

List of RGJ advisors 2023/2024

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 Keywords: Goat, Napier grass, Anthocyanin, Selenium, Antioxidant

Summary of research

Animal husbandry is being impacted by rising global temperatures, particularly in the case of open-system economic animals like sheep and goats. Renovating greenhouses is one key part, and managing food is another. Anthocyanin chemicals, which have antioxidant characteristics, are found in numerous local forage crops with second-order compounds, such as purple Napier grass. It contributes electrons. Thus, cells are shielded from damage by free radicals. When animals (goats), such free radicals greatly multiply. Stress is brought on by heat or high temperatures, particularly in the summer, whereas selenium is a component of enzymes that help to eliminate free radicals. Thus, at the cellular level, the combined action of anthocyanins and selenium is complimentary and benefits animal health. positively impact the output of meat goats by reducing stress. Farmers will be able to increase income and sustainably pursue a career in goat farming by managing goat farms, reducing feed expenses, and improving goat health costs. This study will be conducted using 24 Boer goats. Experiment was divided into *in vitro* and *in vivo* (animal) experiments. Thus, the purpose of this study was to utilize anthocyanin compounds from purple Napier grass in combination with selenium in meat goat feed to reduce free radicals, reduce stress, and yield efficiency in meat goats during the summer.

การกรอกรายละเอียดในแบบฟอร์มนี้ ต้องดำเนินการให้ครบถ้วนตามความเป็นจริง หากตรวจสอบพบว่ามี การปกปิดหรือเป็นเท็จ วช. ขอสงวนสิทธิ์ที่จะไม่พิจารณาสนับสนุนและจะเป็นผู้ไม่มีสิทธิ์รับทุน วช. เป็นเวลา ๓ ปี

### แบบเสนอโครงการวิจัย (Research Project)

ประกอบการเสนอขอทุนอุดหนุนการวิจัยของสำนักงานการวิจัยแห่งชาติ (วช.)  
โครงการปริญญาเอกกาญจนาภิเษก (คปก.) ภายใต้ความร่วมมือไตรภาคีไทย-สวีเดน  
ประจำปีงบประมาณ 2567

1. ชื่อโครงการวิจัย...การใช้ประโยชน์สารประกอบแอนโทไซยานินจากหญ้าเนเปียร์สีม่วง ร่วมกับซีลีเนียมต่อการต้านสารอนุมูลอิสระในพลาสมา และประสิทธิภาพการให้ผลผลิตในแพะเนื้อ ในช่วงฤดูร้อน (Utilization of anthocyanin compounds from purple Napier grass in combination with selenium on plasma antioxidant and yield efficacy in meat goats In the summer season)

2. ชื่อ-สกุล อาจารย์ที่ปรึกษา: รองศาสตราจารย์ ดร.ปราโมทย์ แพงคำ

Advisor: Associate Professor Dr. Pramote Paengkoum

หน่วยงาน สาขาวิชาเทคโนโลยีการและนวัตกรรมทางสัตว์ สำนักวิชาเทคโนโลยีการเกษตร มหาวิทยาลัยเทคโนโลยีสุรนารี

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3. กลุ่มสาขาวิทยาศาสตร์พื้นฐานที่สมัคร (เลือกเพียง ๑ กลุ่ม)

ชีววิทยา (Biology)     เคมี (Chemistry)

ฟิสิกส์ (Physics)     คณิตศาสตร์ (Mathematics)

4. ผู้ใช้ประโยชน์ (Research stakeholders)

Yes...1) Dan Khun Tod Agricultural Cooperative Limited 2) Non-Sung Agricultural Cooperative Limited 3) Zahira Farm

No

5. คำสำคัญ (Keyword) ของโครงการ แอนโทไซยานิน (anthocyanin), หญ้าเนเปียร์สีม่วง (purple Napier grass), ซีลีเนียม (selenium), สารอนุมูลอิสระ (anti-oxidant), ช่วงฤดูร้อน (summer season)

6. ความสำคัญและที่มาของปัญหาที่ทำการวิจัย (Problem statement and significance of research)

Rising global temperatures are affecting animal husbandry, especially in open-system economic animals such as goats and sheep. Renovation of greenhouses and another important aspect is food management. Many local forage crops with second-order compounds, such as purple Napier grass, contain anthocyanin compounds, which have antioxidant properties. It serves to donate electrons. This prevents free radicals from destroying cells. Such free radicals increase to a high extent when animals (goats). Stress is due to heat or high temperatures, especially during summer, while selenium is an element that is an element of enzymes that is responsible for the elimination of free radicals. The joint function of anthocyanins and selenium is therefore complementary at the cellular level and has a positive effect on animal health. Reduce stress and positively affect the productivity of meat goats. Farmers will be able to reduce goat health costs, reduce feed costs, and manage goat farms, allowing farmers to earn more income and sustainably pursue a career in goat farming.

#### 7. ทฤษฎี/สมมุติฐานของโครงการ (Hypothesis)

Purple Napier grass has a high share of secondary compounds, anthocyanins, and tannins. The compound plays an anti-oxidant role which is good for animal health, and especially if the animal is under stress, such as stress due to hot weather, environment, health, high-yielding animals, and unbalanced diet, etc. Selenium is also involved in the function of enzymes responsible for the elimination of free radicals, as well as the reproductive system of animals. Integration with anthocyanins from purple Napier grass is expected to reduce anti-oxidants in plasma and can reduce heat stress during the summer. This results in a better improvement in yield efficiency in goats.

#### 8. วัตถุประสงค์ของโครงการ (Objectives)

The purpose of this study was to utilize anthocyanin compounds from purple Napier grass in combination with selenium in meat goat feed to reduce free radicals, reduce stress, and yield efficiency in meat goats during the summer.

#### 9. การทบทวนวรรณกรรม/ผลงานวิจัยที่เกี่ยวข้อง (Literature Review)

The body of an organism with a natural balance between free radical generation induced by regular metabolic processes of cells and anti-oxidants inside the animal's cell to operate to avoid the accumulation and harm cells. Animals such as milk supply and during pregnancy are more vulnerable to oxidative stress. This scenario is exacerbated when environmental factors such as

food and physiological conditions are considered (Castillo et al., 2005). When the number of free radicals in the cell surpasses the antioxidant, such as vitamins and a set of enzymes that act as antioxidants, etc., resulting in free radical cell damage. This condition will have a negative impact on dairy goat milk output and milk composition. It is vital to obtain an antioxidant supply. Antioxidants contained naturally in many foods are classified into two types. The first category includes vitamins (A, B, C, and E) and minerals (Zn, Cu, and Se). The second group includes phenols and flavonoids, which are secondary metabolites found in plants (Bellville-Nabet, 1996).

Anthocyanin (pigments) can be found in plant flowers and fruits. Anthocyanin is a flavonoid present in agricultural crops such as grapes, strawberries, berries, corn, and grass, among others. Anthocyanin comes in a variety of colors, including purple, red, and blue, and is water soluble. Many studies have focused on this anthocyanin because it possesses antioxidant qualities, which make it useful in preventing chronic diseases such as coronary heart disease. (Cardiovascular disease), cancer, and diabetes (Konczak and Zhang, 2004; Lule and Xia, 2005), antioxidants may be an alternate strategy to regulate the oxidation process and improve animal performance.

This research aims to study the use of Purple Napier grass in combination with selenium in meat goat feed to reduce free radicals, reduce stress, and yield efficiency in meat goats during the summer.

## 10. ระเบียบวิธีวิจัย (Methodology)

### Experiment 1: *In vitro* gas production study

Purple Napier grass which is fresh and silage from the experiment will be used for the study. During the incubation, the total gas production will be measured at 0, 2, 4, 6, 8, 10, 12, 24, 36, 48 and 72 h. Net gas production values will be corrected by subtracting blank values from the samples. The cumulative gas production data will be fitted to the model of Orskov and McDonald (1979) as follows:  $Y = a + b(1 - e^{-ct})$ ; where  $Y$  = the cumulative gas production,  $a + b$  = the potential gas production,  $t$  = time,  $c$  = the rate of gas production (/h).

### Experiment 2: Effect of Napier grass silage supplement with selenium in meat goats.

Four treatments such as T1= Napier, T2=Napier+Se, T3= Purple Napier, T4= Purple Napier+Se. Twenty-four male Boer goats (approximately 18.0 kg average body weights) will be used as randomly assigned as RCBD to receive four dietary treatments.

Sample of offered and refused feeds and feces will be collected and used for DM, ash, ether extract (EE) and crude protein (CP) using the standard methods of AOAC (1995) and NDF and ADF (Van Soest et al., 1991). The anthocyanin will be quantified by measuring its optical density at 525 nm, with cyanidin-3-glucoside as a standard by the pH differential method (Lee et al., 2005), using a spectrophotometer (Mazza et al., 2002).

Rumen fluid samples will be measured pH immediately and subsequently quantifying NH<sub>3</sub>-N and volatile fatty acids (VFAs) concentration. Ruminant fluid sample will be used for extracted for community DNA analysis quantitative of microbial population (Braune et al., 2001; Hidalgo et al., 2012).

Blood samples will be determining blood urea nitrogen (BUN) concentration according to Crocker (1967). The plasma metabolite concentrations and enzyme activities, the total antioxidant status (TAS), total glutathione (GSH) and superoxide dismutase (SOD) will be determined commercially available kit according to (Hosoda et al., 2012b).

The data in this experiment will be analyzed using ANOVA by the general linear model procedure of SAS (SAS, 2002).

**11. ผลผลิต (Output) ผลลัพธ์ (Outcome) และ ผลกระทบ (Impact) ที่คาดว่าจะได้จากการวิจัย**

**Output:** Evaluate effect of anthocyanin from Purple Napier grass on blood antioxidant activity and productivity performance of goats.

Outcomes	Impacts
1. Enrich- anthocyanin from Purple Napier grass supplement with Se can improve productivity and blood antioxidant activity in goats	1. The farmers can improve productivity of meat goat. 2. The farmers can decrease the cost of goat diets 3. More beneficial in overall dairy goat farm
2. Publications	- international journals (ISI, Scopus, Q1-2) 3 papers - international conferences 3 papers
3. Graduate students	- 1-2 Ph.D. student and - 2-3 undergrad students (Special problems)
4. Transfer technology	- Transfer technology to the farmer 50 persons/year