รายงานวิจัยฉบับสมบูรณ์

โครงการ ผลของการใช้มันเส้นหมักยีสต์เป็นแหล่งโปรตีนในอาหารข้น ต่อปริมาณการกินได้ในช่วงก่อนและหลังคลอด และปริมาณน้ำนมในโคนมพันธุ์ผสมโฮลสไตฟรีเซี่ยน

โดย

ชำนาญวิทย์ พรมโคตรและคณะ

มีนาคม 2555

สัญญาเลขที่ MRG5280081

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คณะผู้วิจัย	สังกัด
1. ชำนาญวิทย์ พรมโคตร	มหาวิทยาลัยเทคโนโลยีราชมงคลอีสาน วิทยาเขตกาฬสินธุ์
2. เมธา วรรณพัฒน์	ศูนย์วิจัยและพัฒนาอาหารสัตว์เขตร้อน มหาวิทยาลัยขอนแก่น
3. จุฬาสินี แมนสถิต	มหาวิทยาลัยเทคโนโลยีราชมงคลอีสาน วิทยาเขตสกลนคร

สนับสนุนโดยสำนักงานคณะกรรมการการอุดมศึกษา

และสำนักงานกองทุนสนับสนุนการวิจัย

(ความเห็นในรายงานนี้เป็นของผู้วิจัย สกอ. และ สกว. ไม่จำเป็นต้องเห็นด้วยเสมอไป)

ผลของการใช้มันเส้นหมักยีสต์เป็นแหล่งโปรตีนในอาหารข้น ต่อปริมาณการกินได้ในช่วงก่อนและหลังคลอด และปริมาณน้ำนมในโคนมพันธุ์ผสมโฮสไตฟรีเซี่ยน

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บทคัดย่อ

งานทดลองนี้มีวัตถุประสงค์เพื่อวัดผลของการใช้มันเส้นหมักยีสต์ (Yeast fermented cassava chip, YEFECAP) เป็นแหล่งอาหารโปรตีนในอาหารข้นสำหรับโคนม ในช่วงก่อนและหลังคลอดใหม่ต่อปริมาณการกินได้และผลผลิตน้ำนม โดยในการทดลอง ใช้แม่โคนมและโคสาว จำนวน 32 ตัว (แม่โค 16 ตัว โคสาวท้องแรก 16 ตัว) ซึ่งเป็นโคท้องก่อนครบกำหนดคลอด 14 วัน แบ่งเป็น 2 กลุ่มเท่าๆกันเพื่อให้ได้รับสิ่งทดลองคืออาหารข้น 2 ชนิด ที่ มีและไม่มีมันเส้นหมักยีสต์เป็นแหล่งโปรตีน วางแผนการทดลองแบบสุ่มในกลุ่มสมบูรณ์ (RCBD) การให้อาหารในโคก่อนคลอดแบบแยกอาหารข้น (1.3 เปอร์เซ็นต์น้ำหนักตัว) และอาหารหยาบ (กินเต็มที่) ซึ่งเป็นฟางข้าว และในโคหลังคลอดจนถึง 60 วัน ให้อาหารแบบผสมสำเร็จหรือ Total mixed Ration (TMR) ในสัดส่วนอาหารหยาบ (ฟางหมักยูเรีย 3%) ต่ออาหารข้นเป็น 70 ต่อ 30 ผลการทดลองพบว่า ปริมาณการกินได้ในช่วงก่อนคลอดไม่แตกต่างกันระหว่างกลุ่มทดลอง ในขณะที่ปริมาณการย่อยได้ของโภชนะโปรตีน สูงกว่า ($P<0.05$) และปริมาณการย่อยได้ของวัตถุแห้งและเยื่อใย NDF มีแนวโน้มสูงกว่าในโคกลุ่มที่ได้รับมันเส้นหมักยีสต์เมื่อเปรียบเทียบกับกลุ่มไม่ได้รับในช่วงก่อนคลอด ผลในช่วงหลังคลอดพบว่า มันเส้นหมักยีสต์มีผลทำให้ปริมาณการกินได้, การย่อยได้ของวัตถุแห้งและเยื่อใย NDF สูงขึ้น ($P<0.05$) และ ยิ่งไปกว่านั้นคือ การให้มันเส้นหมักยีสต์ทำให้ปริมาณน้ำนมสูงสุดหลังคลอด (peak milk yield) สูงขึ้น ($P< 0.05$) และมีแนวโน้มทำให้ผลผลิตน้ำนมเพิ่มขึ้นด้วย นอกจากนี้ การให้มันเส้นหมักยีสต์มีผลทำให้ระดับของ NEFA และ BHBA มีแนวโน้มลดลง ในช่วงก่อนและหลังคลอด

จากผลการทดลองนี้สรุปได้ว่า การใช้มันเส้นหมักยีสต์เลี้ยงโคนมก่อนและหลังคลอดมีผลทำให้ปริมาณการกินได้ การย่อยได้ของโภชนะโดยเฉพาะเยื่อใย NDF หลังคลอด สูงขึ้น และมีแนวโน้มทำให้ปริมาณน้ำนมสูงขึ้นด้วยตลอดจนมีแนวโน้มลดระดับสาร เมตาโบไลต์ในน้ำเลือดที่บ่งบอกถึง ความผิดปกติทางเมตาโบลิซึมหลังคลอดได้

คำสำคัญ โคนมสาว โคนม ก่อนคลอด หลังคลอด มันเส้น ยีสต์ มันเส้นหมักยีสต์

Effects of Yeast (Saccharomyces cerevisiae) fermented-cassava chip protein (YEFECAP) on Prepartum Intake and Postpartum Intake and Milk Production of Holstein Fresian crossbred dairy cows

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ABSTRACT

The objective of this study was to evaluate effects of Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) on pre- and postpartum intake and milk production of dairy cattle. Thirty two Holstein Frisian crossbred dairy heifers and cows (16 heifers and 16 cows) were assigned to two treatments at 14 d before calving thought 60 d postpartum. The experimental treatment was concentrate feed with or without YEFECAP. Cattle were fed rice straw (prepartum) and urea treated rice straw (postpartum) as main roughage. Pre-partum cattle were fed concentrate (1.3 %BW) and roughage (*ad lib*) separately while postpartum cattle were fed total mixed ration (TMR) (*ad lib*) with concentrate to roughage ratio at 70:30. During prepartum period, dry matter intake was not significantly different among treatments. However,crude protein digestibility of the YEFECAP diet was higher (P<0.05) than that in diet without YEFECAP. Dry matter and NDF digestibility in prepartum cattle tended to be higher in diet with YEFECAP than without YEFECAP. Body condition score at calving date in cattle fed YEFECAP diet tend to reduce smaller than fed without YEFECAP. Digestibilities of protein and NDF were improved in cows fed YEFECAP, contributing to a greater DMI during the first 8 wk of lactation and trend to higher average milk yield through wk 8 of lactation compared with control cow. Moreover diet with YEFECAP was significantly increase peak milk yield (P<0.05)as compares to diet without YEFECAP. Plasma NEFA and BHBA tended to be lower in cattle fed with YEFECAP pre- and postpartum. Based on this experiment, it could be concluded that dairy cattle fed with YEFECAP during pre- and postpartum period could enhance dry matter intake, nutrient digestibility and tended to improve milk yield.

Keywords: Dairy Heifer, Cow, Pre-partum, Postpartum, Cassava, Yeast , Yeast fermented-cassava chip.

Executive Summary

The transition period of dairy cows has been defined as 3 weeks pre-partum and 3 weeks post-partum. This period is transition from a pregnant non-lactating cow with relatively low nutritional requirements to a non-pregnant high producing lactating cow with elevated nutritional requirements, metabolic transitions to support the ensuing lactation and ruminal adaptations to a change in diet. This physiological change leads to parturition stress, high susceptibility and to prevalence of metabolic health disorders. Nutritional inadequacy pre- and post-partum, has been thought to be one of the main factors in the high incidence of metabolic disorders during this period. Improving the nutrition of the cow during this period may enhance health, dry matter intake (DMI), and milk production.

Incorporation of microbial additives such as a culture of *Saccharomyces cerevisiae* to the diet has become a common practice in ruminant nutrition. The effects of *S. cerevisiae* supplementation during the prepartum period and through peak lactation on DMI and milk yield remain controversial.

Fermentation of cassava chip (dried root) by pure culture of *S. cerevisiae*, called "Yeast fermented-cassava chip Protein" (YEFECAP), could increase its protein content. It could be used for animal feeding. Previous report showed that YEFECAP can fully replace SBM in concentrate mixtures for early lactation milking dairy cows which effected on enhancing rumen fermentation, dry matter intake, nutrient digestibility, milk yield and milk compositions.

Supplemental YEFECAP may be most beneficial to dairy cows if it is fed before parturition, a period that is characterized by decreased DMI as parturition approaches, and through peak lactation. No data are available for effects of YEFECAP in dairy cows during pre-and postpartum in tropical country. The objective of this study was to evaluate effects of YEFECAP on pre- and postpartum intake and milk production of dairy cattle.

Thirty two Holstein Frisian crossbred dairy heifers and cows (16 heifers and 16 cows) were assigned to two treatments at 14 d before calving thought 60 d postpartum. The experimental treatment was concentrate feed with or without YEFECAP. Cattle were fed rice straw (prepartum) and urea treated rice straw (postpartum) as main roughage. Pre-partum cattle were fed concentrate (1.5 %BW) and roughage (*ad lib*) separately while postpartum cattle were fed total mixed ration (TMR) (*ad lib*) with concentrate to roughage ratio at 70:30. During prepartum period, dry matter intake was not significantly different among treatments. However, crude protein digestibility of the YEFECAP diet was higher ($P<0.05$) than that in diet without YEFECAP. Dry matter and NDF digestibility in prepartum cattle tended to be higher in diet with YEFECAP than without YEFECAP. Body condition score at calving date in cattle fed YEFECAP diet trend to reduce smaller than fed without YEFECAP. During postpartum period, dry matter intake, crude protein and NDF digestibility were higher ($P<0.05$) in diet with YEFECAP than that in diet without YEFECAP. Moreover diet with YEFECAP was significantly increase peak milk yield ($P<0.05$) and trended to increase milk yield as compares to diet without YEFECAP. Plasma NEFA and BHBA tended to be lower in cattle fed with YEFECAP pre- and postpartum. Based on this experiment, it could be concluded that dairy cattle fed with YEFECAP during pre- and postpartum period could enhance dry matter intake, nutrient digestibility and tended to increase milk yield.

INTRODUCTION

The transition period of dairy cows has been defined as 3 weeks pre-partum and 3 weeks post-partum (Grummer, 1995). This period is transition from a pregnant non-lactating cow with relatively low nutritional requirements to a non-pregnant high producing lactating cow with elevated nutritional requirements, metabolic transitions to support the ensuing lactation (Bauman and Currie, 1980, Remppis et al., 2011) and ruminal adaptations to a change in diet. This physiological change leads to parturition stress, high susceptibility and to prevalence of metabolic health disorders. Nutritional inadequacy pre- and post-partum, has been thought to be one of the main factors in the high incidence of metabolic disorders during this period. Improving the nutrition of the cow during this period may enhance health, dry matter intake (DMI), and milk production.

Incorporation of microbial additives such as a culture of *Saccharomyces cerevisiae* to the diet has become a common practice in ruminant nutrition. The effects of *S. cerevisiae* supplementation during the prepartum period and through peak lactation on DMI and milk yield remain controversial (Robinson, 1997; Wohlt et al, 1991; Dann et al., 2000; Sakine Yalçın et al., 2011). Recently research, fermentation of cassava chip (dried root) by pure culture of *S. cerevisiae*, called "Yeast fermented-cassava chip Protein" (YEFECAP), could increase its protein content from 3.4 to 32.5% CP (Boonnop et al. 2009; Boonnop et al. 2010, Polyorach et al., 2010; Wanapat et al. 2011). It could be used for animal feeding. Boonnop et al. (2010) further studied the effects of YEFECAP as a protein source replacement of soybean meal in concentrate and found that YEFECAP could fully replace soybean meal in terms of rumen fermentation efficiency and nutrient digestibilities in beef cattle. Recently report by Wanapat et al. (2011) that YEFECAP can fully replace SBM in concentrate mixtures for early lactation milking dairy cows which effected on enhancing rumen fermentation, dry matter intake, nutrient digestibility, milk yield and milk compositions.

Supplemental YEFECAP may be most beneficial to dairy cows if it is fed before parturition, a period that is characterized by decreased DMI as parturition approaches, and through peak lactation. No data are available for effects of YEFECAP in dairy cows during pre-and postpartum in tropical country. The objective of this study was to evaluate effects of YEFECAP on pre- and postpartum intake and milk production of dairy cattle.

MATERIALS AND METHODS

Animals, experimental design and dietary treatments:

Thirty two Holstein Frisian crossbred dairy heifers and cows (16 heifers and 16 cows) from the dairy farm of the Faculty of Natural Resources, Rajamangala University of Technology Isan, Sakon Nakhon Campus were assigned to two treatments at 14 d before calving thought 60 d postpartum to determine the effects of Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP). Randomized complete block design (RCBD) were used (No. of lactation is block). Treatments were concentrate feed with YEFECAP and without (Control) YEFECAP. Dietary concentrate treatments feed were showed in Table 1.

Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) was prepared according to method of Boonnop et al. (2009). Yeast inoculants preparation: baker yeast was cultured in the cylinder vessels which contained solution of 20% molasses (w/v) and 4% urea (w/v). The products were incubated at room temperature and oxygen was supplied by an air pump for 4 days (cell yeast = 8.8×10^8 cells/ml). Yeast inoculum was mixed and inoculated into 0.5 kg of the mash cassava chip as the starter and 250 ml nutrient solution [urea (48 g) and molasses (24 g)] were added. Fermentation was conducted during 72 hours at 25-30°C under shed.

Animal management and feeding

Animals were housed individually for each treatment and had *ad libitum* access to feed, fresh water and a mineral block. Prepartum animals were fed concentrate (1.3 % BW, twice dairy) and rice straw (*ad libitum*) separately while postpartum animal were fed total mixed ration (TMR) with concentrate to roughage (3% urea treated rice straw) at 70:30. The composition of the TMR diets is shown in Table 2. Animal were milked twice daily (05.00 AM and 16.00 PM) by milking machine.

Table 1. Ingredients and compositions of experimental concentrates feed

Ingredient	Prepartum		Postpatum	
	Control	YEFECAP	Control	YEFECAP
	% Dry Matter			
Cassava chip	57.3	52.4	40.0	33.9
YEFECAP[a]	-	11.9	-	26.0
Whole Cottonseed	8.1	7.6	11.6	10
Rice bran	21.5	20.3	22.3	19
Soybean meal	5.2	-	14.3	-
Molasses	3.4	3.1	5.2	4.4
Urea	1.7	1.9	3.1	3.2
Oyster shell	0.5	0.4	-	0
Salt	1.0	1.0	0.7	0.7
Dicalcium[b]	0.5	0.4	0.5	0.5
Mineral mix[c]	0.7	0.7	1.0	1.0
Sulphur	0.1	0.1	0.4	0.4
Tallow	0.0	0.0	0.9	0.9
Dry matter (%)	88.7	88.0	88.7	88.6
Crude protein (%)	12.0	11.8	19.5	19.1
Neutral detergent fiber (%)	12.6	12.0	13.5	12.1
Acid detergent fiber (%)	7.7	7.4	8.6	8.0
Ash (%)	6.3	6.5	8.1	8.1
Total digestible nutrient[d]	69.0	69.8	68.8	69.8

[a]YEFECAP = Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip

[b]Dicalcium (each kg contains): Calcium 300 g; Phosphorus 140 g.

[c]Mineral mix (Dailymin®) (each kg contains): Iron 2.14 g; Iodin 0.15 g; Sulphur 11.82 g; Copper 0.23 g; Magnesium 0.96 g; Sodium 2.68 g; Manganese 7.21 g; Cobalt 0.03 g; Phosphorus 19.60 g; Selenium 0.003 g; Zing 0.16; Calcium 204.03 g.

[d]By calculation.

Table 2. Chemical composition (% of dry matter) of total mixed rations (TMR) with and without (Control) Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP)

Ingredient	Total mixed rations	
	Control	TMR with YEFECAP
Dry matter (DM)	78.3	77.3
Organic matter (OM)	89.9	89.9
Crude protein (CP)	14.9	14.6
Neutral detergent fiber (NDF)	32.8	31.9
Acid detergent fiber (ADF)	22.7	22.3

Sampling and analysis

Dry matter intake (DMI), Feed, milk yield and milk composition

The DMI of each animal was measured daily from 14 (±3) d before expected calving date until 60 DIM. Samples of the prepartum and postpartum diets were collected weekly, composited monthly, and analyzed for DM, ash, CP (AOAC, 1990) NDF, ADF.

Milk yields of each cow were recorded daily until 60 DIM. Milk samples (in ratio of morning milk samples to afternoon milk samples at 60:40.) were collected twice daily during milking on the last day of each week of lactation and were analyzed for fat, protein, lactose and solids-not-fat using infared apparatus (Milko-scan 104, Foss Electric, Denmark).

Body weight (BW), body condition score (BCS), feces and blood samples

Data of BW and BCS were recoded and samples of face and blood were taken on DIM of -14, -7, 0, 7, 14, 21, 35 and 60 of each cow. Each animal was weight and scored (5 scores) after morning milking by the same person. Fecal samples were collected (250 g) from rectum of individual cow once day in the morning before new fresh feed was offered and samples were kept in a refrigerator until analysis. Fecal samples were analyzed for DM, ash, CP (AOAC,1997), NDF and ADF (Goering and Van Soest, 1970).

Blood samples were taken from a coccygeal vessel into heparinized Vacutainer tubes and centrifuged immediately to separate plasma that was stored at -20°C before analysis. Plasma samples were analyzed for urea-nitrogen composition (BUN), None esterifies fatty acid (NEFA), Bata-hydroxyl butyric acids (BHBA) and glucose using automated clinical chemistry analyzers (Vitallab Flexor E).

Energy balance during 60 postpartum was estimate by using equation of Smith et al. (1997) as follow:

$$\text{EB (energy balance)} = NE_L \text{ intake - Lactating Energy (LE)} - NE_M$$

Where

LE = milk yield (kg) + milk energy content

Milk energy content = (226.09 + 89.5 × % fat + 49.83 × % protein)/1000

$$NE_M = 0.08 \times BW^{0.75}$$

NE_L in feed was calculated according to equation of NRC (1989) which

$$\text{NEL (Mcal/lb.)} = (0.0245 * \text{TDN\%} - 0.12) * 0.4536$$

where TDN stand for total digestible nutrient in feed

Statistical analyses

Data were analyzed using the GLM Procedure (SAS, 1996). Treatment mean differences used Duncan's New MultipleRange Test.

RESULTS AND DISCUSSION

Feed and Dry matter intake (DMI)

The chemical composition of the concentrate (Table1) and Total mixed Ration (TMR) (Table 2) met NRC (1989) recommendations for CP nutrients and Energy. The DMI during the last 14 d of gestation tended to be higher in animals fed with YEFECA diet (Table 3). After calving, diets were offered for *ad libitum* intake, and DMI was greater (P<0.05) in cows fed YEFECAP compared with those fed control diet, averaging 14.1 vs. 11.0 kg/d (Table 4). The improvement of DMI during early lactation in animal fed YEFECAP diet in this study agree with previous works (Boonnop et al., 2010; Wanapat et al., 2011ab) that when using YEFECAP as protein sources in concentrate diet for dairy steer (Boonnop et al., 2010) or early lactating cow (Wanapat et al., 2011ab), it could improve CP and nutrients digestibility which could increase rate of passage and therefore improve DMI.

Moreover DMI were significantly improved by higher level of YEFECAP (16.9 – 28 % in concentrate) in diet (Boonnop et al., 2010; Wanapat et al., 2011ab). It also has been considered for YEFECAP in ruminant that have been palatability (Boonnop et al., 2010). Pinos-Rodriguez et al., (2008) found that live yeast can increase DMI, in response was greater with high levels of rumen fermentation carbohydrates patterns.

Table 3. Effect of Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) in rations on daily intakes, total-tract digestibility, live weight and body condition scores (BSC) of prepartum dairy cattle

Item	Prepartum		SEM	P value
	Control	YEFECAP		
DMI, Kg	11.6	12.9	0.4	0.103
DMI, % of BW	2.7	2.6	0.2	ns
Apparent total-tract digestibility				
DM	62.1	64.2	1.2	0.062
OM	63.4	64.5	1.0	ns
CP	64.0[a]	68.2[b]	1.1	*
NDF	54.1	56.5	1.3	0.058
ADF	53.3	54.0	1.0	ns
BW (kg)				
14 d before calving	473.2	492.8	19.3	ns
7 d before calving	478.9	494.4	20.6	ns
Calving date	410.2	447.4	17.2	ns
Body weight change	-63.0	-45.4	1.3	0.101
BCS (5 scores)				
14 d before calving	2.9	2.5	0.2	ns
7 d before calving	2.7	2.6	0.2	ns
Calving date	2.4	2.2	0.2	ns
BCS change (14 d before calving)	-0.5	-0.2	0.1	0.132

Nutrients digestibilities

Animal fed YEFECAP diet for the last 14 d of gestation tended ($P < 0.10$) to have more DM and NDF digestibilities than those fed control diet. Digestibility of CP and NDF was improved (P<0.05) by feeding of YEFACAP during first 8 wk of lactation. Moreover DM, OM and ADF digestibility tended (P<0.1) to be improved also in early lactating cow fed YEFACAP diet (Table 4). Similarly, when using YEFECAP as protein sources in concentrate diet for dairy steer (Boonnop et al., 2010) or early lactating cow (Wanapat et al., 2011ab), it could improve CP and nutrients (DM, OM and NDF) digestibility. The improvement of CP and nutrients digestibilities have contributed to greater DMI by cow fed YEFECAP diet during early lactation.

Yeast-fermented cassava chip protein (YEFECAP) containing of yeast which may provide factors stimulatory to rumen cellulolytic and proteolytic bacteria, especially when high concentrate (> 50 %) diet are fed (Williams, 1989). Feeding YEFACAP has increased numbers of cellulolytic, amylolytic and proteolytic rumen bacteria (Boonnop et al., 2010; Wanapat et al., 2011ab) and resulted in improved fiber digestibility (Boonnop et al., 2010; Wanapat et al., 2011ab). Guedes et al., (2008) reported that yeast could stimulate the activity of cellulolytic bacteria and increase lactate utilization in the rumen, hence increased fiber digestion in feedlot cattle.

Table 4. Postpartum period (d 1 to 60) responses to Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) in rations

Item	Postpartum		SEM	P value
	Control	YEFECAP		
DMI, Kg/d	11.0	14.1	0.4	*
DMI, %of BW	2.7	3.1	0.1	*
Apparent total-tract digestibility				
DM	64.4	67.2	1.5	0.066
OM	67.5	70.4	1.0	0.068
CP	68.0[a]	75.3 [b]	1.1	*
NDF	58.4 [a]	63.5 [b]	1.0	*
ADF	56.3	58.4	1.2	0.087
Average BW, kg	404.2	441.3	16.1	0.082
BW change, kg/60 d	-5.7	-6.1	4.8	ns
Average BCS[1]	2.2	2.3	0.2	ns
BCS change per 60 d	-0.2	0.1	0.2	ns
Energy balance, Mcal/d[2]	-5.0	-4.6	0.7	ns

[1]BCS scale = 1 to 5 point system (Wildman et al., 1982)
[2]Energy balance equals NEL intake minus lactational energy(LE) minus NEM, NEM calculated as 0.08*BW0.75), LE calculated as milk yield (kg) + milk energy content (Smith et al., 1997), Milk energy content was defined as (226.09 + 89.5 x %fat + 49.83 x % protein)/1000 (Tyrrell and Reed, 1965)

Body weight and body condition scores

Initial (14 d before calving) BW and BCS did not differ (P>0.10) between treatments. Feeding YEFECAP diet did not effect (P>0.10) prepartum and postpartum BW and BCS (Table 3). However, during prepartum period, cows that consumed the control diet tend to lost 63.0 kg more BW (P=0.101) or BCS (P=0.132) during the last 14 day of gestation than did cows that consumed the YEFECAP diet (Table 3).

The different trend in BW loss between treatments in prepartum period may be attributable to the different trend in DMI during prepatum period. Another possibility is cows supplemented with yeast culture appeared to be in better energy balance, as was evidenced by tended to be lower loss of body condition and tended to be lower level of plasma NEFA (Table 6). Similarly Robinson (1997) reported that cows supplemented with yeast culture lost less body condition prepartum, which was consistent with numerically higher body weight gain.

Milk yield and milk composition

Milk composition was not effected (P>0.05) by treatment (Table 5). Mean daily milk yields was increasing trend (P=0.128) in animal fed YEFECAP compared with those animal fed control diet (Table 5). The tended to be higher milk production in YEFECAP diet in our study could be related to improved nutrient digestibility and DMI in animal fed YEFECAP diet. This result supports data of Wanapat et al. (2011b) that milk yield was remarkably enhanced when YEFECAP was included at 16-28% DM in concentrate and fed to early lactating dairy cow. The higher milk yield in animal fed YEFECAP could be attributed by higher DMI (Wanapat et al., 2011b).

Peak milk yield occurred earlier (but not significantly) and tended to be greater when animal fed YEFECAP (Table 5). The improved DMI in animal fed YEFECAP in this study was an important factor contributing to earlier and higher peak milk yield in YEFECAP diet.

This finding similar to previous works that cow supplemented with yeast culture reach peak milk production more quickly (Wohlt et al., 1991; Dann et al., 2000) and had a higher milk yield (Wohlt et al., 1991) compared cow fed control diet.

Table 5. Milk yield and milk composition response to Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) in rations

Item	Postpartum		SEM	P value
	Control	YEFECAP		
Day 0 to 60				
Milk yield, kg/d	12.6	14.1	0.7	0.128
Milk fat, %	3.2	3.1	0.1	ns
Milk protein, %	3.2	3.4	0.1	ns
SNF, %	8.6	8.6	0.1	ns
Peak milk yield , kg/d	14.4	16.7	0.7	*
Peak milk yield, d	42.4	40.8	3.5	ns

Blood metabolic and Energy balance

Blood glucose and blood urea nitrogen (BUN) were not affected by dietary treatment both prepartum and postpartum (Table 6).

Plasma nonesterified fatty acids (NEFA) tended to be lower in animal fed YEFECAP diet both prepartum and postpartum. Increased adipose tissue mobilization postpartum is correlated with higher levels of plasma NEFA mobilized from adipose tissue (Ferguson, 1996; Drackley, 1999). This could be interpreted that animal consumed YEFECAP diet mobilized body fat reserve lower than that in animal consumed control diet, as was evidenced by tended to be lower loss of body condition during prepartum period or gain BCS during postpartum in animal fed YEFECAP diet (Table 4, 3).

β-hydoxybutyrate (BHBA) concentration in blood tended to be lower (P<0.2) in animal fed YEFECAP diet both prepartum and postpartum. This could be as a result of lower level NEFA in animal fed YEFECAP diet. Carlson et al.,(2006) described BHBA as a key indicator of hepatic ketogenesis as a result of influx of NEFA into the liver.

Table 6. Effect of Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) in rations on blood metabolic of pre- and postpartum dairy cattle

Item	Control	YEFECAP	SEM	P value
NEFA (mmol/l)				
Average (14 d prepatum)	0.59	0.41	0.1	0.167
Average (60 d postpartum)	0.59	0.44	0.1	0.188
BHBA (mg/dl)				
Average (14 d prepatum)	4.8	3.7	0.4	0.104
Average (60 d postpartum)	4.1	2.7	0.6	0.103
Glucose				
Average (14 d prepatum)	43.5	51.4	6.5	ns
Average (60 d postpartum)	39.6	40.8	4.1	ns
BUN (mg/dl)				
Average (14 d prepatum)	11.5	12.2	0.7	ns
Average (60 d postpartum)	13.7	11.2	1.3	ns

Conclusions

Feeding strategies that help prevent the decline in DMI during the transition period may be beneficial to dairy cattle. Feeding with YEFACAP tended to improved DMI during the last 14 day of gestation and improved DMI during the first 2 months of lactation which result of improved nutrients digestibilities. Feeding YEFECAP also tended to resulted in cattle losing less BW and BCS. There was also tended to be improvement in overall milk production and peak in milk earlier with YEFECAP feeding.

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ABSTRACT

The objective of this study was to evaluate effects of Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) on pre- and postpartum intake and milk production of dairy cattle. Thirty two Holstein Frisian crossbred dairy heifers and cows (16 heifers and 16 cows) were assigned to two treatments at 14 d before calving thought 60 d postpartum. The experimental treatment was concentrate feed with or without YEFECAP. Cattle were fed rice straw (prepartum) and urea treated rice straw (postpartum) as main roughage. Pre-partum cattle were fed concentrate (1.3 %BW) and roughage (*ad lib*) separately while postpartum cattle were fed total mixed ration (TMR) (*ad lib*) with concentrate to roughage ratio at 70:30. During prepartum period, dry matter intake was not significantly different among treatments. However,crude protein digestibility of the YEFECAP diet was higher ($P<0.05$) than that in diet without YEFECAP. Dry matter and NDF digestibility in prepartum cattle tended to be higher in diet with YEFECAP than without YEFECAP. Body condition score at calving date in cattle fed YEFECAP diet tend to reduce smaller than fed without YEFECAP. Digestibilities of protein and NDF were improved in cows fed YEFECAP, contributing to a greater DMI during the first 8 wk of lactation and trend to higher average milk yield through wk 8 of lactation compared with control cow. Moreover diet with YEFECAP was significantly increase peak milk yield ($P<0.05$)as compares to diet without YEFECAP. Plasma NEFA and BHBA tended to be lower in cattle fed with YEFECAP pre- and postpartum. Based on this experiment, it could be concluded that dairy cattle fed with YEFECAP during pre- and postpartum period could enhance dry matter intake, nutrient digestibility and tended to improve milk yield. Moreover animal fed YEFECAP diet resulted in lower level of fat metabolism parameter (NEFA and BHBA) which indicator of good health.

Keywords: Dairy Heifer, Cow, Pre-partum, Postpartum, Cassava, Yeast, Yeast fermented-cassava chip (YEFECAP).

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INTRODUCTION

The transition period of dairy cows has been defined as 3 weeks pre-partum and 3 weeks post-partum (Grummer, 1995). This period is transition from a pregnant non-lactating cow with relatively low nutritional requirements to a non-pregnant high producing lactating cow with elevated nutritional requirements, metabolic transitions to support the ensuing lactation (Bauman and Currie, 1980; Remppis et al., 2011) and ruminal adaptations to a change in diet. This physiological change leads to parturition stress, high susceptibility and to prevalence of metabolic health disorders. Nutritional inadequacy pre- and post-partum, has been thought to be one of the main factors in the high incidence of metabolic disorders during this period. Improving the nutrition of the cow during this period may enhance health, dry matter intake (DMI), and milk production.

Incorporation of microbial additives such as a culture of *Saccharomyces cerevisiae* to the diet has become a common practice in ruminant nutrition. The effects of *S. cerevisiae* supplementation during the prepartum period and through peak lactation on DMI and milk yield remain controversial (Robinson, 1997; Wohlt et al, 1991; Dann et al., 2000; Sakine Yalçın et al., 2011). Recently research, fermentation of cassava chip (dried root) by pure culture of *S. cerevisiae*, called "Yeast fermented-cassava chip Protein" (YEFECAP), could increase its protein content from 3.4 to 32.5% CP (Boonnop et al. 2009; Boonnop et al. 2010, Polyorach et al., 2010; Wanapat et al. 2011). It could be used for animal feeding. Boonnop et al. (2010) further studied the effects of YEFECAP as a protein source replacement of soybean meal in concentrate and found that YEFECAP could fully replace soybean meal in terms of rumen fermentation efficiency and nutrient digestibilities in beef cattle. Recently report by Wanapat et al. (2011) that YEFECAP can fully replace SBM in concentrate mixtures for early lactation milking dairy cows which effected on enhancing rumen fermentation, dry matter intake, nutrient digestibility, milk yield and milk compositions.

Supplemental YEFECAP may be most beneficial to dairy cows if it is fed before parturition, a period that is characterized by decreased DMI as parturition approaches, and through peak lactation. No data are available for effects of YEFECAP in dairy cows during pre-and postpartum in tropical country. The objective of this study was to evaluate effects of YEFECAP on pre- and postpartum intake and milk production of dairy cattle.

MATERIALS AND METHODS

Animals, experimental design and dietary treatments:

Thirty two Holstein Frisian crossbred dairy heifers and cows (16 heifers and 16 cows) from the dairy farm of the Faculty of Natural Resources, Rajamangala University of Technology Isan, Sakon Nakhon Campus were assigned to two treatments at 14 d before calving thought 60 d postpartum to determine the effects of Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP). Randomized complete block design (RCBD) were used (No. of lactation is block). Treatments were concentrate feed with YEFECAP and without (Control) YEFECAP. Dietary concentrate treatments feed were showed in Table 1.

Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) was prepared according to method of Boonnop et al. (2009). Yeast inoculants preparation: baker yeast was cultured in the cylinder vessels which contained solution of 20% molasses (w/v) and 4% urea (w/v). The products were incubated at room temperature and oxygen was supplied by an air pump for 4 days (cell yeast = 8.8×10^8 cells/ml). Yeast inoculum was mixed and inoculated into 0.5 kg of the mash cassava chip as the starter and 250 ml nutrient solution [urea (48 g) and molasses (24 g)] were added. Fermentation was conducted during 72 hours at 25-30°C under shed.

Animal management and feeding

Animals were housed individually for each treatment and had *ad libitum* access to feed, fresh water and a mineral block. Prepartum animals were fed concentrate (1.3 % BW, twice dairy) and rice straw (*ad libitum*) separately while postpartum animal were fed total mixed ration (TMR) with concentrate to roughage (3% urea treated rice straw) at 70:30. The composition of the TMR diets is shown in Table 2. Animal were milked twice daily (05.00 AM and 16.00 PM) by milking machine.

Sampling and analysis

Dry matter intake (DMI), Feed, milk yield and milk composition

The DMI of each animal was measured daily from 14 (±3) d before expected calving date until 60 DIM. Samples of the prepartum and postpartum diets were collected weekly, composited monthly, and analyzed for DM, ash, CP (AOAC, 1990) NDF, ADF.

Milk yields of each cow were recorded daily until 60 DIM. Milk samples (in ratio of morning milk samples to afternoon milk samples at 60:40.) were collected twice daily during milking on the last day of each week of lactation and were analyzed for fat, protein, lactose and solids-not-fat using infared apparatus (Milko-scan 104, Foss Electric, Denmark).

Body weight (BW), body condition score (BCS), feces and blood samples

Data of BW and BCS were recoded and samples of face and blood were taken on DIM of -14, -7, 0, 7, 14, 21, 35 and 60 of each cow. Each animal was weight and scored (5 scores) after morning milking by the same person. Fecal samples were collected (250 g) from rectum of individual cow once day in the morning before new fresh feed was offered and samples were kept in a refrigerator until analysis. Fecal samples were analyzed for DM, ash, CP (AOAC,1997), NDF and ADF (Goering and Van Soest, 1970).

Blood samples were taken from a coccygeal vessel into heparinized Vacutainer tubes and centrifuged immediately to separate plasma that was stored at -20°C before analysis. Plasma samples were analyzed for urea-nitrogen composition (BUN), None esterifies fatty acid (NEFA), Bata-hydroxyl butyric acids (BHBA) and glucose using automated clinical chemistry analyzers (Vitallab Flexor E).

Energy balance during 60 postpartum was estimate by using equation of Smith et al. (1997) as follow:

$$\text{EB (energy balance)} = NE_L \text{ intake - Lactating Energy (LE)} - NE_M$$

Where

$$\text{LE} = \text{milk yield (kg)} + \text{milk energy content}$$

$$\text{Milk energy content} = (226.09 + 89.5 \times \%\ \text{fat} + 49.83 \times \%\ \text{protein})/1000$$

$$NE_M = 0.08 \times BW^{0.75}$$

NE_L in feed was calculated according to equation of NRC (1989) which

$$\text{NEL (Mcal/lb.)} = (0.0245^* \text{ TDN\%} - 0.12)^*0.4536$$

where TDN stand for total digestible nutrient in feed

Statistical analyses

Data were analyzed using the GLM Procedure (SAS, 1996). Treatment mean differences used Duncan's New MultipleRange Test.

RESULTS AND DISCUSSION

Feed and Dry matter intake (DMI)

The chemical composition of the concentrate (Table1) and Total mixed Ration (TMR) (Table 2) met NRC (1989) recommendations for CP nutrients and Energy. The DMI during the last 14 d of gestation tended to be higher in animals fed with YEFECA diet (Table 3). After calving, diets were offered for *ad libitum* intake, and DMI was greater (P<0.05) in cows fed YEFECAP compared with those fed control diet, averaging 14.1 vs. 11.0 kg/d (Table 4). The improvement of DMI during early lactation in animal fed YEFECAP diet in this study agree with previous works (Boonnop et al., 2010; Wanapat et al., 2011ab) that when using YEFECAP as protein sources in concentrate diet for dairy steer (Boonnop et al., 2010) or early lactating cow (Wanapat et al., 2011ab), it could improve CP and nutrients digestibility which could increase rate of passage and therefore improve DMI.

Moreover DMI were significantly improved by higher level of YEFECAP (16.9 – 28 % in concentrate) in diet (Boonnop et al., 2010; Wanapat et al., 2011ab). It also has been considered for YEFECAP in ruminant that have been palatability (Boonnop et al., 2010). Pinos-Rodriguez et al., (2008) found that live yeast can increase DMI, in response was greater with high levels of rumen fermentation carbohydrates patterns.

Nutrients digestibilities

Animal fed YEFECAP diet for the last 14 d of gestation tended (P < 0.10) to have more DM and NDF digestibilities than those fed control diet. Digestibility of CP and NDF was improved (P<0.05) by feeding of YEFACAP during first 8 wk of lactation. Moreover DM, OM and ADF digestibility tended (P<0.1) to be improved also in early lactating cow fed YEFACAP diet (Table 4). Similarly, when using YEFECAP as protein sources in concentrate diet for dairy steer (Boonnop et al., 2010) or early lactating cow (Wanapat et al., 2011ab), it could improve CP and nutrients (DM, OM and NDF) digestibility. The improvement of CP and nutrients digestibilities have contributed to greater DMI by cow fed YEFECAP diet during early lactation.

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β-hydoxybutyrate (BHBA) concentration in blood tended to be lower ($P<0.2$) in animal fed YEFECAP diet both prepartum and postpartum. This could be as a result of lower level NEFA in animal fed YEFECAP diet. Carlson et al.,(2006) described BHBA as a key indicator of hepatic ketogenesis as a result of influx of NEFA into the liver.

Conclusions

Feeding strategies that help prevent the decline in DMI during the transition period may be beneficial to dairy cattle. Feeding with YEFACAP tended to improved DMI during the last 14 day of gestation and improved DMI during the first 2 months of lactation which result of improved nutrients digestibilities. Feeding YEFECAP also tended to resulted in cattle losing less BW and BCS. There was also tended to be improvement in overall milk production and peak in milk earlier with YEFECAP feeding.

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Table 1. Ingredients and compositions of experimental concentrates feed

Ingredient	Prepartum		Postpatum	
	Control	YEFECAP	Control	YEFECAP
	% Dry Matter			
Cassava chip	57.3	52.4	40.0	33.9
YEFECAP[a]	-	11.9	-	26.0
Whole Cottonseed	8.1	7.6	11.6	10
Rice bran	21.5	20.3	22.3	19
Soybean meal	5.2	-	14.3	-
Molasses	3.4	3.1	5.2	4.4
Urea	1.7	1.9	3.1	3.2
Oyster shell	0.5	0.4	-	0
Salt	1.0	1.0	0.7	0.7
Dicalcium[b]	0.5	0.4	0.5	0.5
Mineral mix[c]	0.7	0.7	1.0	1.0
Sulphur	0.1	0.1	0.4	0.4
Tallow	0.0	0.0	0.9	0.9
Dry matter (%)	88.7	88.0	88.7	88.6
Crude protein (%)	12.0	11.8	19.5	19.1
Neutral detergent fiber (%)	12.6	12.0	13.5	12.1
Acid detergent fiber (%)	7.7	7.4	8.6	8.0
Ash (%)	6.3	6.5	8.1	8.1
Total digestible nutrient[d]	69.0	69.8	68.8	69.8

[a]YEFECAP = Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip

[b]Dicalcium (each kg contains): Calcium 300 g; Phosphorus 140 g.

[c]Mineral mix (Dailymin®) (each kg contains): Iron 2.14 g; Iodin 0.15 g; Sulphur 11.82 g; Copper 0.23 g; Magnesium 0.96 g; Sodium 2.68 g; Manganese 7.21 g; Cobalt 0.03 g; Phosphorus 19.60 g; Selenium 0.003 g; Zing 0.16; Calcium 204.03 g.

[d]By calculation.

Table 2. Chemical composition (% of dry matter) of total mixed rations (TMR) with and without (Control) Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP)

Ingredient	Total mixed rations	
	Control	TMR with YEFECAP
Dry matter (DM)	78.3	77.3
Organic matter (OM)	89.9	89.9
Crude protein (CP)	14.9	14.6
Neutral detergent fiber (NDF)	32.8	31.9
Acid detergent fiber (ADF)	22.7	22.3

Table 3. Effect of Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) in rations on daily intakes, total-tract digestibility, live weight and body condition scores (BSC) of prepartum dairy cattle

Item	Prepartum		SEM	P value
	Control	YEFECAP		
DMI, Kg	11.6	12.9	0.4	0.103
DMI, % of BW	2.7	2.6	0.2	ns
Apparent total-tract digestibility				
DM	62.1	64.2	1.2	0.062
OM	63.4	64.5	1.0	ns
CP	64.0[a]	68.2[b]	1.1	*
NDF	54.1	56.5	1.3	0.058
ADF	53.3	54.0	1.0	ns
BW (kg)				
14 d before calving	473.2	492.8	19.3	ns
7 d before calving	478.9	494.4	20.6	ns
Calving date	410.2	447.4	17.2	ns
Body weight change	-63.0	-45.4	1.3	0.101
BCS (5 scores)				
14 d before calving	2.9	2.5	0.2	ns
7 d before calving	2.7	2.6	0.2	ns
Calving date	2.4	2.2	0.2	ns
BCS change (14 d before calving)	-0.5	-0.2	0.1	0.132

Table 4. Postpartum period (d 1 to 60) responses to Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) in rations

Item	Postpartum		SEM	P value
	Control	YEFECAP		
DMI, Kg/d	11.0	14.1	0.4	*
DMI, %of BW	2.7	3.1	0.1	*
Apparent total-tract digestibility				
DM	64.4	67.2	1.5	0.066
OM	67.5	70.4	1.0	0.068
CP	68.0[a]	75.3[b]	1.1	*
NDF	58.4[a]	63.5[b]	1.0	*
ADF	56.3	58.4	1.2	0.087
Average BW, kg	404.2	441.3	16.1	0.082
BW change, kg/60 d	-5.7	-6.1	4.8	ns
Average BCS[1]	2.2	2.3	0.2	ns
BCS change per 60 d	-0.2	0.1	0.2	ns
Energy balance, Mcal/d[2]	-5.0	-4.6	0.7	ns

[1]BCS scale = 1 to 5 point system (Wildman et al., 1982)

[2]Energy balance equals NEL intake minus lactational energy(LE) minus NEM, NEM calculated as 0.08*BW0.75), LE calculated as milk yield (kg) + milk energy content (Smith et al., 1997), Milk energy content was defined as (226.09 + 89.5 x %fat + 49.83 x % protein)/1000 (Tyrrell and Reed, 1965)

Table 5. Milk yield and milk composition response to Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) in rations

Item	Postpartum		SEM	P value
	Control	YEFECAP		
Day 0 to 60				
Milk yield, kg/d	12.6	14.1	0.7	0.128
Milk fat, %	3.2	3.1	0.1	ns
Milk protein, %	3.2	3.4	0.1	ns
SNF, %	8.6	8.6	0.1	ns
Peak milk yield , kg/d	14.4	16.7	0.7	*
Peak milk yield, d	42.4	40.8	3.5	ns

Table 6. Effect of Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) in rations on blood metabolic of pre- and postpartum dairy cattle

Item	Control	YEFECAP	SEM	P value
NEFA (mmol/l)				
Average (14 d prepatum)	0.59	0.41	0.1	0.167
Average (60 d postpartum)	0.59	0.44	0.1	0.188
BHBA (mg/dl)				
Average (14 d prepatum)	4.8	3.7	0.4	0.104
Average (60 d postpartum)	4.1	2.7	0.6	0.103
Glucose				
Average (14 d prepatum)	43.5	51.4	6.5	ns
Average (60 d postpartum)	39.6	40.8	4.1	ns
BUN (mg/dl)				
Average (14 d prepatum)	11.5	12.2	0.7	ns
Average (60 d postpartum)	13.7	11.2	1.3	ns

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Effects of Yeast (*Saccharomyces Cerevisiae*) Fermented-Cassava Chip Protein (YEFECAP) on Prepartum and Postpartum Intake and Milk Production of Holstein Fresian Crossbred Dairy Cows

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ABSTRACT

The objective of this study was to evaluate effects of Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) on pre- and postpartum intake and milk protein production of dairy cattle. Twelve Holstein Frisian crossbred dairy heifers and cows (6 heifers and 6 cows) were assigned to two treatments at 14 d before calving thought 60 d postpartum. The experimental treatment was concentrate feed with or without YEFECAP. Cattle was fed rice straw as main roughage and postpartum cattle was fed total mixed ration (TMR) with concentrate to roughage ratio at 70: 30. The DMI was increased by YEFECAP during the first 42 d of lactation (12.3 vs. 11.6 kg).Total milk produced during the first 60 d of lactation was significantly higher in cow supplemented with YEFECAP than without (12.3 vs. 11.9). Based on these results, it is concluded that YEFECAP could be used as a portion of concentrate for dairy cows during the transition period and increased DMI postpartum and milk production

Key Words: Dairy Hheifer, Cow, Pre-partum, Postpartum, Cassava, Yeast

INTRODUCTION

Cassava (Manihot esculenta, Crantz) is extensively cultivated throughout the tropics and subtropics regions due to its ability to grow in diverse soil conditions and minimal management (Wanapat, 2003) The root is composed almost entirely of carbohydrate which can be used as important food source. However, the critical scarcity of protein resources in tropical countries indicates a need for feed technology research to enhance the use of local feed resources. Fermentation of cassava peels by pure culture of *S. cerevisiae* could increase its protein content from 2.4% in nonfermented cassava to 14.1% in fermented products (Antai and Mbongo, 1994). The fermented cassava flour with *S. cerevisiae* enhanced the protein level (from 4.4% to 10.9%) and decreased the amount of cyanide content (Oboh and Kindahunsi, 2005). In recently reported by Boonnop et al. (2009) that cassava chip can be nutritionally improved with *S. cerevisiae* call "Yeast fermented-cassava chip" (YEFECAP) and could be used for animal feeding. Supplemental YEFECAP may be most beneficial to dairy cows if it is fed before parturition, a period that is characterized by decreased DMI as parturition approaches, and through peak lactation. No data are available for effects of YEFECAP in dairy cows during pre-and postpartum in tropical country. The objective of this study was to evaluate effects of YEFECAP on pre- and postpartum intake and milk production of dairy cattle.

MATERIALS AND METHODS

Animals, experimental design and dietary treatments

Twelve Holstein Frisian crossbred dairy heifers and cows (6 heifers and 6 cows) from the dairy farm of the Faculty of Natural Resources, Rajamangala University of Technology Isan, Sakon Nakhon Campus were assigned to two treatments at 14 d before calving thought 60 d postpartum to determine the effects of Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP). Randomized complete block design (RCBD) were used. Treatments were concentrate feed with (YEFECAP) and without (Control) YEFECAP. Dietary treatments were showed in Table 1. Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) was prepared according to method of Boonnop et al. (2009). Yeast inoculants preparation: baker yeast was cultured in the cylinder vessels which contained solution of 20% molasses (w/v) and 4% urea (w/v). The products were incubated at room temperature and oxygen was supplied by an air pump for 4 days. Yeast inoculum was mixed and inoculated into 0.5 kg of the mash cassava chip as the starter and 250 mL nutrient solution [urea (48 g) and molasses (24 g)] were added. Fermentation was conducted during 132 hours at 25°C under an air relative humidity between 40% and 50%.

Table 1 Ingredients and compositions of experimental concentrates feed

Ingredient	Prepartum		Postpatum	
	Control	YEFECAP	Control	YEFECAP
	% Dry Matter			
Cassava chip	57.3	52.4	42.7	34.5
YEFECAP[a]	-	11.9	-	25.4
Whole Cottonseed	8.1	7.6	11.6	10
Rice bran	21.5	20.3	22.3	19
Soybean meal	5.2	-	11.6	-
Molasses	3.4	3.1	5.2	4.4
Urea	1.7	1.9	3.1	3.2
Oyster shell	0.5	0.4	-	0
Salt	1.0	1.0	0.7	0.7
Dicalcium[b]	0.5	0.4	0.5	0.5
Mineral mix[c]	0.7	0.7	1.0	1.0
Sulphur	0.1	0.1	0.4	0.4
Tallow	0.0	0.0	0.9	0.9
Dry matter (%)	88.7	88.0	88.7	88.6
Crude protein (%)	12.0	11.8	17.4	17.0
Total digestible nutrient[d]	69.0	69.8	69.0	70.0

[a]YEFECAP = Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip

[b]Dicalcium (each kg contains): Calcium 300 g; Phosphorus 140 g

[c]Mineral mix (Dailymin®) (each kg contains): Iron 2.14 g; Iodin 0.15 g; Sulphur 11.82 g; Copper 0.23 g; Magnesium 0.96 g; Sodium 2.68 g; Manganese 7.21 g; Cobalt 0.03 g; Phosphorus 19.60 g; Selenium 0.003 g; Zing 0.16; Calcium 204.03 g

[d]By calculation

Animal management and feeding

Animals were housed individually for each treatment and had *ad libitum* access to feed, fresh water and a mineral block. Prepartum animals were fed concentrate (1.3% BW) and roughage (*ad libitum*) feeds separately while postpartum animal were fed total mixed ration (TMR) with concentrate to roughage (3% urea treated rice straw) at 70: 30. Concentrate, roughage (for prepartum) and TMR (for postpartum) were provided every day. Cow were milked twice daily (05.00 AM and 16.00 PM) by milking machine.

Sampling and analysis

The DMI of each animal was measured daily from 14 d before expected calving date until 60 DIM. Samples of the prepartum and postpartum diets were collected weekly, composited monthly, and analyzed for DM, ash, CP (AOAC, 1990). Milk production was recorded daily for each cow until 60 DIM.

Statistical analysis

Dry matter intake and milk yield were analyzed with the following model: treatment, parity, time (day), treatment × time. Data were analyzed separately for four periods, with the above model, that were deemed a priori to be physiologically important: the last 7 d prepartum, during which time DMI normally declines rapidly; the first 21 d postpartum, when cows rapidly increase DMI; the first 42 DIM, when cows are nearing peak milk yield; and the entire 60-d postpartum experimental period. Calculations were conducted by using the general linear models procedure of SAS (SAS, 1996).

RESULTS AND DISCUSSION

Animal fed with or without YAFECAP was not significant ($p>0.10$) for 7 d prepartum DMI. During the first 21, 42 or 60 d of lactation, animal fed with YAFECAP were significant ($p<0.05$) higher DMI than animal fed Control (Table 2). During the first 21 or 42 DIM, animal fed YAFECAP consumed 0.7 kg/d more DM ($p<0.05$) than cows fed Control. Improved DMI during the first 60 DIM, suggests that YAFECAP supplementation may be most efficacious during the transition period and in early lactation. Arambel and Kent (1990) suggested that Yeast culture might be best utilized by animals under stress. A possible explanation for this effect is that low DMI does not provide the microbial population with enough soluble growth factors, such as organic acids, B vitamins, and AA. Callaway and Martin (1997) suggested that Yeast culture provides soluble growth factors that stimulate growth of cellulolytic bacteria and cellulose digestion. Boonnop et al. (2009) reported that there was a remarkable increase in lysine content in the YAFECAP. On the basis of these previous results, we propose that YAFECAP may provide enough soluble growth factors for rumen microbe which leading to increase fiber digestion, which could increase rate of passage and therefore improve DMI.

Table 2 Least squares means for postpartum DMI by Holstein Frisian crossbred cattle fed control (Control) diet or yeast fermented-cassava chip (YEFECAP)

DMI	Treatment		Pooled SE	p	
	Control	YEFECAP		Treatment	Treatment × day
	(kg/d)				
Postpartum					
d 1 to 21	11.1	11.8	0.16	0.001	0.99
d 1 to d 42	11.6	12.3	0.10	0.001	0.42
d 1 to d 60	11.9	12.1	0.11	0.010	0.97

Mean daily milk yields during the first 60 DIM were significant ($p<0.05$) higher in YAFECAP than Control (Table 3). During the first 21 d of lactation, animal fed with YC tended ($p<0.1$) to have higher milk yield. Increasing of milk yield for animal fed YEFECAP may be a result of the increased DMI during the first 60 DIM. Based on these results, it is concluded that YEFECAP could be used as a portion of concentrate for dairy cows during the transition period and increased DMI postpartum and milk production.

Table 3 Least squares means for milk yield of Holstein Frisian crossbred cattle fed control (Control) diet or yeast fermented-cassava chip (YEFECAP)

Milk yield	Treatment		Pooled SE	p	
	Control	YEFECAP		Treatment	Treatment × day
	(kg/d)				
Postpartum					
d 1 to 21	12.6	13.2	0.28	0.090	0.44
d 1 to d 42	13.3	14.4	0.16	0.001	0.42
d 1 to d 60	11.9	12.3	0.11	0.001	0.98

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บทคัดย่อการเสนอผลงานแบบบรรยาย

"นักวิจัยรุ่นใหม่ พบ เมธีวิจัยอาวุโส สกว." ครั้งที่ 10

Physical Sciences / Biological Sciences / Engineering Sciences

วันที่ 14-16 ตุลาคม 2553
ณ โรงแรมฮอลิเดย์อินน์ รีสอร์ท รีเจนท์ บีช ชะอำ

สำนักงานกองทุนสนับสนุนการวิจัย
The Thailand Research Fund

สำนักงานคณะกรรมการการอุดมศึกษา
Commission on Higher Education

BIO: Biological Sciences

O-BIO-A: Agricultural and Animal Science

October 14, 2010
13:00 – 16:00
Room: ***Petchburi 1***

	Chairperson	Prof. Dr. Peerasak Srinives		
13:00 – 13:30	Invited lecture	Prof. Dr. Soottawat Benjakul		
13:30 – 13:45	O-BIO-A01	Iron and Zinc Fortification in Rice Grain through Parboiling Process	Chanakan Prom-u-thai	*33*
13:45 – 14:00	O-BIO-A02	Isolation of Antioxidative Peptides Prepared from Enzymatic Hydrolysates of Skipjack Tuna Visceral Waste	Akkasit Jongjareonrak	*34*
14:00 – 14:15	O-BIO-A03	Bioactive Compounds Produced by Endophytic Fungus *Pestalotiopsis* sp. PDB151	Boonsom Bussaban	*35*
14:15 – 14:30	O-BIO-A04	Cloning and Characterization of PmToll Receptor in *Penaeus monodon*	Wanchai Assavalapsakul	*36*
14:30 – 14:45		*Intermission*		
	Chairperson:	Prof. Dr. Mongkol Techakumphu		
14:45 – 15:00	O-BIO-A05	Replacing of Beef Tallow by Krabok Fat and Soybean Oil on Growth Performance and Energy Balance in Broiler Diets	Sasiphan Wongsuthavas	*37*
15:00 – 15:15	O-BIO-A06	Molecular Characterization of Antimicrobial Susceptibilities and Virulence Genes of Salmonella Enterica Isolates from Pork Meat and Humans	Rungtip Chuanchuen	*38*
15:15 – 15:30	O-BIO-A07	Economic Impact on Culling Rate of Sows	Annop Suriyasomboon	*39*
15:30 – 15:45	O-BIO-A08	Effects of Yeast (*Saccharomyces cerevisiae*) Fermented- cassava Chip Protein (YEFECAP) on Prepartum and Postpartum Intake and Milk Production of Holstein Fresian Crossbred Dairy Cows	Chamnanwit Promkot	*40*
15:45 – 16:00	O-BIO-A09	Relationship between Seminal and Serum Calcium Concentration with Semen Quality in the AsianElephant (*Elephas maximus*)	Sitthawee Thongtipsiridech	*41*

O-BIO-B: Biomedical Science

October 14, 2010
13:00 – 15:45
Room: ***Petchburi 2***

	Chairperson	Prof. Dr. Chitr Sitthi-amorn, M.D.		
13:00 – 13:30	Invited lecture	Visith Thongboonkerd, M.D.		
13:30 – 13:45	O-BIO-B01	Proteomic Analysis of Stones and Urines Obtained from Kidney Stone Patients	Chanchai Boonla	*42*
13:45 – 14:00	O-BIO-B02	Isolation of the Intact Membrane-Integral Dengue Viral Protease Complex NS2B-NS3 for Chemical and Structural Characterizations	Sarin Chimnaronk	*43*
14:00 – 14:15	O-BIO-B03	Improving the Binding Specificity of Designed Zinc Finger Protein on 2-LTR-Circle Junctions of HIV-1 Integrase Substrate by Molecular Dynamics Simulations	Supat Jiranusornkul	*44*
14:15 – 14:30	O-BIO-B04	The Change in Natural Anticoagulants and Coagulation Markers in Thalassemia Patients Following Stem Cell Transplantation	Nongnuch Sirachainan	*45*
14:30 – 14:45		*Intermission*		
	Chairperson	Prof. Pisake Lumbiganon, M.D.		
14:45 – 15:00	O-BIO-B05	Prevalence, Viremia and Specific Antibody Detection in Human Bocavirus Infection of Pediatric Patients with Lower Respiratory Tract Infection	Maitree Pakarasang	*46*

Effects of Yeast (*Saccharomyces cerevisiae*) Fermented- cassava Chip Protein (YEFECAP) on Prepartum and Postpartum Intake and Milk Production of Holstein Fresian Crossbred Dairy Cows

Promkot, C.[1*], Wanapat, M.[2]

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Abstract
The objective of this study was to evaluate effects of Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) on pre- and postpartum intake and milk protein production of dairy cattle. Twelve Holstein Frisian crossbred dairy cows were assigned to two treatments at 14 d before calving thought 60 d postpartum. The experimental treatment was concentrate feed with or without YEFECAP. Cattle was fed rice straw as main roughage and postpartum cattle was fed total mixed ration (TMR) with concentrate to roughage ratio at 70:30. The DMI was increased by YEFECAP during the first 42 d of lactation (12.3 vs. 11.6 kg).Total milk produced during the first 60 d of lactation tended to be higher in cow supplemented with YEFECAP than without (12.3 vs. 11.9). Based on these results, it is concluded that YEFECAP could be used as a portion of concentrate for dairy cows during the transition period and increased DMI postpartum and tended to increase milk production.

Keywords: dairy cow, pre-partum, postpartum, cassava, yeast

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บทคัดย่อการเสนอผลงานแบบโปสเตอร์

“นักวิจัยรุ่นใหม่ พบ เมธีวิจัยอาวุโส สกว.” ครั้งที่ 11

Physical Sciences / Biological Sciences / Engineering Sciences / Social Sciences

วันที่ 19-21 ตุลาคม 2554

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Commission on Higher Education

Poster Presentations

Technical Programs

Junior Researchers

PJ-PHY-H01	Quasinormal Modes of the 3+1 Dimensional AdS Reissener-Nordstrom Black Holes with Zero Sectional Curvature in the Maxwell Field Background and Holographic Conductivity	Suphot Musiri	*85*
PJ-PHY-H02	Effect of Reduced Dimensionality of the Magnetic Field Fluctuations on the Cross-Field Motion of Charged Particles	Piyanate Chuychai	*86*
PJ-PHY-H03	Constraints on f(R) Gravity from Cluster Number Counts	Khamphee Karwan	*87*
PJ-PHY-H04	Alpha Production in 175 MeV Neutron-Induced Reactions on Oxygen	Udomrat Tippawan	*88*
PJ-PHY-I01	Electrocatalysis of Ultrathin Gold Nanowires Supported on a Glassy Carbon Electrode	Chompunuch Warakulwit	*89*
PJ-PHY-I02	Synthesis of One-Dimensional ZnO Nanostructure via Precipitation Method and Its Optical Properties	Sumetha Suwanboon	*90*
PJ-PHY-I03	Investigation of Low-Cost Rear Surface Passivation for c-Si Solar Cells	Thipwan Fangsuwannarak	*91*
PJ-PHY-I04	Growth and Characterization of Dilute (In)GaAsN Quantum Wires Structures	Sakuntam Sanorpim	*92*

BIO: Biological Sciences

PJ-BIO

October 20, 2011
14:30 – 17:30
Room: ***Grand Sema Hall / Park View Hall***

PJ-BIO-A01	A Novel Multienzyme Complex from a Newly Isolated Facultative Anaerobic Bacterium, *Paenibacillus* sp. TW1	Chakrit Tachaapaikoon	*93*
PJ-BIO-A02	Strain Improvement of *Candida tropicalis* for Ethanol Production by UV-Mutagenesis	Sutticha Thammasittirong	*94*
PJ-BIO-A03	Purification and Molecular Characterization of the *azoR1* Gene Encoding Azoreductase from *Bacillus subtilis*	Montira Leelakriangsak	*95*
PJ-BIO-A04	Investigation of Nuclear Polyhedrosis Virus Infection in Thai Silkworm, *Bombyx mori* under Aseptic Rearing by PCR Method	Siripuk Suraporn	*96*
PJ-BIO-B01	Proteomic Analysis of Differentially Expressed Proteins in the Lymphoid Organ of *Vibrio harveyi* Infected *Penaeus monodon*	Kunlaya Somboonwiwat	*97*
PJ-BIO-B02	The Possible Role of Penaeidin5 from the Black Tiger Shrimp, *Penaeus monodon,* in Protection Against Viral Infection	Premruethai Supungul	*98*
PJ-BIO-B03	Characterization of a Novel C-Type Lectin Gene in the Black Tiger Shrimp, *Penaeus monodon*	Ratree Wongpanya	*99*
PJ-BIO-B04	A Comparative Study of Crustin*Pm1* and Crustin*Pm7* from the Black Tiger Shrimp *Penaeus monodon*	Kuakarun Krusong	*100*
PJ-BIO-B05	Study of Modifications that are Related to Maturation and Capacitation Processes of Sperm in *Macrabrachium rosenbergii* and *Penaeus monodon*	Rapeepun Vanichviriyakit	*101*
PJ-BIO-B06	Study of the Olfactory Neuronal Pathway and Its Function in Perception of the Reproductive Pheromones and Mating Response of *M. rosenbergii*	Charoonroj Chotwiwatthanakun	*102*
PJ-BIO-B07	Determination of Allergens from *Fenneropenaeus merguiensis* (Banana prawn)	Pharima Phiriyangkul	*103*
PJ-BIO-B08	Distribution and Changes of Serotonin and Dopamine Levels in the Central Nervous System and Ovary During Ovarian Maturation Cycle of the Pacific White Shrimp, *Litopenaeus vannamei*	Yotsawan Tinikul	*104*
PJ-BIO-C01	Effect of Yeast (*Saccharomyces cerevisiae*) Fermented-Cassava Chip Protein (YEFECAP) on Energy Balance in Postpartum Dairy Cows	Chamnanwit Promkot	*105*
PJ-BIO-C02	Dietary Beef Tallow, Soybean Oil and Krabok Oil on Growth Performance, Energy Balance, Digestion and Deposition of Fatty Acids in Broiler Chickens	Sasiphan Wongsuthavas	*106*

Effect of Yeast (*Saccharomyces cerevisiae*) Fermented-Cassava Chip Protein (YEFECAP) on Energy Balance in Postpartum Dairy Cows

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Abstract

The objective of this study was to evaluate effects of Yeast (*Saccharomyces cerevisiae*) fermented-cassava chip (YEFECAP) on energy balance of postpartum dairy cattle. Thirty two Holstein Frisian crossbred dairy cows were assigned to two treatments at 14 d before calving thought 60 d postpartum. The experimental treatment was concentrate feed with or without YEFECAP. Cattle was fed rice straw as main roughage and postpartum cattle was fed total mixed ration (TMR) with concentrate to roughage ratio at 70:30. The dry matter intake (DMI), milk yield and energy balance tended to be higher in cow supplemented with YEFECAP than without. On the basis of these results, we propose that YAFECAP may provide enough soluble growth factors for rumen microbe which leading to increase fiber digestion, which could increase rate of passage and therefore improve DMI and more energy balance. Based on these results, it is concluded that YEFECAP could be used as a portion source in concentrate feed for dairy cows during the transition period and tend to increase DMI, milk yield and more energy balance.

Keywords: energy balance, dairy cow, pre-partum, postpartum, cassava, yeast

BIO : Biological Sciences

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