RESEARCH ARTICLE

EFFECT OF THE INCORPORATION OF REJECTS OF CASHEW NUT KERNELS IN SOWFEED ON THE CHEMICAL COMPOSITION OF MILK

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Abstract

In order to obtain more and more resistant piglets during lactation, this experiment was set up. Its objective was to assess the quality of the milk produced by the sow after the use of new agricultural by-products in the feeding of lactating sows. Thus, downgraded almonds were introduced into the diets. Three types were formulated and tested on three separate lots of 10 sows [(Large White x Pietrain) X (Landrace x Duroc)] each. These diets consisted of 0, 6 and 9% downgraded almonds. Releases of cashew kernels in the food ration had no significant effect on the dry matter, protein content of colostrum 1, 2, 3 and milk. In contrast, the use of 9% cashew kernel rejects significantly increased (P <0.05) the proportions of lipid in colostrums and in milk. The lipid contents increased by 1.07%; 1.01%; 1.05% and 1.10% respectively for colostrums 1, 2, 3 and milk. These higher lipid proportions could increase the organic energy level of piglets and make them more resistant to microbial attack.

Introduction:

Piglets under mother are often less resistant due to the low quantity and quality of breast milk. Also, the feed consumed by the sow can influence the composition of her milk and have an impact on the welfare of piglets. A diet rich in lipid administered to pregnant and lactating sows leads to an increase in the lipid content of colostrum (Pettigrew, 1981; Le Dividich et al., 1991; Quiniou et al., 2006) and improves growth rate piglets in maternity (Quiniou et al., 2000). In pigs the fatty acid profiles in the blood and tissues of suckling piglets are dependent on the type of fat fed to the sow (Farmer et al., 2008). There is thus a close relationship between the level and composition of fatty acids in the maternal diet and that of the tissues of the piglet at birth (Gerfault et al., 1999). The rate and composition of fatty acids in the feed of lactating sows will therefore define the proportion and composition of lipids in colostrum and in the sow's milk. Downgraded cashew kernels have a high proportion of fat (43%), unsaturated fatty acids (around 78%) and protein (17%) (Lacena, 2013). They are an agricultural by-product regularly used in animal feed in Côte d'Ivoire. Introduced in pig feed in floury form, their effect has been evaluated in growing and finishing animals (Yao et al., 2013 and 2016) and on the reproductive performance of females (Yao et al. 2019). In addition, these almonds could influence the level and composition of milk lipids when introduced into sow feed. The aim of this present work is to determine the effect of downgraded cashew kernels on the biochemical composition of sow's milk.

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Material and Methods:
The study aims to assess the impact of cashew kernel rejections on the biochemical composition of milk from lactating sows.

Animals and food:
Thirty (30) pregnant sows from a cross (Large White x Piétrain) x (Landrace x Duroc) were selected and divided into three batches of 10 according to the established diets. The lots were identified as lot0, lot6 and lot9. These sows were fed ad libitum after farrowing for lot0 with the control ration L0 containing no cashew kernel suckers (Table 1). Those from lot6 with the lactation ration L6 with 6% rejects cashew kernels and those from lot9 received the lactation ration L9 with 9% rejects cashew kernels. The duration of the tests is 6 weeks. For this experiment, two food distributions were made during the day. The first distribution took place at 8 am after the 1st cleaning of the boxes and the second distribution at 2 pm, following the 2nd cleaning of the day. An eight-day feed transition was observed to better prepare the sows for the new lactation diet.

Table 1: Composition of lactation diets (g / 100 g).

| Ingredients          | L0  | L6  | L9  |
|----------------------|-----|-----|-----|
| Cashew almond        | 0   | 6   | 9   |
| Maize                | 59  | 53  | 50  |
| Wheat bran           | 5   | 5   | 5   |
| Rice flour           | 6   | 6   | 6   |
| Copra oilcake        | 15  | 15  | 15  |
| Soybean oilcake      | 6   | 6   | 6   |
| Fish meal            | 6   | 6   | 6   |
| Seashell             | 1,5 | 1,5 | 1,5 |
| Salt                 | 0,5 | 0,5 | 0,5 |
| Pig premix           | 1   | 1   | 1   |
| Totals               | 100 | 100 | 100 |

Chemical composition (%):

|               | L0  | L6  | L9  |
|---------------|-----|-----|-----|
| Dry matter    | 89,4| 90,5| 89,7|
| Protein       | 16,34| 16,48| 16,62|
| Fat           | 4,44 | 6,5 | 7,88|
| ADF (Fibers)  | 4,82 | 4,72 | 4,68|
| Calcium       | 0,95 | 0,92 | 0,90|
| Total phosphorus | 0,55 | 0,53 | 0,52|
| Saturated fatty acids | 25,0 | 22,0 | 20,1|
| Monounsaturated fatty acids | 63,3 | 65,0 | 65,7|
| Polyunsaturated fatty acids | 9,0 | 11,2 | 13,0|
| Metabolisable energy | 2951,7 | 3030,23 | 3080,5|

Health monitoring during gestation and lactation:
At the start of lactation, preventive antibiotics (Oxytetracycline 20%) and vitamins (Provit) were administered to sows at the start of lactation. The teats were sanitized with germicide (solution 1% iodophor) and 70% ethyl alcohol before any sampling.

Determination of the biochemical composition of milk and colostrums:

Disinfection of udders and teats:
The udder and more specifically the teats were dry cleaned prior to sample collection by brushing the surface with a dry towel. After having immobilized the sows, a few streams of milk were drawn and eliminated in order to reduce the number of bacteria present in the duct of each teat. The teats were soaked in QUARTER MATE® Germicide (1% iodophor solution) for approximately 30 seconds then patted dry with a dry papertowel. The end of each teat was then rubbed vigorously with a cotton swab moistened (but not soaked) with 70% ethyl alcohol. Alcohol has been the antiseptic of choice because it evaporates quickly and leaves no bactericidal residue in the milk sample. A new pad was used for cleaning each teat. Rubbing was continued until the surface of a new pad became clean. In order to
avoid recontamination of the teats, rubbing was done from the teats furthest from the udder to the closest (Lachance, 2010).

**Sample:**
A flask used for collecting the milk samples, a rack and a cooler at 5 °C for storing the samples were used. Colostrum and milk samples were taken from the sows (after oxytocin injections). When the first was born, colostrum 1 (COL1) was taken. After the last piglet, it was colostrum 2 (COL2). The day after farrowing, colostrum 3 (COL3) was taken, 2 weeks after farrowing, the milk (MILK) was collected. A strictly aseptic procedure was followed for the collection of colostrum and milk samples in order to avoid contamination of the udder by the numerous microorganisms present on the skin of the sides, udder and teats of the sow as well as on the hands of the sampler and in the barn. To eliminate the risk of contamination during sampling, the udders and teats were disinfected beforehand before the actual milk collection (Devillers et al., 2007). Two sets of samples were taken, the teat tips were rubbed a second time after the first sample was taken and before the second was taken. The closest teats were collected first to reduce the risk of teat contamination during milk collection. The cap of the 10 cm high, 15 mL capacity POTS TUBES ROLLERS® vial was removed, and without touching its inner surface, it was oriented downward. The teat was oriented horizontally and the stream of milk was directed into the bottle. Samples of approximately 10 mL of milk were taken. The vials were then recapped as quickly as possible to reduce the risk of contamination (Klobasa et al., 1987).

**Analysis of samples:**
The samples once taken were placed and stored in a cooler at 5 °C. In the laboratory, bromatological analyzes on these samples were immediately carried out. The dry matter, total protein and fat contents were determined.

**Statistical analysis**
Biochemical compositions of colostrum and sow's milk were analyzed by ANOVA (analysis of variance) using STATISTICA 7.1 software. Tukey's test was used to compare the means of impact of downgraded cashew kernels.

**Results:**
The use of rejects of cashew kernels in food rations has no significant effect on the dry matter, protein contents of colostrum 1, 2, 3 and milk. The average dry matter and protein contents are respectively 24.30 ± 0.50 and 16.25 ± 0.51 for colostrum 1, 23.33 ± 0.70 and 14.80 ± 0.55 for colostrum 1, 21.45 ± 0.63 and 8.83 ± 0.70 for colostrum 3, and 19.70 ± 0.35 and 5.1 ± 0.08 for milk. In contrast, the use of 9% cashew kernel rejects significantly increased (P <0.05) the proportions of lipid in colostrums and in milk. The lipid contents increased by 1.07%; 1.01%; 1.05% and 1.10% respectively for colostrums 1, 2, 3 and milk (Table 2).

**Table 2:- Biochemical composition of sow's milk by feed treatment (%).**

| Composition | Diets | Means |
|-------------|-------|-------|
| **Composition Colostrum 1** |       |       |
| Dry matter  | L₀    | 24.33 ± 0.50* | 24.25 ± 0.49* | 24.40 ± 0.52* | 24.30 ± 0.50 |
| Protein     | L₀    | 16.24 ± 0.55a  | 16.30 ± 0.43a  | 16.19 ± 0.53a  | 16.25 ± 0.51 |
| Lipid       | L₀    | 4.48 ± 0.28a   | 4.87 ± 0.32a   | 5.55 ± 0.33a   | -             |
| **Composition Colostrum 2** |       |       |
| Dry matter  | L₀    | 23.31 ± 0.77a  | 23.36 ± 0.65a  | 23.33 ± 0.68a  | 23.33 ± 0.70 |
| Protein     | L₀    | 14.84 ± 0.57a  | 14.77 ± 0.58a  | 14.83 ± 0.54a  | 14.80 ± 0.55 |
| Lipid       | L₀    | 4.24 ± 0.30a   | 4.58 ± 0.27a   | 5.25 ± 0.41a   | -             |
| **Composition Colostrum 3** |       |       |
| Dry matter  | L₀    | 21.45 ± 0.64a  | 21.56 ± 0.62a  | 21.39 ± 0.65a  | 21.85 ± 0.63 |
| Protein     | L₀    | 8.73 ± 0.71a   | 8.85 ± 0.65a   | 8.89 ± 0.75a   | 8.83 ± 0.70 |
| Lipid       | L₀    | 7.61 ± 0.83a   | 7.95 ± 0.79ab  | 8.66 ± 0.85b   | -             |
| **Composition Milk** |       |       |
| Dry matter  | L₀    | 19.54 ± 0.38a  | 19.79 ± 0.34a  | 19.76 ± 0.33a  | 19.70 ± 0.35 |
| Protein     | L₀    | 5.07 ± 0.09a   | 5.12 ± 0.08a   | 5.11 ± 0.09a   | 5.1 ± 0.08 |
| Lipid       | L₀    | 8.15 ± 0.32a   | 8.69 ± 0.30ab  | 9.25 ± 0.34b   | -             |

The means per diet assigned with different letters a and b are significantly different (P <0.05) L₀, L₆ and L₉ are feed for lactating sows containing 0, 6 and 9% cashew nuts respectively.
Discussion:-
The increase in lipid contents of all colostrum and milk samples taken after incorporation of rejects of cashew kernels in food rations may be related to the fact that some lipid material cannot be synthesized by the animal. Their presence in the fats produced by animals is linked to that of the food consumed (Courboulay et al., 1999). Indeed, the energy provided by the additional fat ingested by the sow is of very little benefit to it and is mainly directed to the udder (Boyd et al., 1978). Moreover, if a feed for pregnant and lactating sows enriched in lipid makes it possible to improve the growth rate of piglets in the farrowing unit (Quiniou et al., 2000) and their survival (Pettigrew, 1981; Le Dividich et al., 1991; Quiniou et al., 2006), this implies that an increase in the lipid content of colostrum and in milk is also noted. Thus, increasing the fat content of feeds formulated with cashew nut kernels increases the lipid proportions of the sow's milk. This observation is in agreement with the results of Dillon (1989). For this author, food constantly changes the composition of milk, but within relatively narrow limits (1 to 5%). The results obtained are, moreover, different from those of Roy (2003) who maintains that food intake does not significantly modify the chemical composition of milk in general. These proportions of lipid in greater quantity (certainly in polyunsaturated fats) could increase the energy level of piglets and make them more resistant to microbial attacks. This is in agreement with Farmer et al. (2008), who state that in pigs, fatty acid profiles in the blood and tissues of suckling piglets are dependent on the type of fat fed to the sow. For them, fatty acids (polyunsaturated) activate the development of the immune system and influence the synthesis of glycogen which is an essential source of energy for newborn piglets.

Conclusion:-
During lactation, the use of 9% cashew almond suckers in sowfeedsignificantlyincreased the lipid proportions in colostrums and in milk (P <0.05). An increase that would be beneficial for piglets, certainly thanks to a higher proportion of polyunsaturatedfatty acidswhichactivate the development of the immune system and therefore work together more resistant to attacks. In addition, furtherstudiesshould be carried out to determine the fatty acid composition of colostrum and sow milk lipids and to better assess their impact on the growth and survival of piglets after farrowing.

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