Effect of *Picralima nitida* Seed as a Source of Natural Antioxidant on Performance Characteristics, Egg Quality, faecal egg worm count and Egg Lipid Profile of Laying Chickens

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Abstract

The health implications of synthetic drugs in poultry production have spurred interest in organic-based alternative antioxidants. This study was aimed at evaluating the antioxidant effect of Picralima nitida seed powder (PnSP) on performance characteristics, egg quality, and egg lipid profile of laying chickens, while also investigating its potential for worm control and effects beyond anti-oxidative activities. ISA Brown laying chickens (30 weeks old, n=90) were fed PnSP-supplemented diets in a 56-day feeding trial. Birds were randomly allocated to five dietary treatments supplemented with 0, 0.05, 0.1, 0.15, and 0.2 g/kg PnSP. They were replicated six times and three birds per replicate. Performance characteristics, egg quality metrics, lipid profile, faecal egg counts were evaluated. Data collected were subjected to one-way analysis of variance and treatment means separated using Duncan Multiple Range Test at p<0.05. Results showed that performance and egg quality parameters were not adversely affected by PnSP supplementation. Daily Feed Intake decreased with increasing PnSP levels. Triglyceride and Very Low Density Lipoprotein (VLDL) levels were significantly reduced with increased PnSP, indicating potential cardiovascular benefits. The perception for taste did not follow a definite pattern while, notably, fecal egg worm counts were absent in layers fed diets containing 0.05, 0.1, and 0.15% PnSP while 1,200 opg was observed in those fed control diets, suggesting anti-parasitic properties. This unexpected finding implies that PnSP's effects extend beyond its known anti-oxidative activities, potentially offering a dual benefit of improving egg quality while controlling intestinal parasites. In conclusion, the phytochemicals in Picralima nitida appear to exhibit multifaceted biological activities, including antioxidant and anti-parasitic effects. These properties make PnSP a promising natural supplement for enhancing poultry health and productivity while reducing reliance on synthetic drugs.

Keywords: *Picralima nitida*, performance, egg, lipid profile, faecal egg count

Effet de la (*graine de Picralima nitida*) en tant que source d'antioxydant naturel sur les caractéristiques de performance, la qualité des œufs, le comptage des œufs fécaux et le profil lipidique des œufs des poules pondeuses

Résumé

Les implications sanitaires des médicaments synthétiques dans la production avicole ont suscité un intérêt pour les antioxydants alternatifs à base d'organique. Cette étude visait à évaluer l'effet antioxydant de la poudre de graine de Picralima nitida (PGPn) sur les caractéristiques de performance, la qualité des œufs et le profil lipidique des œufs des poules pondeuses, tout en examinant son potentiel de contrôle des vers et ses effets au-delà des activités antioxydantes. Des poules pondeuses ISA Brown (âgées de 30 semaines, n=90) ont été nourries avec des régimes supplémentés en PGPn lors d'un essai alimentaire de 56 jours. Les oiseaux ont été répartis au hasard en cinq traitements alimentaires supplémentés avec 0, 0,05, 0,1, 0,15 et 0,2 g/kg de PGPn. Chaque traitement a été répété six fois avec trois oiseaux par répétition. Les caractéristiques de performance, les métriques de qualité des œufs, le profil lipidique et le comptage des *œufs fécaux ont été évalués. Les données collectées ont été soumises à une analyse de variance à un facteur et les moyennes des traitements ont été séparées en utilisant le test de Duncan à p<0,05. Les résultats ont montré que les paramètres de performance et de qualité des œufs n'étaient pas affectés de manière défavorable par la supplémentation en PGPn. La consommation alimentaire quotidienne a diminué avec l'augmentation des niveaux de PGPn. Les niveaux de triglycérides et de lipoprotéines de très faible densité (LTFD) ont été significativement réduits avec l'augmentation de PGPn, indiquant des avantages cardiovasculaires potentiels. La perception du goût ne suivait pas un schéma défini, tandis que, de manière notable, les comptages d'œufs fécaux de vers étaient absents chez les pondeuses nourries avec des régimes contenant 0,05, 0,1 et 0,15 % de PGPn, tandis que 1 200 opg ont été observés chez celles nourries avec des régimes témoins, suggérant des propriétés antiparasitaires. Cette découverte inattendue implique que les effets de PGPn s'étendent au-delà de ses activités antioxydantes connues, offrant potentiellement un double avantage d'amélioration de la qualité des œufs tout en contrôlant les parasites intestinaux. En conclusion, les phytochimiques dans Picralima nitida semblent exhiber des activités biologiques multifacettes, y compris des effets antioxydants et antiparasitaires. Ces propriétés font de PGPn un complément naturel prometteur pour améliorer la santé et la productivité avicoles tout en réduisant la dépendance aux médicaments synthétiques.*

Mots-clés : *Picralima nitida*, performance, œuf, profil lipidique, comptage des œufs fécaux

Introduction

Eggs are susceptible to autolysis when stored for long time and the use of synthetic antioxidants has been reported to improve the quality of eggs (Olagoke *et al*., 2019). However, synthetic antioxidants such as Butylated Hydroxylanisole (BHA), Butylated Hydroxyltoluene (BHT), propyl gallate and alpha tocopheryl acetate, appears as foreign substance in the body which are also known to degrade cells over time and cause adverse health effect like risk of cancer (Karen, 2007). Therefore, there is further need to source for natural antioxidants which are plant based and cheap to address this issue.

Phytoadditives are plant based products used in animal nutrition for the purposes of improving the quality of feed and the quality of animal products (meat and egg) and to improve the animal performance and health. Olagoke *et al.* (2019) reported that ginger (*Zingiber officinale*), garlic (*Allium sativum*) and roselle (*Hibiscus sabdarifa*) are good antioxidants that exert modulatory effects on lipid metabolism in broiler chickens. Orego-Stim, an herbal product has been reported to capture natural bioflavonoid essential oil based compound that increase the production of commercial laying hens around the world (Anonymous, 2021). Diets supplemented with garlic powder had also been reported to have the ability to reduce serum and egg cholesterol levels in hens (Mottaghitalab and Taraz, 2002). There is dearth of information on the use of *Picralima nitida* (K. Schum) Hallier in laying chickens, however, it has been established that *P. nitida* improved weight gain of broiler chickens, reduced the proliferation of pathogenic microbes and had protein sparing effect (Haruna, 2021). Haruna and Odunsi (2022) also reported the chemical properties of *P. nitida* and recommended its use in livestock industry as a phyto-additive. In this context, the present research was aimed at evaluating the antioxidant effects of *P. nitida* on performance characteristics, egg quality, lipid profile and faecal egg worm of laying chickens fed diets supplemented with graded levels of *P. nitida* seed powder (PnSP).

Materials and Methods

Description of experimental site

The experiment was carried out at the Layers Unit, Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso.

Ogbomoso is located in the derived Savannah that lies on longitude 4° 10' East of Greenwich meridian and Latitude 8° 10' North of the equator. The altitude ranges from 300 m to 600 m above sea level while the mean temperature and annual rainfall are 27°C and 1247mm, respectively (Google Earth, 2019)

Procurement, Identification and Processing of Picralima nitida Seeds

Picralima nitida pods were sourced from Ago Owu Farm Settlement, Ikoyi, Osun State, Nigeria. The pods and leaves of the plant were deposited at Forestry Research Institute of Nigeria (FRIN) for identification and authentication in the herbarium, taxonomy section and a herbarium number FHI-113021 was obtained. The pods were broken to remove the seeds, processed to powder form as described (Haruna and Odunsi, 2022) in the Animal Biosciences Unit of Department of Animal Nutrition and Biotechnology, LAUTECH, Ogbomoso. The seeds were rinsed with distilled water, de-hulled and diced into small sizes with stainless knife to facilitate air-drying under room temperature until constant weights were obtained. The dried seeds were screened to remove extraneous materials and thereafter milled with Super Master (SMB-2977) electric blender into powder form, stored in an air-tight container and kept in a cool place until needed for biological trial.

Experimental birds, diets and management

Ninety 30 weeks old ISA Brown laying chickens were procured from a reputable commercial farm in Ibadan, Oyo state, Nigeria. The birds were housed in a 2-tier cage compartment in an open-sided pen. The birds were randomly allotted to five dietary treatments of six replicates and three birds per replicate. The initial weights were taken using Camry (Emperors) digital weighing scale and subsequently on four weeks interval. The model number of the scale was El-02HS with a weighing capacity of 3000 g and to the nearest 0.5 g. The birds were offered adequate feed and drinking water *ad-libitum.* Standard poultry management operations were adhered to during the 8 weeks feeding trial. Five iso-nitrogenous and iso-caloric layers diets were formulated such that *P. nitida* seed powder was included at five levels (0, 0.05, 0.1, 0.15 and 0.2%) in diets, A, B, C, D and E respectively, and the control diet is presented in Table 1.

Table 1: Gross and analysed composition of layers diet (DM %)

Ingredients (%)	Control
Maize	50.00
Soya bean meal	20.30
Wheat offal	15.50
Fish meal (72%)	2.50
Di-calcium phosphate	4.00
Lime stone	7.00
Methionine	0.25
Premix*	0.25
Industrial salt	0.20
Picralima nitida seed powder	-
Total	100.00
Analysed composition (%)	
Crude protein	18.50
Ether extract	5.40
Crude fibre	5.70
Ash	16.00
Dry matter	91.65
Nitrogen free extract	46.05
Metabolizable energy (kcal/kg)**	2602.30

**100 kilogram of diet contained the following vitamins and trace minerals: Vitamin A = 4,000IU, Vitamin D_3 = 1,000IU, Vitamin E = 0.006mg, Vitamin K = 0.08mg, Vitamin B_2 = 0.002mg, Vitamin B12 = 0.0048mg, Nicotinic acid = 0.0012mg, Pantothenic Acid = 0.004mg, Folic Acid = 0.0004mg, Biotin = 0.002mg, Zinc = 0.0018mg, Iron = 0.002g, Copper = 0.0008mg, Iodine = 0.0006mg, Selenium = 0.00004mg and Cobalt = 0.0008mg. **Calculated.*

Data collection

Zootechnical performance indices

Data collected for Zootechnical performance are Body Weight Gain (BWG), Average Daily Feed Intake (ADFI), percentage Hen-Day Production (%HDP), Average Egg Weight (AEW) and Feed Conversion Ratio (FCR) i.e feed / kg egg and feed / tray egg. The BWG was determined by subtracting the initial weight from final weight and divided by number of birds to get the weight of a bird. The ADFI was determined on daily basis by subtracting left over from feed supplied and divided by number of birds. Percentage HDP was calculated by dividing the number of egg laid by number of birds and multiply the result obtained by hundred. At the end of each week, eggs laid per treatment were weighed and the average was determined to know the average egg weight per week.

Egg quality and proportions in layers fed Picralima nitida

At two weeks interval, 6 eggs per treatment were randomly selected and used to determine:-Internal (Haugh unit (HU), yolk index, yolk colour and albumen height), external (Egg Shape Index and Egg shell thickness) and egg proportions (yolk %, albumen %, membrane % and shell %). The yolk index was calculated by dividing the yolk height by the yolk diameter of the broken egg and this was determined using spherometer, The albumen height was determined at the thickest white point of spread out albumen on a flat tray, at the chalaza point using spherometer. Haugh unit of egg was determined using the formula of Haugh (1937) HU= 100 X log (H - $1.7W^{0.37}$ + 7.57) Where: H =

albumen height in mm and W = egg weight in g. The yolk colour was determined using Roche yolk colour (RY) fan.

Egg shape index was determined from the ratio of egg width to the length. Egg length and width were measured with Venier calipers in centimetre (cm) and the shell thickness was measured using a micro-meter screw gauge. The shell was air-dried for 24 h and prior to drying the shell membrane was detached from the shell to remove the adhering albumen before taking the thickness and weight. The thickness was taken at three different spots (head, middle and bottom regions). The mean of these points was used as the shell thickness in millimetre.

For egg proportion, eggs were carefully broken into a clean, smooth, white surface plate and the internal parameters were measured using KERRO electronic compact scale. The model number of the scale was BL-30001 with a weighing capacity of 3000 g and to the nearest 0.01 g. Yolk, albumen, dried membrane and shell weights were determined and expressed as percentage of the broken egg weight.

Sensory evaluation

Six eggs from each treatment (1 per replicate) were boiled in a water bath at 70^{o} C for 7 minutes, after which the water bath was turned off and the eggs were kept in the water (lid on) for 20 min. The water was drained from the pot and the strained eggs were cooled under running tap water, a little cooler than ambient temperature, until the eggs were considered to be at room temperature. The eggs were peeled and then cut into two (lengthwise) and delivered into an identified sample plates with respect to the egg code. Ten semi-experienced panellists were used for the sensory evaluation; each panellist was required to masticate one sample per treatment with ranked preference in the following categories: albumen colour, smell, taste, texture and overall acceptability while for the yolk colour, a Roche yolk colour (RY) fan was used for ranking. A nine-point hedonic scale was used, 1 referring to extremely dislike and 9 as extremely like (Modified procedure of Hayat *et al*., 2012).

Yolk lipid and cholesterol determination

The quantitative determination of yolk lipid profile and cholesterol was carried out using an enzymatic test kit described by Shen *et al*. (1982**)**

Faecal egg worm count

Total faecal egg worm count was carried out at the end of the experiment using floating method as described (Bortoluzzi *et al*., 2015). Fresh faecal samples were collected in a small plastic container from the birds. The samples were preserved at 4^{o}C prior the analysis.

Proximate analysis

The proximate composition of the control diet was determined using the A.O.A.C. (2007) method.

Statistical analysis

The data collected were subjected to one way analysis of variance (ANOVA) in a completely randomised design using the procedure of SAS (2003). Significant mean differences were determined using Duncan Multiple Range Test of the same package at 5% significance level.

Model:

$Y_{ij} = \mu + \alpha_i + e_{ij}$

Where,

Y_{ij} = jth observation of the ith treatment

μ = Population mean

α_i = Effect of ith PnSP (I = 0, 0.05, 0.1, 0.15 and 0.2)

e_{ij} = Experimental Error

Results and discussion

Results

There were no significant (p>0.05) differences in the parameters monitored except for feed intake which significantly (p<0.001) reduced with the inclusion of PnSP (Table 2). Birds fed control diet had highest intake (110.97g) while the least (106.27g) was recorded for birds fed 0.05% PnSP. Without exception, all the parameters monitored for egg quality were not adversely (p>0.05) affected by PnSP levels (Table 3). Egg weight and feed conversion ratio (kg feed / kg egg or kg / feed / tray of egg) were not adversely affected by the dietary inclusion of PnSP even though, there were significant reduction in feed intake.

The lipid and cholesterol profile of eggs collected from hens fed varying levels of PnSP are presented in Table 4. The hens showed significant (p=0.04, 0.02 and 0.04) influence on triglyceride, low density lipoprotein (LDL) and very low density lipoprotein (VLDL), respectively; while cholesterol and high density lipoprotein (HDL) were not significantly (p=0.48 and 0.62, respectively) influenced. The values of triglyceride and VLDL reduced while that of LDL increased with increase in PnSP levels. Egg lipid profile of layers fed PnSP showed a decrease in triglyceride and VLDL while there was no significant influence on HDL.

Table 2: Effect of PnSP as natural antioxidant on laying performance

Parameters	A (Control)	B (0.05_{PnSP})	C (0.10_{PnSP})	D (0.15_{PnSP})	E (0.20_{PnSP})	SEM	P. Value
HDP (%)	74.90	80.46	81.94	79.56	75.10	1.34	0.35
ADFI (g/bird)	110.97^{a}	106.27^{c}	108.85^{b}	107.69^{ab}	106.65^{c}	0.41	<0.001
Initial weight (g/bird)	1708.33	1769.44	1738.89	1711.11	1725.00	91.51	0.88
Final weight (g/bird)	1719.44	1755.56	1722.22	1800.00	1755.56	19.80	0.73
ADG (g/bird)	11.11	-13.89	-16.67	88.89	30.56	15.44	0.18
Egg weight (g/egg)	60.06	60.52	60.05	60.44	59.39	0.47	0.96
FCR kg feed/Kg Egg	2.47	2.18	2.21	2.24	2.39	0.06	0.27
FCR kg feed /Tray	4.44	3.96	3.99	4.06	4.26	0.08	0.13

^{abc}: Treatment values on the same row with different superscripts are significantly different (p<0.05), HDP = hen day production, ADG = Average daily gain, FCR = feed conversion ratio, ADFI = average daily feed intake, SEM = standard error mean, PnSP= *Picralima nitida* Seed Powder

Table 3: Effect of PnSP as natural antioxidant on egg quality of laying chickens

	A	B	C	D	E	SEM	P. Value
Parameters	(Control)	(0.05_{PnSP})	(0.10_{PnSP})	(0.15_{PnSP})	(0.20_{PnSP})		
Egg Quality							
Egg weight, g	61.07	61.28	60.69	60.66	60.01	0.56	0.97
Haugh unit, %	94.22	95.12	94.80	93.48	94.85	0.53	0.89
Yolk Index	0.38	0.37	0.38	0.35	0.38	0.00	0.14
Shell thickness, mm	0.38	0.38	0.39	0.36	0.35	0.00	0.27
Yolk colour	1.00	1.00	1.00	1.17	1.00	0.21	0.43
Egg shape index	0.76	0.77	0.75	0.78	0.77	0.00	0.16
Albumen height, mm	8.21	8.48	8.27	7.99	8.21	0.15	0.91
Proportion (%)							
Yolk	25.90	25.95	25.54	24.94	25.67	0.29	0.84
Albumen	64.68	64.09	64.39	65.42	64.48	0.29	0.69
Shell	8.95	9.53	9.65	9.17	9.38	0.12	0.45
Membrane	0.47	0.43	0.42	0.47	0.47	0.02	0.86

$^{a, b}$: Treatment values on the same row with different superscripts are significantly different (p<0.05). SEM = standard error mean, PnSP= *Picralima nitida* Seed Powder.

Table 4: Egg lipid profile of laying chickens fed diets containing PnSP as natural antioxidant

Parameters	A	B	C	D	E		
(mg/dl)	(Control)	(0.05_{PnSP})	(0.10_{PnSP})	(0.15_{PnSP})	(0.20_{PnSP})	SEM	P. Value
Triglyceride	176.95^{a}	173.00^{a}	168.50^{a}	146.25^{ab}	133.15^{b}	5.82	0.04
Cholesterol	93.85	82.45	90.65	94.75	105.30	3.75	0.48
HDL	39.10	33.95	41.20	43.65	49.05	2.87	0.62
LDL	19.40^{b}	14.85^{b}	15.85^{b}	21.85^{ab}	29.65^{a}	1.74	0.02
VLDL	35.35^{a}	34.60^{a}	33.65^{a}	29.25^{ab}	26.65^{b}	1.15	0.04

$^{a\ b}$: Treatment values on the same row with different superscripts are significantly different (p<0.05). HDL = High density lipoprotein, LDL = low density lipoprotein and VLDL = very low density lipoprotein, SEM = standard error mean, PnSP= *Picralima nitida* Seed Powder

The sensory attributes of boiled eggs of layers fed graded levels of PnSP (Table 5) revealed that taste was (p=0.02) influenced while albumen colour (p=0.33), yolk colour (p=0.69), smell (p=0.09), texture (p=0.28) and overall acceptability (p=0.07) were not influenced.

Feacal egg worms (*Eimeria sp*) were noticed in birds fed control diet while no egg worm was recorded in faeces of those fed supplemented diets containing 0.05, 0.1 and 0.15% PnSP (Table 6). However, about 1200opg and 100opg of *Eimeria sp* and strongyle was noticed in faecal of layers fed control and 0.2% PnSP diets, respectively.

Table 5: Sensory attributes of eggs collected from laying chickens fed diets containing PnSP as natural antioxidant

Parameters	A (Control)	B (0.05_{PnSP})	C (0.10_{PnSP})	D (0.15_{PnSP})	E (0.20_{PnSP})	SEM	P. Value
Albumen colour	7.86	7.29	7.29	7.57	6.86	0.15	0.33
Yolk colour	4.00	3.86	3.71	4.71	3.71	0.24	0.69
Smell	3.00	2.71	3.00	3.14	4.00	0.16	0.09
Taste	7.00^{ab}	6.29^{b}	7.14^{ab}	6.00^{b}	7.86^{a}	0.20	0.02
Texture	5.00	5.57	7.14	5.43	7.14	0.39	0.28
Overall acceptability	7.57	6.86	7.57	6.57	8.00	0.18	0.07

$^{a\ b}$: Treatment values on the same row with different superscripts are significantly different ($p<0.05$). SEM = standard error mean, PnSP= *Picralima nitida* Seed Powder**.**

Table 6: Faecal egg worm count of laying chickens fed diets containing PnSP as natural antioxidant

Parameters	A (Control)	B (0.05_{PnSP})	C (0.10_{PnSP})	D (0.15_{PnSP})	E (0.20_{PnSP})
Faecal egg count/g	1,200 opg	Negative	Negative	Negative	100opg
Identification	*Eimeria sp*	-	-	-	Strongyle

opg= oocysts per gram

Discussion

Egg weight and feed conversion ratio (kg feed / kg egg or kg / feed / tray of egg) were not adversely affected by the dietary inclusion of PnSP even though, there were significant reduction in feed intake which might be a response to bitter taste of PnSP (Olufunmilayo *et al*., 2015). Park *et al.* (2012) and Ooi *et al*. (2018) reported that phytoadditives including turmeric rhizomes, Vietnamese coriander leaves and dayak onion bulbs improved HDP and that is in contrast with the current result. The variation could be that the inclusion levels used in this study were not high enough to elicit any effect on the production responses. Egg quality parameters (Haugh unit, shell thickness, yolk index, yolk colour and egg shape index) and egg proportions were not significantly influenced by dietary inclusion of PnSP. Vekić *et al*. (2011) and Park *et al*. (2012) reported that turmeric as a phytoadditive did not influence egg quality except yolk colour which was enhanced. In contrast, Onwumelu *et al.,* (2023) reported that inclusion *Vernomia amygdalina* and *Ocimum grastissimum* in diets of laying hens caused an increase in yolk weight. Possibly the inclusion level used in this study was not enough to elicit major response on egg production and egg quality.

Generally, phytoadditives like turmeric (Chattopadhyay *et al*., 2004) and curcumin (Riasi *et al.,* 2012), onion extract (An *et al.*, 2015) were reported to exert hypo-lipidemic and hypo-cholesterolemic effects due to the presence of alkaloids present in the plants (Olufunmilayo *et al*., 2015) and this reflected with the use of PnSP. The increase in low density lipoprotein (LDL) at 0.15% and 0.2% inclusion levels of PnSP could not be explained because the values contradicted the very low density lipoprotein (VLDL) which decreased with the use of PnSP. The decrease in the values of VLDL and triglyceride (TG) with the use of PnSP showed that PnSP ameliorated the bad cholesterol and this could be attributed to its antioxidant effect (Adeneye *et al*., 2014 and Nwaogu, 2016). The decrease in triglyceride and VLDL is consistent with the reports of Hayat *et al*. (2009) and Dedousi *et al*. (2022) that the use of antioxidant (Hayat *et al*., 2009) and dried olive pulp (Dedousi *et al*., 2022) in layers diet increased the percentage of Polyunsaturated Fatty Acid (PUFA) in eggs, decreased that of (Saturated Fatty Acid) SFA and improved the PUFA to SFA ratio in a manner proportional to the inclusion rate in the hens' diet. Adeneye and Crooks, (2015) also reported that 25 and 50 mg/kg/day alkaloid fraction of *H. umbellata* administered to rats for 14 days effectively attenuated significant increases in the serum TG, TC, LDL-c, and VLDL-c while HDL-c level decreased, thereby, revealing the anti-hyper-lipidemic activity of PnSP.

Some phytoadditives such as garlic have aromatic compounds that gave end products unpleasant flavour when perceived and consumed, this calls for the sensory evaluation of eggs collected from layers fed PnSP. The panellists were unable to distinguish egg from birds fed diets containing different levels of PnSP and control diet. However, they observed significant influence on taste. The panellist preference for eggs taste were inconsistent, however, the scores are in close range with the results of obtained by Akinwumi *et al*. (2019) and Olugbemi *et al.* (2013) for exotic chickens.

The elimination of *Eimeria sp* oocysts in the faeces of the birds with the use of PnSP suggested anti-parasitic properties of PnSP. This unexpected finding implies that PnSP's effects extend beyond its known anti-oxidative activities, potentially offering a dual benefit of improving egg quality while controlling intestinal parasites.

Conclusion

In conclusion, the use of PnSP had no adverse effect on egg production and egg quality parameters. PnSP reduced triglyceride and VLDL of the egg. The panellist preference for taste was not definite. The use of PnSP could probably help in the control of coccidiosis by reducing or hindering the proliferation of *Eimeria sp* oocysts. The phytochemicals in *Picralima nitida* appear to exhibit multifaceted biological activities, including antioxidant and anti-parasitic effects. These properties make PnSP a promising natural supplement for enhancing poultry health and productivity while reducing reliance on synthetic drugs.

Recommendation

Further research is warranted to elucidate the mechanisms behind PnSP's anti-parasitic action and to optimize its use as a multifunctional feed additive in poultry production systems seeking organic

alternatives to conventional treatments.

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