMeth with fat influence on milk yields and stability of energy, the results showed all treatments increased milk yield but the treatment it contains RPMeth lead to decreased fat milk and increased protein percentage (Ayala et al., 2010). The ration dairy cattle which consist each RPMeth, fat, and RPMeth combined with fat raised the percent of protein, milk sugar, fat in the milk. However, RPMeth caused to decline the levels of blood sugar and blood urea. Moreover, in another study showed that the supplementation of RBMeth on diary production responses and serum biochemical, this showed that no any changes levels of protein and lactose in milk.

The dairy cattle received 42 grams RPMeth in the rations lead to increased milk production as compared the cows that no received RPMeth. Also, the result showed that numerally elevated milk fat percent but declined the amino acids in the serum without methionine and arginine when dairy cattle fed on fifty-six gram in their rations.

Additionally, the percent of protein in the milk has been influenced by addition of RPMeth and RPLys in the dairy cattle rations which increased milk production, protein, FCM (fat correction milk) and essentials amino acids in the milk, these elevated parameters in milk returned by entered the sufficient amount of Meth and Lysine in the intestinal tracts (Li et al., 2014).

In addition, the impact of supplementation of each RPMeth, RPLys and RPCol (rumen protected choline) on dairy cattle in the high stage production. Showed all groups had lowered level of triglycerides and VLDL, while the cattle in the Meth plus Lys received, had improved protein, fat and milk sugar production. However, the cattle received RPCol had the greater values of USFAs (unsaturated-fatty- acids), MSFAs (mono-unsaturated- fatty- acids) tocopherol, and choline in milk. All cow groups have the same levels of blood urea, blood sugar, and serum cholesterol. Thus, adding RPMeth, RPL, or RPCol in the diets to dairy cattle was advantageous when the cow in the initial stage of lactation (Amrutkar et al. 2015).

In recent times, studied have been done declared the addition of RPMeth only, or RPMeth with RP Lysine lead to increased average daily milk production, all treatments no significant influences on composition of milk (milk sugar, TS total solids, NSF solid non-fat and fat). Cow fed on alone RPMeth did not any change of plasma amino acids. While, Meth and Lysine together in

cattle fed had the highest protein in the milk (Awawdeh, 2016). Hence, the rations of dairy cattle needed to contained both of RPMeth and RPLys lead to higher in milk production and milk components as compared of using RPMeth only in dairy cattle ration. The initiation of milk production in dairy cattle is distinguished via extreme negative energy and protein balances. The improvement of functional immune system and lipid metabolism when production of milk in dairy cattle, they needed more Meth which metabolites in the cow liver.

Clearly, dietary supplementation of RPMeth or (RPP) rumen-protected proteins can be indicated to react positively to increased milk production and milk fat and protein constituents, especially during the early lactating cows, but less effective in the late stage of dairy cattle

2. Feed intake as DM Basis and apparent digestibility

Routinely, the report of Armentano et al. (1993) indicated that the rations of dairy cattle consist of forage such as hay and silage with the low of crude protein in the diet, it is sufficient for low growth and milk yield, but many authors declared with adding the rumen-protected protein can be increased the level of production. Klemesrud *et al.* (2000) reported that the feed intake as DM basis plus the different amount of RPMeth in dairy cow had no impact on the growth of calves, while Meth-Lysine together has been better in animal performance. Gajera et al., (2013) declared that the higher digestibility of protein have been done when addition of RPMeth as alone or RPMeth with protected amino acids in the ruminant rations.

The impact of addition RPMeth on digestibility, NH₃, VFAs volatile fatty acids and microbial protein incoming to the third part of the stomach (omasum) of a ruminant did not any changed, but RPMeth increased organic matter and cellulose and hemicellulose or (NDF) as compared control groups. Socha et al. (2005) studied that the supplementation of RPMeth and RP Lys in the rations for both before and after parturition in dairy cattle declared have no significant change in dry matter intake during feeding trials. However, the data showed in the previous study increased average dry matter intake in the feed, which contain eighteen-percentage protein as compared the other treatment which adding RPMeth and RPLys in cow fed fourteen percent of crude protein (Piepenbrink et al., 1996). Furthermore, Armentano et al. (1997) reported that the crossbreed dairy cattle, which fed with two percent of RPMeth has no any change of dry matter intake as control groups. The increased absorption of amino acids in the intestinal tract dairy cattle without any change of live body weight with the addition of mixed RPMeth and RPLys when each ration consists sixteen and eighteen- half per cent of crude protein of the rations before and after parturition, respectively (Socha et al., 2005).

3. Blood and serum biochemical parameters

The health status of animal was noticed by measuring blood parameters. The impact of RPMeth in the ration of dairy cattle, which lead to decrease blood sugar and RBC as compared to control groups but they did not any different between treatments for biochemical parameters such as serum glutamic-oxaloacetic transaminase (GOT), serum alkaline phosphatase (ALP) and gamma glutamyl transferase (Liker et al., 2005). The authors showed that the RPMeth in the rations of late pregnancy dairy cattle, it is a role as against stress in the cold weather (winter).

The influence of addition RPMeth on some blood parameters and serum biochemical in cattle when the animal in the stage growth, including enzymes of liver function, are glutamic oxaloacetic transaminase (GOT), glutamic pyruvic transaminase GPT), kidney functions like blood urea and creatinine, lipid profiles including serum cholesterol and triglycerides, serum γ - glutamyl transferase (G.G.T), serum total protein (STP), serum albumin(SAlb) and cell blood counts (CBC), which including; RBCs, Hb, Hct, MCV, WBC and differential of WBC. The result showed that the RPMeth higher stimulation of GPT, serum cholesterol, blood sugar, while addition RPMeth lead to declined blood urea and no any change all above parameters which described (Liker et al., 2006).

Another study showed that the impact of RPMeth and RPCol in the rations of dairy cattle on some plasma parameters. The results higher value of GOT and decline total protein after calving. Besides, the influence of RPMeth and RPCol in the ration did not any effect on concentrations of each blood sugar, triglycerides, blood urea, non-ester fatty acid and beta-hydroxybutyrate before the cow starting parturition (Ardalan et al., 2011). Moreover, the report declared that the addition of

RPMeth to the ruminant rations lead to higher value of insulin and decrease glucose concentration by appearance activity of insulin in the blood. Therefore, RPMeth has been beneficial for animal maturing, which role both oxidation of fatty acids (FAs) and glucose synthesis in animal liver (Jacometo et al., 2016). Generally, the addition of rumen protected protein especially RPMeth alone have been little influence on liver enzyme's function and blood profiles.

4. Nitrogen efficiency

The reduction of milk yield returned by decreased of crude protein in the diet, it too reduces nitrogen release in the rumen, thus the CP is elevated in the ration caused to great produce of nitrogen volatile in the rumen (Kröber et al., 2000). Several experiments carried out to resolve of the case pollutant by nitrogen gas release from the animal to the environment, but did not effect on milk yield. So, the researchers targeted to create a new standard formulation feed that lead to produce optimal milk yield and less nitrogen release to the environment.

Therefore, the researches Bertrand et al. (1998) declared that several methods to reduce the percent of crude protein in the ration, but did not affect the decrease of milk yield. The solve of this problem by adding several essential amino acids when there are using the as low level. However, impact of adding of RPMeth on nitrogen release and nitrogen used by the microflora did not any influence on nitrogen excrete in the milk and feces (Kröber et al. 2000). The increasing utilization of nitrogen in the rations returned by crude protein percentage in the diet with added of RPMeth. So, the level of NH_3 is decreased in the rumen. Furthermore, the study revealed that the supplementation of Meth with a low level of protein in the diet did reduce whole protein excreted within the urine. The using low level of crude protein and addition of RPMeth in the diet, results showed that the efficiency of nitrogen significantly increased but decreased urea nitrogen excreted for each milk and urine of dairy cattle (Broderick et al., 2008).

In the present studied that using RPMeth showed that nitrogen utilization has been increasingly approximately eighty per cent absorbed by intestinal tracts of dairy cattle as compared to the rations contain isopropyl-hydroxy-methylthio-butanoic- acid (HMBAi) that is fifty per cent. While both treatments enhanced by amino acid protection (AAP) have similarity nitrogen usage and milk yield when the crude protein percent in these rations is 15.6. When the feeding of dairy cattle contained sixteen -point-eight crude protein plus RPMeth lead to improve the utilization of nitrogen and decreased nitrogen release as compared to HMBAi the same ratio of protein in the diet (Chen et al., 2011). Furthermore, the results of the previous study have shown a mixed the rumen protect amino acids (RPAAs) including Methionine, Lysine, Leucine has significant impact to the higher efficiency of nitrogen but decreased the level of urea in milk, casein, milk sugar, and dry matter intake with low protein in the rations of dairy cattle (Apelo et al., 2014).

The research was done by (Pereira et al., 2017) reported that used four treatment which have been the same iso protein and metabolizable energy for all treatments including the first diet contain 24 soy bean (SBM), 360 crashed corn and 13 urea g/kg DM, the second ration contain 98 SBM, 297 crashed corn, 1.3 rumen protected lysine (RPLys) and 0.7 RPMeth g/kg DM, the third contain 24 SBM, 250 grinded pea field and 123 corn g/kg DM the fourth ration are SBM which contain 1.5 RPLys and 0.5 RPMeth g/kg DM. This studied carried out to investigate the impact of each soya bean (SBM), urea, RPLys and RPMeth in the rations of dairy cattle. The result showed that urea and SBM had increased release nitrogen as form purine and decrease urea nitrogen in the milk and rumen. In contrast, the higher concentration of urea nitrogen in the four rations or 1.5 RPLys and 0.5 RPMeth g/kg DM. Moreover, in this studied dose not enhanced milk production and milk component especially casein, while enhanced efficiency of nitrogen utilization and reduced nitrogen urea excreted by urine.

CONCLUSIONS

The requirement of protein by ruminants has been greater than simple stomach animals. Which are the roles in providing for microorganisms in the rumen, to supply some essential amino acids for the animal host. Because partly of protein in the ration has degraded by the microflora called rumen degradable protein. So, the dairy cow needs to adding types of protein in their rations, which escape in the rumen without degradation (rumen-protected protein like rumen-protected

methionine (RPMeth) to maintenance, growth and milk production. Information from multiple studies can bring attention to the possible animal performance to the addition using RPMeth especially when the cows in the stage of lactation, they are required for high protein in the rations. Conversely, most study the supplementation of RPMeth and its key role in various stages of ruminant performance, so many scientific projects are still necessary will do in the future.

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دور الحمض الأميني (الميثايونين) المحمي على الأداء الإنتاجي لأبقار الحليب

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الخلاصة

من أهم الجوانب في تغذية أبقار الحليب هو إمدادها بكميات كافية ومتزنة من المغذيات المصنعة، وفي العديد من الوظائف الفسيولوجية للعناصر الغذائية المتعلقة بالأحياء المجهرية بالكرش يلعب البروتين دوراً هاماً في هذا المجال. في المجترات الأحماض الأمينية ليست محمية من التحلل من قبل الأحياء المجهرية المحللة للمصادر العلفية لذلك الحفاظ على البروتينات من التحلل في الكرش، في حين إنتاج الأحماض الأمينية بصورة عالية أو معتدلة مطلوبة ويجب تأمينها؛ وأن إضافة المكمل الغذائي المحتوى الميثايونين المحمي في الكرش من التحلل من قبل الأحياء المجهرية الضرورية. يجذب العديد من الباحثين إلى دراسة الحمض الأميني للميثايونين المحمي وتأثيرها على إنتاج الحليب، معدل النمو، كفاءة النيتروجين، ومعامل الهضم للمادة الجافة المتناولة. لسوء الحظ، أظهرت النتائج التي تم الحصول عليها في العديد من الدراسات في تغذية المجترات بين تأثيره المفيد والغير مفيد وخاصة خلال الفترة المبكرة والمتأخرة من موسم إنتاج الحليب، وعلى مربي الأبقار الحذر عند استخدام الميثايونين وباختصار الميثايونين المحمي لها تأثير إيجابي متوازن، حتى مع عدم وجود تأثير ضار على الأداء الإنتاجي لأبقار الحليب، قياسات الكيمياء الحيوية للدم خاصة خلال الفترة المبكرة لموسم إنتاج الحليب مع استخدام علف حاوي على مستوى منخفض من البروتين الخام.

الكلمات المفتاحية:

الميثايونين المحمي، الميثايونين، إنتاج الحليب، ماشية الحليب، الأداء، موسم الحليب.