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Abstract

Purpose: A study was conducted to examine the potentials of scent leaves (SL) (*O. gratissimum*) meal as a feed additive on performance, blood biochemicals and antihelmintic in weaner pigs.

Methodology: Completely Randomized Design (CRD) was adopted using 30 mixed breed of large-white and duroc weaner pigs, allocated to three treatments with ten pigs each, replicated five times with two pigs per replicate. Formulated diet (1) is a Positive Control (PC) – supplemented with Kepro-dewomer, diet 2 a Negative Control (NC) – without Kepro-dewomer and Scent Leaves (SL), while Diet 3 was supplemented with Scent Leaves (SL) at 1.0%. Data collected were analysed using ANOVA with SAS software. Treatment means were separated using Duncan's New Multiple Range Test.

Findings: Results indicated that there were significant ($p<0.05$) differences among treatments in final body weight gain (FBWG). Highest daily weight gain (HDWG) (0.51kg) and highest daily feed intake (HDFI) (0.46kg) were recorded in pigs fed diet 3. Packed cell volume (PCV), Red blood cell (RBC), Haemoglobin (Hb) levels were not significantly ($p>0.05$) different among the experimental groups 1 and 3: (37.01) (26.7), (12.72) (39.11) (25.5) (12.88) respectively. Meanwhile, diets 1 and 3 were significantly ($p<0.05$) improved serum biochemicals parameters (Aspartate amino transferase – AST). (Alanine aminotransferase – ALT) and (Alkaline phosphate – ALP) compared with diet 2. Kepro dewomer and scent leaves dietary supplementation had a significant reduction on oocysts shedded per gram of feaces in diet 1 (30.42, 31.03, 32.96) and diet 3 (36.78, 35.89, 31.11) compared with diet 2 (61.3, 63.41, 68.01) respectively

Unique Contribution to Theory, Practice and Policy: The idea of alternative medication theory to synthetic drug in livestock feeds was conceived and developed; towards solving the problem of resistance of microbial pathogens to synthetic antibiotic as a result of its continuous usage. Findings, therefore, showed that the strategic supplementation of scent leaves meal as an alternative dewomer to synthetic dewomer that poses health risks to consumers could be avoided. Also, the need to adapt a collection and processing strategy at many locations wherever the scent leaf plant is produced and are poorly utilized or being wasted.

Keywords: *Oocysts Shedded, Kepro Dewomer, Scent Leaves, Phytochemical, Supplementation, Weaner Pigs*

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INTRODUCTION

The demand for protein by young and old across the globe is greatly increasing on daily basis. However, man obtains his necessary protein from either animal or plant source. The meat from cattle, goat, sheep, pig and poultry, including the offal are the main sources of daily per capital consumption of animal protein (Ngozi *et al*., 2015). In Nigerian economy, although, the livestock sector accounts for 4.5 to 5% of the gross domestic products (GDP) (Adenaike, 2020). Meanwhile, approximately one-fifth of the world's pigs are found in the tropics and the production in the tropics is increasing more rapidly than the mid-latitude regions. Similarly, the swine industry has witnessed an unprecedented increase in production and consumption over the past decade and this situation is likely to continue. According to NRC (2012) pigs are highly efficient converters of feed to meat. They can provide the greatest return for the least investment of any hoofed livestock because of their fecundity, low management costs, broad food preferences, and rapid growth. Furthermore, pigs are capable of providing 20 – 30 piglets from 2 or 2 ½ litters per year. Pigs under efficient management and balanced nutrition can reach slaughter weight of 80 – 90kg in 7 to 8 months (Adenaike, 2020).

Nevertheless, if pigs are improperly managed or, maintained in filthy conditions, pigs may quickly succumb to disease. Diseases depress every aspect of production (Adedoyin, 2018) and aneaemia is common (Kahn, 2005), resulting a decrease of RBC values below the normal range and is clinically characterized by pale mucous membranes, parasite epidemics (NRC, 2012) and associated high neonatal mortality constitute a major obstacle to the promotion of large scale holding of swine production in Nigeria (Talabi *et al*., 2004 and 2010; Ademola and Onyiche, 2013). Moreover, herbal medicines (phytobiotics) have become indispensable and are forming an integral part of the health care system of many nations (Fajimi and Taiwo, 2005). The efficacies of conventional medicaments against endo-and ecto- parasites diseases have been reported with variable success (Ngozi *et al*., 2015). Moreso, the toxic effects of these chemicals on humans and livestock (Hashemi *et al*., 2009), the development or resistance to it by target parasite (Levic *et al*., 2017) as well as high cost of drugs (Ghazalah, 2008) pave way for herbal remedies as reasonable alternatives. Such as, scent leaf (*Ocimum gratissimum*) a widely used local plant in Nigeria for both nutritional and therapeutic purposes. It is widely grown as a perennial herb in tropical Africa. In Nigeria, it is found in the savannah and coastal areas. Ijeh *et al*. (2005) reported that *O. gratissimum* and *Xylopia aethiopica* in combination are used in the preparation of potions and teas for women during peuperium (Arhoghro *et al.*, 2009). The whole plant is used as an antibacterial agent throughout West Africa. Oboh (2004) reported the antioxidant and antimicrobial properties of *O. gratissimum*. The extracts of *O. gratissimum* exhibited antibacterial activity (Oforkansi *et al*., 2003). It has also been used extensively in the traditional system of medicine in many countries. For instance, the treatment of epilepsy, high fever, diarrhoea, cold and catarrh, ear infection, tooth gargle, and as a cure for prolapsed of the rectum (Prabhu *et al*., 2009). Meanwhile, various researchers (Agbede and Aletor, 2003; Tewe, 2004; Nwakpu *et al*., 2010 and Adegbenro *et al.*, 2018) advocated 1% leaf meal supplement in the diets of monogastric animals. This study was therefore designed to investigate the potentials of scent leaves meal (*O. gratissimum*) on the following:

1. Growth response, feed to gain ratio and cost per kilogram weight gain in weaner pigs.
2. To assess the nutritional enhancements of (*O. gratissimum*) supplemented diet on selected blood biochemicals of weaner pigs.
3. To identify and characterize the efficacies of (*Ocimum gratissimum*) on diseases (parasites) prevention.

LITERATURE REVIEW

The use of antibiotics in livestock diets at therapeutic or sub-therapeutic levels to improve growth rates, feed efficiency or reduction of mortality as well as reproductive performance of birds is no longer encouraged in animal production (Plail, 2006). Although antibiotics growth promoters achieved good performance in livestock, their potential side effects has become a real public health concern globally (Odoemelam, *et al.*, 2013) and have led to their prohibition in animal feeds in most western nations (Cardozo, *et al.*, 2004). The search for natural and safe alternative performance enhancers has resulted in the introduction of many herbal products in livestock diets (Cardozo *et al.*, 2004). Spices and herbs are useful because they produce secondary metabolites such as phenolic compounds, essential oil and sarasaponins (Chesson, et al., 1982; Kamel, 2001). They act as antibacterial, antioxidant, antifungal and growth promoters (Tipu, *et al.*, 2002). Spices and herbal products are in form of bulb, rhizomes, knot and leaves which improves food palatability through their aroma, increase digestibility and serve some medicinal functions when consumed by man or animal as parts of their food (Tian, 2008). Some of these herbs and spices are abundant in Africa they include garlic, ginger and scent leaf or basil leaf (*Ocimum gratissimum*) etc. African sweet basil (*Ocimum gratissimum*) which comes from the family Lamiaceae and genus Ocimum is found throughout the tropics and sub-tropics both wild and cultivated, its greatest variability occurs in tropical Africa where it probably has its origin in India (Osuji, *et al.*, 1995).

Ocimum gratissimum is also known as clove basil, African basil and in Hawaii as wild basil. It is locally known in Yoruba, Hausa and in Igbo Languages of Nigeria as Efirin, Daidoya and Nchiawu, respectively (Iwu, 1993).

Blood parameters are major indices of the physiological, pathological and nutritional status of an animal. A change in the constituent compounds of blood when compared to normal values could be used to interpret the metabolic state, health status of an animal as well as quality of feed (Babatunde *et al.*, 1992).

Moreso, the term phytogenic compounds refers to the utilized parts (e.g. seeds, fruits, roots, bark and leaves) of various aromatic herbs and spices (e.g. oregano, thyme, rosemary, coriander, cinnamon, anise, garlic, capsicum, mustard and pepper) as well as to their respective plant extracts in the form of essential oils (EO) and oleoresins (Kamel, 2001; Windisch et al., 2008). Many of the purported beneficial properties of phytogenic compounds are derived from their content of bioactive molecules (e.g. carvacrol, thymol, cineole, linalool, anethole, allicin capsaicin, allyl isothiocyanate, and piperine). Among the most well-documented biological activities of these phytomolecules are their antibacterial and antioxidant ones (Lambert *et al.*, 2001; Burt, 2004; Windisch *et al.*, 2000). In addition, antiviral, antimycotic, antitoxigenic, antiparasitic and insecticidal properties have also been reported (Burt, 2004).

Herb and spices have been shown to exert antioxidative properties (Cuppett and Hall, 1998; Naktani, 2000). The antioxidant property of many phytogenic compounds can contribute to protection of feed lipids from oxidative damage. Plant species like ginger, scent leaf, garlic, as well as other plants rich in flavonoids have been described as exerting antioxidative properties (Nakatani, 2000; Nwachukwu, 2009). The antimicrobial activity of a variety of herbs and spices has been reported (Junaid *et al.*, 2006; Anyanwu, 2010). Junaid *et al.* (2006) indicated the antimicrobial efficacy of *Ocimum grattisimum* leaf extracts on some bacteria isolates like *Aeromonas hydrophila, Bacillus cereus, E.coli, Salmonella typhimurium and Yersinia enterocolitica*.

The use of herbs and spices as well as their products in rations is aimed primarily at harnessing their antimicrobial potentials to boost performance. Their use in broiler and swine production has been reported (Al-Harthi, 2006; Odoemelam *et al.,* 2012). At least for broilers, an overall antimicrobial potential of phytogenic compounds in vivo cannot be ruled out (Windisch *et al*. 2007; Muhammad *et al.,* 2009).

Meanwhile, plenty of Phytogenic Feed Additives (PFAs) have been investigated during the last two decades. It has been mostly reported that addition of herbal products to diets has growth promoting effect on poultry and swine. Li *et al.* (2012) compared the performance of pigs fed with the diets supplemented with essential oils and reported weight gain and digestibility of dry matter and crude protein were improved by 10.3, 2.9 and 5.9%, respectively.

Mohammadi Gheisar *et al.* (2017) reported that feeding broiler chickens with diet containing 0.075% of a phytogenic blend led to 3.9% and 3.4% improvement in BWG and FCR, respectively. Results of another study on meat-type ducks have indicated 2.6% and 3.5% improvement in BWG and FCR, respectively. There is some evidence showing that adding 0.075% of essential oils blend (75g/kg of fed; containing thymol and vanillin) to the diet of broiler chickens resulted in increased population of *Lactobacillus*. It was also reported that feeding broiler chickens with phytogenic feed additive (PFA) (*Artemisia annua*) resulted in a significant reduction in TBARS value in breast and thigh meat. They suggested that the reduction in TBARS value could be due to individual or combined antioxidant properties of poly-phenolic compounds or vitamin E in *Artemisia annua.* However, there is paucity of body of knowledge on scent leaves meal as a phytogenic feed additive.

MATERIALS AND METHODS

Leaf meal production: Fresh and healthy leaves from scent plants in the botanical garden, University of Ibadan, Nigeria were harvested, washed and air-dried in the laboratory for 7 days. The air-dried leaves were milled using hammer mill and stored in plastic containers prior to use.

Experimental Diets: Diet 1 served as a positive control (PC – with piper deworner WSP-kepro at 70g/100kg diet), diet 2 served as negative control (NC – without piper deworner WSP – Kepro and scent leaves supplementation), and diet 3 was (supplemented with 1.0% scent leaves) (SL). Basal diet was formulated to meet the requirement of swine recommended by (Tewe, 2004 and Olomu, 2011).

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Table 1: Proximate and Phytochemical Compositions of Scent Leaves (*Ocimum gratissimum*)

Parameters		Concentration (%)
Proximate	Moisture	13.36
	Crude protein	16.16
	Crude fibre	8.93
	Crude fat	3.27
	Carbohydrate	55.23
	Total Ash	11.63
Phytochemical	Alkaloids	5.96
	Flavonoids	14.67
	Carotenoids	0.9
	Tannins	5.86
	Saponins	9.88
	Phenol	9.97

Table 2: Percentage Composition of Experimental Diet

Ingredients %	Diet 1(PC)
Maize	42
Wheat offal	20
Palm kernel cake	15
Fish meal	5.0
Soybean meal	7.0
Groundnut cake	8.0
Bone meal	2.0
Premix	0.5
Salt	0.5
Total	100.0
WSP Kepro	+
Scent leaves	___
AnalyzedNutrients(%)	
Dry matter	96.36
Crude protein	18.77
Crude fiber	5.01
Ether extract	3.68
Ash	16.12
Nitrogen free Extract (NFE)	68.08
Gross energy mg/kg	17.07

Experimental Animals and Management: Thirty mixed-breed of large-white and duroc weaner pigs, eight weeks old weighing averagely 7.51kg were randomly divided into three dietary treatments of ten pigs each, replicated five times with two pigs per replicate. Weaner pigs fed with positive control diet (PC-diet 1) were medicated with dewormer (WSP-Kepro with vitalyte) as outlined by (Tewe, 2004 and Olomu, 2011). In contrast, weaner pigs, fed with negative control (NC-diet 2) were provided only with vitalyte, while diet 3 were provided with vitalyte (supplemented with 1.0% scent leaves).

The experimental sites was a standard block with open sides covered with net, concrete floor and roofed with asbestos roofing sheets, each pen measuring 4.0x 6.0m long, with feeding, drinking and wallowing troughs. Each pen was partitioned with wood planks for collection of feacal droppings by Swab Suckler method (Heiko, 2019).

The pigs were provided their respective weaners' diets at 3 - 5% of their body weight daily, and water ad libitum twice daily at 9.00h and 16.00h for 12 weeks of the experimental period. The pigs were weighted at the beginning of the experiment and subsequently on a weekly basis. Growth, feed to gain ratio (FGR), and mortality were recorded weekly and were used as indicators of weaner pigs' performance. Also, parameters measured were blood biochemicals and parasitological index. FGR was calculated as follows:

$$\text{FGR} = \frac{Feed\,\text{int}\,ake}{Bodyweightgain}$$

Blood Collection and Biochemical Analysis: At the 12th week of the experiment, five grower pigs were randomly selected from each treatment group and blood samples were collected from their jugular veins with sterile needles. The blood samples were collected into properly labeled sterilized bottles containing EDTA (ethylene-diamine-tetra-acetic acid) for haematological analysis and another into properly labeled sterilized bottles without EDTA for the serum biochemical analysis.

Packed cell volume (PCV) and haemoglobin concentration (Hb) were determined by methods described by Lamb (1991). Red blood cell (RBC) and total while blood cell (WBC) counts were estimated using the haemocytometer, while mean corpuscular haemoglobin (MCH), mean corpusculan volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) were calculated according to Mitruka and Rawnsley (1977) and as modified by (Jain, 1993).

Calculated as follows:

MCV (fl) = 10 x PCV(%)/RBC counts (millions/μl)

MCH (Pg/cell) = haemoglobin (g/100ml) /RBC counts (millions/μl)

MCHC(g/dl) = haemoglobin (g/100ml) x 100/PCV (%)

Biochemcial analysis of the serum enzymes for as partate amino-transfarase (AST) and alanine aminotransferase (ALT) and Alkaline phosphatase (ALP) were determined as described by Kaneko (1998).

Parasitological index: On weekly basis oocysts counts were determined in 4gram of excreta collected. Samples were placed in separate plastic airtight storage bags, mixed thoroughly with 3% formalin: 1 ml formalin to 4g faeces and kept refrigerated. Then, they were firstly ten-fold diluted in a tap water and the resulting solutions were further diluted in Nacl with 500g glucose per litre (floating technique) and oocysts per gram of feaces was determined by duplicated counts of duplicate feacal slurry from each specimen using McMaster chamber technique. The results obtained were presented as the number of oocysts per gram faeces as outlined by (Allan and Peter, 1998; Abdelheg *et al*., 2015).

Proximate and phytochemical composition: Experimental diets were analyzed for proximate composition using the methods of A.O A. C (2006), While the phytochemical

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analysis was done using phytochemical screening and mineral composition as outlined by Alexander (2016).

Statistical Analysis Data collected were subjected to analysis of variance (ANOVA) with SAS software SAS/STAT, 2012. Treatment means were separated using Duncan's New multiple Range Test (Duncan, 1965). At P<0.05, significance was determined.

RESULTS AND DISCUSSION

Table 3: Performance of Weaner Pigs Fed Scent Leaves Supplemented Diet

Parameters	Diets			SEM ±
	1–PC–With Kepro dewormer	2–NC–Without Kepro dewomer and scent leaves	3–scent leaves supplemented type	
Initial live weight (kg)	7.78	7.91	7.55	0.29
Final live weight(kg)	49.11^{b}	44.03^{c}	49.98^{a}	3.28
Daily weight gain (kg)	0.49^{b}	0.43^{c}	0.51^{a}	0.06
Daily feed intake (kg)	0.44^{bc}	0.45^{c}	0.46^{a}	0.6
Feed: Gain ratio	0.938^{b}	1.05^{a}	0.941^{b}	0.10
Mortality (%)	0.0	0.00	0.00	0.0
Cost of feed /kg gain(#)	634.8	706.06	616.11	
Cost /kg feed (#)@70/100 of #550.	84.17	80.32	81.32	
Cost /feed consumed (#)	3,110.92	3036.09	3,142.2	

abc… means on the same row with different superscripts are significantly different (P< 0.05)

SEM- standard error of means.

Table 4: Haemetological Indices of Weaner Pigs Fed Scent Leaves Supplemented Diet

Parameters	Diets			SEM ±
	1–PC–With Kepro dewormer	2–NC–Without Kepro dewomer and scent leaves	3–scent leaves supplemented type	
PCV(%)	37.01^{b}	35.19^{c}	39.11^{a}	1.78
RBC (mm^{3} x 10^{6})	26.7	24.5	25.5	0.07
WBC (mm^{3} x 10^{3})	28.95^{ab}	25.12^{c}	29.98^{a}	0.89
HB (conc g/100ml)	12.72^{a}	10.01^{b}	12.88^{a}	2.81
MCHC (%)	24.97	24.01^{a}	24.08	0.9
MCH(%)	10.03	10.27	10.16	0.21
MCV(MM^{2})	60.04^{a}	53.12^{c}	59.59^{b}	6.4

abc.. means on the same row with different superscripts are significantly different (P< 0.05)

SEM- Standard error of means

Table 5: Selected Serum Biochemical Indices of Weaner Pigs Fed Scent Leaves Supplemented Diet

Parameters	Diets			SEM ±
	1–PC–With Kepro dewormer	2–NC–Without Kepro dewomer and scent leaves	3–scent leaves supplemented type	
ALP(iu/l)	1.59^{bc}	2.98^{a}	1.88^{b}	0.61
AST (iu/l)	26.83^{b}	29.17^{a}	26.01^{b}	2.99
ALT(iu/l)	24.04^{bc}	28.81^{a}	24.13^{b}	4.01

abc.. means on the same row with different superscripts are significantly different (P< 0.05)

SEM- Standard error of means

Table 6: Relative Oocysts Excretion (X10^3) per G of Feaces in Weaner Pigs Fed Scent Leaves Supplemented Diet

Parameters	Diets			SEM ±
	1–PC–With Kepro dewormer	2–NC–Without Kepro dewomer and scent leaves	3–scent leaves supplemented type	
1st month	30.42^{c}	61.3^{a}	36.78^{b}	24.9
2nd month	31.03^{bc}	63.41^{a}	35.89^{b}	27.1
3rd month	32.96^{bc}	68.01^{a}	31.11^{b}	29.4

abc… means on the same row with different superscripts are significantly different (P< 0.05)

SEM- Standard error of means

The performance weaner pigs fed scent leaves (SL) is shown in Table 3. Results indicate that, there were significant (P<0.05) differences among treatments in final body weight daily. Highest daily weight (0.51kg) and highest daily feed intake (0.46kg) were recorded in pigs fed diet 3 – scent leaves (SL) supplemented type, followed by pigs fed diet 1 – positive control (PC) - with kepro dewormer, daily weight (0.49kg) and daily feed intake (0.44kg) were observed respectively. Meanwhile, feed to gain ratio, were similar in pigs fed diets 1 – (PC) – with kepro dewormer and 3 – scent leaves (SL) supplemented type; (0.938, 0.941) respectively. Also, cost/kg weight gains (N616.11) were, however, significantly (P<0.05) lower in weaner pigs fed the 1% scent leaves (SL) supplemented diet compared to the control diets. The mortality ratio (0.0%) recorded were same across the dietary treatments.

This is a first report of its kind regarding the potential of scent leaves (*O. gratissimum)* as a phytobiotic agent in pigs diet. This present study showed that *O. gratissimum* supplemented diets enhanced and promoted the growth and nutrient utilization parameters which resulted in improved daily weight gain, better feed to gain ratio and as well as cost feed/kg weight gain of pigs fed diet 3 (1.0% - scent leaves supplemented type). It could be inferred that the plant enhanced the digestion in the digestive tracts of weaner pigs. This is in agreement with the report of Adegbesan and Abdulraheem (2020) that 1.5% africanal leaves–paste could effectively promote growth and nutrient utilization of cultured *C. gariepinus* brood-stock. Similarly, results observed in the works of Amala and Okoro dudu (2016) also revealed significant improvement in weight gain of weaned rabbit fed T. procumbens leaves diet. Furthermore, Adegbenro, *et al*. (2018) advocated the inclusion of 1.0% cassava composite leaf meal to alternate the expensive commercial premix in diets for growing pigs. Tewe (2004) also reported of 1.0% cassava leaves meal to completely replace commercial premix in pig diets without any deleterious effect. These superior performance in growth of weaner pigs fed scent leaves compared to kepro dewormer based control (diet 1) could be linked to the presence of growth promoting phytochemicals in the plant. Biologically active compounds e.g (Thymol, eugenol, gratissimol, 1,8-cineole, flavonoids, oleanolic acids) were also found to enhance the relaxant action of smooth muscle of ileum in the animals. Platel and Srinivasan (2004) reported another possible mechanisms that a wide range of herbs are known from medicine to exert beneficial actions within the digestive tract, such as laxative and spasmolytic effects, as well as prevention from flatulence. That stimulation of digestive secretions (e.g. saliva) bile, mucus, and enhanced enzyme activity which are proposed to be a core mode of nutritional action were also not uncommon (Chrubasik et al., 2005). Mortality ratio were the same across the dietary treatments. However, pigs have shown that they can handle scent leaves (SL) comfortably and since supplementation of SL at 1.0% in the diet of pigs has resulted in reduced cost feed/kg weight gain and parasitic infection in the gastro intestinal tract. It shows, therefore, that it is reasonably important to include SL in the diet of weaner pigs not only for economic reasons but also for wellness of the animals.

Table 4**:** shows the examined haemetological indices. Packed cell volume (PCV), Red blood cell (RBC), Haemoglobin (Hb), white blood cell values (39.11), (25.5), (12.88), (29.98) respectively were observed to be highest in the weaner pigs fed diet 3 – SL – supplemented type, compared with diets 1 (PC) with Kepro dewomer and 2 – negative control (NC).

Haemetological examination was defined to contributes immensely to detection of some changes in health status of livestock that may not be obvious at the time of physical examination but undoubtedly affect the fitness of the livestock (Arogbodo *et al*., 2020).

It was reported by Ukorebi *et al*. (2019) in an in-vivo study that G. latifola leaf extract enhanced blood-building capacity in monogastric animals. According to Nanbol, *et al.* (2016) haemotolgoical parameters of 8 weeks old broilers were: PCV 32 – 45%, Haemoglobin concentration 9.0 – 12.0 (g/l). This corroborates the results of this study which fall within the recommendation of Ross *et al*. (1978) and Arogbodo *et al*. (2020). However, helminthosis caused a decline in the mean values of PCV and RBC values which is anaemic in weaner pigs fed diet 2 – NC – without – Kepro dewormer and scent leaves. The anemia is as a result of blood loss. Adejinmi *et al*. (2004) reported anaemic situation as a reliable indicator of severity of parasitic infection as observed in the pigs fed diet 2. Meanwhile, helminthosis may be associated with the reduction in the mean PCV and RBC in infected pigs. The mean WBC count increased following helminthosis. The increase might be as a result of eosinophilia which is associated with parasitic infection (Adenaike, 2020). Oladunmoye (2006) also suggested the ethanolic leaf extract of scent leaves to be effective in inhibiting the disease condition after infection and was capable of reducing excessive breakdown of red blood cells and neutralizing toxin produced by the organism within the digestive tract. It can still be said that the similar increased in WBC parameters in weaner pigs fed diet 1 (Kepro dewormer) and diet 3 (scent leaves – supplemented type) shows that SL can be an efficient feed additive (Adedoyin *et al.*, 2019) to replace synthetic dewormer in pigs. Similar reports were revealed by Pradeep and Kuttan (2004), and Zhou et al., (2014), who worked on cytokines as an immune-modulating agent.

Table (5) shows enzymes activities of alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphate (ALP) in the serum of weaner pigs fed diets 1 (PC) – with kepro dewormer and 3 - scent leaves supplemented type were significantly decreased compared to diet 2 (NC)– without Kepro dewormer and scent leaves. The values: diet 1 – PC (24.04) (26.83) (1.59) and diet 3 – SL (24.13) (26.01) (1.88) versus diet 2 – NC (28.81) (29.17) (2.98) respectively.

Analysis of serum biochemical constituents level has revealed valuable information in detecting and diagnosis of metabolic disturbances and diseases in weaner pigs (Tewe, 2004). Serum levels of ALT, AST and ALP were Significantly different among weaner pigs in all the treatments. Weaner pigs fed diet 2 – NC (without kepro dewormer and scent leaves) had the highest mean values of ALT, AST and ALP. Although, ALP value obtained in this study goes contrary to that reported by Mitruka and Ramnsley (1977) for normal experiment animals (5 – 25iu/l). This variation in the concentrations of ALT, AST and ALP of pigs fed diet (2 – NC) which was in contrast to diets 1 – (PC) and 3 – (SL) was reported to be influenced by starvation and disease (Usip, 2014) which might be the resultant effects of helminthosis. Results like these are consistently alluded to by Galain *et al.*, (2018) and Akabarian *et al.*, (2012), which implied no damage or impairment on heart and liver in weaner pigs fed with either kepro-dewormer or scent leaves meal-supplemented diets. Because many disease processes have very distinct abnormalities in the liver enzymes. Data from (Table 6) showed the relative oocytes excretion per gram of feces were significantly ($P<0.05$) higher in weaner pigs fed diet 2 (NC – without kepro dewormer and scent leaves) compared with others for the period of twelve weeks. 1st month (60.3), 2nd month (63.41), 3rd month (68.01) respectively. According to (Mercy *et al*., 2017; Adenaike, 2020; and Arogbodo *et al*., 2020) phytochemicals are found in herbal plants and they are non-nutritive chemicals that are protective or efficacious in diseases prevention. The responsible therapeutic phytochemical in medicinal plants are mainly alkaloids, tannins, saponins, flavonoids, phenols, minerals and vitamins. This may be the confirmation of anti-parasitic activity of the used plant as compared with synthetic dewormer. Nonetheless, both the kepro dewormer and scent leaves do not eliminate the parasites from the gastro intestinal tract of those weaner pigs fed diets 1 (PC) and 3 (scent leaves supplemented type).

Conclusion

The scent leaves (*O. gratissimum*) inclusion at 1.0% had positive effects on growth, blood biochemical, cost/kg weight gain of weaner pigs. This study concluded that SLM is an excellent functional phytobiotic for use in the prevention of worms because of its remarkable dietary and medicinal applications.

Recommendations

It is recommended that there should be an opportunity to report back findings like this to farmers and to learn from them about the performance of the herbal medicine (scent leaves meal) supplemented feed formulations recommended by nutritionists or researchers.

There is need for a concerted effort by both the government and private sector in the unique area of research and development of herbal medicines (phytobiotics) formulations of livestock feeds.

There is, also, the need for collection, collection and analysis of data on synthetic drugs versus herbal medicines and for prompt dissemination of such findings to the livestock industry and the public at large.

There should be an on-farm trials done all over the ecological zones, in order to identify any effect of various zones in the response of animals to the promising fed additive, such as (SLM).

The study also recommends that the government should reverse agricultural policies and strategic plans on alternative medicine (phytobiotic-use) in livestock feeds. The first of which is to deal specifically with the inventory of scent leaves products/parts (e.g. Juice from the leaves, stem, crushed leaves) and strategies for their supplies.

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REFERENCES

Abdelheg Barberis, Nadir, Omar, B., Ammar, A and Amir, A (2015). Effect of using an anticoccidial and a prebiotic on production performances, immunity status and coccidiosis in broiler chickens. Asian Journal of poultry science 9:133 – 143

Adedoyin, A. A. (2018) Potentials of Hot Red Pepper (Capsicum annum L.) on performance and coccidiosis in broilers. In: Animal science Association of Nigeria and Nigerian institute of Animal science 7th ASAN – NIAS Joint Annual meeting. Book of proceedings 23rd Annual conference 9th – 13th Sept. 2018 Ilorin, Pp 40 – 44.

Adedoyin, A.A., Mosobalaje, M.A. and Bamimore, A.I. (2019). Performance, Immunostimulating and Blood Biochemical Indices of Broiler Chickens Fed Hot Red Pepper (Capsicum annum L.) Supplemented Diets. Journal of Experimental Agriculture International 36(3):1-8. JEA 1.34966.

Adegbenro, M. Agbede, J.O, Onibi, G.E., and Aletor, V.A (2018). Performance and meat quality of growing pigs fed composite leaf meal premix as an alternative to commercial premix. Inter journal of environment. Agriculture and Biotechnology (IJEAB) Vol 3(1) 66 – 71.

Adegbesan, S.I. and Abdulraheem, I. (2020). Growth Performance nutrient utilization, haematology and serum biochemistry of African Catfish (*Clarias gariepinus*) broodstock fed varying levels of Aspilia africana leaves-paste. Nigerian Journal of Animal Production 47(1):129-139.

Adejinmi, J.O, Sadiq, N.A, Fashanu, S.O., Lasis, O.T and Ekundayo, S (2004). Study on the blood parasite of sheep in Ibadan, Nigeria. African Journal of Biomedical Research 7, 42 – 43.

Ademola, I.O. and Onyiche, T.E. (2013) Haemoparasites and Haematological parameters of slaughtered Ruminants and Pigs at Bodija .Abattoir, Ibadan, Nigeria. African Journal of Biomedical Research 16: 101- 105.

Adenaike, E. A. (2020). Effect of halminthosis on some blood parameters of pigs in Ibadan, Nigeria. Nigerian Journal of Animal production Vol 47(1): 53 – 57.

Agbede, J.O. and Aletor, V.A. (2003). Evaluation of fish meal replaced with leaf protein concentrate from glyricidia in diets for broiler-chicks: Effect on performance, muscle growth, haematology and serum metabolites. International Journal of Poultry Science 2(4):242 – 250.

Akbarian, G.A., Kermanshashi, H., Gilani, A. and Moradi, S. (2012). Influence of turmeric rhizome and black pepper on blood constituents and performance of broiler chicken. African Journal Biotechnology II: 8606 – 8611.

Alexander, P. (2016) Phytochemical Screening and mineral composition of the leaves of scent leaf (*Ocimum gratissimum*). International Journal of Applied Sciences and Biotechnology 4(2): 161-165.

Al-Harthi, M.A. (2006). Impact of supplemental feed enzymes, condiments mixture or their combination on broiler performance. Nutrients digestibility and plasma constituents. *Internal journal of Poultry Science*. 5(8), 764-771.

Allan, R. and Peter, N. (1998). Epidemiology, Diagnosis and control of Helminth parasites of swine. Food and Agriculture Organization of the United Nations, Rome FAO Animal Health Manual 159pp.

Amala, I.A. and Okorodudu, E.O. (2016). Comparative Evaluation of the Growth Performance and Feed Intake of Weaned Rabbits Fed Tropical Grasses and selected forages leaves. Int. Journal of Research Studies in Agricultural Sciences (IJRSAS). 2(2): pp 14-18.

Anyanwu, M. (2010). Evaluation of the feed preservative potentials of *Ocimum gratissimum*. An unpublished B.Sc. research project, Department of Animal Science, Federal University of Technology, Owerri.

AOAC (2006). Association of Official Analytical chemists. Official methods of Analysis 15th ed. Washington, D.C. Procedure number, 1230.

Arhoghro, E.M., Ekpo, K.E and Ibeh, G.O (2009). Effect of aqueous extract of scent leaf (*O. gratissimum*) on carbon tetrachloride (CCl4) induced liver damage in albino wister rats. African Journal of Pharmacy and Pharmacology Vol. 3(11): 562 – 567.

Arogbodo, J.O, Osho, I.B Faluyi, O.B and Awoniyi, T.A M. (2020). Haematological indices of Salmonella Gallinarum (Gr. Di – 1, 9, 12) Infected broiler chickens treated with ethanolic leaf extract of chrysophyllum albidum (G. Don). Nigerian Journal of Animal Production 47(1) 65 – 80.

Babatunde, G.M., Fahimi, A.O. and Oyedeji, A.O. (1992). Rubber seed oil versus palm oil in broiler chicken diets: Effects on performance, nutrient digestibility, haematology and carcass characteristics. *Anim. Feed Sci. Tech.* 25:133-146.

Burt, S. (2004). Essential oils: their antibacterial properties and potential applications in foods-a review. *International Journal of Food Microbiology*, 94:223-253.

Cardozo, J. and Fred, M. (2004). Species: A global History. Reaction Books. Pp. 128.

Cardozo, P.W., Calsamiglia, S., Ferre, t A. and Kamel, C. (2004). Effect of natural plant extracts on ruminant protein degradation and fermentation profiles in continuo's culture *J. Animal Sci.* 82:323-3236.

Chesson, A., steward, C.S. and Wallace, R.J., (1982). Influence of plant phenolic acid on growth and cellulytic activity of rumen bacterial. *Applied Environ Microbiol.*, 44:597-603.

Chrubasik, S.M., Pittler, M. H and Roufogalis B.D. (2005) Zingiberis rhizome: A comprehensive review on the ginger effect and efficacy profiles. Phytomedicine 12:684 – 701.

Cuppett, S.L. and Hall, C.A. (1998). Antioxidant activity of *Labiatae. Food and Nutrition Research.* 42, 245-271.

Duncan, D.B (1965) Duncan Multiple range Tests Biometrics 11:1.

Fajimi, A.K and Taiwo, A.A. (2005). Herbal remedies in animal parasitic diseases in Nigeria. A review African journal of Biotechnology 4: 303 – 307.

Galani, A., Kermanshashi, H., Golian, A., Tahmasbi, A. and Aami, M. (2018). Appraisal of haematological indices and humoral immunity in commercial laying hens fed rations consisting cotton seed meal and sodium bentonite. Iranian Journal of Applied Anim. Science. Archive of SID.

Ghazalah, A.A and Ali, A.M (2008). Rosemany leaves as dietary supplement for growth in broilers. International Journal of Poultry Science, 7(3): 234 – 239.

Hashemi, S.R., Zulkifl Hair-bejo, M., Karami, M. and Soleimani, A.F. (2009). The effects of Euphorbia hirta and acidifier supplementation on growth performance and anti-oxidant activity in broiler chickens. Proceedings of the 21st Vet. Association Malaysia (VAM) Congress, Aug. 7 – 9. Port Dickson, Malaysia, Pp: 215 -217.

Heiko, N. (2019). Applied biosystems – Guidelines for taking diagnostic sample from pigs faeces. Thermo Fishers Scientific. Royal Veterinarian Society UK 6pp.

Idodo-Umeh G. (2011). College biology. 4th Edition. Idodo-Umeh Publishing. Benin City, Nigeria pg. 657.

Ijeh, I.I., Omodamiro, O.D. and Nwanna, I.J. (2005). Antimicrobial effects of aqueous and ethanolic fractions of two species *O. gratissimum* and *xylopia aethiopica*. African Journal of Biotechnology 4:953 -956.

Iwu, M. M. (1993). Hand book of African Medicinal plants. CRC Press. Boca Raton Pp 214 – 215.

Jain, NC (1993) Essential of veterinary Haemetalogy, Lea and farbiger, Philadolphia pp 20 – 35.

Junaid, S., Olabode, A.O., Onwuliri, F.C., Okwori, A.E.J and Agina, S.E. (2006). The antimicrobial properties of *Ocimum gratissimum* extracts on some selected bacterial gastrointestinal isolates. *African Journal of Biotechnology*, 5(22), 2315-2321.

Kahn, C.M. (2005). The Merch Veterinary Manual 9th edition. Cynthia M. Kahn and Scott line (Eds). Merck & Co. Inc. Rahway, Us.A 2344pp.

Kamel, C.T. (2001). Modes of action of plant extract in non-ruminant: In Recent advances in Animal Nutrition. P.C. Garasssiorthy and J. Wiseman (eds.), Norhinghan Union press Morthinghan U.K. pp. 387.

Kaneko, J.J. (1989). Clinical biochemistry of domestic animals. 4th Edition. Academic Press. Inc. New York. Pp 102-122.

Lamb, G.N (1991) Manual of veterinary laboratory technique. (CIBA – GEIGY) Kenyi, 92 – 109.

Lambert, RJW, Skandamis PN, Coote PJ and Nychas GJE (2001). A study of the minimum inhibitory concentration nd mode of action of oregano essential oil, thymol and carvacrol. *Journal of Applied Microbiology.* 91:453-462.

Levic, J., Sredanovic, S., Duragic, O. Levic, L.J and Pakov, V. (2017). New feed additives based on Phytogenics and acidifiers in animal nutrition Biotech in Anim Husbandry 23 (5 – 6) 527 – 534.

Li, PF, Piao XS, Ru YJ, Han X, Xue LF, Zhang HY. 2012. Effects of adding essential oil to the diet of weaned pigs on performance, nutrient utilization, immune response and intestinal health. Asian-Aust J Anim Sci. 25:1617-1626.

Mercy, G.A, Light, F.W and Gospel, A (2017). Qualitative and Quantitative phytochemical screening of some plants used in ethnomedicine in the Niger Delta Region of Nigeria. Journal of Food and Nutrition Sciences 5(5): 198 – 205.

Mitruka, B.M and Rawnsley, H.M (1977). Clinical biochemical and haematologicalm reference values in normal experimental animals. Mason, New York, 42 – 45.

Mohsen Mohammadi Gheisar and In Ho Kim (2017). Phytobiotics in poultry and swine nutrition – a review. *Italian Journal of Animal Science.*

Muhammad, J., Fazil-Raziq, D. Abdul H., Rifatullah, K. and Ijaz, A. (2009). Effects of aquous extract of plant mixture on carcass quality of broiler chicks. *Animal Research Publishing Network (ARPN) Journal of Agricultural and Biological Sciences,* 4(1): 37-40.

Nakatani, N. (2000). Phenolic antioxidant from herbs and spices. Biofactors, 141-146.

National Research Council (2012). Microlivestock: Little-known Small Animals with a promising Economic Future – Washington DC: The National Academics Press. https://doi.org/10.17226/1831.

Naubol, D.L. Boniface, N.B., Helen, D.N Charity, A.A Deborah, M.A., Peterside, R.K and Mary M (2016) Establishment of reference values for some biochemical and haematological .parameters for broilers and Layers in plateau State. Nigerian. Vom Journal of veterinary science vol 11: 30 – 35.

Ngozi, D.U., Ohalete, C.N, Ibiam, U.K and Okechuckwu, R.I (2015), Medicinal plants effectiveness against helminthes of cattle Journal of Applied Bioseiences 86: 7900 – 7917 ISSN 1997 – 5902.http://dx.doi.org/10.4314/jab.v86il.6.

Nwachukwu, E. (2009). Evaluation of the antioxidative properties of *Monodora nynsrica* (African nutmeg), B.Sc project. Micheal Okpara University of Agriculture, Umudike.

Nwakpu, P.E., Uchewa, E.N. and Nweke, F.N. (2010) Growth performance and haematological traits of weaner pigs fed graded levels of Raw Bambara Nut (Vigna Subterranean (L) Verdc) waste. Nigerian Journal of Biotechnology Vol 21 (65 – 70).

Oboh, G. (2004). Antioxidant and antimicrobial property of *Ocimum gratissimum* leaves. Book of abstracts: 24th Annual Conference of Nigerian society of Biochemistry and Molecular Biology Pp66.

Odoemelam, V.U., Etuk, I.F., Ndelekwute, E.K., Iwuji, T.C. and Ekwe, C.C. (2013). Herbs and Spices: Options for Sustainable Animal Production. *Journal of Biology, Agriculture and Healthcare*. 3(7): 116-123.

Odoemelam, V.U., Nwaogu, K.O., Ukachukwu, S.N., Esonu, B.O., Okoli, I.C., Etuk, E.B., Ndelekwute, E.K., Etuk, I.F., Ogbuewu, I.P. and Kadurumba, O.E. (2012). Performance of Broiler Chuckens Fed *Ocimumgratissimum* L. Supplemented diets. *Proceedings of 6th Annual Conference of Nigeria Soceity for Indigenous Knowledge and Development (NSIKAD), June 5th – 7th MOUA, Umudike*,Pp. 15-16.

Ofokansi, K., Adikwu, M. and Esimore, C.O. (2003). Antibacterial activity of the leaf extract of *Ocimum gratissimum* (Fam. Labiatae) Bio-Research Vol. 1(1) 35-42.

Oladunmoye, M.K (2006) Immunostimulatory Activity ethanolic leaf extract from ocimum gratissimum in albino rat orogastrically dosed with Escherichia coli (NCIB 86). Journal pharrmacol. Toxicol 1: 389 – 94.

Olomu, J.M (2011). Monogastic Animal Nutrition-Principle and Practices. 2ndedu. St Jackson Publishing Benin City Nigeria 478Pp.

Osuji, P., Fernandez-Riviera, O.S. and Odenyo, A. (1995). Improving fibre utilization and protein supply: Inm animal Fed poor quality Roughages ILRI nutrition Research and plans. Wallace, R.J. and Lahlon-Kassi, A. (ed) Rumen Ecology Research and planning Vol. 1 International Livestock Research Institution Addis-Ababa Pp: 1-22.

Plail, R. 2006. 'The Innovative Power of Probiotics', *Poultry International.* Pp. 34-36

Plate1, K. and Srinivasan, K. (2004). Digestive Stimulant action of spices: A myth or reality? Indian J. Medical Research 119:167 – 179.

Prabhu, K.S., Lobo, R., Shirwaikar, A.A. and Shirwaikan, A. (2009) *Ocimum gratissimum*: A review of its chemical pharmacological and ethno medicinal properties. The open Complementary Medicine Journal, 1:1 – 15

Pradeep C.R. and Kuttan G. (2004). Piperine is a potent inhibitor of nuclear factor-kB (NF-kB), c-Fos, CREB, ATF-2 and Pro-inflammatory cytokine gene expression in BT6F-10 melanoma cells. International Immuno-pharmacology, 2004;4:1795-1803.

Ross, J.G., Christie, G., Holliday, W.G. and Jones, R.M. (1978). Haematological and blood chemistry comparison values for clinical pathology. Vet. Record. 102:29-31.

SAS Institute Incorporation (2012) SAS/STAT User's Guide. SAS Institute Incorporated cary, NC.

Talabi, A.O., Oyekunle, M.A., Abiola, J.O., Makinde, G.E.O, Akinleye, S.O., Ettu, R.O. and Oyejobi, Y.A. (2010). Prevalence of swine diseases in Ijebu division of Ogun State. Nigerian Journal of Animal Production 38:125 – 129.

Talabi, A.O., Oyekunle, M.A., Onasanya, A.S., Tijani, L.A., Sosanya, O.S. and Ettu, R.O. (2004). Comparison of the efficacies of Diazinon + Albendazole, lvomec and lvojec on the control of gastrointestinal nematodes and ectoparaistes of pigs. African Journal of livestock Extension 3:55 – 58.

Tewe, O. O. (2004). Cassava for livestock feed in sub-Sahara Africa. IFAD and FAO Publications. 69pp

Tian, W. (2008). Herbs in Africa. A field guide to the natural history of herbs NSW department of primary industries http//www.ozelacademy.com/8)ojas%2520786%2520.

Tipu, M.A., Pasham T.N. and Ali, Z. (2002). Comparative efficacy of salinomycin sodium and Neem fruit (*Azadirachta indica)* as feed additives anticocidials in broilers. *Int. J. poult. Sci*, 1(4); 91-93.

Ukorebi, B.A., Akpet, S.O and Gbose, P.N (2019) Heametology, serum biochemistry and organ histopatology of broiler chickens fed graded dietary levels of *Gongronema latifolia* (Utasi) Nigerian Journal of animal production 46(2) 164 – 175

Usip, L.P.E (2014) Blood Parasites of Slaughtered Pigs in Uyo Local Government Area, Akwa Ibom State Nigerian Journal of Agriculture, Food and Environment 10:108 – 112.

Windisch, W., Schedle, K., Plitzner, C. and Kroismayr, A. (2008). Use of phytogenic products as feed additives for swine and poultry, *Journal of Animal Science*, 86:140-148.

Zhou, H., Chen S, Wang, M., and Cheng, A. (2014). Interferons and their receptors in birds: A comparison of gene structure, phylogenetic analysis, and cross modulation. International Journal of Molecular Science. 2014;15:21045-21068.