EFECTOS DE UN PRODUCTO DE FERMENTACIÓN CON SACCHAROMYCES CEREVISIAE SOBRE EL DESEMPEÑO DE LAS CAMADAS, COMPOSICIÓN DE LA LECHE Y PERFIL HEMATOLÓGICO DE CERDAS PRIMERIZAS

EFFECTS OF A SACCHAROMYCES CEREVISIAE FERMENTATION PRODUCT ON GROWTH PERFORMANCE OF LITTERS, MILK COMPOSITION AND HEMATOLOGY PROFILE OF PRIMIPAROUS SOWS

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Resumen: Un total de 16 primerizas (158.158±3,5 kg) fueron asignadas a uno de dos tratamientos para determinar el efecto de la suplementación de un producto de fermentación de *Saccharomyces cerevisiae* (SCFP) durante la lactancia en el desempeño de las cerdas primerizas y las camadas. Los tratamientos fueron: CT) formulados para cubrir los requerimientos nutricionales según el Consejo Nacional de Investigación, NRC (2012); SCFP) similar a CT, más 0,88% de SCFP.
El consumo de alimento (FI) se registró diariamente desde el parto hasta el día 21 de lactación. Al nacimiento y en los días 7, 14 y 21 de lactancia, se registró el peso de las camadas para determinar la ganancia de peso (BWG), y se tomó muestras de leche para determinar la composición nutricional de la leche. El FI de las cerdas y la BWG de las camadas se estratificaron en tres fases con 7 días por fase [fase 1 (P1: d1-7); fase 2 (P2: d8-14); fase 3 (P3: d15-21)]. Se recolectaron muestras de sangre de las cerdas los días 7, 14 y 21 de lactancia para determinar el perfil hematológico. Se obtuvo una interacción tratamiento por día para FI, con un mayor FI en cerdas alimentadas con SCFP durante P1 y P2, sin diferencias en el P3 (.<0,05). No se encontraron diferencias para la BWG de las camadas durante la lactancia (.<0,05). Además, hubo diferencias significativas en la interacción tratamiento por día para la concentración de leucocitos (.<0,05). Las cerdas suplementadas con SCFP tuvieron un mayor porcentaje de grasa láctea en comparación con las cerdas del CT (.<0,05). En conclusión, la suplementación con SCFP estimuló el consumo de alimento de las cerdas, el contenido de grasa de la leche y el perfil leucocitario de las cerdas primíparas durante la lactancia, sin ejercer mejoras productivas en el rendimiento de la camada.

Palabras clave: Consumo de alimento, leucocitos, grasa en leche, lechones.

Abstract: A total of 16 gilts (158,158±3.5 kg) were assigned to one of two treatments to determine the effect of a *Saccharomyces cerevisiae* fermentation product (SCFP) supplementation during lactation on performance of sows and litters. The treatments were: CT) formulated to meet the nutritional requirements according to the National Research Council, NRC (2012); SCFP) similar to CT, plus 0.88% SCFP. Feed intake (FI) was recorded daily from farrowing until day 21 of lactation. At birth and on days 7, 14, and 21 of lactation, the weight of the litters was recorded to determine body weight gain (BWG), and milk samples were taken to determine the nutritional composition of the milk. The FI of the sows and the BWG of the litters were stratified into three phases with 7 days per phase [phase 1 (P1: d1-7); phase 2 (P2: d8-14); phase 3 (P3: d15-21)]. Blood samples were collected from the sows on days 7, 14, and 21 of lactation to determine the hematological profile. A treatment per day interaction was obtained in the FI, with a higher FI in sows fed SCFP during P1 and P2, with no differences in P3 (.<0.05). No differences were found in the BWG of the litters during lactation (.<0.05). Furthermore, there were significant differences in the treatment per day interaction for leukocyte concentration (.<0.05). Sows supplemented with SCFP had a higher percentage of milk fat compared to CT sows (.<0.05). In conclusion, SCFP supplementation stimulated sow feed intake, milk fat content and leukocyte profile of primiparous sows during lactation, without exerting productive improvements in litter performance.

Keywords: Feed intake, leukocytes, milk fat, piglets.

INTRODUCTION

The immediate metabolic changes that are triggered at farrowing (Mosnier et al., 2010) as well as the high temperatures that sow commonly face in tropical conditions (Williams et al., 2013) compromise the adequate voluntary feed intake (FI) of sows, generating a nutritional imbalance, mainly of an energetic nature during the lactation period (Eissen et al., 2000; Renaudeau et al., 2001).

A reduction in FI generates several negatives effects that affect the performance of sows and litters, such as loss of body reserves (Valros et al., 2003; Mosnier et al., 2010), reductions in milk production (Renaudeau et al., 2003; Ribeiro et al., 2018), delayed growth of litters (Renaudeau et al., 2001) and a marked increment in the weaning-service interval (Bertoldo et al., 2012; Renaudeau et al., 2012). Based on the above-mentioned, new nutritional strategies are necessary to counteract the productive and reproductive inefficiency of sows during lactation in tropical conditions.

Additives such as probiotics are used in pig diets to alleviate the effects of heat stress that are triggered during pregnancy and lactation (Kim et al., 2013). There are several commercial presentations of yeast products as additives for animal feed. Most of them are fermentable live yeast that offers the characteristics of a probiotic, while the same yeast are grown in a plant based substrate, acting as a prebiotic. However, the prebiotic plus the fermenting media to maintain the activity of yeast and also the metabolites obtained from yeast fermentation, offer the properties for being considered as postbiotic (Shen et al., 2011).

The inclusion in diets of Saccharomyces cerevisiae based products has been shown to improve milk production in dairy cattle (Ramsing et al., 2009; Poppy et al., 2012) as well as improvements on productive performance and meat quality in growing pigs (Davila et al., 2020). However, there is a lack of scientific information on the supplementation with a yeast culture (Saccharomyces cerevisiae) during the prepartum period (15 days before farrowing) and lactation in gilts subjected to microenvironmental heat stress and its effects on hematological profile and milk quality in gilts and the performance of litters. Based on the above mentioned, the aim of this investigation was to

evaluate the effects of a Saccharomyces cerevisiae based product (SCFP), with postbiotic characteristics, on hematology profile, milk content, FI of sows and performance of litters during 21-days lactation period.

MATERIAL AND METHODS

The study was carried out at the Agricultural Research Center of the Faculty of Agricultural Sciences, province of Chiriqui (CEIACHI), located at 8°23'15.12" north latitude and 82°19'47.48" west longitude and with an elevation of 26 meters above sea level. The average environmental temperature and relative humidity during the morning were 25.43 °C and 87.36%, while 32.36 °C and 65.60% during the afternoon, respectively.

A total of 16 primiparous sows with an average body weight of 158 kg were randomly assigned to one of two dietary treatments under a naturally ventilated conventional facility. Each treatment consisted of 8 sows. The dietary treatments (trt) for each phase were: CT) formulated to meet the nutritional requirements established by the National Research Council, NRC (2012); SCFP) similar to CT, plus the addition of 0.88% of a commercial postbiotic obtained from the Saccharomyces cerevisiae fermentation plus the yeast skeletal structure (Table 1).

Sows moved to the farrowing facility when had 100 days of gestation, had 15 days of adaptation period to experimental diets, with a restricted intake of 2.5 kg of feed per day. The commercial product used was a postbiotic, which contained the final metabolites of the fermentation of Saccharomyces cerevisiae plus the yeast skeletal structure. After farrowing, sows were fed for 21 days with their respective experimental diets having ad libitum access to feed and drinking water during the entire experiment. Sows were weighted on day 100 of gestation and on day 3 of lactation.

Feed intake (FI) and refusal was recorded daily to determine the average FI per day during the lactation. Regarding the litter, the weight was recorded at birth, and on days 7, 14, and 21 of lactation. All sows had similar litter size (10 pigs/littler). All litters were under the same sanitary protocol, which included administration of 200 mg of intramuscular iron on the second day after birth, tail docking, and identification or ear tattooing on day 4 after birth.

Tabla 1

Diet formulation and calculated chemical composition of diets.

Ingredients, % (Fresh basis)	Gestation		Lactation	
	CT	SCFP	CT	SCFP
Corn	50.63	49	44.46	42.5
Soybean meal	20.7	21.05	33.97	34
Rice polish	18.7	18.35	13.7	14
Molasses	5	5	3.2	3.2
Palm oil	2	2.75	1.78	2.53

Tabla 1a

Diet formulation and calculated chemical composition of diets.

Salt	0.4	0.4	0.4	0.4
M-dicalcium phosphate	0.4	0.4	0.45	0.45
Ca carbonate	1.55	1.55	1.45	1.45
Premix Vit-Min	0.3	0.3	0.3	0.3
L- Lysine	0.04	0.04	0.02	0.02
DL-Methionine	0.03	0.03	0.01	0.01
L-Threonine	0	0	0.01	0.01
Myco-AD A-Z	0.25	0.25	0.25	0.25
Yeast product	0	0.88	0	0.88
Calculated Chemical Composition (Dry based)				
Dry matter, %	87.60	87.7	87.7	87.7
ME, (Kcal/kg)	3300.73	3300.31	3300.99	3300.25
Crude protein, %	15.01	15.04	20.23	20.23
Calcium, %	0.79	0.79	0.79	0.79
Available Phosphorus, %	0.35	0.35	0.42	0.42
Lysine, %	0.79	0.79	1.11	1.11
Methionine, %	0.27	0.27	0.31	0.31
Threonine, %	0.55	0.55	0.77	0.77
Neutral detergent fiber, %	9.13	8.98	9.37	9.24
Acid detergent fiber, %	2.84	2.81	3.27	3.25

Samples of the experimental diets were pre-dried in a mechanical convection oven at 60°C for 72 hours (Yamato DKN810, New York, USA) and ground to a particle size of 2 mm (Restsch GmbH & Co., Germany) for further analysis of the nutritional content. The feed samples were placed in an oven at 105°C for 24 hours (40GC Lab. Oven; Quincy Lab. Inc.; IL, USA) to determine the percentage of dry matter, and then incinerated in an oven at 600°C for 3 hours (Thermolyne, Thermo Scientific, NC, USA) for the determination of ash content (Table 2). Mineral levels (Ca, P) were determined by atomic absorption spectrophotometry (Analytik Jena -nov 400P, Germany), while nitrogen was analyzed using the Kjeldahl methodology (Velp Scientifica, Germany).

Tabla 2
Chemical composition of diets.

Chemical Composition	Gestation		Lactation	
	CT	SCFP	CT	SCFP
Dry matter, %	86.9	87.1	87.0	87.10
Crude protein, %	15.0	15.1	20.6	20.72
Calcium, %	0.77	0.79	0.81	0.77
Available Phosphorus, %	0.35	0.36	0.41	0.40

Milk samples were collected during day 1, 7, 14, and 21 of lactation for composition analysis. Two ml of (40 IU) oxytocin was injected into the fold located 2 cm apart from the sow's vulva to stimulate milk secretion and facilitate milk collection, and milk samples were collected in sterile bags for milk collection. Additionally, the chemical parameters of milk (lactose, fat, protein, and non-fat solids) were determined using the Speedy Lab analyzer (Astori Tecnica snc, Brescia, Italy).

Blood samples were collected from all sows at farrowing and during days 7, 14, and 21 of lactation. Samples were collected via the intermediate auricular vein of the ear and stored in 2 ml K2-EDTA tubes (BD Vacutainer, Becton, Dickinson, and Company, Franklin Lakes, NJ). Blood samples were processed 2 to 4 hours after collection to determine the complete blood count through a hematology analysis system (Hemavet 950 FS, Drew Scientific, Waterbury, CT).

All data were entered into a Microsoft Excel® 2021 spreadsheet for processing. The littler and sow´s performance, the milk composition, and the blood profile data were analyzed using a mixed linear model of repeated measures, whose algebraic equation is the following:

$$y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + a_{k(i)} + e_{ijk}$$

Where y_{ijk} is the response variable, μ is the general mean, α_i is the effect of the ith diet, β_j is the effect of the jth day, $(\alpha\beta)_{ij}$ is the effect of the interaction between the ith diet and the jth time, $a_{k(i)}$ is the random effect of the kth animal nested within the ith treatment, and e_{ijk} is the random error.

The solution of both the parametric BLUEs of fixed effects, as well as the prediction of the BLUPs of random effects was performed by solving the Henderson (1975) equations. The variance components were estimated using the REML method (Patterson and Thompson, 1971). The F statistics were estimated by correcting the degrees of freedom of the denominator according to the Kenward-Roger method (Kenward and Roger, 1997). All these statistical procedures were carried out in the R programming language (R Core Team, 2022), and the comparison of means was carried out according to the Tukey method.

RESULT AND DISCUSSION

A Trt*Day interaction was obtained in the FI during the lactation ($p < 0.05$). The supplementation of SCFP stimulated the FI of sows by 22% and 20.6% higher compared to sows fed CT ($p < 0.05$; Table 3). However, in phase 3 (d 15-21) no effects were obtained related to FI; but numerically, sows fed SCFP had a higher FI, by 0.14 kg/day. In agreement with our findings, Domingos et al.(2021)

found an increment of 13% in FI of sows fed Saccharomyces cerevisiae var. boulardii

based live yeast compared to the control.

In addition, Tan et al. (2015) compared different levels of Saccharomyces cerevisiae var. boulardii and found an overall FI higher, by 10%, than the control group. In contrast, Lázaro et al. (2005) and Ayala (2001) reported that supplementing live yeast (Saccharomyces cerevisiae) in diets for sows did not influence the voluntary FI during lactation. The differences observed between studies can be related to the different yeast strains, the inclusion levels as well as the different mechanisms that exert a life yeast product versus a postbiotic yeast culture as used in our study. Also, other external factors such as the temperature in sows' s facility, the metabolic stress during lactation, and changes in diet formulation, quality, and palatability (Shen et al., 2009), which might contribute to the discrepancy observed among discussed studies.

Tabla 3

Effects of a Saccharomyces cerevisiae fermentation product on feed intake during lactation .

Feed Intake, kg/day/sow	Treatments		SEM	*p*-Value
	CT	SCFP		
P1 (d 1-7)	3.14	4.04	0.28	0.032
P2 (d 8-14)	3.84	4.84	0.27	0.021
P3 (d 15-21)	4.92	5.06	0.31	0.751
Overall (d 1-21)	3.68	4.60	0.25	0.02

During the experimental period, the environmental temperature and relative humidity of the facility were 25.43 °C and 87.36% during the morning, and 32.36 °C and 65.60% during the afternoon, respectively. The thermoneutral zone for sows is 18-20°C and 50-65 % (Quiniou & Noblet, 1999), which indicates that sows were under heat stress. The negative impact of heath stress on sows performance has been widely studied (Black et al., 1993; Renaudeau et al., 2012; Matthew & Safranski, 2017). Heat stress can cause significant changes in the gut microbial composition, especially in the abundance of short chain fatty acids (SCFA) producing bacteria, allowing gut dysbiosis and inflammatory response (Ringseis & Eder, 2022). Beside this, the microbial imbalance allows the pathogenic bacteria to growth, affecting gut health and feed utilization (Ross et al., 2015).

The postbiotic metabolites such, small chain fatty acids (SCFAs), microbial cell fractions, functional proteins, extracellular polysaccharides (EPS), cell lysates, teichoic acid, peptidoglycan- derived neuropeptides and pili-type structures are involved in immune system regulation and gut health (Pelton et al., 2020). Based on the aforementioned, the ingestion of skeletal structure of dried yeast plus metabolites of yeast fermentation could improve the production of cytokines, reducing the colonization of pathogenic bacteria throughout the gastrointestinal tract and reducing the inflammatory response. Altogether, improve gut health status; therefore, ameliorating the negative effect of heat stress and allowing better conditions for voluntary FI and utilization.

Regarding the performance of the litters, no significant differences were obtained for the interaction Trt*Day on the live weight gain ($p > 0.05$) in the live weight of litters in any phase. However, the litters from sows fed TC and SCFP had an overall weight gain, from farrowing to weaning, of 39.5 kg and 40.9 kg, respectively, denoting that the litters from sows fed SCFP were numerically heavier by 1.4 kg than the litters from sows fed CT (Table 4).

Tabla 4

ffects of Saccharomyces cerevisiae fermentation product on the performance of litters.

Variable (kg)	Treatments		SEM	*p*-Value
	CT	SCFP		
Litter weight, d0	15.3	15.0	0.93	0.77
Litter weight, d7	26.6	26.7	1.90	0.99
Litter weight, d14	39.9	40.3	2.48	0.91
Litter weight, d21	54.8	55.9	2.92	0.78
LWG P1 (d 1-7)	11.3	11.7	1.42	0.83
LWG P2 (d 8-14)	13.3	13.7	1.76	0.87
LWG P3 (d 15-21)	14.9	15.6	1.78	0.78

LWG P1 = (Weight d7 – Weight d0); LWG P2 = (Weight d14 – Weight d7); LWG P3 = (Weight d21 – Weight d14).

In the study carried out by Shen et al. (2011) evaluated the effects of a SCFP during the entire gestation and lactation with a higher final litter weight at weaning when feeding 12 grams/day on top feed. In another study, Rocha et al. (2022) evaluated the effect of Saccharomyces cerevisiae, from day 94 of gestation until day 24 of lactation, on productive performance, colostrum and milk composition, and litter performance in low and high temperature humidity index (THI), and found improvements in FI of sows, but without increments in littler birth weight, gain weight, and weaning weight of litters from sows fed Saccharomyces cerevisiae at an inclusion level of 0.08%. Furthermore, Chen et al. (2020) evaluated the inclusion of 0.30 % of a SCFP from day 85 of gestation until day 21 of lactation, reporting no effects on litter performance.

Because the supplementation of SCFP in our study started 15 days before farrowing, this may not have been an enough period of supplementation for having a direct effect on milk production. Most scientific evidence indicates that the supplementation of SCFP do not exert effect on farrowing weight, but with positive benefits in the weight gain of the litters during lactation. Even though in this study the sows fed SCFP has a higher FI by 0.81 kg than control sows, it did exert increments in the gain weight of the litters in the last week. Several factors such as sow´s breed and environmental conditions, number of parity, and health status as well as the quality and composition of the SCFP might influence in the discrepancy among studies discussed above. Because of sows milk was the only source of nutrient to piglets during lactation, the supplementation of yeast culture might help to increase milk production based on a higher feed intake, allowing a higher nutrient availably for milk synthesis. Further studies has to be done to evaluate the supplementation of a SCFP during the entire gestation and lactation of primiparous

and multiparous sows, and determine the milk production and its correlation with litter performance.

Tabla 5

Effects of a Saccharomyces cerevisiae fermentation product on the milk nutritional content of gilts.

Variable	Treatments		SEM	*p*-Value		
	CT	SC		Trt	Day	Trt*Day
Protein, %	6.0	5.3	0.35	0.17	0.007	0.89
Lactose, %	5.8	5.2	0.33	0.19	0.005	0.89
Fat, %	6.7[a]	10.1[b]	0.73	0.002	0.72	0.66
Not-fat solids, %	13.1	11.7	0.74	0.19	0.005	0.9
Density, g/ml	1.2	1.2	0.07	0.73	0.001	0.98

Regarding the nutritional profile of milk composition, no differences between treatments were observed in the percentage of protein, lactose, and non-fat solids as well as in the milk density. However, a significant difference ($p < 0.05$) was found for the percentage of fat, with 33.66 % higher in sows fed SCFP than those supplemented with CT (Table 5).

Several studies have indicated that the supplementation with a SCFP do not improve milk composition of sows, including protein, lactose, not-fat solids and fat content either fed sows during the entire gestation and lactation (Shen et al., 2011; Jang et al., 2013) or just during the end of gestation and the entire lactation (Rocha et al., 2022). These studies are consistent with our findings where the supplementation of SCFP did show effect on most of the milk nutritional components, except for the fat content. According to Bernabucci et al. (2013), the composition and yield of colostrum and milk of dairy animals are affected by several factors, such as environmental conditions, feeding program, animal breed and health status.

In general, about 50 percent of the fatty acids in milk are synthesized in the mammary gland and the other 50 percent are derived directly from blood (Linn, 1988). Milk fat originates from three sources such as dietary fat, body fat mobilization, and de novo fat synthesis in the mammary gland (Lv et al., 2015). In addition, glucose is the quantitatively most important substrate for de novo fatty acid synthesis in sows (Krogh et al., 2021) and it is also used for synthesis of the glycerol backbone to which Fatty Acid is esterified, whether de novo synthesized or derived from body fat mobilization. Furthermore, Zhe et al. (2023) evaluated the different levels of fat in diet of sows and found that the dietary intake of fat and the milk output in sow´s milk are not the main driven of the piglet growth, being the protein and water retention the main nutrients for gain weight in piglets. In the current study, the improvements in the FI of sows means a higher amount of dietary fat and carbohydrate consumption, which in turn might allow an increment in the availability of main sources for de novo fat synthesis in the mammary gland. The significant differences obtained in this study with respect the effect of sampling days is common reported because of the

physiological transition of a high nutrient composition at the beginning of the lactation because of colostrum production, and then changes in the nutritional density of nutrients along the lactation period, including the milk fat, which did not show statistic differences.

Tabla 6

Effects of a Saccharomyces cerevisiae fermentation product on the hematological profile of gilts.

Variable	Treatments		SEM	*p*-Value		
	CT	SC		Trt	Day	Trt*Day
RBC. x10^6	6.06	5.94	0.074	0.27	0.53	0.32
HGB. g/dL	11.89	11.75	0.187	0.60	0.16	0.19
HCT. %	35.92	34.99	0.553	0.25	0.17	0.67
WBC. x10^3/uL	21.94	15.28	1.207	0.001	0.02	0.02
lymphocytes. %	48.31	34.10	3.236	0.005	0.76	0.32
Monocytes. %	6.81	5.50	0.382	0.02	0.28	0.06
neutrophils. %	43.75	58.65	3.223	0.003	0.83	0.21
eosinophils. %	1.125	1.75	0.383	0.26	0.69	0.39

RBC: red blood cells; HGB: hemoglobin; HCT: hematocrit; WBC: White blood cells.

No statistical differences were obtained in the treatment per day interaction of the blood red series (RBC, HCT, WBC; $p > 0.05$). On the other hand, significant differences were found in the treatment per day interaction of white blood cell concentration ($p < 0.05$; Table 6, Figure 1). In addition, a lower percentage of lymphocytes and monocytes, and a higher percentage of neutrophils were found in sows fed SCFP ($p < 0.05$).

Burdick et al. (2021) investigated the influence of yeast products on metabolism and immunity of pigs, showing that the supplementation with a SCFP reduced the total WBC and neutrophil concentrations. Similar results were found in this study, where the supplementation of SCFP maintain the WBC concentration more stable throughout the study, as shown in figure 1. However, those sows fed diet CT had inconsistent WBC concentration, with the highest level at the end of lactation. It has been widely known that the WBC are stimulated when there are some opportunistic bacteria invading the organism and generating a subclinical infection (Rosales, 2018). It is possible that the SCFP evaluated in this study exerted some antimicrobial effects, thus controlling possible growth and infection of common pathogenic bacteria related to swine in our conditions. Even though the supplementation of a SCFP might control the negative effects of some opportunistic pathogens, without exerting any impact on performance of litters in this study.

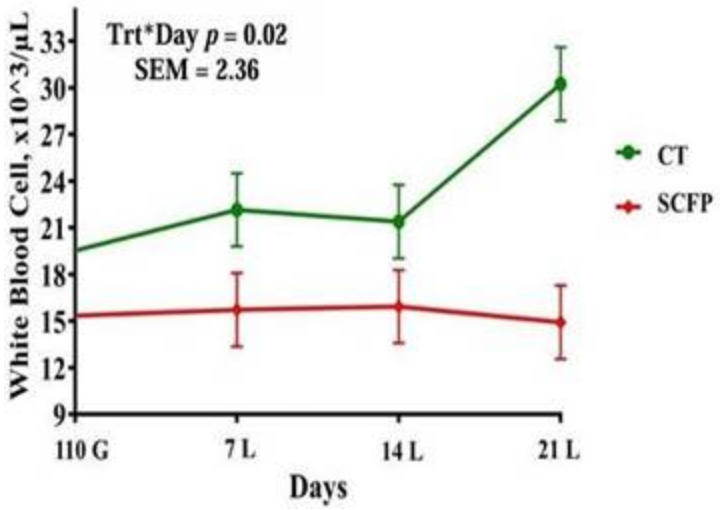

Figure 1

Effects of a Saccharomyces cerevisiae fermentation product on white blood cell count during the experimental period.

100 G: 100 of gestation or 15 days before farrowing. Initial day of the experiment// 7 L, 14 L, and 21 L: sampling days during the lactation period.

The effect of an autolyzed yeast on the blood profile of weaned pigs was studied by Namted et al. (2022), finding a lower concentrations of monocytes and neutrophils in pigs fed 1% of autolyzed yeast than in those fed a control diet. In addition, Shen et al. (2011) evaluated a SCFP during the entire gestation and lactation and did not find differences in the blood cell profile at day 30 of gestation, but reported a reduced blood cell concentration and lower neutrophil concentration at day 110 of gestation and at day 24 of lactation.

The effects of yeast culture on health and immunity have been evidenced to stimulate positive benefits after a long period of its supplementation (Shen et al., 2009). The main contrasting response of our study and Shen et al. is the higher neutrophil level in sows fed SCFP than CT. Neutrophils are the main line of defense against pathogenic bacteria or viruses (Rosales, 2018). The short period of supplementation with SCFP might not be enough to exert a significant effect on good health status or adequate immune regulation, thus increasing the neutrophil percentage. Future studies are necessary for evaluating the supplementation of a yeast culture for a longer period and determining its effect on the immune system. Interestingly, most of the specific

leukocyte cells had lower levels for SCFP than CT. Beside this, even though neutrophil level in SCFP sows showed to be stimulated, its level were within the normal range.

CONCLUSION

The supplementation of a Saccharomyces cerevisiae fermentation product in gilts from day 110 of gestation until 21 of lactation improved feed intake, modulate leukocyte profile, and improve milk fat content during lactation, without effect on performance of litters.

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EFECTOS DE UN PRODUCTO DE FERMENTACIÓN CON SACCHAROMYCES CEREVISIAE SOBRE EL DESEMPEÑO DE LAS CAMADAS, COMPOSICIÓN DE LA LECHE Y PERFIL HEMATOLÓGICO DE CERDAS PRIMERIZAS
EFFECTS OF A SACCHAROMYCES CEREVISIAE FERMENTATION PRODUCT ON GROWTH PERFORMANCE OF LITTERS, MILK COMPOSITION AND HEMATOLOGY PROFILE OF PRIMIPAROUS SOWS

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