*IOSR Journal Of Agricultureand Veterinaryl Science (IOSR-JAVS)*
*e-ISSN:2278-3008, p-ISSN:2319-7676. Volume 15, Issue 1 Ser. IV (Jan –Feb 2020), PP 18-22*
*www.Iosrjournals.Org*

# Products Frompineapple Varietysmooth Cayenne (*Ananáscomosus*) As an Alternative Food for Fattening Bullocks in Tropical Regions

A. Cabrera-Núñez[*1], M.A.Lammoglia-Villagómez, C.E. Martínez-Sánchez, F. M. Montero-Solís, R. Rojas-Ronquillo and S.A. Alarcón-Pulido.
*Facultad de CienciasBiológicas y Agropecuarias,*
*Universidad Veracruzana,Tuxpan, Veracruz, México*

***Abstract:*** *This work was undertaken in a livestock production system (LPS) in the south of the state of Veracruz in the municipality of Villa Isla. The aim was to introduce by-products from the smooth cayenne (Ananascomosus) pineapple strain for feeding bovines in the tropical area of Veracruz and assess their weight gain, using a confined system. 30 Cebu x Swiss calves with an approximate weight of 300 kg were assessed; assigned to three treatments in a completely random design; T1: concentrate without pineapple by-product, T2: diet formulated from pineapple + fresh fodder and T3: diet formulated from a base of pineapple crown leaves + fresh fodder. All foods included sorghum, soybean paste and mineral salt. The food was offered twice a day with free access, at a rate of 3% of live weight for 60 days, weighing twice; at the beginning and at the end. The average daily gain (p≤0.05) was 2.25 kg (T2) and 3.06 kg (T3) kg/animal respectively. Results indicate that supplementation with by-products based on pineapple crown at 11% CP promoted greater yield in fattening production.*

***Keywords- By-products, pineapple, weight gain, production.***

---

Date of Submission: 12-02-2020 Date of Acceptance: 28-02-2020

---

## I. Introduction

Generally, farmers and nutritionists use very large amounts of cereal grains, fattening agents and palm oils in rations, in order to increase the energy density of the diet, which simultaneously increase production costs, making the business less efficient and profitable because of the cost of these inputs. In order to reduce production costs, improve feed conversion and reduce food consumption at the feeder, a number of agro-waste productsare being utilized (Ajila*et al*., 2012 andWadhwa y Bakshi, 2013).

Because of societiesenvironmental concerns, agribusiness must be sensitive to environmental issues, aiming towardsgreater social conscience, which prohibits production at the expense of the planet (Acero, 2005). Instead, this sustainable strategy, contemplates that agro-industrial by-products, generated in the growing area and those derived from its management and commercialization, constitute a serious waste problem (Rebolledo*et al*., 2006).

Pineappleis the third tropical fruit of economic importance in the world, its production worldwide from 2010 - 2017, was from 21.6 to 27.4 million tons of fresh fruit, withCosta Rica, Philippines, Brazil, Thailand and China representing the main producing countries,comprising 55% of total production (NRC, 2007 and TAPP, 2013).as a nutrient with 100% energy required according to National Research Council (NRC) (Wadhwa andBakshi, 2013 and NRC, 2007).

Alongside expansionof thecultivated area and sales of this product, there has been an increase in the by-products obtained from this crop, to include the entire plant, the stubble (plants without roots), the crowns, the stems, the husks, the pulp and the heart; materials with high potential use for feeding ruminant animals.established that each hectare of pineapple crop harvested, leaves behind between 200 and 250 tons of green material (entire plant) that is notmade use ofbut has potential to be used for feeding ruminants(Lopez *et al*.,2014).

Investigations (Gutierrez *et al.,* 2003), in Costa Rica, show that by-products from the pineapple crop have a nutritional composition similar to fodder used in livestock systems that can be conserved for later use, implementing the silage technique. Similarly, works carried out in production systems in Brazil, Ethiopia, Malaysia, Romania and the United States amply recommend the use of pineapple by-products for feeding ruminant animals (Dhanasekaran*et al*., 2011).

In recent years, pineapple production has been expanding rapidly in the southern area of the state of Veracruz, estimating a total of 22,500 hectares (SIAP, 2018).These types of areas have been facing problems with this crop, related to inadequate agronomic management practices and contamination derived from pesticides, affecting water sources and causing proliferation of the stable fly (*Stomiasiscalcitrans*), associated with damage to the health of animals(CANAPEP, 2011).

Alternative feed from by-products destined for bovines is an option open to farmers, who aim to improve weight gain amongconfinedcattle. In this case, foods based on pineapple by-products can be used during any season of the year (Sanchez, 2006). Regarding its nutritional composition, most pineapple by-products are characterized by their high energy content, measured astotal digestible nutrients (> 59 mcal).

Foliage, comprising the crown and bagasse from pineapple is consumed by cattle, which can be collected in a juicer 3 to 4 times a week during any season, because it is a fruit that is sown all year round in the southern zone of the state of Veracruz. It is generally supplied on the same day/week as it is collected. The surplus can be stored for up to 6 months, although it loses nutritional value if not protected from humidity and high temperatures (Banik*et al*.,2011).

The bagasse from pineapple collected in a juicer is crushed and this is the most advisable way to obtain it. The crown of the pineapple is complete and can be consumed as such. Large quantities can be housed on a cool and dry floor (2-4 wide) with the base and edges covered to avoid contamination from soil. For animals older than one year, pineapple bagasse can be in the form it is received and the crown can be chopped into small pieces (less than 2cm in diameter) to avoid esophageal obstruction in young calves (López *et al* ., 2014).

By-products from pineapple (pineapple crown and bagasse) recommended for confined cattle can be administered alone or in combination with other supplements (corn, sorghum poultry, soy, among others) in case of pineapple crown, molasses can be added to improve palatability and increase productive yield(Adegbite and Adeoye, 2014).

For this reason, this research workwill reveal whether by-products derived from pineapple can provide a nutritional alternative to improve weight gain in confined cattle in farms of the southern zone of Veracruz, wherecritical environmental conditions such as drought and excess humidity preside.

## II. Material and Methods

This research was developed in a Livestock Production System (LPS) in the south of the state of Veracruz in the municipality of Villa Isla, geographically located at the meridians 18º 01'45 "north latitude and 95º 31'35" west longitude, at an altitude of 60 meters above sea level and with an average annual temperature of 24.9ºC.

We used 45 Zebu x Swiss roes, weighing approximately 300 kg, which were assigned to three treatments, according to a completely randomized design (n = 15 C / U). T1 (control) fresh fodder with no pineapple by-product; T2: concentrate formulated from pineapple bagasse at 4.18% CP + fresh fodder and T3: concentrate formulated from base of pineapple crown with 8.20% CP + fresh fodder.

This was supplied in the form of dry matter, twice a day at a rate of 3% of live weight Elias (1997) during the 60 days that the experiment lasted. On average, food consumption corresponded to 13 kg/animal. Treatment rations were offered in 3 stages, comprising initiation, transition and completion.

The initiation stage lasted 8 days and the ration consisted of 100% fresh star grass fodder (*Cynodonplectostachium*). The transition stage lasted 8 days and was made up of 50% fodder and 50% concentrate with nopineapple by-product. However, duringthe 74-day completion stage, free access to green fodderconsisted of 17% concentrate and 83% pineapple by-product (Table 2 and 3).

Animal management consisted of vaccination, deworming, taggingwith an earring and the intramuscular application of vitamins A, D and E. Variations in animal weight were recorded at fortnightly intervals. Data were processed using the statistical package, SPSS version 10, applying analysis of variance and differences between treatments were detected using the Duncan test. Level of significance was 5%.

Nutritional values were analyzed using the Van Soest and Wine method (AOAC, 1995).Animal management consisted of vaccination, deworming, tagging with an earring and the intramuscular application of vitamins A, D3 and E. Variations in the weight of the animals were recorded monthly.

For the preparation of concentrate for treatments (Table T2 and T3), pineapple by-product was collected in a juicer located in the Municipality of Isla, Veracruz. To facilitate mixing of the ingredients, the 83 kg of pineapple bagasse (T2) and 83 kg of pineapple crown leaf (T3) were separately placed on stretched canvases, to which wereadded soybean paste (5kg), ground sorghum (10kg), vitamins and minerals (2kg). The ingredients were mixed carefully to producehomogeneous feed. The food supplement was prepared daily, and administered morning and evening.

## III. Results and Discussion

There is information which shows (Van Soest and Wine, 1967) that in terms of nutritional levels, pineapple by-products havehigh energy content. With a total of Total Digestible Nutrients, TDN, that exceeds 59%, a content of dry matter of 21% and crude protein of 11.0%.

The values obtained from the bromatological analysis for pineapple by-products (Table 1), showed that pineapple crown leaves presented a slightly higher protein value (8.20%) as well as fiber (30.80%) and TDN (63.78 mCal). As for T2, this was lower,witha protein value of 4.18% and a TDN of 63.78%.

Crude protein concentration for peel aloneis similar to that for most cut grasses (King grass, Cameroon, Tanzania) and lower than that presented by the majority of tropical grazing pastures (Kikuyo, African Star, Ryegrass).

The experimental rations used in this investigation (Table 2 and 3) showed significantly different values for Crude Protein (CP),resulting in varied outcome in terms of animal weight, depending on treatment.

However, the nutritional values for the experimental concentrate complied with the nutritional recommendations from the NRC (2007) for confined livestock,with 8-14% of Crude Protein (CP).

The productive behavior of the animals in the treatments (Table 4), in relation to weight gain/day was significantly higher ($p\neg \leq 0.005$) in the T3 group with 3.06 kg and 2.25 kg (T2) respectively.These differences were due to the nutritional contribution and the effect of the inclusion of leaf from the smooth cayenne (*Ananas comosus*) pineapple strain as a protein source for feeding stabled bullocks, effecting food consumption and gains in live weight.

Compared with the control, we anticipated that the bullocks that received the pineapple by-products would respond better in terms of the variable indicatingcumulative daily weight gain,because these animals had their nutritional requirements satisfied (Table 4). Cumulative weight gain during the 60 days for the 15 bullocks,complemented with pineapple crown leaf, was 184.0 kg,whereas the pineapple bagasse treatment was significantly lower with 135 kg,and the control group only gained 87 kg.

Pineapple by-products can be supplied to all stabled cattle, in both fresh and silage form, because it has mid-level nutrients, compared to commonly used fodder and other feed supplied under tropical conditions.

When pineapple by-products are mixed with protein nutrients and/or hay they can be successfully conserved despite their high moisture content, and likewise the inclusion of soybean paste, harinoline, urea or pollinaza among other foods, will improve the crude protein content, with the benefits that this entails. Pineapple peel can be made into silage on its own, or combined with some protein food and/or hay for a period of six months without significantly affecting the most important nutritional components.Notably, animals that received pineapple bagasse with 4.18% crude protein manifested a lower increase in kilos compared to treatments supplemented with pineapple crown leaf strainsmooth cayenne (*Ananas comosus*),where a significantly higher response was evident ($p \leq 0.005$).

This relates to that reported (Sanchez, 2006), stating that daily production per animal is determined by a combination of factors that include availability and quality of food (energy-protein supplementation), and also the appetite and genetic potential of the animal. Currently, in the context of nutrition of beef cattle meat producers, not only is protein important, as the level and quality of energy is fundamental in the productive response of animals,but it is also the key to achieving the greatest profits in any livestock production system under confinement conditions (Lopez *et al*., 2014).Notably, energy provides the body with the capacity to work, produce and reproduce. In rations for fattening cattle, energy is required for activities such as growth and maintenance; so energy is a nutrient required by livestock in large quantities. Cellulose and hemicellulose are the primary sources of energy in fodder, and in grains comprisingstarch. Fats and oils have higher energy content but are usually added to the diet in small amounts.

The palatability of food plays an important role in the consumption of ruminants, as notably changes that occur in the food have a direct effect, drastically altering the taste, smell, resistance and resulting in decreasedfoodconsumption (Elkholy*et al*., 2009). This research work demonstrated that although both rations were equally palatable, being two varieties of pineapple by-products, similar nutrient supply was not obtained, due to the low percentage of protein present in pineapple bagasse.

In terms of response to treatments, T3 showed the best response, where greater body weight gain was observed, compared to TI and T2. The superior weight gain observed among bullocks fed with smooth cayenne (*Ananascomosus*) pineapple crown leaf strain was due to a better protein nutritional contribution (11.9%) that was formulated to cover the nutritional requirements of the bullocks.

One should also mention that the animal race, physiological stage, individual behavior of each animal, size of the animal and its appetite significantly influence the consumption of the smooth cayennepineapple leaf food, affecting nutrient intake requirements. Growing animals change their consumption to adjust to their daily requirements (Ajila*et al*., 2012).

## IV. Conclusion

The use of the pineapple (*Ananascomosus*) crown leaf in the diet of ruminants is an alternative for livestock, because of the nutritional and energetic contribution it makes to animal feed.

Within strategic supplementation, the food based on smooth cayenne (*Ananas scomosus*) pineapple crown leaf strain is a strategy for ruminants in confinement, not only during periods of drought, but also as a supplement providing essential nutrients that can improve the efficiency of utilizing this fruit during periods of relative abundance.Its ready availability in the southern area of the state of Veracruz makes it an easily adopted practice for producers in this tropical region.

## References


[1]. Adegbite O.; Oni, O.; and Adeoye, I.(2014). Competitiveness of pineapple production in Osun State, Nigeria. Journal of Economics and Sustainable Development 5(2): 205-214.

[2]. Acero, M.S. (2005). Food products and byproducts for ruminants in confinement. First Edition. Editorial Ocean. Mexico. D. F. P. 23-33.

[3]. Ajila, S.K.; Brar, M.; Verma, R. D.; Tyagi, S.; Godbout andValéro, J.R. (2012). Bio-processing of agro-byproducts to animal feed, Critical Reviews in Biotechnology, 32:4, 382-400, DOI: 10.3109/07388551.2012.659172.

[4]. AOAC.(1995). Official Methods of Analysis. Ass. Agric. Chem. 16th Ed. Washington, D.C.

[5]. Banik, S.; Nag, D.; and Debnath, S.(2011). Utilization of pineapple leaf agro-waste for extraction of fibre and the residual biomass for vermicomposting. Indian J. Fibre Text. Res. 36:172-177).

[6]. CANAPEP (NationalChamber of PineappleProducers and Exporters). (2018).https://canapep.com/wp-content/uploads/2018/06/pina-de-cr-29.pdf

[7]. Dhanasekaran, D.; Lawanya, S.;Saha, N.; Thajuddin, and Panneerselvam, A.(2011). Production of single cell protein from pineapple waste using yeast. Innovat. Rom. Food Biotechnol. 8:26-32.

[8]. Elias, A. (1997). Advances and perspectives in the transformation of organic residuals into food. Meeting on Monogastric animals. Institute of Animal Science, Havana. Cuba. P. 218.

[9]. Elkholy, M.; Hassanein, E.; Edrees, N.; Eleraky,, W.; Elgamel M.;Ibraheim D. (2009). Nutritional aspects of recycling plants by-products and crop residues (corn stalk) in sheep. Pakistan Journal of Nutrition 8 (12):1834-1841.

[10]. Gutierrez, F.A.; Rojas, H.; Dormond, M.; and R. WingChing. (2003). Nutritional and fermentation characteristics of silage mixtures of pineapple and poultry waste. Agron. Costa Rican 27 (1): 79-89.

[11]. López, M.;WingChing-Jones, R.; and Rojas, A. (2014). Fermentation and nutritionalcharacteristics of pineapplestubblesilaging (Ananascomosus).Agron. Mesoam. 25(2):383-392

[12]. https://studylib.es/doc/6634958/meta-an%C3%A1lisis-de-los-subproductos-de-pi%C3%B1a--ananas

[13]. National Research Council (NRC). 2007. Nutrient requeriments of dairy cattle. 7 ed. National Academy Press, Washington DC., USA.

[14]. Rebolledo, A., Pérez; Rebolledo, I.; and Becerril, A.E. (2006). Yield and fruit quality of pineapple cultivars in plantation densities. Rev. Fitotec. Mex. 29:55-62.

[15]. https://studylib.es/doc/6634958/meta-an%C3%A1lisis-de-los-subproductos-de-pi%C3%B1a--ananas

[16]. Sanchez, J. (2006). Nutritional value of forages in Costa Rica. Bulletin Center for Animal Nutrition Research. University of Costa Rica. Costa Rica.

[17]. Servicio de Información Agroalimentaria y Pesquera (SIAP). (2018). Producción de la agricultura mexicana. https://www.gob.mx/siap/acciones-y-programas/produccion-agricola-33119

[18]. Tanzania Agriculture Productivity Program(TAPP). (2013). Market trends for pineapple. Market survey. USDA, Tanzania, Africa.

[19]. https://studylib.es/doc/6634958/meta-an%C3%A1lisis-de-los-subproductos-de-pi%C3%B1a--ananas

[20]. Van Soest, J.P. y Wine, R.H., 1967. Use of detergents in analysis of fibrous feeds. LV. Determination of plant cell wall constituents, *J. of the A.O.A.C.* 50:50.

[21]. Wadhwa, M.; Bakshi, M. P. S.; 2013. Utilization of fruit and vegetable wastes as livestock feed and as substrates for generation of other value-added products. (H. Makkar, Ed.) (p. 68). Italia, Roma.


**Table1.** Nutritive value of pineapple by-products

| Indicator | Pineapple bagasse food | Food based on pineapple crown leaf |
|---|---|---|
| Crude protein (%) | 4.18 | 8.20 |
| Ethereal Extract (%) | 3.10 | 5.96 |
| Nitrogen-free extract (%) | 74.61 | 47.18 |
| Ashes (%) | 3.30 | 7.92 |
| Crude fibre (%) | 14.92 | 30.80 |
| Total digestible nutrients (TDN/ Mcal) | 60.39 | 63.78 |

Source: Lab. Bromatología Animal /2018

**Table 2.** Nutritive value of concentrate

| Ingredients | Kg | PC | Total CP |
|---|---|---|---|
| Pineapple bagasse | 83 | 4.18 | 8.44 |
| Soybean paste | 5 | 40.00 | 2.00 |
| Ground sorghum | 10 | 9.00 | 0.80 |
| Vitamins and minerals | 2 | - | - |
| Total | 100 | | 11.20 |

Source: Lab. Animal Bromatology /2018

**Table 3.** Nutritive value of concentrate

| Ingredients | Kg | CP | Total CP |
|---|---|---|---|
| Pineapple crown leaf | 83 | 8.20 | 9.13 |
| Soybean paste | 5 | 40.00 | 2.00 |
| Ground sorghum | 10 | 9 | 0.80 |
| Vitamins and minerals | 2 | - | - |
| Total | 100 | | 11.90 |

Source: Lab. Animal Bromatology /2018

**Table 4.** Productive parameters among stabled bullocks

| Indicator | T1 | T2 | T3 |
|---|---|---|---|
| Inicial weight (Kg) | 300 | 300 | 300 |
| Final weight Kg) | 387 | 434 | 484 |
| Kg. gained/animal 60 days/group | 87 | 135 | 184 |
| Gain in weight/day (kg) | 1.45 | 2.25 | 3.06 |

Source: Own data/2018

A. Cabrera-Núñez, etal. "Products Frompineapple Varietysmooth Cayenne (Ananáscomosus) As an Alternative Food for Fattening Bullocks in Tropical Regions". *IOSRJournal Of Agricultureand Veterinaryl Science (IOSR-JAVS)*, 15(1), (2020): pp. 18-22.